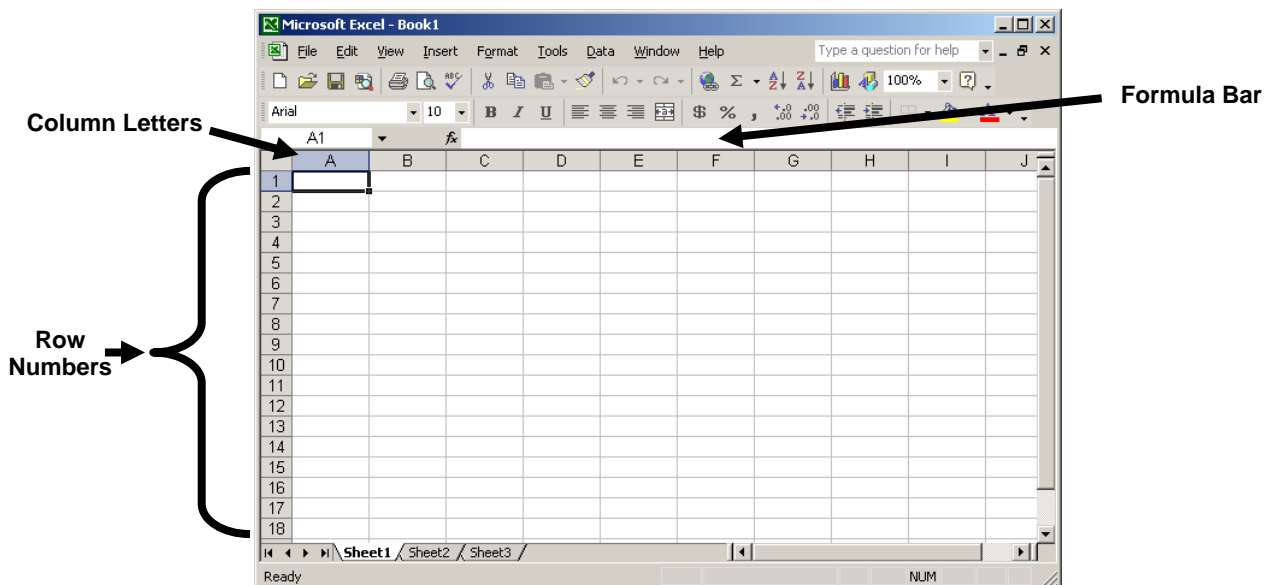


Introduction to Spreadsheets
With Excel 2002-2007
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Spreadsheets are powerful tools for, storing data, making complex calculations, and creating charts and graphs. Originally, spreadsheets and databases were very distinct, but newer spreadsheets have taken over many of the functions of databases. Spreadsheets are still a poor choice for storing very complex data, particularly when several different kinds of data interact with one another (such as in a scheduling program that relates students to teachers to classrooms to courses to course sections); for that kind of task, choose a relational database product like Microsoft Access or Filemaker Pro. However, for most personal needs, a spreadsheet is a good choice.

A spreadsheet consists of a table of cells organized in columns and rows. Columns are designated by letters and rows are designated by numbers, so a particular cell can be identified by its column letter and row number. For example, cell C17 would be in column C row 17.

The figure below shows some of the main elements of a spreadsheet. The picture is from Excel 2002. Excel 2003 looks identical to this. While the overall look and menu structure has changed in Excel 2007, the parts labeled below remain the same.



Data is put into cells, but as you type your data, you type in the formula bar. Some versions of some spreadsheets also show the data in the cells as you type, but you generally want to look in the formula bar and edit the data in the formula bar.

Cells in a spreadsheet are independent of one another. That is, just because a cell is next to another cell or below it does not mean that it has the same kind of information or information about the same kind of thing. However, you are likely to set up your spreadsheet in way that makes sense so cells near each other are related to one another. Most spreadsheets that you create

will be tables with rows and columns. I hear you cry, “The spreadsheet is made up of rows and columns so doesn’t my table have to be in rows and columns?” The answer is “no.” The overall spreadsheet is organized that way, but that does not mean that your data has to be organized that way. You can put anything into any cell and anything else into the cell next to it with no organization at all. However, you generally won’t do that. You might, for example, have a spreadsheet of grades for your students. Row 1 will have headers for the table. The rest of the rows will each have one student in them. Row 2 might be for John Smith and have all his grades; row 3 might be for Juanita Jones and have all her grades, etc.

Moving Around the Spreadsheet



There are several ways to move around a spreadsheet. You can point your mouse to any cell and click. You will notice that the dark box (that is around cell A1 in the above figure) will move to whatever cell you have clicked. Whatever cell is selected will be where your data will go.

You can also move from cell to cell by using the arrow keys on your keyboard. The right arrow key will move you to the right one cell, the left arrow key will move you to the left one cell, the up arrow key will move you up one cell, and the down arrow key will move you down one cell.


You can also use Tab to move to the right, shift-Tab to move to the left, Enter to move down, and shift-Enter to move up.

The following table summarizes the different ways to move around within a spreadsheet.

Keyboard Key or Action	Result	Special Notes
Clicking on a cell	Moves to the cell that is clicked	When entering a formula into a cell, clicking on another cell will insert the cell number into the formula and not move to that cell
Tab key	Move to the right one cell	
Shift-Tab	Move to the left one cell	
Enter	Move down one cell	Enter will try to be smart and move you to the beginning of the next row. Also, in the Options, Enter can be set to enter the information from the formula bar without moving to a new cell, or it can be set to move in a direction other than down.
Shift-Enter	Move up one cell	If Enter is set so that it does not move to a new cell, Shift-Enter will not move to a new cell. Whatever direction Enter is set to move, Shift-Enter will do the opposite (e.g., if Enter is set to move to the right, Shift-Enter will move to the left).

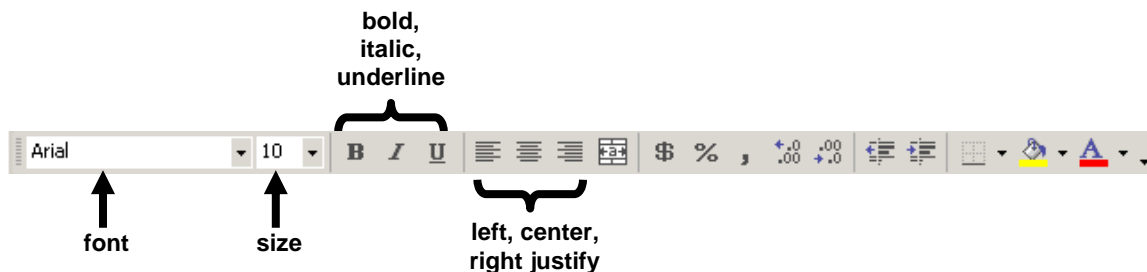
Green check mark  (not green in 2007)	Enter the information in the formula bar without moving	The green check mark appears to the left of the formula bar as soon as you start typing something in the formula bar.
Red X  (only red in 2007 when you point to it)	Cancel whatever is in the formula bar and leave the cell unchanged.	The Red X appears to the left of the formula bar as soon as you start typing something in the formula bar.

Simple Data Entry

The simplest way to enter data is to type it. What you type will show up in the formula bar, and depending on the settings of your computer, in the cell itself. However, the data is not entered into the cell until you accept it. Almost all the methods of moving around will accept the data in the cell, but the most common are to hit the Tab key to accept the data and move to the cell to the right (so you are ready to type in the next cell), hit the Enter key to accept the data and move to the next row, or click on the check mark  to accept the data without moving.

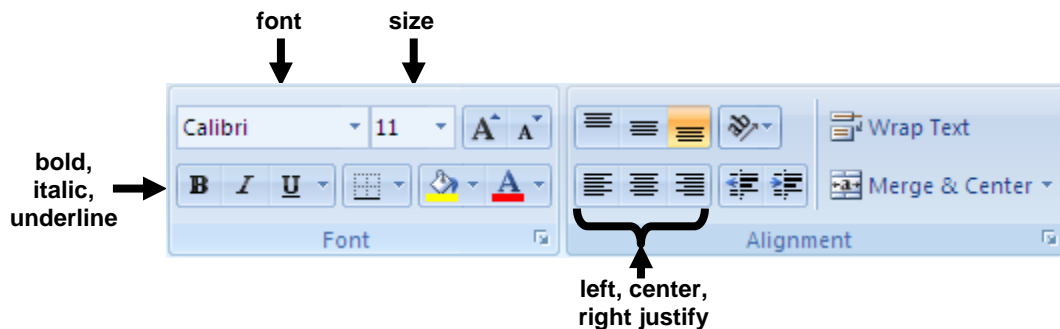
Formatting Data

Once you have entered your data, you will want to format it. You can do many of the things that you do in a word processor within each cell. For example, any individual cell can be made bold or italic or underline; any individual cell can have a different font or font size; and any individual cell can be left, right, or center justified. Simply click on the cell and use the tools in the format toolbar in Excel 2003 and earlier:

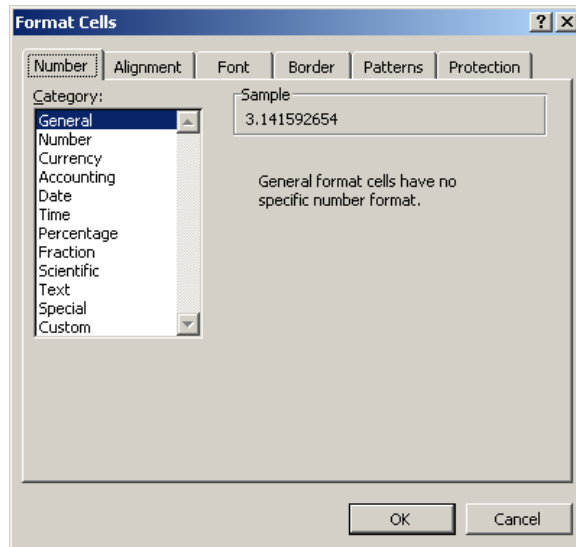


Or click on the cell and choose Cells from the Format menu. Most standard formatting (things you would do with a word processor) can be found in the Alignment or Font tabs.

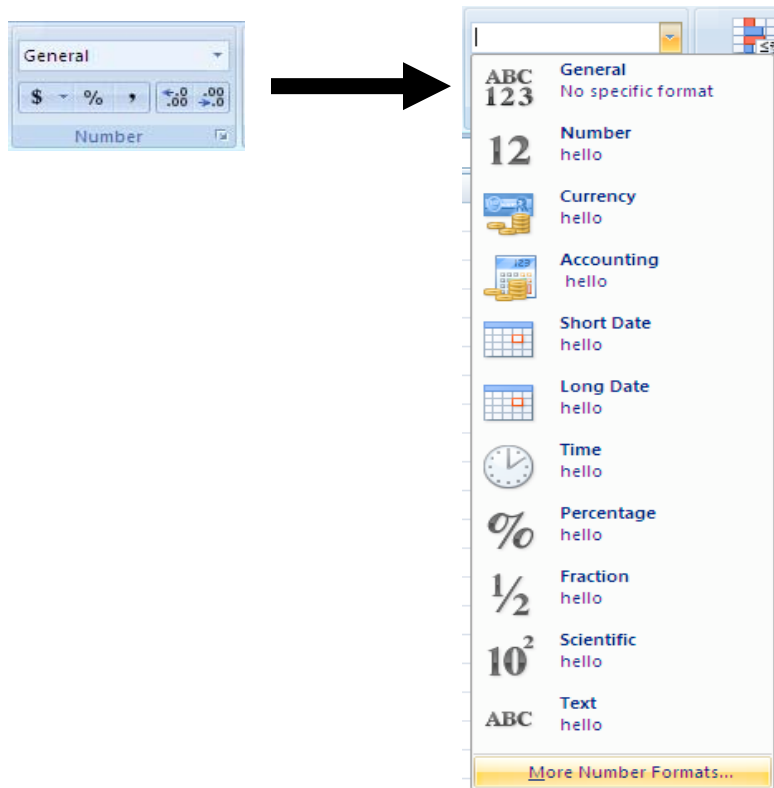
In 2007, you will use the Home Ribbon to do basic formatting:



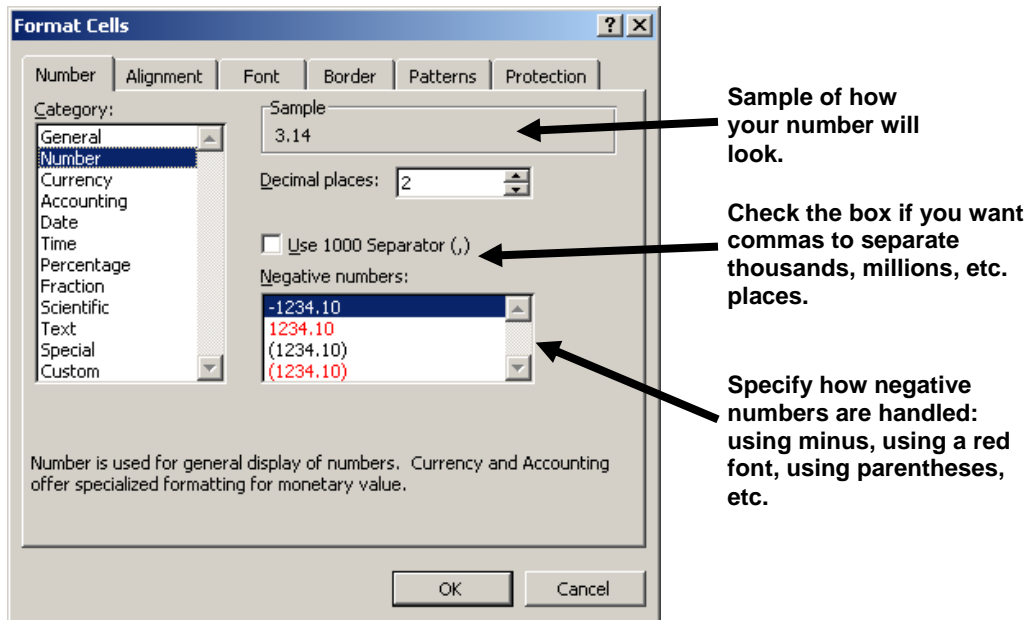
In 2003 and earlier, choosing Cells from the Format menu and clicking on the Number tab, gives you several options for formatting different kinds of data.



In 2007, you can get some basic cell formats in the Number section of the Home Ribbon. You'll see a drop down menu, probably set to General, and you can get several popular format options. If you choose More Options from the pull-down menu, you will see a dialog box similar to the one above.



On the left is a list of types of data that your cell can contain. The General category lets Excel make its best guess as to how to display the data. This works for many things, but not everything. If you choose number or currency, you will have the option to specify how many decimal places should be displayed, whether to separate thousands, millions, etc. places with commas, and how to handle negative numbers.



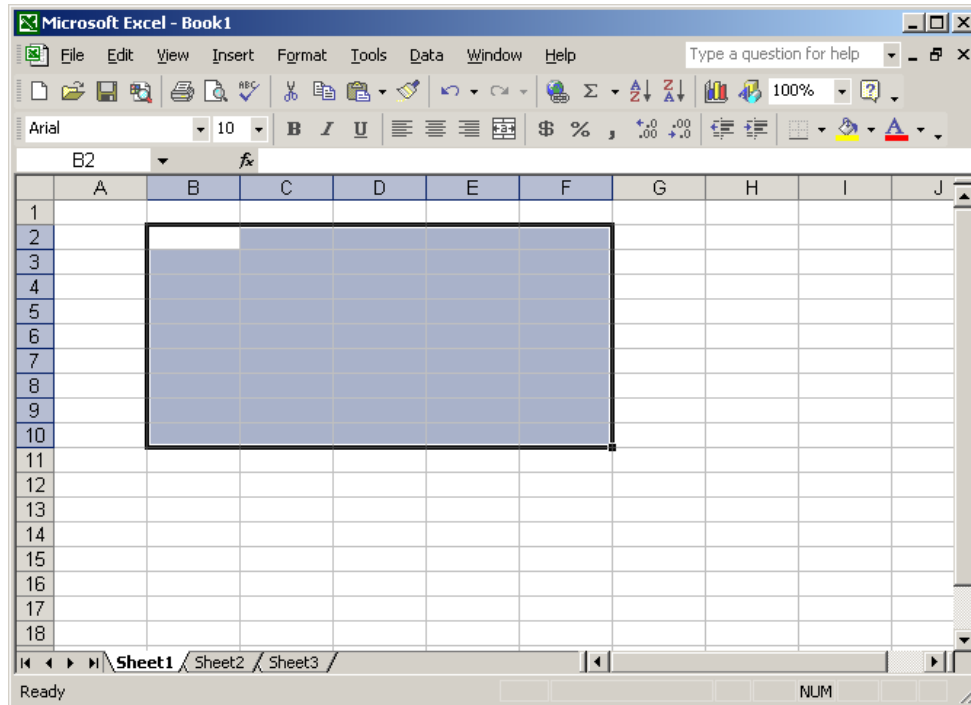
The currency category also gives you the option to choose what currency symbol you want, such as dollars (\$) or pounds (£).

If you are entering dates, you can use the Date category to choose the format of the date to include the month in numbers or words, the day of the week, etc.

Note that changing the format of the number or date does not change the number itself, just how the number or date is displayed. If you accidentally choose to display a number as a date, for example, it will look like a date, but when you change the format back to number, it will look like a number once again.

Formatting Several Cells at Once

Any formatting changes you can make to one cell can be made to several cells at the same time. First, select the range of cells that you want and then change the formatting as described above. You can select an entire row by clicking on a row letter. You can select an entire column by clicking on a column number. And you can select any group of cells by pointing the mouse to the first cell in the group and holding the left mouse button down and dragging across the range.

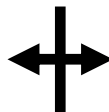


In this picture, you can see that cells B2 through F10 are selected, so any change in formatting will affect all of those cells. You should notice that the entire block of cells has a thick box around it, and all but the first cell are shaded. Even though the first cell (B2 in this case) is not shaded, it is still selected and formatting changes will affect it.

You can also select cells that aren't next to each other by highlighting a block of cells, holding down the Control key (Command or "Apple" key on a Mac) and highlighting another block of cells.

Column Widths

You might notice that as you type data, it might not always fit in your cells. At other times, you might notice that data might fit in your cells with lots of extra room. In the first case, you can't see everything in your spreadsheet. In the second case, you are wasting space. While you won't adjust the width of an individual cell, you can adjust the width of an entire column. To do this, move your mouse between the column letters of two columns until your cursor changes to a line with two arrows pointing out:



When your cursor looks like this, you can either drag the line between the columns to adjust the column size, or you can double-click your mouse. Double-clicking will make the column just the right size to hold the data that is currently in that column.

No Numbers – Just

Sometimes your cells are not wide enough to hold your data. For some things, such as text, Excel will display as much as it can. For other things, such as numbers and dates, it will not. Instead, it will fill the cell with number signs: #####. This indicates that there is something in the cell, but it is not big enough to show the whole thing. This will avoid confusion if, for example, you have typed 100 in a cell, but it is only wide enough to display two digits. You wouldn't want to think that the number in the cell is 10 (if the last digit is cut off). Instead, you will see ##, and you will have to widen the cell's column to see the entire number.

Calculations

Formatting data is very nice and convenient, but you could do most of the formatting in a word processor if that was all you wanted to do. The real power of spreadsheets lies in its ability to calculate.

In the simplest formulas, you use +, -, *, and / to add, subtract, multiply, and divide, respectively. All formulas must start with an equal sign (=) to let Excel know that it is supposed calculate something, not just put the text you type into the cell. If you want to add six and seven, you could type the following:

=6+7

If you want to multiply six and seven, you could type the following:

=6*7


Of course, that is not very powerful. The real power comes when we base our formulas on data that is already typed in the spreadsheet. If you want, to add the contents of cells G2 and H2, you could type the following:

=G2+H2

In the following example, a table lists the number of books read by each of three classes, specifically how many in each class read *The Cat in the Hat*, *Horton Hears a Who*, and *The Lorax*. Cell E3 contains a formula to add the total number of books read by Class A.

	A	B	C	D	E
1	Books Read By Class				
2	Class	The Cat in the Hat	Horton Hears a Who	The Lorax	Total
3	A	12	7	3	=B3+C3+D3
4	B	5	10	1	
5	C	15	0	2	
6					
7					

To enter the cell numbers in the formula, you can either type the cell numbers yourself, or you can click on each cell when it's time to enter that cell in the formula. For example, you might do the following to enter the formula:

- Click on cell E3 to select it
- Type =
- Click on cell B3 (containing the number 12)
- Type +
- Click on cell C3 (containing the number 7)
- Type +
- Click on cell D3 (containing the number 3)
- Click on the check mark  to accept the formula.

The spreadsheet will add up the numbers to get the answer, and it will display the answer (22) in the cell. What's more, the spreadsheet will update that answer if the numbers get updated. That is, if three more students read *The Lorax*, and you change the 3 in cell D3 to 6, cell E3, will automatically change to 25.

The formulas can be more complicated, representing any mathematical expression you can imagine (Excel can do just about anything short of calculus). For example, suppose the books were worth points, and the class with the most points was going to be rewarded with a pizza party. However, *The Cat in the Hat* is a fairly easy book so it is only worth one point. *Horton Hears a Who* is harder so it is worth two points, and *The Lorax* is the hardest of all so it is worth four points. You could type the following formula to determine the total points for each class:

$$=(1*B3)+(2*C3)+(3*D3)$$

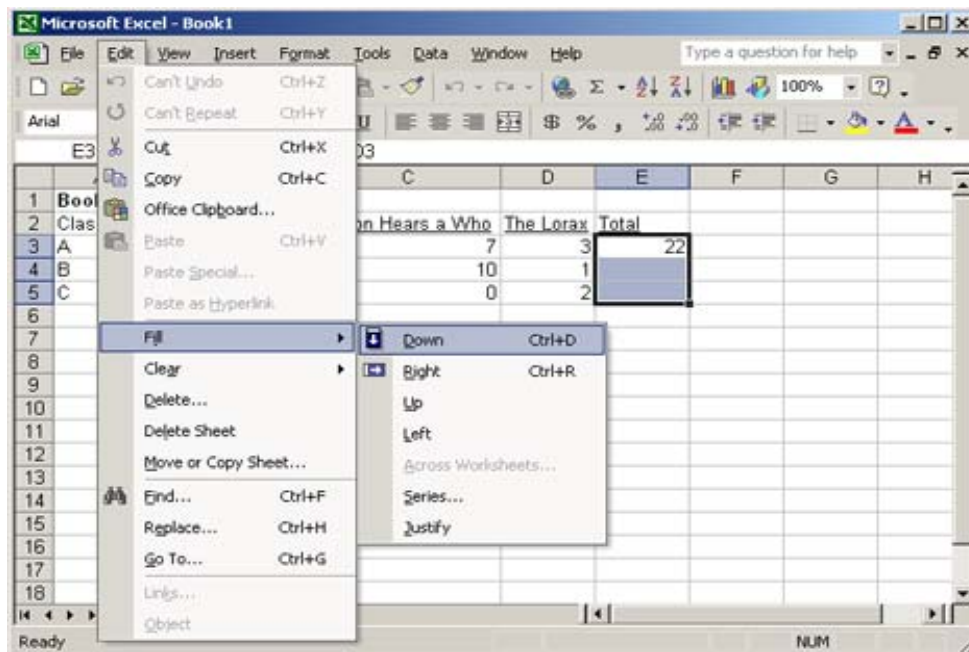
As you try to figure out more complex formulas, be sure to separate any math anxiety you might have from any computer anxiety you might have. That is, figure out how you would calculate what you want to calculate mathematically (if you were going to use pencil and paper or a calculator), then figure out how translate that into something that the computer would

understand. If you suffer from both math and computer anxiety, and you try to create a complex formula for the computer all at once, you could have a nervous breakdown. By worrying about the math first and the computer second, you have a chance to maintain your mental health.

Filling Formulas

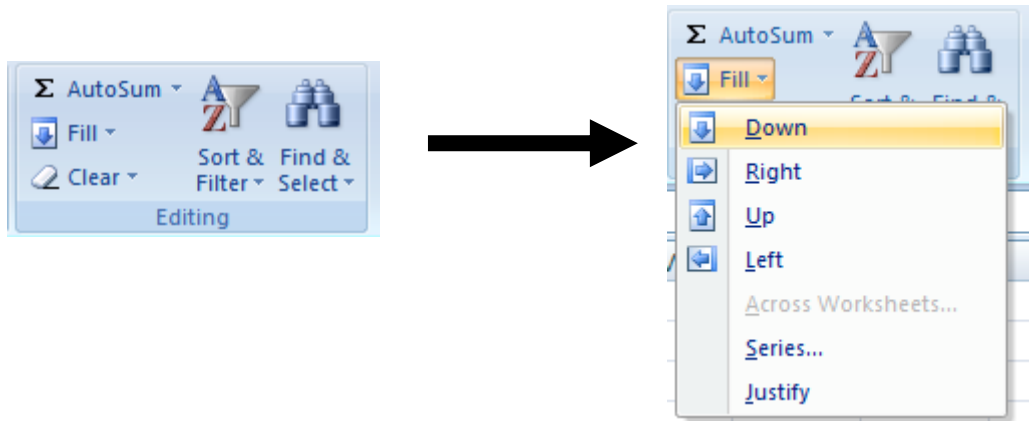
Once you have created a formula for one row of your table, you could do exactly the same thing to create formulas for all your other rows. However, that would be a waste of time. For our three-row example, that wouldn't be a big deal, but imagine a more complicated formula and/or more rows. That could take a very long time. Instead, we will use our friend Fill to do most of the work for us.

Once you have set up the formula in one row, you should highlight all the cells where you want the formula including the cell in which you just put the correct formula. The cell with the formula will be used as the example. In 2003 and earlier, from the Edit menu, choose Fill, and from the menu that flies out, choose Down.



In this figure, notice the highlighted cells and the selection from the Edit menu.

In 2007, Fill can be found on the Home Ribbon in the Editing section (far right of the ribbon):



You will also notice that you can Fill Right, Up, and Left if you create a formula that you need to duplicate to cells that are not below the cell with the formula.

If you click in cell E3, you will see, in the formula bar, the original formula we typed: =B3+C3+D3. If you go down to row 4 and click in cell E4, you will see that the formula is changed slightly: =B4+C4+D4. Excel was smart. It knew that you were adding numbers in row 3 for cell E3, so you would probably want to add numbers in row 4 for cell E4 and row 5 for cell E5. If you don't want Excel to update the row numbers for you, precede each row number with a dollar sign in your formula:

$$=B\$3+C\$3+D\$3$$

Then when you Fill Down, the 3s will not change to 4s. This would be useful if we used the point system, but we included the point values for our book in row 3.

The screenshot shows an Excel spreadsheet titled 'Microsoft Excel - Book1'. The formula bar displays the formula $=B\$3*B4)+(C\$3*C4)+(D\$3*D4)$. The spreadsheet contains the following data:

	A	B	C	D	E
1	Books Read By Class				
2	Class	The Cat in the Hat	Horton Hears a Who	The Lorax	Total
3	Pt. Value	1	2	3	
4	A	12	7	3	35
5	B	5	10	1	28
6	C	15	0	2	21
7					
8					

In this example, the only thing we don't want to change are the cell numbers for the point values so they have dollar signs (B\$3, C\$3, and D\$3), but we do want to change the row numbers for the number of books read so those numbers do not have dollars signs (B4, C4, and D4).

Functions

Many things that you want to do can be done with simple formulas using +, -, *, and /. Sometimes, however, the formulas get very long and cumbersome, and other times what you want to do is more advanced and can't be done with simple operators. Excel has a large number of built-in functions. These functions can do a wide range of arithmetic, statistical, and logical operations. Excel can do just about anything short of calculus.

Remember, you don't always need functions +, -, *, and / will work, but functions can save you time. The simplest function is the SUM function. SUM can be used to add together a bunch of numbers. In our earlier example, we used + to add together the number of books read (=B3+C3+D3). This could also be done with the SUM function:

=SUM(B3,C3,D3)

When SUM is used in this way, it looks at each number inside its parentheses and adds them together (note that the numbers are separated by commas). Alternatively, you could use:

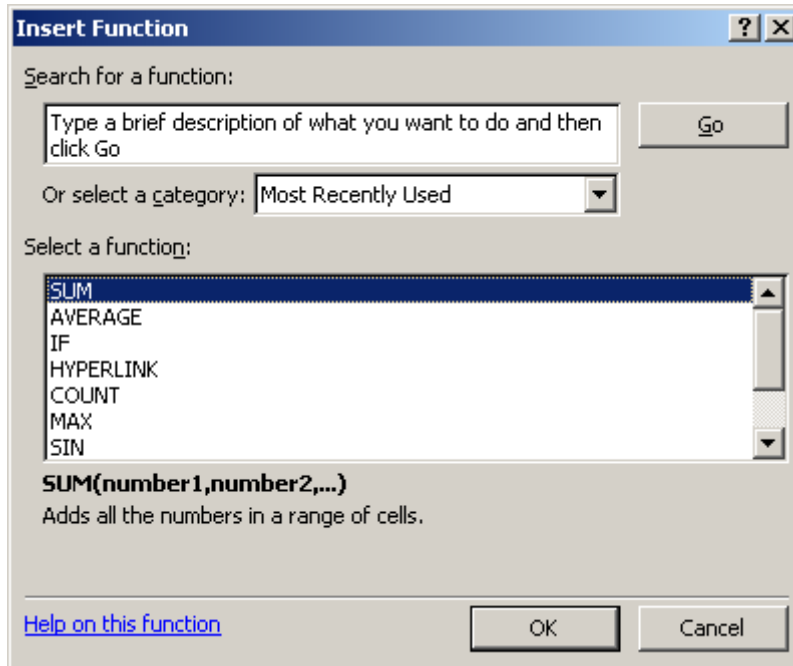
=SUM(B3:D3)

This adds together a range of cells from B3 through D3. They both work the same, but B3:D3 is easier to type than B3,C3,D3, and much easier if you are adding up more than three numbers.

As you type formulas, you don't have to type cell numbers. You can click on cells instead of typing their cell numbers. For a range of cells, instead of typing or clicking, you can drag your mouse across the range of cells, and the range will be automatically entered into your formula.

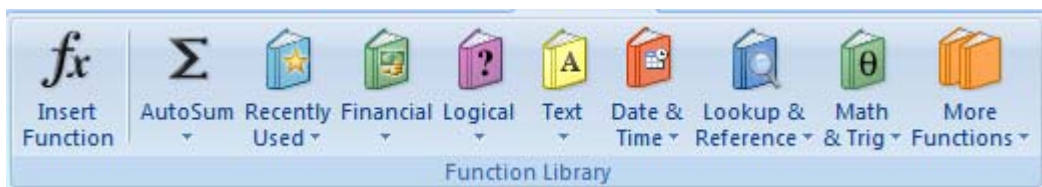
The most common functions you can use are SUM, AVERAGE, MIN, and MAX (to add up numbers, find the average of numbers, find the smallest of a group of numbers, and to find the largest of a group of numbers). Each of these functions works in the same way with cell numbers separated by commas or a cell range.

While you can type in the name of the function as described above, you might want to insert it from a menu. Let's use our earlier example and add a row at the bottom to calculate the average number of each book read by all the classes. To do this in 2003 or earlier, I would click on an empty cell at the bottom of Column B and choose Function from the Insert menu. A dialog box will pop up that looks like the following:



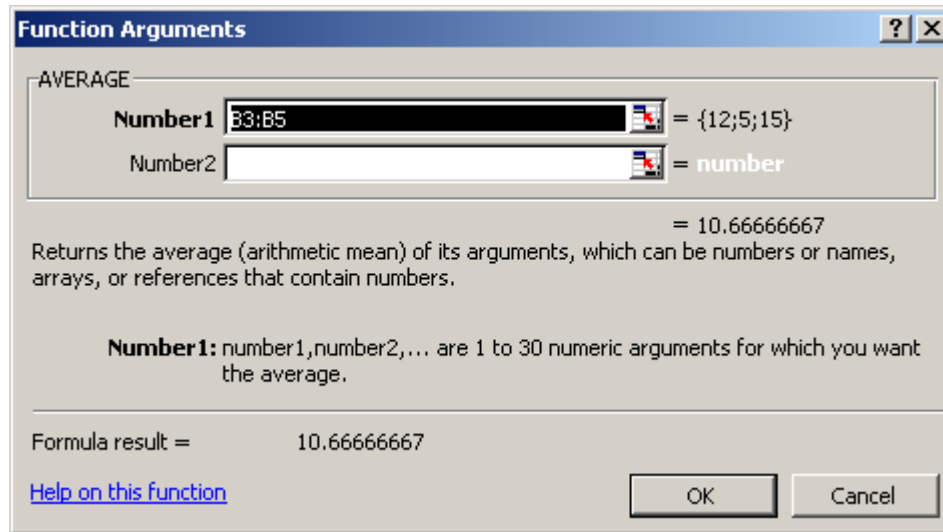
The drop-down menu allows you to select a category of functions. Often what you want will be listed under the “Most Recently Used” category. If it’s not, you will have to choose a category. Because I can never remember what category anything should be under, I usually choose “All” to show all the functions. I can never remember, for example, if AVERAGE should be found under the “Math & Trig” category or the “Statistical” category. By choosing “All,” you see a long list of functions in the bottom portion of the dialog box. Use the scroll bars to scroll through until you see the function you want.

In 2007, you can get to the same menu by choosing the Formulas Ribbon and clicking on the Insert Function button on the far left of the ribbon. Alternatively, you can choose a category from one of the categories and pick a function from the drop-down menu.



If you are not sure which function you want, you can either search for a function by describing it, or you can click on a function and look at the bottom of the dialog box for a description of that function.

In our case, we want the AVERAGE function. If you click on the AVERAGE function and click OK, you will be presented with another dialog box:



I call this dialog box, “The Dialog of Guessing.” In this dialog box, Excel has tried to guess what you want to average. It has guessed B3:B5; i.e, the range of cells from B3 through B5. In this case, it is correct. Unfortunately, I find that it is wrong over half the time so I usually ignore what it has guessed.

If Excel is wrong (or you want to ignore its guess because it is often wrong), you can simply click OK and ignore what it has typed in the formula bar. What it has done isn’t entirely useless because the dialog box gave you a description of the function and information about how it is used.

Once we click OK, we get the following in the formula bar:

=AVERAGE(B3:B5)

To ignore this, delete what is between the parentheses so you have:

=AVERAGE()

Be sure your cursor is flashing between the parentheses. Now, you can either type cell numbers separated by commas:

=AVERAGE(B3,B4,B5)

or click on cell numbers separated by commas

- Click on B3
- Type a comma
- Click on B4
- Type a comma
- Click on B5
- Type a comma

or drag your mouse across a range of cells to get:

=AVERAGE(B3:B5)

Notice that this is the same as what Excel guessed, but that won't always happen. As you drag the mouse across a range of cells, notice that the numbers inside the parentheses change automatically.

Sample Calculations

The following page shows a spreadsheet with some example calculations. The table that follows shows the formulas in each of the cells that use formulas. This spreadsheet should give you ideas of some of the things that you can use formulas to calculate. It includes formulas that were described earlier and formulas that were not. It uses + for addition as well as SUM and AVERAGE functions. It uses the COUNT function to count the number of Xs in a range of cells. It uses the IF function to determine the correct gendered pronouns in rows 14 through 18, checking in column B for the gender and putting the correct male or female pronoun in columns C through E. Finally, it shows a sample gradebook in which homeworks are worth 10% of the grade, quizzes are worth 40% of the grade and tests are worth 50% of the grade. The formula to calculate the average is somewhat complex but realistic for a gradebook. The last column uses a fairly complex series of IF statements to convert the numerical average to a letter grade.

With these examples, you might be able to figure out how to use some of these functions, but these are merely examples to show you the range of possibilities of what Excel can do.

Microsoft Excel - formulas.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

Arial 10 B I U \$ % , .00 +.00

H5 =H3+H4

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Some sample spreadsheet formulas												
2	AVERAGE				SUM			ADD					
3	99				99			27					
4	100				100			46					
5	75				75			73	←--Add two number without the SUM function				
6	47				47								
7	80.25	←--Average of A3 through A6			321	←--Sum of E3 through E6							
8													
9													
10	Count X's	X		X		X	X	4	←--Counts the number of X's in cells B10 through G10				
11													
12													
13	Name	Gender	he/she	him/her	Mr./Ms.								
14	Joe	m	he	him	Mr.	←--Cells C14 through E18 contain formulas that base the entry on column B							
15	Juan	m	he	him	Mr.	←--							
16	Juanita	f	she	her	Ms.	←--							
17	Leah	f	she	her	Ms.	←--							
18	David	m	he	him	Mr.	←--							
19													
20	Weighted Average (Column J) With Calculated Letter Grade (Column K)												
21	Name	HW1	HW2	QUIZ1	HW3	QUIZ2	HW4	TEST1	TEST2	AVERAGE	LETTER		
22	Joe	92	87	36	44	72	91	83	80	70.2	C		
23	Juan	76	86	96	72	82	92	90	88	88.25	B		
24	Juanita	90	100	99	98	92	89	91	93	93.625	A		
25	Leah	41	72	87	86	91	81	72	73	78.85	C		
26	David	99	86	68	61	59	87	53	51	59.725	F		
27													

Sheet1 / Sheet2 / Sheet3

Ready NUM

Cell	Formula
A7	=AVERAGE(A3:A6)
E7	=SUM(E3:E6)
H5	=H3+H4
H10	=COUNTIF(B10:G10,"X")
C14	=IF(B14="m","he","she")
C15	=IF(B15="m","he","she")
C16	=IF(B16="m","he","she")
C17	=IF(B17="m","he","she")
C18	=IF(B18="m","he","she")
D14	=IF(B14="m","him","her")
D15	=IF(B15="m","him","her")
D16	=IF(B16="m","him","her")
D17	=IF(B17="m","him","her")
D18	=IF(B18="m","him","her")
E14	=IF(B14="m","Mr.,"Ms.")
E15	=IF(B15="m","Mr.,"Ms.")
E16	=IF(B16="m","Mr.,"Ms.")
E17	=IF(B17="m","Mr.,"Ms.")
E18	=IF(B18="m","Mr.,"Ms.")
J22	=(0.1*AVERAGE(B22,C22,E22,G22)+0.4*AVERAGE(D22,F22)+0.5*AVERAGE(H22,I22))
J23	=(0.1*AVERAGE(B23,C23,E23,G23)+0.4*AVERAGE(D23,F23)+0.5*AVERAGE(H23,I23))
J24	=(0.1*AVERAGE(B24,C24,E24,G24)+0.4*AVERAGE(D24,F24)+0.5*AVERAGE(H24,I24))
J25	=(0.1*AVERAGE(B25,C25,E25,G25)+0.4*AVERAGE(D25,F25)+0.5*AVERAGE(H25,I25))
J26	=(0.1*AVERAGE(B26,C26,E26,G26)+0.4*AVERAGE(D26,F26)+0.5*AVERAGE(H26,I26))
K22	=IF(J22>=90,"A",IF(J22>80,"B",IF(J22>70,"C",IF(J22>60,"D","F"))))
K23	=IF(J23>=90,"A",IF(J23>80,"B",IF(J23>70,"C",IF(J23>60,"D","F"))))
K24	=IF(J24>=90,"A",IF(J24>80,"B",IF(J24>70,"C",IF(J24>60,"D","F"))))
K25	=IF(J25>=90,"A",IF(J25>80,"B",IF(J25>70,"C",IF(J25>60,"D","F"))))
K26	=IF(J26>=90,"A",IF(J26>80,"B",IF(J26>70,"C",IF(J26>60,"D","F"))))