

Excel Tutorial

This is an assignment designed to introduce you to Microsoft Excel, an excellent way to easily answer simple scientific questions about things including statistics and probability, and which also can be a full-fledged scientific modeling platform when needed.

The Assignment

Follow these instructions carefully. Full credit is *not* guaranteed, and will require strict adherence to the instructions. If you have questions, email me. There are thinking/observation/description questions in this assignment. You can answer those by entering a comment (go to Insert>Comment, or [right click] > Insert Comment) on the relevant cell.

1. Make a static list of numbers.
 - a. Click on cell A3 and type "**Static (1)**".
 - b. Click on cell A4 and type "**0**".
 - c. Select the range of cells from A4 to A50 by clicking on cell A4 and dragging downward (it should scroll when you are near the bottom of the window).
 - d. Select from the edit menu: Edit>Fill>Series... (or Ribbon>Home>Editing>Fill>Series).
 - e. Choose Columns, Linear, and a step value of 1.
 - f. You should now have a list of numbers from 1 to 47 in cells A2 to A50.
 - g. Try it again with other values in the Fill>Series window.
2. Make a second static list (easier).
 - a. Click on cell B3 and type "**Static (2)**".
 - b. Click on cell B4 and type "**0**", and type "**1**" into cell B5.
 - c. Select the range of cells from B4 to B5 by clicking on cell B4 and dragging downward.
 - d. Move the cursor near the lower-right corner of cell B5. It should change from the hollow plus sign to a smaller, solid black plus sign.
 - e. While the cursor is the solid plus sign, click and drag downward in column B to B50.
 - f. You should get a list of numbers.
 - g. Try it again with a values of 0 and 10 in B4 and B5 instead of 0 and 1. It should extend the pattern.
3. Make a calculated list. This is the first calculated formula you will create.
 - a. Click on cell C3 and type "**Calculated**".

- b. Click on cell C4 and type "0".
 - c. Click on cell C5 and type "**=C4+1**". Hit return and it should say "2". This is the result of a formula, which uses the contents of another cell.
 - d. Try changing the value in cell C4 and the formula in cell C5. **What happens if you remove the equals sign?**
 - e. Put the regular formula back in cell C5 and the value of "0" back in cell C4.
 - f. Click on cell C6 and type "=" (but do not hit return). Hit the up-arrow on your keyboard. Note that you get a moving highlight, and the formula changes as you move the highlight around. Move the highlight to cell C5, (don't hit return yet), type "+1" and hit return. The cell's calculated value should be "2", and its formula should be "**=C5+1**". You have the beginning of a calculated list of numbers.
 - g. Try to make cell C7 have the formula "**=C6+1**" but instead of using the keyboard, this time type "=" and then click on cell C6 with the mouse, and then type +1 and hit return.
 - h. Select cell C7 and copy it downward by changing the cursor to a solid plus and dragging downward to cell C50. You should have a list from 0 to 46.
 - i. **What happens when you change the value in cell C4?**
 - j. **What is the formula in cell C50?**
 - k. **Describe what happens when you copy a formula that relies on another cell as you did here.**
4. Make a list that varies depending on a particular cell's value.
- a. Click on cell D1 and type "1".
 - b. Click on cell D3 and type "Dynamic".
 - c. Click on cell D4 and type "0".
 - d. Click on cell D5 and enter the formula "**=D4+D1**". The idea is to make a column of increasing numbers but this time instead of increasing by 1, it will increase by the value in D1.
 - e. As above use the cursor to copy the formula down to cell D50. You should see that cells D7 and below give an error (signified by the error message "**#VALUE!**"). **Examine the formula in D7; why is there an error?** (Note that if you double-click on a formula cell, you get a nice visual display of the cells it uses for its calculation!)
 - f. To fix the error, we need to be able to selectively hold parts of formulas fixed during copying operations. To do this, we use the "\$" character. If you put it before the letter of a cell reference, then the column will not change during copying; if you put it before the number, then the row will not change.

- g. Go back to cell D5, and change the formula to "**=D4+D\$1**". Now copy the formula down to D50. You should have a list of numbers from 0 to 46.
 - h. Change the value of D1 to 3. **What is the value of D50?**
 - i. **Use this column to determine the values of 17 x 28, 17 x 29, and 17 x 30.**
(Do not calculate these in some other way! If you are not sure how to do that, then note that you can easily see the values of 3 x 7, 3 x 8, 3 x 9, etc. in the list).
5. Make a calculated list that uses values in another list.
 - a. Click on cell E3 and type "Double".
 - b. Click on cell E4 and type "**=D4*2**". (The asterisk is the Excel symbol for multiplication).
 - c. Using the techniques above, copy this formula down to cell E50.
 - d. You should have a list of values that are double those in column D.
 6. Make a list of random numbers.
 - a. Click on cell F3 and type "Random".
 - b. Click on cell F4 and type "**=RAND ()**".
 - c. Using the techniques above, copy this formula down to cell F50.
 - d. **Describe the set of values you observe in the list.**
 - e. **Describe what happens when you make any changes to the document, such as typing a value in some other cell.**
 7. Make a list of random numbers with a different range.
 - a. Click on cell G3 and type "Random 0-6".
 - b. Click on cell G4 and type "**=F4 * 6**".
 - c. Using the techniques above, copy this formula down to cell G50.
 - d. **Describe the set of values you observe in the list.**
 8. Let's translate this into list of random "die rolls".
 - a. Type a heading ("Die Rolls") in H3, as we did above.
 - b. We can use IF statements to choose values based on other values. As an example, type this into cell H4: "**=IF(G4<3, "small", "big")**". Copy it down to H50.
 - c. You can even nest these IF statements to develop moderately complex decision trees. Try this one in H4 instead:
"**=IF(G4<2,1,IF(G4<3,2,"bigger than 2"))**". Copy it down to H50.
 - d. Now we could make column H with 5 nested IF statements to call all the values between zero and one a die roll of "one", etc., but there's an easier way, using math.
 - e. First you'll go back to cell H4, and type "**=FLOOR(G4,1)**". This command will discard all of the value following the decimal point.
 - f. As you can see, we now have random values from 0-5, but of course dice don't roll zeros, so we'll add one to every value.

- g. You can go back to cell H4, and type "**=FLOOR (G4 , 1) +1**".
- h. Using the techniques above, copy this formula down to H50.
- i. Count the number of sixes you've rolled in cell I01H.
9. Let's count how many sixes you rolled. This is the first statistics function.
 - a. Enter this into cell H52: "**=COUNTIF (H4 : H50 , 6)**". **How many sixes did you roll?**
10. Let's count the total number of rolls, and note a new way to enter parts of formulas.
 - a. Type this into cell H53: "**=COUNT (**" but don't hit return yet.
 - b. Note that the function COUNT is expecting a range of cells next. You can click and hold on H4 and drag down to H50, and Excel will fill in the range for you. After that is done, type **)**" and hit return.
 - c. It should say 47.
11. Let's determine the sum and average value of your dice rolls.
 - a. Enter this formula into cell H54: "**=SUM (H4 : H50)**". You can enter the range however you prefer.
 - b. Enter this formula into cell H55: "**=AVERAGE (H4 : H50)**".
 - c. **What was the average value? What ought it to be if the dice were fair? Why are these values different?**
12. Select all these summary statistics values and copy them leftward (using the solid plus sign) so you have calculations for all the columns.
 - a. **What was the average value for column D (the multiples of 17)?**
 - b. **Which columns have sixes in them?**
13. Let's make some labels so your sheet is more readable.
 - a. We would like to label the statistics rows, but we have no place to put the labels. Let's make a space.
 - b. Click the "A" at the top of column A to highlight the whole column. Go to Insert>Columns. Note that everything moves over. Also note that all the formulas are changed (even the ones with the dollar signs!) so they still work.
 - c. Make appropriate labels in cells A52 through A55 that correctly describe what is being calculated.
14. One last very useful trick: Named cells. When you have lots of formulas in a sheet, they can get ugly pretty fast. You can create names for cells, and then use the names in your formulas, so they are easier to read. Note that these work best for single-cell values.
 - a. Let's name the cell with the 17 in it (the factor used in the "Dynamic" column).
 - b. Highlight the cell (should now be E1).
 - c. Go to Insert > Name > Define (or Ribbon>Defined Names>Define or [Ctrl]-[F3]), and type "Factor" in the box.

- d. Now if you have the formula bar visible (you can make it visible under View menu), you'll see that it no longer shows "E1" when you select that cell, but "Factor".
 - e. Let's alter the column's formulas to use this name.
 - f. Go to cell E5 and change the formula from "**=E4+E\$1**" to "**=E4+Factor**".
 - g. Copy this down to E50. Note that all the values still work. Note also that named cells, by default, are fixed and don't change during a copy operation (so "Factor" corresponds to \$E\$1 now, not just E\$1 as before).
15. Put your name in Cell A1.
16. Let's reduce the clutter and prettify this a bit.
- a. The random value cells have a ton of decimal places that are ugly.
 - b. Select all the cells from G4 to H50, and go to Format > Cells. Choose Number style, and you should be able to select the number of decimal places displayed. Choose 2. (For Excel 2007, choose number from the Home section of the Ribbon to do the same thing).
 - c. Do the same thing to any other cells with lots of decimal places.
 - d. Chances are, your labels that you made in column A, and possibly your name as well, did not fit in the available space. Let's adjust the column widths to match the contents.
 - e. Select the column heading letters A-I. Go to Format > Column > Autofit Selection (Excel 2007: Ribbon > Home > Cells > Format > Autofit Selection). The column widths will adjust to fit. (You can also make things fit by wrapping text in cells).
17. Turn in the file you made to the server with the title "[YourLastName]_XL.xls".