RNR 321 • Introduction to Excel

Even if you are experienced with Excel, please work through the entire tutorial. The steps and associated tips will help you with the assignment, which is at the end of this document.

1. Spreadsheets are composed of:

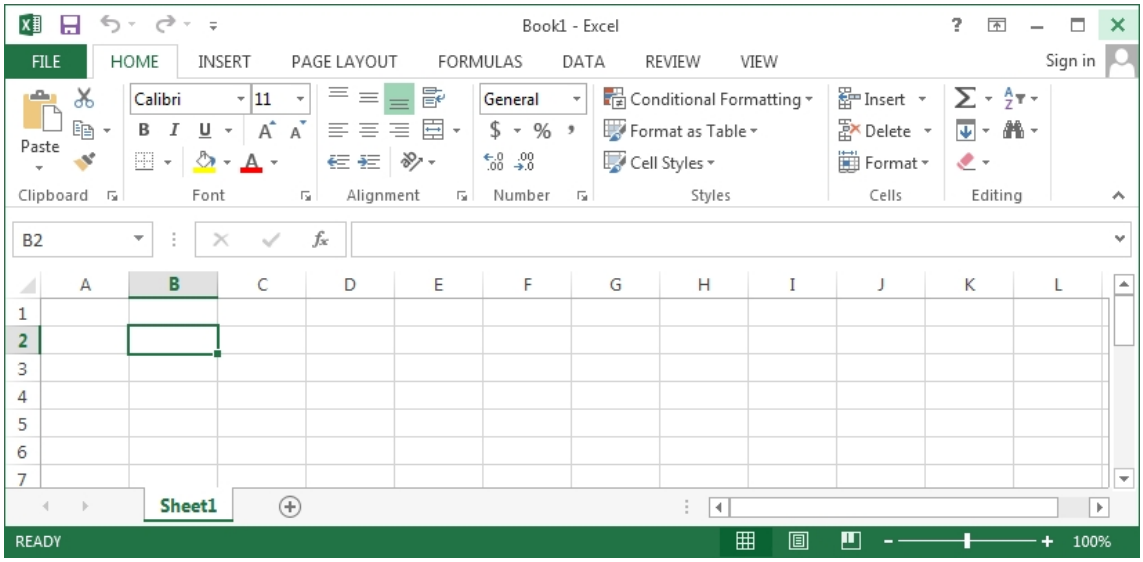
- Columns (Designated with letters, **B**)
- Rows (Designated with numbers, **2**)
- Cell, the intersections of columns and rows (Designated by column letter and row number, **B2**)
- Sheets

2. Cells can contain:

- Text
- Numbers
- Formulas (mathematical equations)

3. Active Cell or Selected Cell

The cell that has the dark border around it is the *active cell*. This is the cell that can be acted upon and indicates where the insertion point is located.



4. Moving around a spreadsheet

- Arrow keys can be used to move left, right, up, and down one cell at a time.
- Click with the mouse to move to a cell directly, making it the active cell.
- The [PageUp] and [PageDown] keys move the cursor up or down one screen at a time.
- Use vertical and horizontal scroll bars to see other parts of the spreadsheet
- Sheet tabs or scrolling buttons move between sheets (pages)
- To split screens (horizontal or vertical), go to the **View** menu and select **Split** within the Windows group. A vertical and horizontal gray line appear that will split the screen into different

panes. Drag the lines to the position you want, or drag them to the edges of the screen to remove them. This feature is useful for entering data into large tables.

Other useful keys for moving the active cell are:

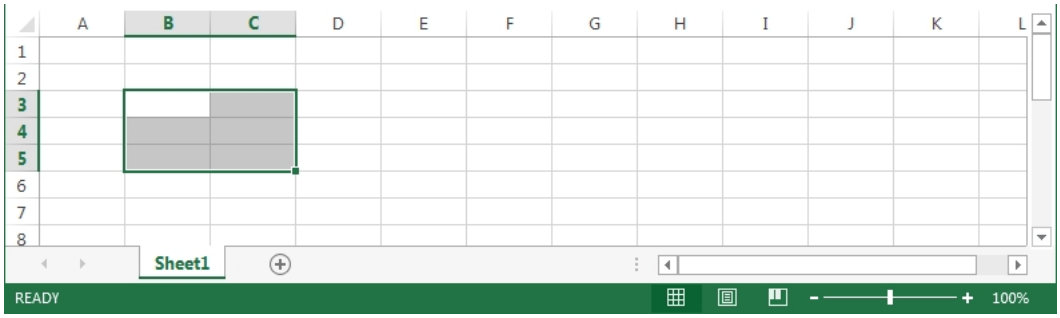
- [Home] moves to the first column on the current row
- [Ctrl]+[Home] moves to the top left of the document or cell A1 (press Ctrl, then Home)
- [Ctrl]+[End] moves to the last cell in the spreadsheet (lower right corner)

5. Selecting Cells

We often need to reference data in other parts of the spreadsheet. When entering your selection (usually when entering a formula) you can use either the keyboard or the mouse.

Select a group of **contiguous cells** by identifying a starting cell and an ending cell, which will select ALL cells within this specified BLOCK of cells. Blocks are defined by the addresses of the two cells that are in the opposite corners of the block, from the top left cell in the block to the bottom right cell in the block.

Select a block of cells by (1) typing the addresses into the name box, (2) using the mouse, (3) holding down the Shift key and using the arrow keys, or (4) clicking on a starting cell and then clicking on the ending cell while holding simultaneously holding down the Shift key. Once a block is defined, you can move it, copy it, delete it, or alter the how its contents are displayed with formatting options. This block is B3:C5:



To form a block of cells that are **not contiguous**, use a comma to separate the cell blocks (when typing in name box) or hold down the Control-key [Ctrl] and select cells or blocks of cells and the comma will be inserted automatically to separate these smaller blocks. To skip column D and add the block E3:E5 to that block above, we can type in B3:C5,E3:E5 or use the mouse and control-key.

6. The m&m Data

Download the workbook **IntroExcel.xlsx** from **D2L**. On the first two sheets, you'll see counts from real samples of plain and peanut m&ms.

7. Editing Data

There are several ways to modify the contents of a cell:

- To replace the entire contents of a cell, make it the active cell and type in the new value.

- To replace a portion of a cell (edit its contents) double-click on the cell you want to edit and the cursor will appear inside the cell. Use the arrow keys to navigate, then edit as needed. Alternatively, make the cell the active cell, and its contents will display in the formula bar where you can make changes.
- Select the cell (or cells) you want to alter and press the [DEL] key to clear the marked cells.

8. Entering formulas

A formula is a sequence of values, cell references, names, functions, or operators that produces a new value from existing values. A formula will display in the cell as a number but the formula bar will show that the cell really stores a formula. As numbers that affect the formula change, the value in the cell (the expression of the formula) also changes. **Formulas are Excel's primary power!**

Open the sheet labeled "**Temp Convert**"

a. Suppose you want to use temperature data recorded in Fahrenheit and convert it to Celsius; the appropriate formula for the conversion is: T[C] = (T[F] - 32)*5/9

b. Go to the cell containing the first data value (say B5) and move the mouse into the cell in a blank column but in the same row (say D) where you'd like your result stored (cell D5).

c. In D5, type: **=(B5-32)*5/9** and hit **Enter**. Note that typing " = " tells Excel a formula is about to be entered. The result of your conversion will appear in cell D5.

d. If you want to convert the rest of the values in the column, do not retype the formula. Instead, just copy the formula and let Excel adjust all cell references. One way to do this is to make a cell containing the formula the active cell (say D5), then choose **Home, Copy** (or Ctrl-C), which places the formula on the Window's Clipboard. Then choose the cell (or entire block) where you would like to place the formula (D6 or D6:D20), and then choose **Home, Paste** (or Ctrl-V).

e. A second way to copy the formula is to go to the lower right corner of the cell containing the formula and the mouse will change to a narrow **+**. Hold the (left) mouse button and drag the corner of the cell all the way down to the last cell in the column, and then release the mouse, which will copy into the selected cells.

f. A third way is to highlight a block in column D that contains the cell with the formula and the cells where you want to copy the formula, go to the **Home** menu, then select **Fill** and then **Down**.

g. Copying the formula updates the cell references. **Sometimes you do not want to update these but want instead to use the contents of one cell for other calculations.** In the formula above, you could put the constant, 32 into one cell (say D2). Your formula then should read: **=(D5-D2)*5/9. Using $ signs insures that the referenced cell will not change when you copy the formula. Please be sure you understand this operation, it is useful!**

h. One way to format the contents of a cell (for example, to control the number of decimal places), is to choose the block of cells to be formatted, and under the **Home** menu, click on the arrow at the bottom right of the **Number** section. Then you can select **Number** and adjust the number of decimal places accordingly. Alternatively, you could adjust the number of decimal places by selecting the block of cells and clicking these buttons: Note, this automatically changes the cells to Number format.

i. When you want to copy/paste **values** from a cell that were created with a **formula** (rather than the formula) you will need to use the **Paste Special** function, because by moving the values you will be shifting the original cell references used in the formula. Once you have copied the cells of interest and selected where you want to paste the values, choose **Home,** and click on the arrow below **Paste.** If you select any of the options under **Paste Values,** you will paste the values (with or without formatting), but not the original formula.

Returning to the "Plain" spreadsheet, in the column immediately to the right of the last data column, create a new column with the label "total." Using the data you entered above, create a formula that adds the number of m&m's of all colors in a single row. If you used the same columns, the formula for the first row would be =**C3+D3+E3+F3+G3+H3**. Now copy that formula to add values for all remaining rows.

9. Using functions

You can enter functions directly or use the **Insert Function** button  .

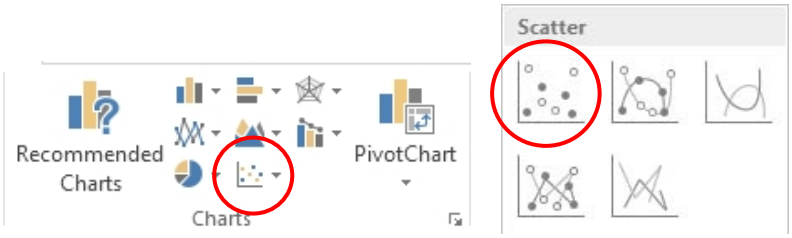
a. Select the cell where you want the result of your function to appear and push the  button. From the list, select the function you want to use.
b. After selecting a function, a detailed description of the function appears and you can type in the arguments of the function or select them in your worksheet by using the mouse. If the sheet is hidden under the **Function Arguments** window, click the  button, which will hide the window. Select the cells and hit enter if the input of the argument is complete or return to the **Function Arguments** window by pushing the  button.
c. As soon as you know how a function works, you can type the function with arguments directly.

Go to the **Tucson Climate** worksheet in **IntroExcel.xlsx**. Use a formula that you create (=F6+F7+F8….) to calculate the total amount of rainfall in an average year in Tucson by summing the monthly averages. Now with the same data, use the built-in @SUM function to calculate the total average annual rainfall. The values in these two cells should be identical.

10. Creating and editing charts

Now we want to chart the relationship between **High** and **Low** temperatures as an **XY (Scatter) Plot**. It is easier to select the blocks of data you want to chart first, then instruct Excel to create the chart.

If the data are in columns (as is our case), first select the two column blocks for plotting (B6:C17) (If the data were in rows, select the two rows for plotting in the same way as for columns...). With the data selected, choose **Insert,** then from the **Chart** portion of the menu, choose **Scatter**, and then select the first type of scatter plot:



You can edit components of charts, such as axes, labels, symbols, etc., by selecting the component (left click), then by right clicking the component that causes a menu to pop up; the last item on that list gives you access to the format options for that component. You can also explore the options available through the **Chart Tools** at the top of the screen.

To add elements that are not currently in the chart, such as an axis label, left click on the chart and then click on the "+" symbol that appears. Place a check next to any items you want to add and then format them appropriately.

A few helpful hints for formatting charts:

1. Label all axes.
2. Alter the range (bounds) for each axis to avoid wasted space.
3. Remove all gridlines.

Adding a trendline to a chart

1. Create the chart and select the data by left clicking on any of the points. Then right click and select **Add Trendline…** and a menu will appear.
2. Select the type of trendline you want to add; we will choose **Linear**. Select the **Display equation on chart** and **Display R-squared on chart** options. Then close the menu.
3. You can move the equation anywhere on the chart and change the format (e.g., the number digits displayed) by right clicking on it and selecting **Format Trendline Label**.

11. Miscellaneous tips and advice

1. When copying formulas, make sure you reference the correct cells. An easy way to check which cells are referenced by a formula is to make the cell active, then press the [F2] button. This will highlight all the cells that are referenced in the formula.
2. When making XY plots, use the **XY (Scatter)** chart type, not the **Line** chart type, even when you want to connect the data points by a line. A **Line** chart uses the row number on the X-axes instead of the data in the column that you have highlighted. Even in the scatter plot, you are able to connect data points.
3. Place complex charts on their own worksheet.
4. You can perform some sophisticated data analyses within Excel, including regression, correlation, creating histograms, etc. To access these tools, click **Data Analysis** in the **Analysis** group on the **Data** menu. If this option does not appear there, you need to install the **ToolPak**. To do this, choose File, Options, Add-Ins, Analysis ToolPak, Go..., then check the box next to Analysis ToolPak, then OK at the bottom of the window.
5. Data files that you download from the web are often not in Excel format, but might be comma-separated values (.csv) or tab-separated values (.tsv). When you open those files, Excel will help convert the files. However, once you have manipulated a file, for example by making graphs or adding formulas, make sure that you save the file as a **Workbook (.xlsx)** and not in the original format, because you will lose everything you added to that file beyond the simple numbers.
6. It is possible to have two Y-axes with different scales, but only one X-axis.
7. If you want to add data to a chart that is already created, highlight the column of data to be added and copy the column into the chart.

8. **Excel functions for variance and standard deviation**: There are several functions for these quantities. For example, to calculate sample variance in Excel 2007 or earlier versions, use the **VAR** function. In Excel 2010 or 2013, you can use either the **VAR.S** or **VAR** function, as both should give you the same value. Do **not** use any other variance functions like VARA, VAR.P, etc… Similarly, to calculate sample standard deviation in Excel 2007 or earlier versions, use the **STDEV** function. In Excel 2010 or 2013, you can use either the **STDEV.S** or **STDEV** functions.

9. ***** Creating complex formulas ***:** When creating complex formulas, it is easier to break the calculations in a few parts rather than typing the entire formula into a single cell. This also reduces the chances that you'll make an error in the formula. For example, instead of typing the entire formula for sample mean deviation in a single cell, you could calculate the absolute deviations from the mean for each observation in different cells (C2:C4), sum those cells together (B7), then divide by *n* (B8).

	A	B	C	D
1		**Data**	**Absolute deviations**	
2		2	=ABS(B2-B$6)	
3		5	=ABS(B3-B$6)	
4		9	=ABS(B4-B$6)	
5				
6	**Mean**	5.3		
7	**Sum dev**	=SUM(C2:C4)		
8	**Mean dev**	=B7/3		
9				

RNR 321 • Intro to Excel • Due 20 September 2021

Reminder: assignments are due on or before the **start** of next week's lab period.

1. For both "Plain" and "Peanut" worksheets, in Excel:
    a. Use the built-in functions to calculate the total (sum), average, variance, and standard deviation for the number of m&m's of each color separately; fill in the yellow cells.
    b. Create your own formulas (that is, do not use the built-in functions) to calculate the total (sum), average, variance, and standard deviation for the number of m&m's of each color separately; fill in the green cells. Of course, make sure the answers for 1a and 1b match where they should!
    c. Use the totals for each color you calculated in 1a (or 1b) to calculate the proportion that each color represents of the total number of m&m's for each type (plain and peanut).
    d. Create two bar charts, one for plain and one for peanut, to display the relative proportion of each color *in a new worksheet named* "**Charts**". Be sure to label axes and format the chart using the helpful hints in section 10 above.
2. In the worksheet labeled **Assignment**:
    a. Create your own formulas to convert monthly rainfall in an average year and in 2005 from inches (in.) to millimeters (mm); fill in the green highlighted cells.
    b. Use Excel functions to calculate total annual rainfall and average rainfall per month in mm; fill in the blue cells.
    c. Create your own formulas to calculate the percent of annual rainfall in each month, for an average year, and for 2005; fill in the red cells.
    d. Finally, calculate the percent of annual rainfall received during the monsoon season (July, August, and September) for an average year and for 2005; fill in the yellow cells.
3. In a MS Word document:
    a. Write a paragraph describing the patterns you've established for the distribution of colors from part 1. Are the relative proportions for each color about the same? Are the distribution patterns generally similar for plain and peanut?
    b. From your calculations in part 2, what percent of annual rainfall does Tucson typically receive during the monsoon season? Was the percentage of rainfall received during the monsoon season in 2005 above or below average?
    c. In an average year, how many months does Tucson receive less than 5 mm of rain? How many months had less than 5 mm of rain in 2005?
    d. From the chart you created in the **Tucson Climate** worksheet, report the equation for the trendline and describe briefly the relationship in words.
    e. On a clear evening this week, estimate the number of stars visible in the sky. Report your estimate, but more importantly, describe the approach you used.
4. Upload your <u>final</u> spreadsheet and the Word document to the appropriate folder in D2L. Please save it using this format described in the Homework Guidelines: **YourLastName_IntroExcel.xlsx**.