Monday Feb 2

We begin today's lesson with the $ symbol, one of the biggest hurdles for Excel users. Let us learn about **the $ symbol** in the context of what I call the Classic Bank Interest Program: we deposit $100 in the bank and contemplate what we will have in 10 years at various rates 3%, 5% and 10%.

	A	B	C	D	E
1	TEN YEARS	3%	5%	10%	
2	2015	100	100	100	
3	2016	103	105	110	
4	2017	$ 106.09	$ 110.25	$ 121.00	
5	2018	$ 109.27	$ 115.76	$ 133.10	
6	2019	$ 112.55	$ 121.55	$ 146.41	
7	2020	$ 115.93	$ 127.63	$ 161.05	
8	2021	$ 119.41	$ 134.01	$ 177.16	
9	2022	$ 122.99	$ 140.71	$ 194.87	
10	2023	$ 126.68	$ 147.75	$ 214.36	
11	2024	$ 130.48	$ 155.13	$ 235.79	
12	2025	$ 134.39	$ 162.89	$ 259.37	

Here are the formulas for the above spreadsheet using PREFERENCES under EXCEL then VIEW then the checkbox that says SHOW FORMULAS.

Those are the steps for SHOWING FORMULAS until you learn a shortcut later in this lesson. Notice how the columns DOUBLE in width when you show formulas. We get this view after showing formulas:

	A	B	C	D	E
1	TEN YEARS	0.03	0.05	0.1	
2	2015	100	100	100	
3	2016	=B2*1.03	=C2*1.05	=D2*1.1	
4	2017	=B3*1.03	=C3*1.05	=D3*1.1	
5	2018	=B4*1.03	=C4*1.05	=D4*1.1	
6	2019	=B5*1.03	=C5*1.05	=D5*1.1	
7	2020	=B6*1.03	=C6*1.05	=D6*1.1	
8	2021	=B7*1.03	=C7*1.05	=D7*1.1	
9	2022	=B8*1.03	=C8*1.05	=D8*1.1	
10	2023	=B9*1.03	=C9*1.05	=D9*1.1	
11	2024	=B10*1.03	=C10*1.05	=D10*1.1	
12	2025	=B11*1.03	=C11*1.05	=D11*1.1	

But let us say that my boss wants to contemplate ANY possible percentage for interest in column E. He or she says to me "hey Steve -- please set up column E for me so that I can type any percent I want in E1 and then I can see the values below.

Ok boss, I say, let me try this. I type =E2*(1+E1) into E3 and all looks good

	A	B	C	D	E
1	TEN YEARS	3%	5%	10%	9%
2	2015	100	100	100	100
3	2016	103	105	110	109

But then when I try to fill E3 down, even just 3 more rows, I get a disaster with the money growing to 11K in row 4 and 1 million dollars in row 5.

	A	B	C	D	E
1	TEN YEARS	3%	5%	10%	9%
2	2015	100	100	100	100
3	2016	103	105	110	109
4	2017	$ 106.09	$ 110.25	$ 121.00	$ 11,009.00
5	2018	$ 109.27	$ 115.76	$ 133.10	$ 1,210,990.00
6	2019	$ 112.55	$ 121.55	$ 146.41	$ 13,332,999,900.00

And when I choose to see the formulas, I know that something is wrong.
"Hey Boss, I know I can do this for you. I just need some more time."

	A	B	C	D	E
1	TEN YEARS	0.03	0.05	0.1	0.09
2	2015	100	100	100	100
3	2016	=B2*1.03	=C2*1.05	=D2*1.1	=E2*(1+E1)
4	2017	=B3*1.03	=C3*1.05	=D3*1.1	=E3*(1+E2)
5	2018	=B4*1.03	=C4*1.05	=D4*1.1	=E4*(1+E3)
6	2019	=B5*1.03	=C5*1.05	=D5*1.1	=E5*(1+E4)

So what should I do? Help please! What should I do?
I call up a friend who says "Just wrap the E1 with $ symbols and then fill down."
Sounds weird to me but I try it in E3, then fill down and it now it truly looks weird. Do you agree? Each cell has these two dollar symbols in it. Crazy, right? Weird, right?

	A	B	C	D	E
1	TEN YEARS	0.03	0.05	0.1	0.09
2	2015	100	100	100	100
3	2016	=B2*1.03	=C2*1.05	=D2*1.1	=E2*(1+$E$1)
4	2017	=B3*1.03	=C3*1.05	=D3*1.1	=E3*(1+$E$1)
5	2018	=B4*1.03	=C4*1.05	=D4*1.1	=E4*(1+$E$1)
6	2019	=B5*1.03	=C5*1.05	=D5*1.1	=E5*(1+$E$1)
7	2020	=B6*1.03	=C6*1.05	=D6*1.1	=E6*(1+$E$1)
8	2021	=B7*1.03	=C7*1.05	=D7*1.1	=E7*(1+$E$1)
9	2022	=B8*1.03	=C8*1.05	=D8*1.1	=E8*(1+$E$1)
10	2023	=B9*1.03	=C9*1.05	=D9*1.1	=E9*(1+$E$1)
11	2024	=B10*1.03	=C10*1.05	=D10*1.1	=E10*(1+$E$1)
12	2025	=B11*1.03	=C11*1.05	=D11*1.1	=E11*(1+$E$1)

Yes weird, but it works and my boss is now very happy because it works!

	A	B	C	D	E
1	TEN YEARS	3%	5%	10%	9%
2	2015	100	100	100	100
3	2016	103	105	110	109
4	2017	$ 106.09	$ 110.25	$ 121.00	$ 118.81
5	2018	$ 109.27	$ 115.76	$ 133.10	$ 129.50
6	2019	$ 112.55	$ 121.55	$ 146.41	$ 141.16
7	2020	$ 115.93	$ 127.63	$ 161.05	$ 153.86
8	2021	$ 119.41	$ 134.01	$ 177.16	$ 167.71
9	2022	$ 122.99	$ 140.71	$ 194.87	$ 182.80
10	2023	$ 126.68	$ 147.75	$ 214.36	$ 199.26
11	2024	$ 130.48	$ 155.13	$ 235.79	$ 217.19
12	2025	$ 134.39	$ 162.89	$ 259.37	$ 236.74

Got it? The $ symbol means ABSOLUTE REFERENCE and you officially become a varsity Excel user when you can solve problems with the $ symbol in the formula.

Here is another example. Construct a spreadsheet that shows the sum of the first 3 or 5 or 10 ODD numbers.

	A	B	C	D	E	F
1	Find the Sum of the first 2 or 3 or 5 or 10 odd numbers					
2	1					
3	3	4				
4	5					
5	7					
6	9					
7	11					
8	13					
9	15					
10	17					

Here is the formula in B3

	A	B	C
1	Find the Sum of the first 2 or 3 or 5 or 10 odd numbers		
2	1		
3	3	=SUM(A2:A3)	
4	5		
5	7		
6	9		
7	11		
8	13		
9	15		
10	17		
11			

Can you guess what we have to do to the formula =SUM(A2:A3) before filling down? HINT: when we magic fill down this formula, is there one cell that needs to stay CONSTANT? Which one? Yes, correct -- I heard you say "the A2 needs to stay constant." And how do we keep something constant? We put $ signs around it, making it ABSOLUTE not RELATIVE.

It now looks like

	A	B	C
1	Find the Sum of the first 2 or 3 or 5 or 10 odd numbers		
2	1		
3	3	=SUM($A$2:A3)	
4	5		
5	7		
6	9		
7	11		
8	13		
9	15		
10	17		

And when I fill down, it looks like

	A	B	C
1	Find the Sum of the first 2 or 3 or 5 or 10 odd numbers		
2	1		
3	3	=SUM($A$2:A3)	
4	5	=SUM($A$2:A4)	
5	7	=SUM($A$2:A5)	
6	9	=SUM($A$2:A6)	
7	11	=SUM($A$2:A7)	
8	13	=SUM($A$2:A8)	
9	15	=SUM($A$2:A9)	
10	17	=SUM($A$2:A10)	

And we have the nice result for odd numbers showing that the first 2 odd numbers add up to 2-squared. The first 5 odd numbers adds to 25 (5 squared) and so on.

	A	B	C	D	E	F
1	Find the Sum of the first 2 or 3 or 5 or 10 odd numbers					
2	1					
3	3	4				
4	5	9				
5	7	16				
6	9	25				
7	11	36				
8	13	49				
9	15	64				
10	17	81				

Ready for another example, more practical? Consider this spreadsheet that converts the grade in column "B" into a letter grade such as A- or B- or C- using a new formula in our course called the =LOOKUP( ) FORMULA.

	A	B	C	D	E	F
1	GIVING STUDENTS A LETTER GRADE				GRADING MATRIX	
2	Larry	91	A-		0	F
3	Kevin	81			70	C-
4	Robert	71			80	B-
5	SHORTCUT	You can use CTRL and ` to change SHOW FORMULAS			90	A-

Here you see the shortcut CTRL ` in blue that will SHOW or HIDE formulas.
You will find the funky ` key at the top left of your MAC or PC keyboard

Here is what the one formula looks like

	A	B	C	D	E	F
1	GIVING STUDENTS A LETTER GRADE				GRADING MATRIX	
2	Larry	91	=LOOKUP(B2,E2:E5,F2:F5)		0	F
3	Kevin	81			70	C-
4	Robert	71			80	B-
5	SHORTCUT	You can use CTRL and ` to change SHOW FORMULAS			90	A-

Yes I know this is a new formula for you but I believe you can all handle it.
The formula is =LOOKUP(B2,E2:E5,F2:F5)
and it means "lookup the number in cell B2 and compare it with the numbers in ascending order from E2 to E5 and find out where B2 belongs. Once you find it on this little chart or table, please find the corresponding word in F2 to F5 and bring back that word or number.

Notice that LOOKUP has 3 parameters inside with 2 commas -- the first parameter is B2 the thing we are looking up. The second parameter is E2:E5 which is the left side of the grading matrix area *that MUST be in LOW to HIGH order*. The third parameter is F2:F5 which is the right side of the grading matrix area.

If this is confusing, please allow me to change the word F to "FAILING" and to change Larry's grade to 33 and now look what we have:

	A	B	C	D	E	F
1	GIVING STUDENTS A LETTER GRADE				GRADING MATRIX	
2	Larry	33	FAILING		0	FAILING
3	Kevin	81			70	C-
4	Robert	71			80	B-
5	SHORTCUT	You can use CTRL and ` to change SHOW FORMULAS			90	A-
6						

I hope that help you with our new friend the LOOKUP command that can be used in many flexible ways. By the way, you can locate the GRADING MATRIX anywhere on the spreadsheet -- to the right or below the data. You can even locate it on a separate worksheet TAB.

But the problem still remains. Should I FILL DOWN with C2 or adjust it first with $ symbols?

	A	B	C	D	E	F
1	GIVING STUDENTS A LETTER GRADE				GRADING MATRIX	
2	Larry	33	=LOOKUP(B2,E2:E5,F2:F5)		0	FAILING
3	Kevin	81			70	C-
4	Robert	71			80	B-
5	SHORTCUT	You can use CTRL and ` to change SHOW FORMULAS			90	A-

What do you think? Well, I called up Russell Wilson from the Seattle Seahawks and he said "just fill it down Steve and let us hope it works." Here is what I got -- something clearly went wrong in cell C4 for Robert.

	A	B	C	D	E	F
1	GIVING STUDENTS A LETTER GRADE				GRADING MATRIX	
2	Larry	33	FAILING		0	FAILING
3	Kevin	81	B-		70	C-
4	Robert	71	#N/A		80	B-
5	SHORTCUT	You can use CTRL and ` to change SHOW FORMULAS			90	A-

When I looked at the formulas doing it Russell's way, I see clearly that he was wrong because the formulas in both C3 and C4 are not referencing the grading matrix properly.

	A	B	C	D	E	F
1	GIVING STUDENTS A LETTER GRADE				GRADING MATRIX	
2	Larry	33	=LOOKUP(B2,E2:E5,F2:F5)		0	FAILING
3	Kevin	81	=LOOKUP(B3,E3:E6,F3:F6)		70	C-
4	Robert	71	=LOOKUP(B4,E4:E7,F4:F7)		80	B-
5	SHORTCUT	You can use CTRL and ` to change SHOW FORMULAS			90	A-
6						

So then I called up Tom Brady from the Patriots and even though he was busy, he explained to me that "the grading matrix must be made into absolute reference since it is a fixed portion of the spreadsheet that should not change as you fill down." So I took Tom's advice and made my top formula absolute like this:

	A	B	C	D	E	F
1	GIVING STUDENTS A LETTER GRADE				GRADING MATRIX	
2	Larry	33	=LOOKUP(B2,$E$2:$E$5,$F$2:$F$5)		0	FAILING
3	Kevin	81			70	C-
4	Robert	71			80	B-
5	SHORTCUT	You can use CTRL and ` to change SHOW FORMULAS			90	A-

And then when I filled down I got

	A	B	C	D	E	F
1	GIVING STUDENTS A LETTER GRADE				GRADING MATRIX	
2	Larry	33	=LOOKUP(B2,$E$2:$E$5,$F$2:$F$5)		0	FAILING
3	Kevin	81	=LOOKUP(B3,$E$2:$E$5,$F$2:$F$5)		70	C-
4	Robert	71	=LOOKUP(B4,$E$2:$E$5,$F$2:$F$5)		80	B-
5	SHORTCUT	You can use CTRL and ` to change SHOW FORMULAS			90	A-

and all the data was accurate when I chose to HIDE the formulas with CTRL and `.

	A	B	C	D	E	F
1	GIVING STUDENTS A LETTER GRADE				GRADING MATRIX	
2	Larry	33	FAILING		0	FAILING
3	Kevin	81	B-		70	C-
4	Robert	71	C-		80	B-
5	SHORTCUT	You can use CTRL and ` to change SHOW FORMULAS			90	A-

Make sense? Clear? Confused? Got a headache? Need a joke to relax you?
For over 20 years, I have used the bad joke that "Bill Gates declared nothing to be more absolute than money and that is why he chose the $ symbol to mean ABSOLUTE REFERENCE"

I look forward to talking with you and hearing from you!

HW 3A Here is the required video to watch that assumes you have read through these 7 pages

http://youtu.be/MIAJF8AIeP4

Required HW 3B: Recreate the spreadsheet with several tabs each of which demonstrates the $ symbol usage with each of these problems.

The first tab needs to show money deposited in a bank at various interest rates. To make yours different from mine, let us deposit $1000 into our bank in 2015 and contemplate what happens by the year 2100. Got it? 2015 through 2100. Do this for 4%, 8% and 12% interest rates. Then in the last column "make your boss happy" by giving him or her the fancy method to type any percentage in and via the $ symbol, the calculations appear below. One more thing is to COLOR CODE the first value in each column when the money doubles and gets to be $2000.

OPTIONAL: using conditional coding, do something special when the money doubles in the last column that is chock full of $ symbols.

The second tab needs to show the sum of the first ODD numbers from 1 to 20.

OPTIONAL: in the third column use a formula to show the square of the numbers in the first column verifying that the first 7 odd numbers add up to 49 or in general that the first N odd numbers add up to N-squared.

The third tab needs to show students and grades the way that I did. Please make it correspond to the way that grades are at your school (if that is relevant and if you know).

Next Topic: Charts

People ask me all the time about the Google Drive Spreadsheet vs. Excel. The two systems are incredibly similar but not so for charts. Excel offer many more chart options and flexibility. Let's begin with a simple example from the Countries of the World.

PROBLEM: Make a pie graph of the countries of Western Europe showing their populations as percentages of the pie.

We begin by doing a FILTER on the Countries of the World to get just countries from Western Europe and sorting them into alphabetical order. We then use COPY and PASTE to move the data into either a NEW FILE or a NEW WORKSHEET TAB.

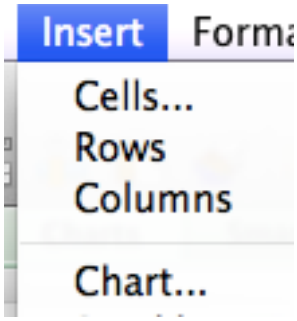
Here is what we get either in a new spreadsheet or new worksheet TAB:

	A	B
1	Country	Population
2	Andorra	71,201.00
3	Austria	8,192,880.00
4	Belgium	10,379,067.00
5	Denmark	5,450,661.00
6	Faroe Islands	47,246.00
7	Finland	5,231,372.00
8	France	60,876,136.00
9	Germany	82,422,299.00
10	Gibraltar	27,928.00
11	Greece	10,688,058.00
12	Guernsey	65,409.00
13	Iceland	299,388.00
14	Ireland	4,062,235.00
15	Isle of Man	75,441.00
16	Italy	58,133,509.00
17	Jersey	91,084.00
18	Liechtenstein	33,987.00
19	Luxembourg	474,413.00
20	Malta	400,214.00
21	Monaco	32,543.00
22	Netherlands	16,491,461.00
23	Norway	4,610,820.00
24	Portugal	10,605,870.00
25	San Marino	29,251.00
26	Spain	40,397,842.00
27	Sweden	9,016,596.00
28	Switzerland	7,523,934.00
29	United Kingd	60,609,153.00

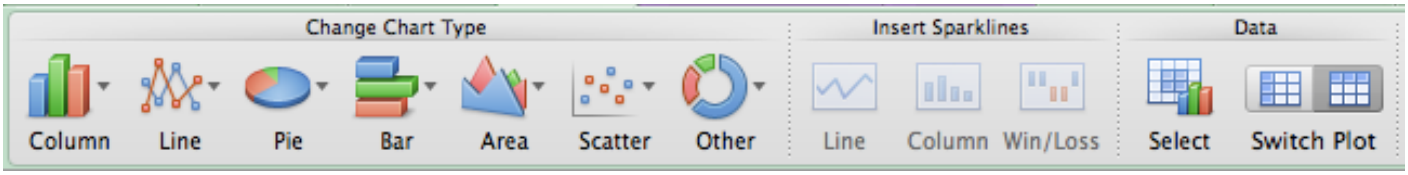
This is very important step. It is much easier to graph data when you have isolated the data and have it on its own spreadsheet.

We now highlight from A1 to B29 perhaps using the SHIFT CLICK trick.

We then INSERT CHART from the INSERT menu or we click on CHARTS on the Toolbar.



Our CHART toolbar now looks like



and so we pick PIE. Once we do so, we see the CHART QUICK LAYOUTS change on the right hand side.

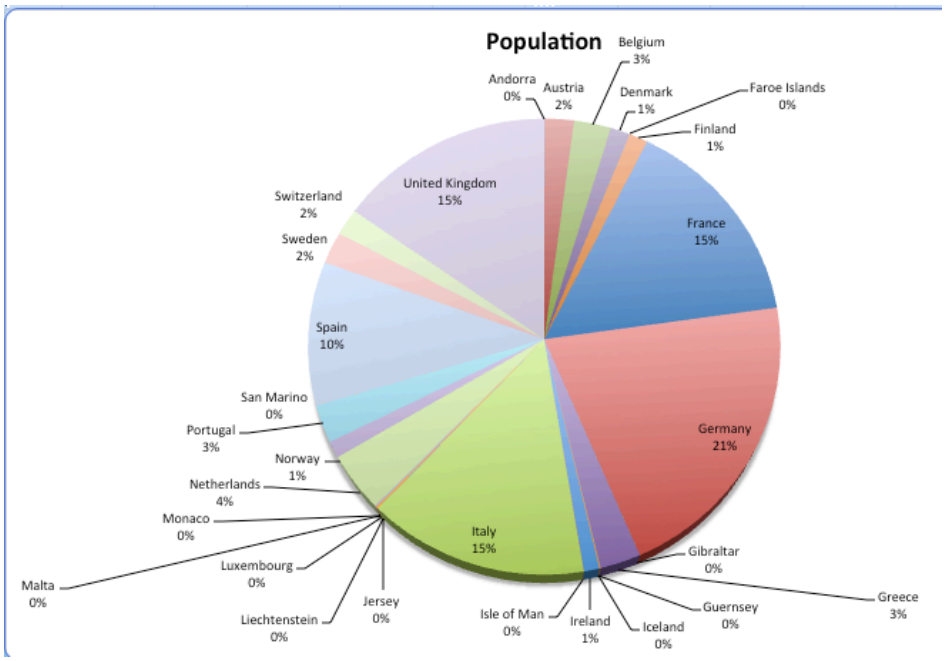
Notice the variety of choices including the triangles for "more choices."

Some contain percents and some contain legends. The left side shows the variations while the right side shows the color choices. Google Drive does not contain anything like this!

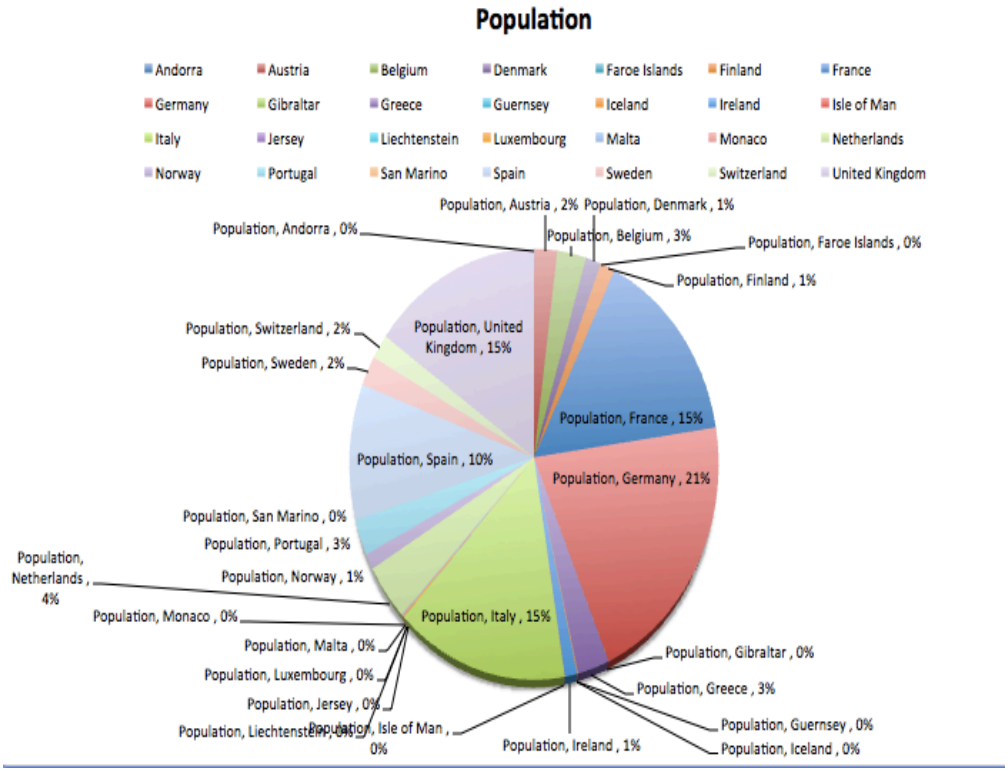
Take advantage of these Quick Layouts and Chart Styles!

Once you have your graph chosen, you can RESIZE it by clicking and dragging from a corner. Also, you can move it by clicking and dragging from the middle.

Here is one option I liked:



And here is another below. Every portion of the graph is CLICKABLE and changeable. In other words, you can click on the word POPULATION and change it. To delete the graph and start again, you click in the middle of the graph to highlight it then push the delete button.



HW 3C Make a pie graph of the COUNTRIES of the NEAR EAST showing their populations and percentages. There are 16 countries from NEAR EAST.

OPTIONAL: Read a little about SCATTER GRAPHS using these links (or any links)
http://simple.wikipedia.org/wiki/Scatter_graph or http://en.wikipedia.org/wiki/Scatter_plot
and then make a Scatter Graph of the population vs. area of the same 16 countries.

General principles of graphing
Principle #1: Copy and paste the relevant info into a new spreadsheet or new worksheet TAB so that before you choose INSERT CHART you have the data you want to graph with rows and columns.

Principle #2: Take advantage of the Excel Quick Charts that are very clever.

Principle #3: Every component of the chart is clickable and modifiable. Just do one at a time and see how it affects things.

Our Challenge Problem for this week

Take the challenge with whatever comfort level you prefer. Some people like to drive themselves crazy figuring out the solution. Other people like to get some hints from the video and then pause and solve the rest. Other people like to watch the video thoroughly and then replicate the solution. Got it? Whatever you do, you must share comments in our collaborative document as part of your weekly homework!

HW 3D: Produce a spreadsheet and graph that demonstrates what is sometimes Moore's Law. This can be simplified to saying "every 2 years since the first digital computer in 1946 we get ourselves a more powerful computer that is half the cost and twice the power." Setup the spreadsheet so that the user can change the cost in 1946 to be $1000 or 1 million dollars or 1 billion dollars and everything changes. Send me the solution via email once done.
(please name your file **Larry Bird HW3D Feb 2.xlsx** using your name and current date of course)

OPTIONAL BONUS: Add a third column to show Moore's Law if the percent decrease is not .5 (50%) but a variable on the spreadsheet that the user could change. This will require the use of the $ symbol for absolute reference.

Here is the 14 minute solution video: http://youtu.be/ZyEtzNRmeMU

Have a good week -- I am here for you via email or phone if/when you need. Steve

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All lessons stored at http://teachingcompany.com/jan15 • Our Shared Doc at http://tinyurl.com/jan15excel

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☑ HW 3B: Recreate the spreadsheet with several tabs each of which demonstrates the $ symbol usage with each of these problems (page 8)

☑ HW 3C Make a pie graph of the COUNTRIES of the NEAR EAST showing their populations and percentages. (page 12)

OPTIONAL: Read a little about SCATTER GRAPHS using these links

☑ HW 3D Challenge Problem and Optional Bonus (page 12)