Homework 1-1

Feb. 7, 2012, 2:25 pm

Reminders

For the following problems you may discuss the concepts that will help solve these problems with classmates and course staff. You may *not* simply copy down the answers of your classmates as that is a violation of the collaboration policy. The one exception to this rule are those problems marked as Independent. You may discuss independent problems *with course staff only*. **IMPORTANT:** Please use a computer that runs Windows (either your own or one in the CIT) to complete this assignment.

Basics

These problems should take you just a few minutes each; each one aims to teach you a particular skill that you'll need to have in Excel. Most involve a task and some hint of how to approach it; you'll want to do a web search, or ask a friend, or use the Help function (press the F1 key!) in Excel to learn how to do things.

One good reference is the Excel tutorial at `http://www.baycongroup.com/el0.htm`. In fact it's so good several of the following problems involve parts of it; if you have some time, it's worth working through the whole thing over the next week or two.

This homework may seem long, as there are quite a few pages to work through, but don't get intimidated! Most of the assignment is a tutorial, and the problems themselves are very easy. If you are already comfortable with Excel, feel free to skim over most of the homework, focusing mainly on anything that you are not familiar with. (We strongly recommend that you also try out a few of the exercises with Excel 2007 if you have never used that particular version before, as it does things very differently than do previous versions. There is also a required handin at the end of the lab that will test most of the subjects covered in this tutorial.

Task 1:

Go to `http://www.baycongroup.com/excel2007/01_excel.htm#window` and do everything described there on the first page. When you're done, you should know how to move around in an Excel spreadsheet, enter data into cells, delete data from cells, select a region of cells, and how to save and close a spreadsheet.

Task 2:

Now we're going to enter a "formula" in a cell. Formulas are the heart of Excel, but for now we're doing something very simple.

a. First enter your name in cell A1. Then click on cell B1, and in the formula bar, type

```
=A1
```

and hit "Enter." The equals sign is essential; it tells Excel that you're entering a formula rather than just a piece of text like your name. When you hit "Enter", cell B1 should show your name, just as cell A1 does. Now click on cell C1 and in the formula bar, type

```
A1
```

(notice that there's no equals-sign). Press Enter. Cell C1 should display the text "A1".

b. Now go to cell A1 and enter a different name. Notice that cell B1 also changes. That's because the rule defining B1 is that it "equals whatever's in A1." The rule defining A1 is that it's "Robin Smith" (or whatever you typed in there). Change cell A1 back to your own name.

Task 3:

At the lower-left of the spreadsheet, you'll notice some tabs labelled "Sheet1," "Sheet2," "Sheet3," and so on. When Excel starts up, you're looking at Sheet1, and the others are hidden. Enter your name in cell A1 (it may still be there from exercise 2) Now click the Sheet2 tab; you'll see a fresh spreadsheet in which cell A1 is empty. Enter a friend's name in cell A1. Click on the Sheet1 tab, and then on the Sheet2 tab. Describe what you see in cell A1 after each click. **Important note:** The name "Sheet1" has no blank between the "Sheet" and the "1"; the same goes for all the other sheets.

Task 4:

If you go to Sheet2, and in cell B1 you enter "=A1," the value that will appear in cell B1 will be your friend's name. In general, cell-addresses refer to the current sheet. But you CAN enter a formula that lets you get at cells from another sheet. On Sheet2, click on cell B1. Enter the formula

```
=Sheet1!A1
```

and press Enter. Your name should show up in cell B1, having been copied from cell A1 on Sheet1. Go to sheet 1, cell A2, and enter your age. Notice that it appears all the way to the right in cell A2 because Excel has interpreted it as a number.

Naming

Naming things is one of the ways that we impose structure on the world[1]. While Excel has default names (like "A1", "N13") sometimes it makes sense to give things names that are more readable by humans. For instance, the contents of cell A2 (your age), might be better called "age" than "A2." Here's how to add a name to a cell:

Task 5:

1. Click on cell A2. Just to the left of the formula bar, you'll see a white space with "A2" in it. Click on this and type "age," and then press Enter. The cell is now named "age" in addition to "A2."
2. Click on B2, and enter the formula "=age"; the result should be that your age appears in cell B2.
3. Click on cell B2 and enter the formula "=A2"; again, your age should appear. The cell A2 can be referred to either by its standard spreadsheet address (A2), or by its name ("age").
4. Go to Sheet2, and in cell B2, type a formula that will copy your age from Sheet1, cell A2. Use the name "age" rather than "A2."

[1] The forms of things unknown, the poet's pen / Turns them to shapes, and gives to airy nothing / A local habitation and a name. (Shakespeare, Midsummer Night's Dream V.i.15-17). See also Naming of Parts, by Henry Reed.

Point of information: you can also rename sheets. Click on the Sheet3 tab. Then right-click on it. A menu pops up; click "rename" and rename it "Junk." You'll see the name change on the tab. Now change it back to Sheet3.

Descriptions

When you build a spreadsheet, you're doing so with some *intent*. You should record your intentions by adding comments to your spreadsheet(s).

Task 6:

Right click on cell A2 of Sheet1. Select "Insert comment." Type "This is where you have to enter your age" as a comment. Notice:

a. A small red triangle appears in the upper right of the cell to indicate there's a comment for the cell.

b. When you select the cell, the comment appears.

Filling

Let's talk about "Filling" – taking some data from a cell or two, and using it to generate data for a whole bunch of cells. We'll do this by example. By the way, cutting, pasting, and copying work in spreadsheets much as they do in many other programs, with a few subtle differences that you'll learn about. Filling is kind of like a fancy copy/paste operation.

Task 7:

Visit `http://www.baycongroup.com/excel2007/03_excel.htm`, and search for "Fill Cells Automatically." Carry out the exercises there, stopping when you get to "Create Headers and Footers"

There are other ways to perform filling on the cells besides those described in the tutorial. First, select the cells you would like to fill, including the original "base" cell(s). In the ribbon under the tab "Home" and the section "Editing," there is the "Fill" button. When you click on it, it should give you a menu for different options. Pick "Series." This should give you a dialog providing different options to use to fill the selected cells. Play around with these options to get a feel for what they do.

Task 8:

Do exercises 1 through 5 at `http://www.baycongroup.com/excel2007/02_excel.htm`.

There's great power in establishing a bunch of relationships, and then seeing what happens when you change one cell. ("What would the company profits be if we could reduce the cost of manufacturing widgets by three percent?") The formulas you've already encountered let you do things like that. But one kind of formula adds a special power to a spreadsheet: the conditional formula, which usually involves an "If." Here's how it works: when you tell a friend how to get to your home, you might say something like "Take route 42 for the first 8 miles. If it's rush hour, take 302 to go around the city; if not, just take route 42 straight through the city. On the other side, whichever route you took, watch for signs for Millville, and take the first Millville exit..." This is a conditional description: what your friend should do depends on whether or not it is rush-hour. So rush-hour-ness is the condition, and there are two choices for what to do: one if it is rush hour, and one if it isn't.

In writing expressions in Excel, we don't *do* things so much as we *express computations*: Cell A3 should be the sum of cells A1 and A2. How can a notion of conditionality fit into this? This isn't something you see in algebra class, so we have to write it a little differently. Let's see an example:

Task 9:

In cell D1, enter 12. In cell D2, enter the formula

```
=If(D1 > 10, 3, 0)
```

Observe the result. Change the value of D1 to 4, and observe the result.

The "If expression" checks to see whether D1 is more than 10; if so, the value of the "If expression" is 3; if not, its value is zero. The "condition" can use equality-testing ("If(D1 = 3, ..."), various inequalities ("If(D1 >= 2, ...," "If(D1 < 5, ..."), or even other functions ("If(IsBlank(D1), ..."); this last test determines whether cell D1 has anything in it or not.

The result-if-true can also be more complicated than a single number. For instance, the expression

```
If(D1 < 5, D1+3, D1-2)
```

gives D1+3 if D1 is less than five, but if it's five or more, the expression gives D1-2.

Task 10:

1. Once you have completed the tutorials and above exercises, download `HW1-1Part1.xlsx` from the website.
2. Rename your Excel file to something like JohnHughesHW1-1Part1.xlsx (i.e., your name, followed by "HW1-1Part1.xlsx").
3. This Excel file will contain several exercises. Complete these exercises and save your finished spreadsheet.
4. You will e-mail this file to the TAs at the end of this homework.

Pivot tables

Throughout this course, we'll tend to work with very organized data. It'll be very common to have lots of instances that are very similar, which we can organize in columns. For example, suppose we have records for a class: each week we have a quiz or two, and each student gets a grade. (Equivalently, we have a senate, and every so often we have a vote; each senator casts a vote. Or we're running Netflix, and every so often a customer rents a movie.) Our data might look like this (for a very small class):

Name	Week	QuizScore
Amy	1	80
Mary	1	72
Robin	1	90
Amy	2	85
Robin	2	91
Mary	2	65
Mary	2	79
Robin	2	90
Amy	2	70
Mary	3	90
Robin	3	80
Amy	3	79

We've entered the grades into our spreadsheet in the order the papers happened to fall during grading, so some weeks Amy is first, other weeks Mary

is first, etc. Notice that in week two, we had two quizzes rather than just one.

This spreadsheet is a kind of *database*, in the sense that it's a bunch of *records*, where each record provides information about a single name/week/quiz score. The key thing about these records is that each consists of the same three things: a name, a week, and a quiz score. These three things are called *fields* in the database. (We'll see databases quite a lot more later in the course, so this is just a nice easy example to get you used to some terminology.)

Now imagine that we'd like a summary of each student's average performance, by week. We want a table that looks like this:

	Week1	Week2	Week3
Amy	80	77.5	79
Mary	...		
Robin			

To do this, we can create what's called a "pivot table," and Excel has a tool that can produce this for us.

There is a tutorial on how to do pivot tables Excel here.

Task 11:

Download `HW1-1Part2.xlsx`, and do Task 1 in the spreadsheet, which asks you to create a pivot table using the students' weekly average.

A note about pivot tables

There's one tricky thing about pivot tables: they only work for summarizing numbers. If you had a table of letter grades, then things like "max" and "min" and "average" don't work, and pivot tables are of no use to you. You can still use them, however, by a little subterfuge: suppose you replaced each `A` with a `5,` each `B` with a `4,` and so on. Then you could compute the maximum grade, or the minimum. The "average" would not make sense. You could compute it, but it would have no real meaning. (Why not?) When you created the pivot table of maximums, however, you'd have a table full of 5s, 4s, 3s, etc. That's not ideal. So you could take that table and replace all the 5s with As, 4s with Bs, and so on. Summary:

- Convert letter grades to numerical representations

- Make pivot table based on numerical representations
- Convert pivot table results back to letter grades

There's one case where this convert-pivot-convert-back approach is especially effective: when each entry in the pivot table corresponds to exactly one row in the input table. For instance, in class we'll look at senators' votes on various bills. Each senator gets exactly one vote (Yea/Nay/Not Voting) on each bill. In this case, the operation that's done on each cell "max, min, average, ..." will always end up computing that single votes.

Concatenating two cells

You have already seen the addition of two cells in Excel, but sometimes you would like to combine the contents of two cells in other ways. If you have `foo` in cell A1 and `42` in cell A2, you can make `foo 42` in cell A3 by typing `= A1 & " " & A2` into A3. The `&` operation combines two strings of characters by concatenating them.

Task 12:

On `Sheet1` of `HW1-1Part2.xlsx` in cell E26, make the contents read `hello, world!` as a combination of E23 and E24, spaces included (Task 2 on spreadsheet).

More If Statements

Task 13:

(Independent) In cell F31, enter a formula that produces a 5 if E31 has an `A` in it, a 4 if E31 has a `B` in it, and so on. Hint: try this formula:

```
=If( E31 = "A", 5, If(E31 = "B", 4, 700))
```

Change this so that it does work, and fill in the column labeled "Numerical Representation" with your formula. Does this work for all letter grades (A, B, C, D, F)? By the way, if the value in cell A1 is not a letter grade, what should you put in cell A2? A good idea is to put something that will stand out, like `Bad Data.` Do so. **Note:** The quotation marks around the `A`, `B`, and `Bad Data` are necessary. The quotations marks tell Excel that this thing is to be treated explicitly as text, and *not* as a number or a name.

Task 14:

1. Rename your Excel file to something like JohnHughesHW1-1Part2.xlsx (i.e., your name, followed by `HW1-1Part2.xlsx`).
2. Make sure all 4 tasks are completed.
3. You will e-mail this file to the TAs at the end of this assignment.

Stock Report

Task 15:

a. Create a new spreadsheet called `StockReport`. Use `Data...Get External Data ...From Web` to import a part of `http://finance.yahoo.com/q?s=GOOG` into your spreadsheet. The `s=GOOG` part of that URL tells Yahoo that you want to see the price for Google; you can change this to any other ticker-symbol you like.

   What should you import? Find a small piece of the page to import — perhaps the stock name, price, and most recent change — but feel free to be creative; import a couple of stocks if you like. Be sure to import the *most-recent-change*, because you'll need it in the next part of the exercise.

b. Now using `Data ...Connections`, change the Properties of your connection to "refresh every 2 minutes". This will make Excel check the source webpage every two minutes to see if anything in the table has changed.

c. Use `Home...Conditional Formatting` to make the background of the "change" cell be pale green if the price is rising and pale red if it's falling.

d. Finally, save your spreadsheet as `YourNameHW1-1Part3.xlsx`.

The Row() function

Task 16:

a. Open `Sheet2` of `YourNameHW1-1Part3.xlsx` and name it `FillStuff`. Put the number `7` in cell `A1`. Use `Fill...Series` to fill in the numbers 8, 9, 10, ... 16 in rows 2 through 10.

b. Enter the formula `=Row() + 6` in cell `B1`. Fill down for ten rows. Your results should be the same as those in column `A`.

   Explanation: The value of the `Row()` function in a cell is the number of the row that the cell is in. So cell `B1` is in row 1, hence `row() + 6` has the value `7`.

c. Experiment with `Column()`; describe its behavior.

d. In cell `C1`, enter the formula `=A1 + row()`. *Before you do so*, predict what will happen when you fill down from cell `C1` to `C10`, and write your prediction in a comment for cell `C1`. Now execute the fill, and in a comment for cell `C10`, explain what happened (even if it agrees with your prediction).

e. In cell `D1`, enter the formula `=A$1 + row()`. Again, predict the results of filling down, and explain the results you actually get, using comments on row `D` instead.

The `Match()` function

The `Match()` function finds the location of a particular item in a row or column of items. If the item appears more than once, then `Match()` reports the first occurrence, at least if you set the third parameter to "0," which is what you should do in all these examples.

For example, if you want to find the first cell that contains the exact text "Test tube" in cells `A1:A9`, you would type: `=Match("Test tube",A1:A9,0)`

Task 17:

a. In cells `A15:F15` of `FillStuff`, enter `P, Q, P, Q, Q, R`. In cells `A16:F16`, enter `15, 13, 12, 6, 3, 9`. In cell `A17`, enter a formula that produces a "1" if `A15` has an `Q` in it, and a zero otherwise. Fill this to the right for six cells. In cell `H15`, enter a formula involving `Match()` that will tell which column in row 15 is the first to contain the letter `Q`. In cell `H17`, enter a formula involving `Match()` that will tell which column in row `17` is the first to contain the number `1`.

b. In cell `A18`, enter the formula `=A17`, which will copy the zero from the row above. In cell `B18`, enter the formula `=A18+B17`; this takes the previous result, and adds to it the next entry from row 17. Fill this formula to the right from `B18` to `E18`. The resulting values are called the *partial sums* of the numbers in `A17:E17`. You'll notice that the partial sums increase by one exactly in the columns where the letter `Q` appears in row `15`. Observe what happens if you use `Match()` to locate the numbers `1, 2` and `3` in row 18.

c. In cell `G17`, put a formula to count the number of ones in `A17:F17`.

The Offset() function

The `Offset()` function can be used to grab a particular cell by saying "it's the one two steps down and 3 steps over from some *other* cell." For instance, the formula `=Offset(A1, 2, 3)` will give the value in cell `D3`: we add two rows to `A1` to get the location `A3`, and then add three columns to get to `D3`.

We're going to use `Offset` to copy exactly those columns of our original data where there's a `Q` in row 1. This would be easy to do by hand, of course — there are just three columns, and we could just copy them one at a time. But when you get to 200 columns, that becomes impractical. Here's the idea:

In row 18, we've got a sequence in which each new number *first* appears in a row containing the letter `Q`. The first `1` is in column `B`; the first `2` is in column `D`; the first `3` is in column `E`. If we use `Match` to find these columns, we can copy them to a new location.

Task 18:

a. Since there are three `Q`s in the table, enter the numbers `1, 2,` and `3` in cells `A20:C20`.

b. In cell `A21`, enter a formula using `Match()` that identifies the column in which the first `1` appears in row `18`. Don't use the number `1` directly; instead, get it from cell `A20`. Fill your formula two more cells to the right, so that cells `B21` and `B22` contain the columns of the first appearance of the numbers `2` and `3`, respectively. Hint: when entering the range to search, you should use `$A18:$F18`, so that the same range will be used when you fill right, rather than the range being adjusted to the right as well.

c. In cells `A22:C22`,enter a formula that subtracts one from the corresponding entries in cells `A21:C21`.

d. In cell `A24`, enter the formula `=Offset($A15,0, A$22)`. Because `A22` contains the number `1`, this goes to cell `A15`, moves down zero rows, and across by *one* column; it copies the value in cell `B15`, which is `Q`. Now enter a formula in cell `A25` that copies the data in `B16` by offsetting from cell `A15`.

e. Would `fill` have worked to make the second formula in the previous task? Use `fill` to fill in formulas for cells `B24:C24`. You've succeeded in copying all columns from the original table that had a `Q` in the first row.

f. Explain the use of dollar signs in the formula `=Offset($A15,0,A$22)` as a comment in cell `A24`.

g. Save your file (which includes both the Stock Report and FillStuff) as YourNameHW1-1Part3_1.xlsx, where YourName is replaced with your first and last name. You will e-mail this file to the TAs at the end of this assignment.

Task 19:

a. Download `GradeSheet.xlsx` from the website.

b. Make a second sheet, containing a table of the same size and shape. For this table, make every cell show either a 0 or a 1. A cell should show a 1 if the score is higher than Anne's score and a 0 of it's equal to or less than Anne's score. This is tricky because of the need for absolute addressing in one index!

c. Use conditional formatting to color in the cells on the original sheet that contain grades higher than Anne's score on that same assignment.

d. Save this spreadsheet as `YourNameHW1-1Part4.xlsx`.

Final Handin

Task 20:

Congratulations, you're done with your first assignment! Send the following files to `cs0931handin@gmail.com` with the "Subject:" line ``` ``YourNameHW1-1'' ```:

1. YourNameHW1-1Part1.xlsx
2. YourNameHW1-1Part2.xlsx
3. YourNameHW1-1Part3.xlsx
4. YourNameHW1-1Part4.xlsx

"YourName" should be replaced with your first and last name. Make sure every task has been completed.