

Beginner Excel Tutorial: Tables, Cells, and Formulas

Understanding the basics of excel and its core functions

Disclaimer

The purpose of this tutorial is simply to provide an introduction to a variety of topics in Microsoft Excel. It is in no way a substitute for a full for-credit course on Excel, and should students want to pursue Excel on a more serious level they should look to the university courses on the subject

A note on the background of Excel:

The first ever spreadsheet software came about in the late 70's with the program VisiCalc, which stood for "visible calculator". While it was a spreadsheet software, it focused most heavily on being a fast way to make calculations on a personal computer. The second iteration of spreadsheet software was known as Lotus 1-2-3. Lotus 1-2-3 was the birthplace of most of the capabilities we think of when we think of Excel. Lotus 1-2-3 took the calculator software and added charting, plotting and database abilities, as well as introduced naming cells, cell ranges and macros. Excel, which came about in the late 80's, took all the functionality of Lotus 1-2-3 and improved on the user interface, creating seamless drop down menus and adding point and click abilities. By the mid 90's/Early 2000's, Excel had become the leading spreadsheet software and it continues to hold that title today.

More history at: <https://www.cs.umd.edu/class/spring2002/cmsc434-0101/MUIseum/applications/spreadsheethistory1.html>

Getting to know excel

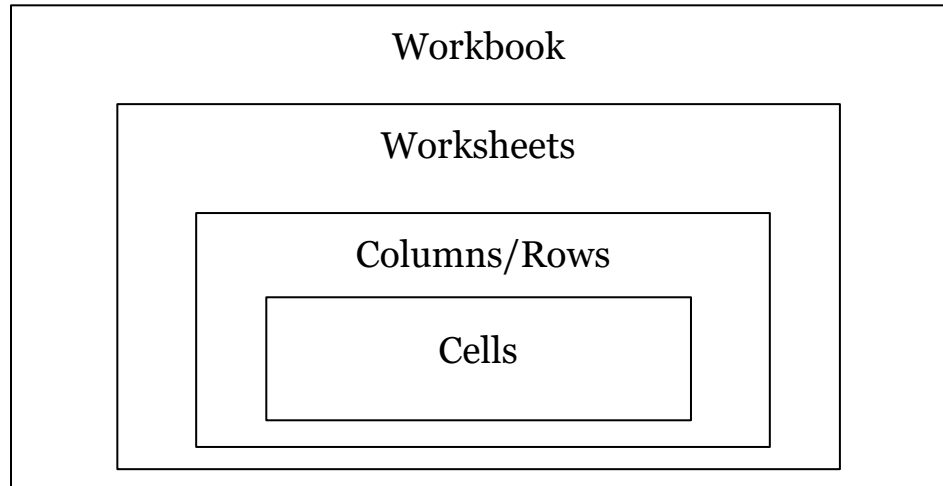
The first step to learning excel is getting to know the vocabulary that is commonplace in the Excel universe. In excel, every new file that you create is called a **workbook**, this is the .xlsx (or .xlsm if you are using VBA, but we'll get to that later) file that you save on your computer when using Excel.

Within every workbook, your data will be organized into **worksheets**, or more commonly known as *sheets*. You can have as many sheets in a workbook as your physical memory allows, but you must have at least one sheet in any workbook. While you could easily do all of your work for some projects on a single sheet in excel (if your project is small enough), for organizational purposes it is often best to add a new sheet with every step of your project. Think of them like paragraphs in an essay, they help you organize your thoughts.

On every worksheet you will be faced with a grid of rectangular **cells**. These cells are divided into **columns** and **rows**. Columns are labeled with letters, the leftmost column being "A", while rows are labeled using numbers, the top row being "1". Every cell has an address that is

determined by the column and row that they are in. The cell in the top left hand side of the sheet is always “A1” for example.

Here is a visual:



Tabs

File: Standard microsoft suite tab. Where we go to save and open workbooks

Home: Formatting for text, cells, and tables

Insert: Insert a table, pivot table, charts, pivot charts, images, and slicers

Page Layout: Set up your workbook for sharing and printing

Formulas: Library of available formulas, name manager (for named ranges/cells), find precedents and dependents of cells, and calculate your sheets.

Data: Connect to outside data models, refresh data models, basic sorting, filtering and grouping

Review: Spell check, commenting, protecting sheets from view (password protected sheets)

View: Changes the view for the user interface, hide gridlines and formula bar, freezing panes

Developer: Where we access visual basic and macros. Will be used in the advance Excel tutorial

Our problem:

We run the Nintendo Corporation. Our company employs 151 pokemon as our workers, and each one works as a salesperson (or “Sales-pokemon”) selling pokeballs. Unfortunately, since our early success in the 90’s when the pokeball market was booming, demand for pokeballs has severely decreased. As a result, our company needs to downsize. We will need to cut 5 of our employees. How should we decide who to let go?

Raw data

Download the raw data file for this tutorial.

Keyboard shortcuts: While I tend to leave shortcuts to more advanced users of excel, there are a few shortcuts that are especially helpful for beginners. These are “ctrl” and “ctrl + shift”. Pair these with your arrow keys to quickly jump around your excel sheet and select large groups of data.

We will start by getting rid of all the formatting that is applied to the cells. There are two ways to do this:

- Select all the data in the table, go to the **Home** tab, and under “cell styles” select “normal”
- Select all the data on the table, copy it to your clipboard, and paste it onto a new sheet using the “paste values” option

Different Paste Special options:

Paste Values: Pastes only the raw values in the cells, no formatting or formulas carried over. Good for playing with raw numbers outside of your data model

Paste Formulas: Only pastes the formulas, good to apply old calculations to new datasets

Paste Formatting: Only pastes the formatting (coloring/sizing/alignment). Good for making sheets look more visually consistent

Transpose: Takes the data and rotates it 90 degrees, turning horizontal data into vertical data and vice versa. Good for reorganizing datasets

Creating a Table

Now that we have our data looking cleaner, let's create a table so we can do some more detailed analysis. There are two ways to create a table:

- Select your data, go to the insert tab and select “table”
- Select your data, then use keyboard shortcut “Ctrl-T”

Adding Columns

We want to get some more descriptive information about these pokemon employees. To do so, we will be creating a series of columns on this table that are calculated using excel formulas.

Before we create these columns, we will discuss how formulas in excel work and the different types of formulas.

R1C1 v.s. A1 format

R1C1 format came out of the earlier spreadsheet softwares prior to Excel, and while we won't be using it in this tutorial, understanding it helps you understand how Excel formulas work. At its core, Excel uses R1C1 format in the backend, and simply translates that format into A1 format for the user. In R1C1 format, a cell's row address is the same as it would be for A1 format (Row one being the top of the page), but the cell's column address uses numbers instead of letters.

Examples:

	A1 Format	R1C1 Format
Cell Address	A1	R1C1
Cell Address	B2	R2C2
Cell Address	H10	R10C8

The biggest difference between the two is when writing formulas. In A1 format, it seems that Excel just magically knows how to change the formula inputs based on how you drag/move formulas throughout your sheet. Let's compare the two.

A1 Format:

	A	B	C
1	2010	2011	Total
2	56	10	=A2+B2
3	67	71	=A3+B3
4	25	72	=A4+B4
5	49	69	=A5+B5

R1C1 Format:

	1	2	3
1	2010	2011	Total
2	56	10	=RC[-2]+RC[-1]
3	67	71	=RC[-2]+RC[-1]
4	25	72	=RC[-2]+RC[-1]
5	49	69	=RC[-2]+RC[-1]

If you do the same calculation in R1C1 format, you will see that the formula is actually not actually changing at all between cells. This is because formulas in Excel are **relative** and simply calculate based off of the location of the two cells in relation to each other.

Source for images:

<https://excelmate.wordpress.com/2013/04/22/excel-r1c1-reference-style-vs-a1/>

Formulas

Now that you understand how formulas work, we can look at the different types of formulas.

The Basics

When writing any formula in Excel, you must start by typing an “=” sign into the cell where you want your formula. This is how excel knows to treat this cell as a formula and not just as text.

Formula Types

Logical: These functions are great for doing conditional analysis. They include functions like AND(), OR(), IF(), TRUE(), and FALSE()

Date & Time: They functions serve many purposes, but they are all based around excel being able to convert the day and time of any date into an integer and make calculations on it accordingly. Useful ones include DAY(), MONTH(), YEAR() and TODAY()

Text: These functions act on text strings and produce a series of changes to your text. Useful ones include CONCAT(), FIND(), and SUBSTITUTE()

Math & Trig: Standard math functions like SUM(), MAX(), AVERAGE() and ABS()

Lookup & Reference: These functions search throughout vectors or arrays and will bring back values depending on the inputs. Useful ones include: INDEX(), VLOOKUP(), and GETPIVOTDATA()

Excel has hundreds of formulas so feel free to look through them and look into ones that interest you further. A comprehensive list can be found here: <https://support.office.com/en-us/article/Excel-functions-by-category-5f91f4e9-7b42-46d2-9bd1-63f26a86coe8>

Columns we will be adding

Full Name

- =CONCAT([@Name],[@[Japanese Name]])
- Or-
- =[@Name]&" "&[@[Japanese Name]]

Salary with Taxes

- We will first need to name a Tax Rate. Let's say 5% (0.05).
- Type that value in any blank cell (not in our table) and then “name the cell” in the formula bar at the top left hand corner of your sheet
- This is what we call a named range
- Create Salary with taxes column using: =[@Salary]+([@Salary]*TaxRate)

Profit

- Let's say pokeballs have a profit margin of \$20, now we calculate the profit for each pokemon
- $=20 * [@[Number of Sales]]$

Gross Margin

- Finally, this is how much each pokemon is worth to us, ie: the cost of paying their salary less the profit they bring to Nintendo
- $=[@[Salary with Taxes]] - [@[Profit]]$
-

New Employee?

- One last piece of information we might want is when this employee was hired
- $=IF(@[EvolvedFrom] = "Egg", 1, 0)$

Formatting

Now that we have a wonderful table filled with data, how do we make it presentable to our client?

Analysis

We can start by simply filtering our table by some key metrics, gross margin, profit, or whether or not they are a new new employee.

What might be more helpful though is the use of **charts**