

INTRODUCTORY EXCEL TUTORIAL

This handout was designed for the **Introductory Excel** workshop, held early in each semester at the DoJo. For a schedule of upcoming workshops, check the Academic Support website ([here](#)), or sign up for workshop alerts via [this link](#). If you'd like to request a workshop for you and your friends, or would like one-on-one help with Excel, please contact Emily at esuvada@reed.edu, or book a coaching session at <http://esuvada.youcanbook.me>

If you want to learn more on your own, a simple google search will bring you to many sites with step-by-step guides to almost any calculation. Excel has been around for many years and has an enormous user base. Just remember to include the version and platform information (i.e. Excel 2011 for Mac, Excel 2016 for Windows, etc).

TOPIC 1 - ENTERING AND FORMATTING DATA INTO EXCEL.

This handout was written for **Excel 2016 for Mac OS X**. Other versions of Excel have similar features, but the buttons and menus may be presented differently.

Here are a few facts that I would like to enter into an Excel spreadsheet:

- The 2010 population of Oregon was about 3.9 million.
- The 2010 population of California was about 38 million.
- The 2010 population of Washington was about 6.9 million.
- The land area of Oregon is about 96,000 square miles.
- The land area of California is about 156,000 square miles.
- The land area of Washington is about 66,000 square miles.
- In 2010, approximately 22.1% of Oregonians were under 18 years old.
- In 2010, approximately 24.3% of Californians were under 18 years old.
- In 2010, approximately 23.0% of Washingtonians were under 18 years old.

How can I most effectively organize this information in Excel?

First, identify the **variables**, and the **cases**. If you're not sure which is which, consider the definition below:

*Variables are **attributes** that can be measured.*

*Cases are the **objects** that have these attributes.*

In the example above, the variables measured are "population", "land area" and "percentage of population under 18". The cases studied are "Oregon", "California" and "Washington".

Each of these 9 data points will occupy a single **cell** in the spreadsheet. The variables will be **columns** (i.e., presented vertically), while the cases will be **rows** (i.e., presented horizontally).

SKILL: SELECTING CELLS

You can **select** a cells in the following ways:

- Select a cell by clicking anywhere within its borders
- Select a whole row by clicking the row number on the left.
- Select a whole column by clicking the column letter.
- Select multiple cells in a block using one of three methods:
 - click the first cell and drag across the block
 - click the top-left cell, then hold Shift and click the bottom-right cell
 - click the top-left cell, then hold Shift and use the arrow keys to select the block
- To select non-contiguous cells, hold the “command” (⌘) key as you click them.

Once entered, the data will look as shown below:

	A	B	C	D	E
1	Oregon	3900000	96000	22%	
2	California	38000000	156000	24%	
3	Washington	9900000	66000	23%	
4					
5					

Now, this information isn't easy to read. It would be better if we had a row at the top with the names of our variables. So, let's insert a row and add data names. It's also a good idea to include the units the measurements are in.

SKILL: INSERT/DELETE A ROW (OR COLUMN)

Right-click (or hold “Control” on the keyboard while clicking) on the name of a column (or row). Choosing “Insert” will create a new, empty column immediately to the left of the selected column (or above the selected row). To delete, follow the same process, but click “Delete”. What happens if you do the same thing while right-clicking on a cell? What options are there for inserting? Try them out with a data set, to see what happens

With column names, our data looks better. If you need to resize a column or row, click on the border to drag it. You can also double-click the border to automatically resize:

	A	B	C	D	E
1	State Name	2010 Population	Land Area (in square miles)	Percentage of 2010 Population Under 18	
2	Oregon	3900000	96000	22%	
3	California	38000000	156000	24%	
4	Washington	9900000	66000	23%	
5					
6					

Okay, now our data is a little easier to take in. However, the numbers are long and hard to read. We want to change these number formats.

SKILL: CHANGING NUMBER FORMATS

Change number formats quickly by selecting the cells with numbers you want to change, then clicking on the format options in the “Home” tab. Quick options include accounting formats, percentages, and ways to change the number of decimal places.

For more options, you can right-click on a selection of cells and go to “Format Cell”. Note the keyboard shortcut listed – shortcuts in Excel can save a lot of time! In this menu, you can change formats for text entries, times and dates, and even custom formats for your own data.

Here's some data with number formatting applied:

	A	B	C	D	E
1	State Name	2010 Population	Land Area (in square miles)	Percentage of 2010 Population Under 18	
2	Oregon	3,900,000	96,000	22%	
3	California	38,000,000	156,000	24%	
4	Washington	9,900,000	66,000	23%	
5					
6					

TOPIC 2 – SAVING AND IMPORTING DATA

At this point, it's a good idea to save your spreadsheet!

SKILL: SAVING EXCEL SPREADSHEETS

To save this spreadsheet for later use in Excel, simply choose “Save As...” from the File menu. The default format is *.XLSX, which saves the spreadsheet exactly as it appears in Excel. Some other programs are able to import Excel files directly, but if your goal is to **export** your data for use in another program, you should choose to save your file as a comma-separated variable text file (*.CSV). You can choose this option from the “Format:” pull-down menu in the “Save As...” dialog box. You will likely encounter a warning dialogue that says features of the file may be lost.

This is because CSV files are simply text files with your data encoded in them. They will not save formatting, formulas, graphs, or anything else that you've produced within

Excel. Before exporting data to a CSV file, it's a good idea to first save your spreadsheet as a XLSX file, to ensure that you don't lose any of your work.

A note on formatting data for compatibility

Each cell in Excel is assigned a data type, which determines how the data in the cell is dealt with "behind the scenes" and how it is displayed within Excel. Most of the time, the default data type is "general." The "general" format works reasonably well for many uses in Excel, but can lead to some trouble when trying to export the data to another program. To avoid these problems, you should change the format of each cell to a more specific data type (e.g., number, text, date). Usually, you can do this by column, since a single column often contains only a single type of data.

SKILL: IMPORTING DATA FROM CSV

To **import** data from another source, CSV is again a helpful format. You can either open a CSV file using File>Open, or if you would like to import the data into an existing Excel workbook, click where you would like the data to begin, and then choose Data->Get External Data->Import Text File. Either of these Methods will launch Excel's Text Import Wizard.

TOPIC 3 - USING FORMULAS

All formulas in Excel begin with an equals sign '='. Once you press your "enter" key, Excel will perform a computation and display the result of that computation in the cell. When you select a cell containing a formula, the original formula (and not just its result) becomes visible in the formula bar, which appears just above the spreadsheet (and below all of the other toolbars).

Some formulas simply perform calculations on some given numbers. For example, entering "=2+3" in a cell will cause "5" to appear in that cell. More powerful formulas refer to values in other cells of the spreadsheet. Entering "=B3+B4" will result in the sum of the numbers in cells B3 and B4.

SKILL: USE A SIMPLE FORMULA

In our test spreadsheet, let's calculate the total land area in all three states. First, click on cell C6 and put in a title so we later know what we've calculated. Then, in C7, enter the following formula:

```
=C2+C3+C4
```

This will give us the total land area! Now, we can also enter this formula without as much typing. This time, click on C8. Type the "=" sign in the formula bar, and select C2, wither by clicking or navigating with the arrow keys. See how it appears in the formula? Add a plus sign, then click on C3. Do the same for C4. Thus, we can enter formulas by **selecting** cells instead of typing their addresses in. There is a third, and even easier way to do this calculation, by using a **function**.

SKILL: USE FUNCTIONS IN EXCEL

A **function** in Excel performs a fixed operation on a given set of inputs. Functions are distinguished by their all-caps names. The AVERAGE function returns the arithmetic mean of a set of inputs. The SUM function calculates the sum. To continue our land area example, let's do the following,

1. Select C9, and type "=SUM("
2. Select the range of cells whose values you would like to average. You can do this with your mouse (using the rules in the previous section), by navigating and holding shift, or by using Excel's formula syntax to enter the data range by keyboard. For a beginner, I recommend using your mouse first, but paying attention to the way that Excel represents the data range you have selected.

Excel has many, many functions available to use. To learn about other functions, try exploring the Functions section of the Formulas tab, and especially the "Reference" button. Google search is also a good resource. Formulas to note are:

- =LN(x) - calculate natural logarithm of x
- =LOG10(x) - calculate log of x, base 10
- =LOG(x, y) – calculate log of x, base y
- =AVERAGE(range) - arithmetic mean of a range
- =SUM(range) - sum of a range
- =MAX(range) and MIN(range) – the maximum or minimum value in a range
- =COUNT(range) – calculate the number of non-blank values in a range
- =STD(range) – standard deviation in a range
- =MEDIAN(range) – median of range (some programs calculate medians differently, be careful!)

To **copy a formula** used in one cell to potentially many other cells,

1. Select the cell that contains the formula, and select "Copy" from the Edit menu.
2. Select the range of cells where you would like the formula copied.
3. Choose "Paste" from the Edit menu.

The cells referenced in the original formula may change in the copied formulas. For example, if the original formula references cell C3, and the formula is copied to a cell in a lower row, the new formula may now reference C4. This is because cell references in the format "C4" are **relative**. You can "lock" a formula to a particular cell by changing its address in the formula bar to the form: "\$C\$4". This is called an **absolute** reference. Use the shortcut (F4) to quickly change a cell's absolute/relative address.

TOPIC 4 – MANIPULATING DATA

Now that you can manually enter and import data, as well as run functions and write equations, it's time to consider ways to manipulate data in Excel.

Some useful tools are listed below, but not covered extensively here. More information can be found online, but the best way to learn these tools is by using them yourself.

Freeze the top row or column: Choose the Layout menu from the ribbon near the top of your screen. Near the far right of the Layout toolbar, select “Freeze Panes.”

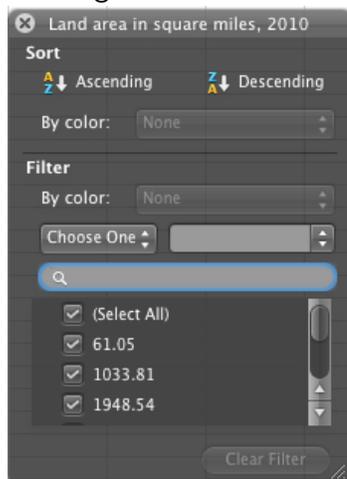
Use the Text to Columns tool: Data -> “Text to Columns”. This tool can be helpful to create several columns from a single column of text. For example, you could take a column of names presented in the format “Obama, Barack” and split it at the comma, resulting in a column of last names and a separate column of first names.

Sorting data: Sort data by following steps:

- Select the data you would like to sort.
- Click on “Sort...” from the Data menu.
- If your data has a header row, make sure that “My list has headers” is checked in the resulting dialog box. This will preserve the variable names in the top row after the sort.
- Next, choose the column (variable name) that you would like to sort by, as well as any other preferences you have for sorting by that variable.
- If you would like to sort by multiple criteria (e.g., sorting a list of Reed students first by class year, and then alphabetically by last name within each class year), click the ‘+’ button to add a second sorting variable.

Filtering data: Filtering causes rows that do not meet specific criteria to be hidden. To filter, follow these steps:

- Select the data you wish to filter.
- Click the filter button from the “Sort & Filter” section of the Data tab. This causes a filter button to appear in the top cell of each column.
- Clicking this button will bring up a menu box:



- Choose a filtering method (e.g., equals, greater than, contains) from the “Choose One” menu, and enter a value in the empty box to the right. For example, choosing “greater than” and entering “300,000” will hide all rows that do not have a value in this column that is greater than or equal to 300,000.

To show all data (turn off filters), again choose Filter from the Data menu.

TOPIC 4 – GRAPHING DATA

Graphing in Excel is a broad topic that can be covered in a workshop of its own. A basic overview is shown below.

Graphing is roughly a 3-step process:

1. **Plan:** Before beginning your graph in Excel, you will need to know what data range you want to graph and what type of graph you would like to make. If you're working with a complex workbook, you may want to copy/paste the data you'll be graphing into a clear area. Before asking Excel to graph something, you should be able to roughly sketch what the graph should look like: What information is represented on the horizontal and vertical axes? Should the graph be a line graph, a scatterplot, a bar graph, or something else?

2. **Rough Draft:** Select the relevant data range. Choose **Charts** from the ribbon at the top of the screen, and then select the graph type. (Although there are a *ton* of options for graph types, you'll probably want to choose something simple, at least for a first try.)

3. **Make it pretty:** Excel is (sometimes) pretty smart about formatting the graph to at least approximate your vision. However, there are bound to be some changes that you would like to make. To do this, click on the graph to select it, and then choose **Chart Layout** from the purple section of the green ribbon at the top of the screen. You may want to change or format:

- The title of the graph
- The title of the horizontal and vertical axes
- The legend for the graph
- The color scheme (this is actually in the **Charts** screen, not **Chart Layout**)

Consult with your instructor about graph formatting standards for a course.