SAMLab Tip Sheet #3
Using Excel's Function Library

Perhaps the most powerful feature of Excel is its enormous library of functions. These are mini-programs within Excel that will perform specific tasks given the proper input. This tip sheet describes how to use functions and introduces some of the most basic and frequently used functions.

Function Structure

Just like the formulas described in Tip Sheet #2, **the content of all cells containing functions must begin with an "=" character**. Additionally, all functions look similar inside a cell; you see the function name followed by the input in parentheses. The input can be a cell reference(s), a number(s), and/or an array(s). Below is a schematic.
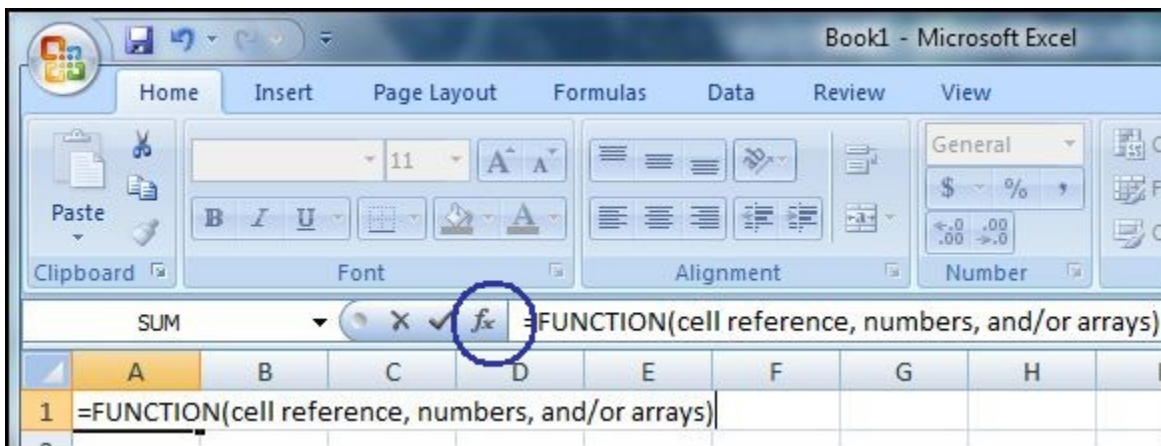

Using Functions (aka Paste Functions)

Functions can be accessed in many ways, but we'll discuss the three most common and perhaps the easiest methods. First, you can just type them directly into a cell or the formula bar, which works well with basic functions. Second, you can click the "f_x" button (circled above), or third, you can select the "Formulas" tab from the top (circled in red below) and "Insert Function" (circled in blue below).
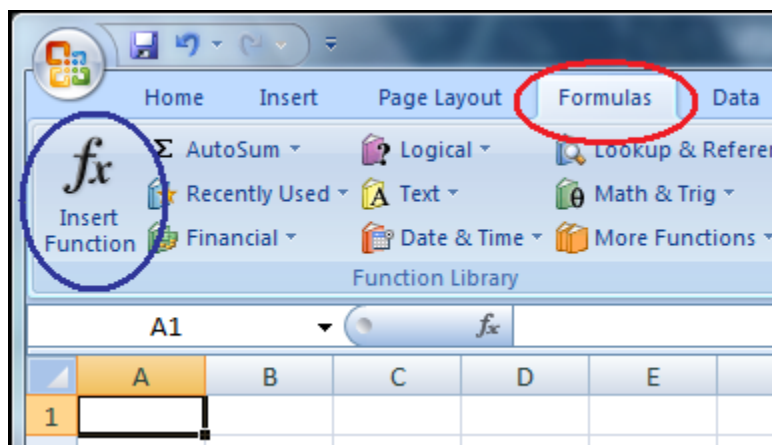

Selecting either the "f_x" button or choosing "Insert Function" from the "Formulas" tab is best for using more complex functions. Both selections will lead you to the screen shown on the next page.
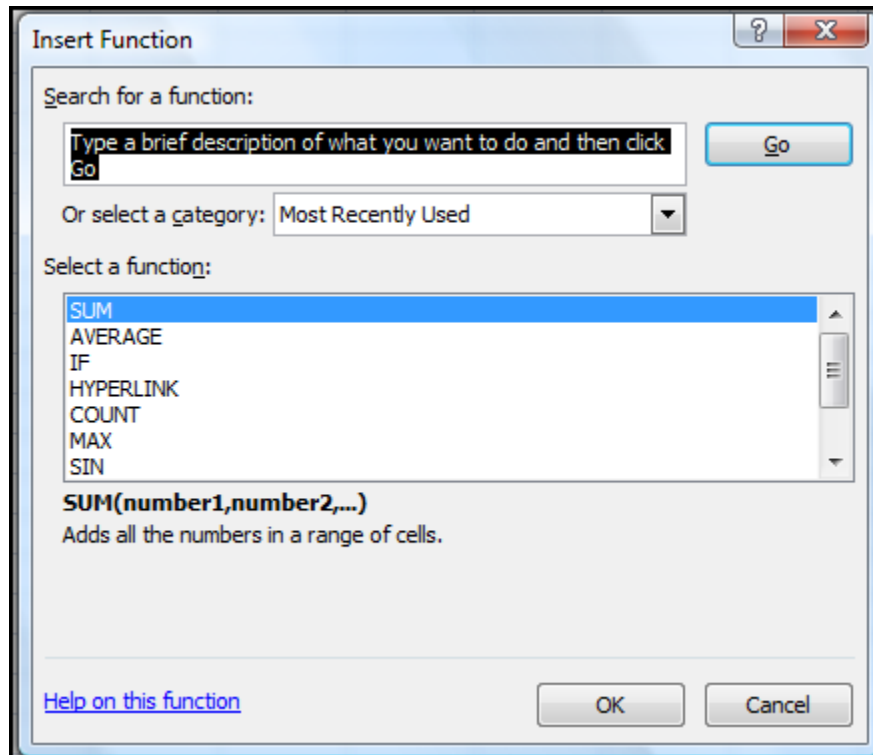
The screen is set up to be intuitive. On top is a menu of functions (located to the right of "Or select a category:"), and the functions in that category are displayed below (directly underneath "Select a function:") Look at the pictures below for how to select the SUM function. (Note: you can also access the SUM function by clicking on the Σ button located in the "Editing" section under the "Home" tab).
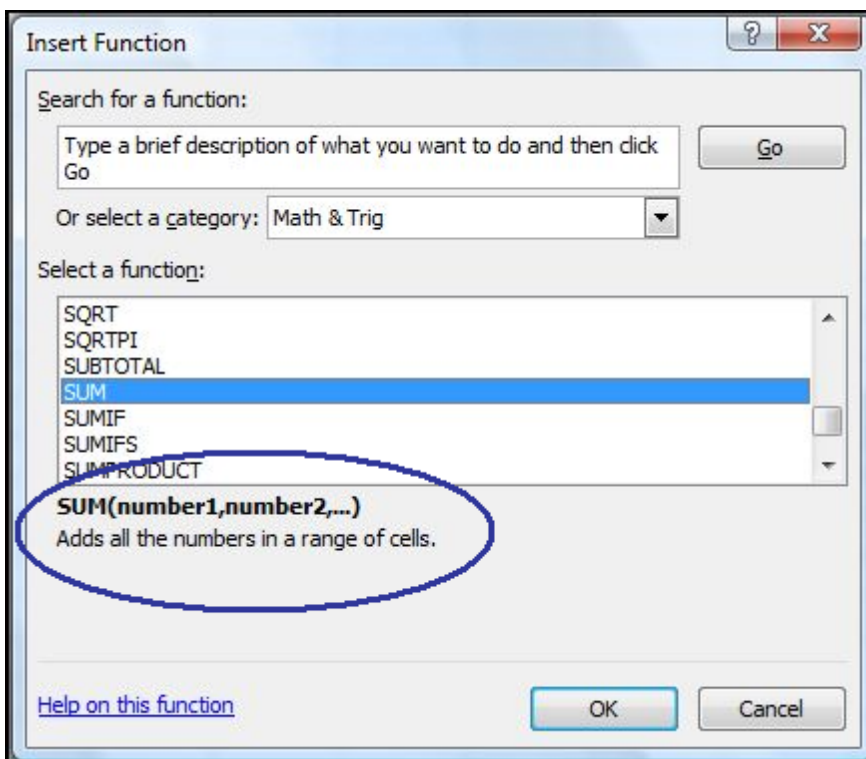
After selecting out category, "Math & Trig" in this case, we scroll down below to find SUM. A description of what the function does is given below the list of categories (circled). After pressing OK, the window on the next page appears.

SUM

Number1 [|] 🔲 = *number*

Number2 [ ] 🔲 = *number*

=

Adds all the numbers in a range of cells.

Number1: number1,number2,... are 1 to 255 numbers to sum. Logical values and text are ignored in cells, included if typed as arguments.

Formula result =

Help on this function   [OK]   [Cancel]

The field labeled "**Number 1**" will be where we input the numbers or cell references we want to sum. You can put one number, a cell reference, or a cell reference array in each field. The picture on the next page shows how to accomplish this

With the cursor flashing in a field ("Number 1," "Number 2," or "Number 3"), type in a number or click on the cell you wish to reference (shown above). To reference an array, place the cursor in the field as above but select the array (shown below). You can also simply type the array's reference.

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This is the value of the entire formula in the cell. It might be different from the value of the function (e.g., if there are two or more functions in the cell).

Notice that Excel displays the results of the function before you press ENTER.

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Functions can also be typed directly into the formula bar. On the left below even the cell references have been typed directly into the cell as opposed to clicking on the cells (below right).
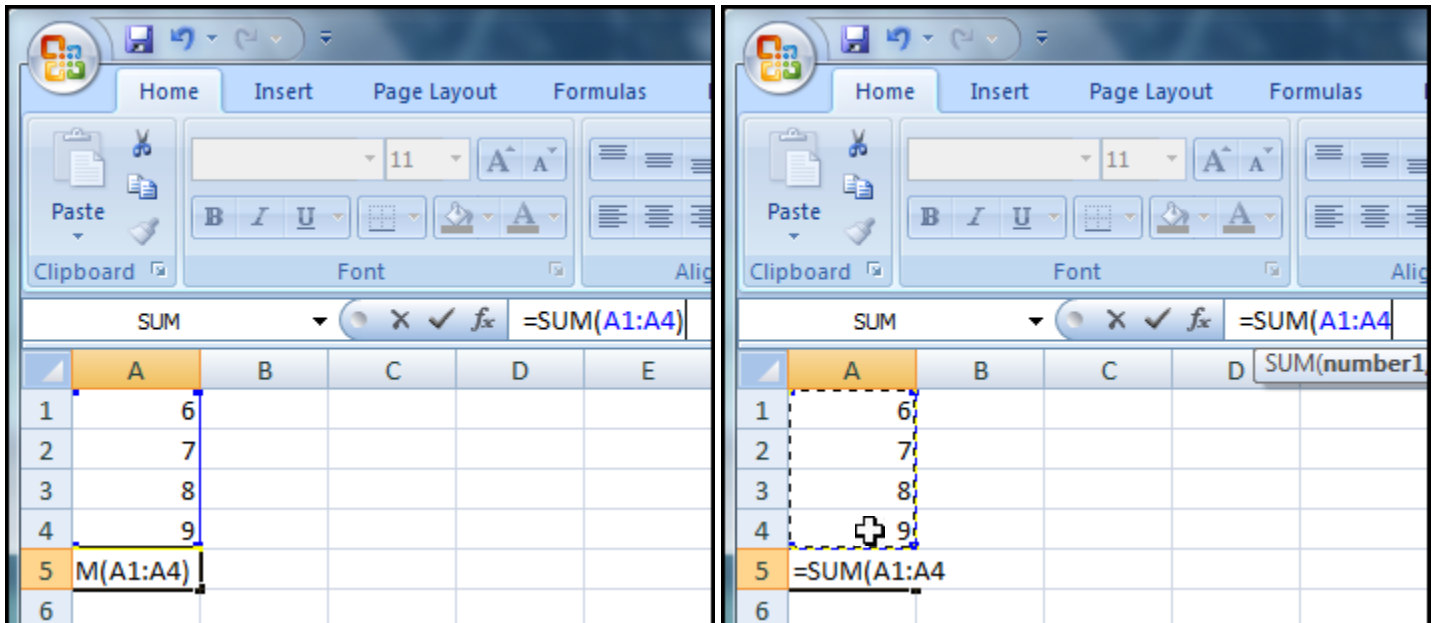
Excel's functions can also be used in other formulas. For example we can divide two squared sums.
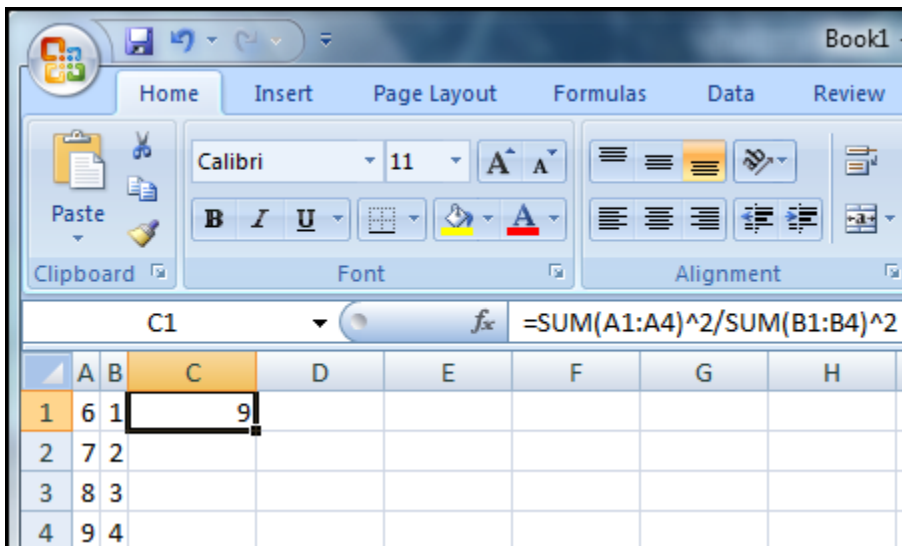
Here it's important to see that **Excel adds an extra step to the PEMDAS order of operations**. Excel will always evaluate the functions before doing any other calculations. Check the math yourself to verify this.

Below, some basic and frequently used functions and their uses are listed.

- SUM — Provides the sum of an array of numbers
- SQRT — Provides the square root of a number (same as raising the number to the ½ power)
- AVERAGE — Returns the arithmetic mean of an array of numbers
- POWER — Raises a number to any power (same function as "^" character)
- QUOTIENT — Provides only the integer portion of a division (no remainder)
- ROUND — Rounds a number to a specified number of digits

Obviously, there are many other functions in Excel's library. Taking a little time to explore the library to see what's available can be extremely helpful for future projects.