Microsoft Excel 2013: Formulas and Functions
June 2014

Description
Excel has hundreds of formulas and functions. We will explore how to create a formula, copy and manipulate calculations, work with functions and operators, and handle relative and absolute references.

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Learning Objectives
• Creating a formula with operators
• Using and adapting basic functions
• Exploring function arguments
• Relative and absolute references

Web Resources
• Microsoft Office Online Training (http://office.microsoft.com/en-us/training/).
• Safari Tech Books Online – electronic books. Type “Safari” in Penn Libraries FindIt box to get the link.
• Lynda.com video tutorials – Weigle information Commons and the Vitale Digital Media Lab have a site license to Lynda.com (http://wic.library.upenn.edu/wicideas/lynda.html).
• Google!
**References & Cell Addresses**

A reference or cell address identifies a cell or a range of cells on a worksheet and tells Excel where to look for the values or data you want to use in your formula. Addresses are made up of a column letter and a row number. No two cell addresses are the same. Example: B1 or C3

**Formulas**

An Excel formula is a mathematical operation used to calculate a value.

- All formulas begin with an (=) equals sign and may consist of functions (i.e. SUM, AVE) or math operators.
- Formulas can include numeric values, but more often they contain cell references (e.g. A1). When you use cell references in a formula, allows you to make changes to the data in the spreadsheet without having to update the formula. Enclose cell ranges in parentheses.

The following are the basic math operators.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exponentiation</td>
<td>^</td>
</tr>
<tr>
<td>Multiplication</td>
<td>*</td>
</tr>
<tr>
<td>Division</td>
<td>/</td>
</tr>
<tr>
<td>Addition</td>
<td>+</td>
</tr>
<tr>
<td>Subtraction</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note:** When concatenating several text cells, instead of using “+” you should use “&”.

**Order of Operations**

Excel follows the basic “Order of Operations.” From left to right, it calculates as follows:

1. Parentheses (Brackets)
2. Exponents
3. Multiplication and Division in the order they appear
4. Addition and subtraction in the order they appear

**Quickly enter a formula in multiple cells**

1. Select the cells where you want the formula to go
2. Type the formula into the cell (but don’t press ENTER just yet)
3. Hold the CTRL key down, then press ENTER
Functions

Excel has a number of built-in functions available, which analyze data and simplify formulas. Some of the categories available are mathematical, statistical, and financial functions.

All functions start with a function name followed by a list of parameters enclosed within brackets i.e. =FUNCTION (parameters). It is possible to type a function or choose one through the function wizard.

Three ways to add a functions

1. Manually with Function AutoComplete
   - Start typing formula in cell you want the calculated value to appear. A drop down box appears with functions.
   - Select a function and enter an open parentheses followed by cell references or numeric values.
   - Close parentheses, and hit Enter to see the calculated value.
2. Formula Ribbon, Function Library group.
3. Function Insert Dialog Box: fx located next to formula bar OR on the Formula ribbon (far left)

Most frequently used functions

Includes SUM/AVERAGE/COUNT/MAX/MIN

- The formula =SUM (A1:A100) will add up all the values entered in cells A1 through A100. The colon indicates a cell range. You may type the range in the formula manually or click and drag your mouse to select the cells.
- The formula =AVERAGE (A1, A3, B2:B10)*.5 will calculate the average of values A1, A3 and cells B2 through B10 and then multiply the average by .5

Logical functions

Includes AND/OR/IF/IFERROR/NOT/TRUE/FALSE

- AND - Returns TRUE if all of its arguments are TRUE
- OR - Returns TRUE if any argument is TRUE
- IF - Specifies a logical test to perform, e.g. IF (A1>60,”Passed”, ”Failed”) means If the grade in cell A1 is greater than 60, put the word Passed in this cell, otherwise put the word Failed.

Note: Logical functions can be combined with other functions, like SUM/AVERAGE/COUNT and so on to calculate cells in a range that meet certain criteria, such as SUMIF/SUMIFS.
Other functions

Excel provides functions categorized in different sections, see the following link for comprehensive list of functions in Excel:


Relative and Absolute References

Relative and absolute references behave differently when copied and filled to other cells. Relative references change when a formula is copied to another cell. Absolute references, on the other hand, remain constant, no matter where they are copied. Using dollar sign “$” to fix the direction you want to freeze, i.e.

A1 – relative reference, when copied to another cell, both the row and column numbers will change

$A1 – the column number is fixed

A$1 – the row number is fixed

$A$1 – both the column and row numbers are fixed