Excelets: Designing Interactive Learning Tools to Captivate the Google Generation

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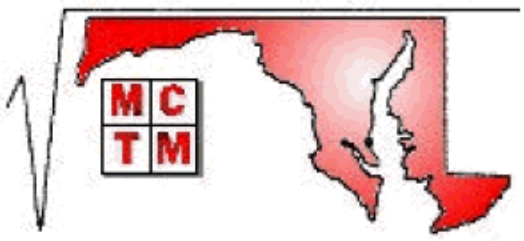

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Excelets: Designing Interactive Learning Tools to Captivate the Google Generation

This is a quick guide or introduction to developing interactive Excel spreadsheets or Excelets (aka – simulations). It assumes that you have a basic knowledge of working with Excel.

The objectives of this guide are five-fold:

1. wow! Excel can do that with no programming or macros;

2. to introduce you to the Forms Toolbar and a number of the tools available;

3. to introduce you to naming variables (helps algebraic thinking);

4. to create a dynamic graph with manipulable variables interactive Excel spreadsheet, and;

5. to resize the Excelets to fit for full screen viewing on your computer.

The Possibilities in Excel

For a variety of Excelet examples in mathematics and chemistry plus all the "how to" instructions for constructing them, see the "Developer's Guide to Excelets" at

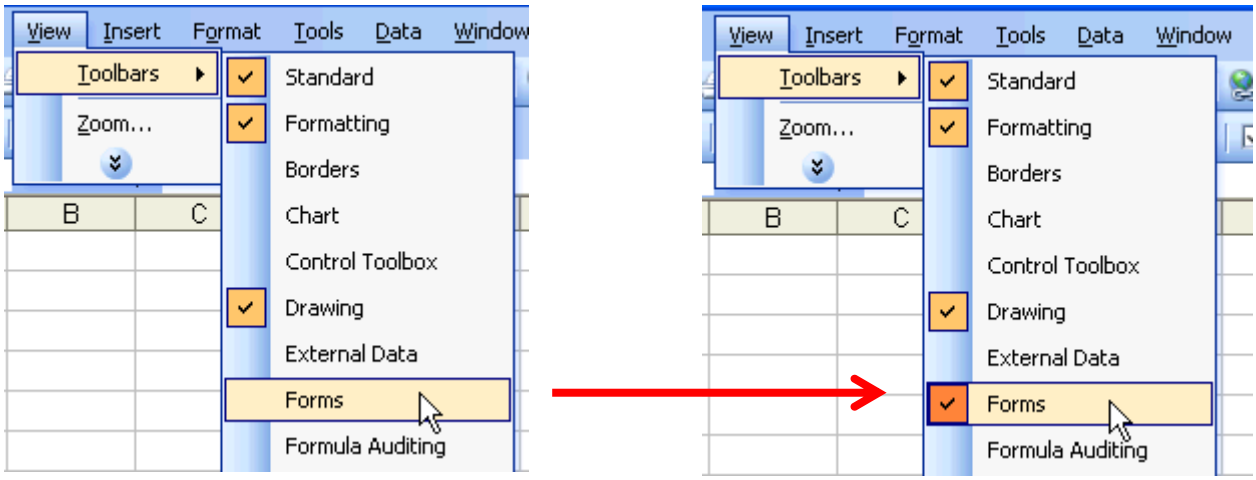
http://academic.pgcc.edu/~ssinex/excelets.

Go to this site and click on the examples of Excelets. Pick an Excelet of your choice and explore. All of the interactive features are demonstrated on the interactive features tour.

You will also find resources to handling, graphing, and analyzing data in Excel as well as getting into mathematical modeling.

Getting the Forms Toolbar

Let's get the forms toolbar. Go to View on the menu bar and select Toolbars and then select Forms (a check mark will appear when you click on it).



The toolbar will then appear as shown below. You may have to drag it to "dock" it with the toolbars at the top of the screen.

In Excel, if you move the cursor over each tool it will show you its name.

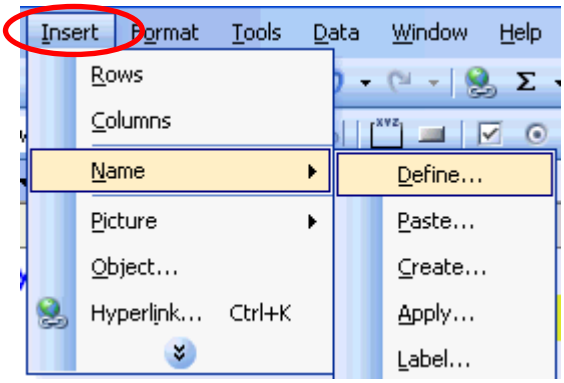
Using named variables in Excel

Type in the variable name "initial height" as shown below, then click in the yellow cell.

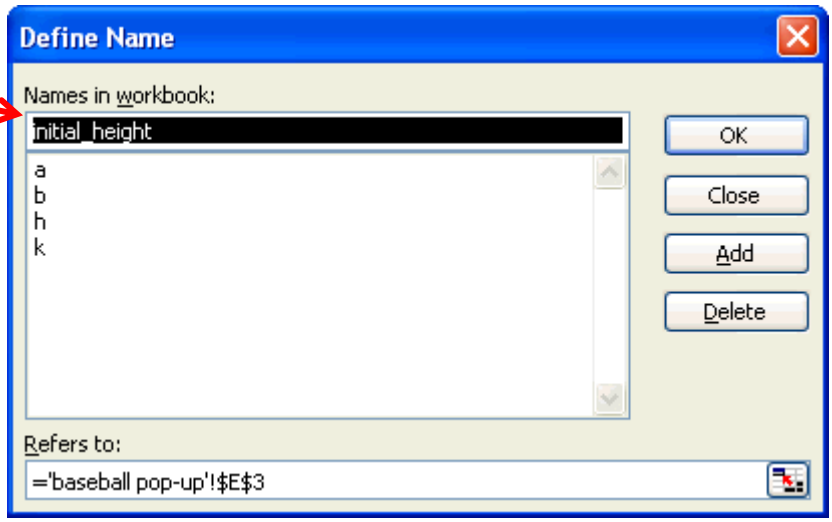
initial height = 0

Naming helps support algebraic thinking, so let's use the ability to name variables in Excel.

Now go to the Inert on the menu bar > Name > Define… and the Define Name menu pops ups.



You will find "initial_height" in the box as shown.



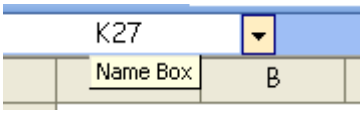
It will not be listed in the lower box until you click OK.

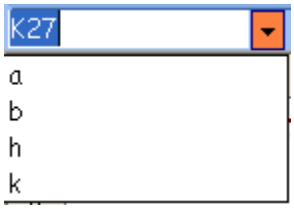
All the named variables in a worksheet appear in the list as shown here to the right (initially it will be empty).

Excel will automatically use the text in a nearest neighbor cell to the left or above (with left given priority over above) to create a name or you can type any name in.

A named variable is automatically an absolute reference (like A2) to the cell.

You can grab the named variables by clicking on the cell where the variable was assigned or from the Name Box.





You can also create variable names in here by typing over the cell reference as well.

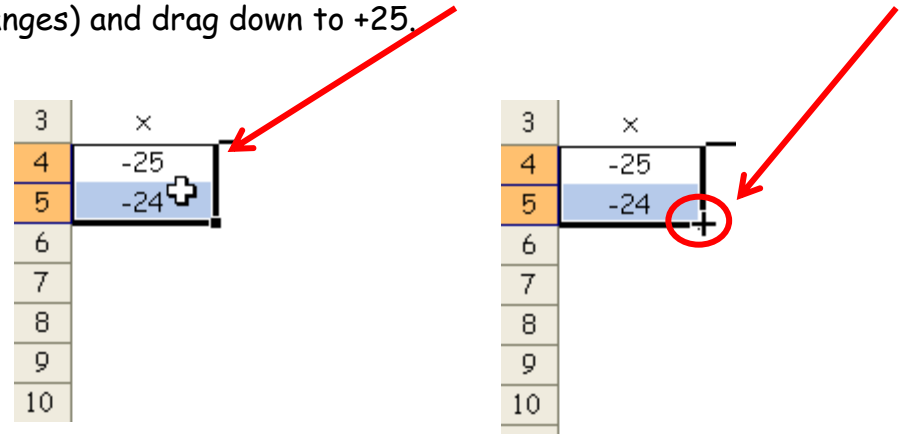
Constructing an Interactive Excel Spreadsheet

We are going to construct the vertex form tab of the "Exploring the Family of Quadratic Functions" as part of this workshop.

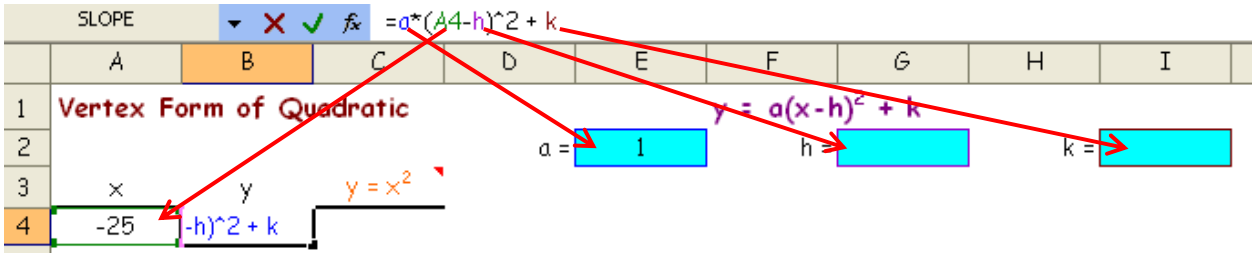
Get a blank workbook and set up the following in it:

	A	B	C	D	E	F	G	H	I	J
1	Vertex Form of Quadratic					$y = a(x-h)^2 + k$				
2					a =		h =		k =	
3	x	y	$y = x^2$							
4										
5										

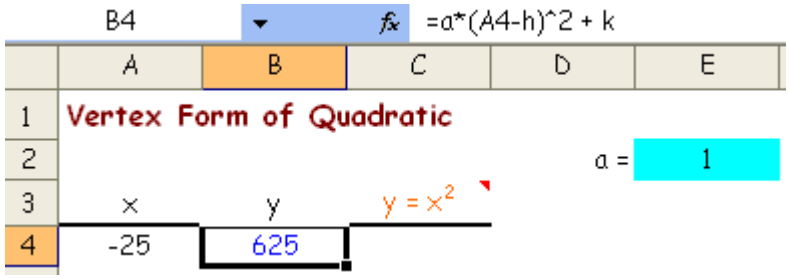
Now we need to name the variables: "a", "h" and "k" as described in the previous section. Then let's have the quadratic plot from -25 to 25. Go to cell A4 and type -25 and then -24 in A5. Click and highlight both cells and then grab the corner (cursor changes) and drag down to +25.



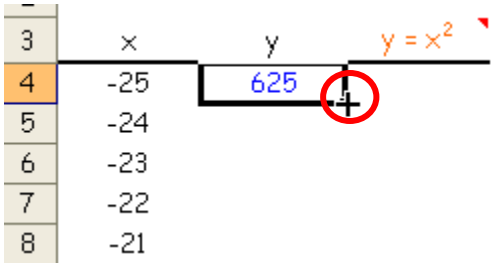
Now we want to put the formula for the vertex form in cell B4. Click on B4 and type an equal sign ("=") and then click on E2 and the rest of the formula as shown below.



When you are finished, press enter and the value 625 should appear in B4.

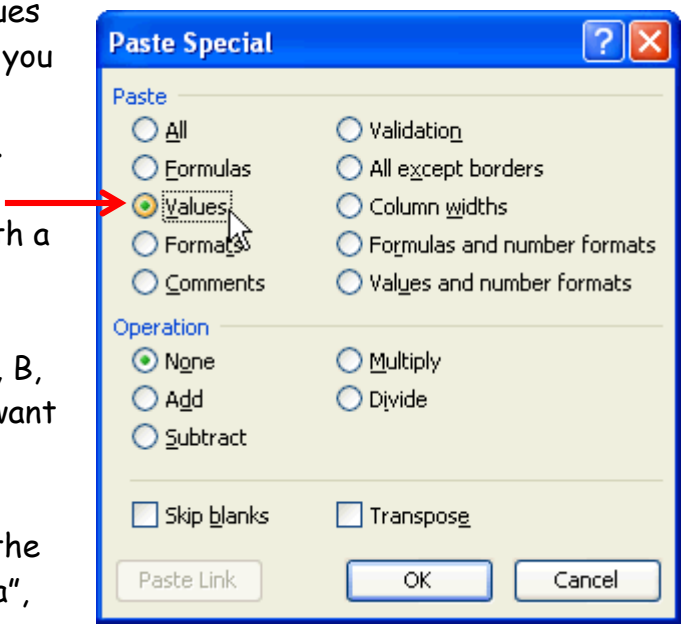


Highlight B4, cursor over the corner (cursor changes) and then double click. This will fill down using the formula.



Copy the numbers in column B and then click on cell C4. Now go to Edit on the menu bar and select Special Paste… This will give you

the special paste menu and select Values from the Paste option. This will allow you to paste the number from column C without using the formula in Column B.



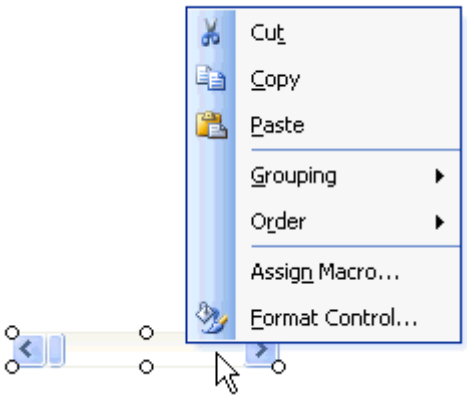
This creates the comparison curve with a = 1, h = 0, and k = 0.

Now highlight the values in columns A, B, and C and select Inert > Chart… We want an XY scatter plot.

After you label the graph and set up the colors, you should be able to change "a", "h" and "k" to see a response!!!!

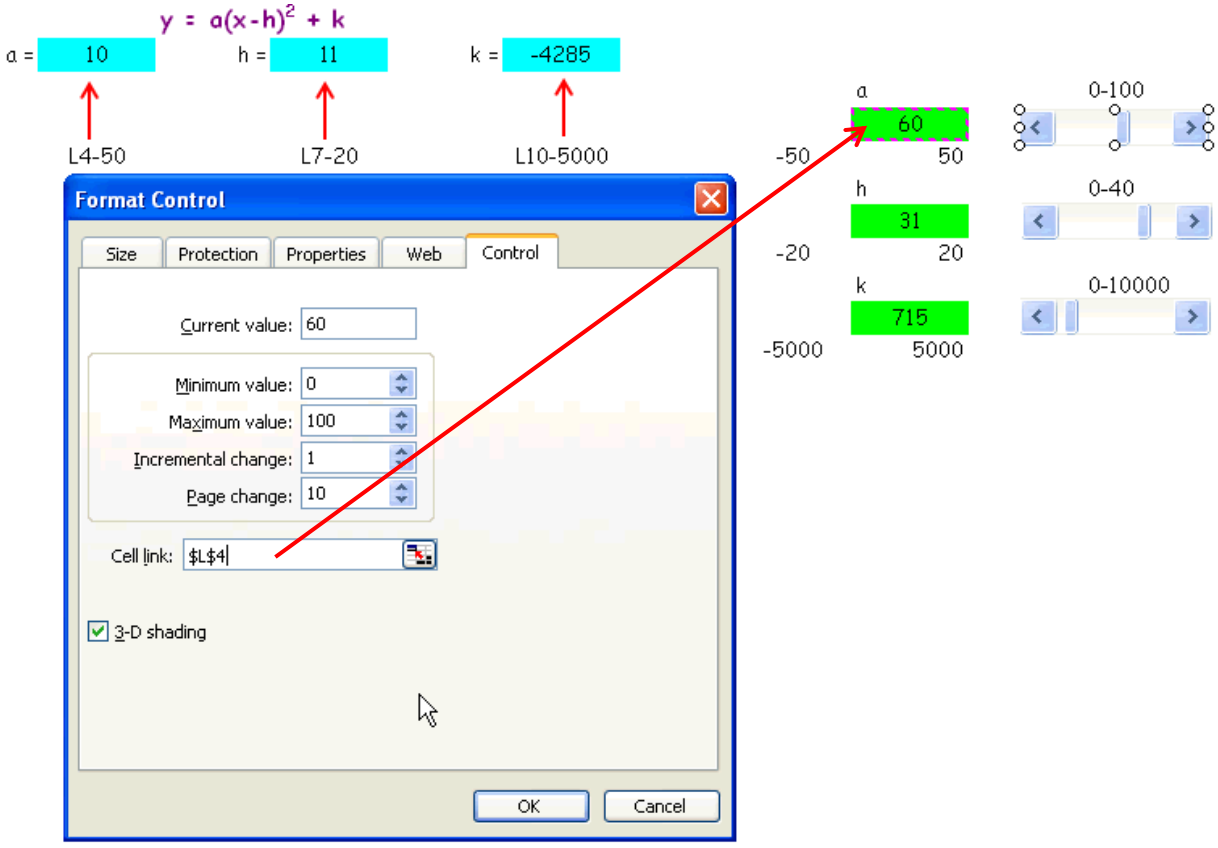
Let's put sliders or scroll bars as they referred to in Excel on the variables (for more details, see To get the Forms Toolbar). Click on the scroll bar on the forms toolbar and then go to the area where you want to place the scroll bar and click and drag to size it. When you release the click a scroll bar with appear.

Right click on the scroll bar and select Format Control… from the menu.



The Format Control menu will appear as shown on the next page. The scroll bar and spinner can only have positive integers values, so we need to use formulas to get negative values as well as decimal values. See Decimals and Negative Values for

Spinners and Scroll Bars for more. Set up the three scroll bars, linking them to the green cell to their left as shown below. Set the minimum and maximum values to the range above each scroll bar. Check them by dragging the scroll bar or clicking the terminal arrows to see if the range of numbers appears in the appropriate green cells.



In the blue cells on the screen shot above, type the formula as shown below them (remember to include the "=" in them). This will allow the scroll bar to change and deliver the negative to positive range for the blue cells.

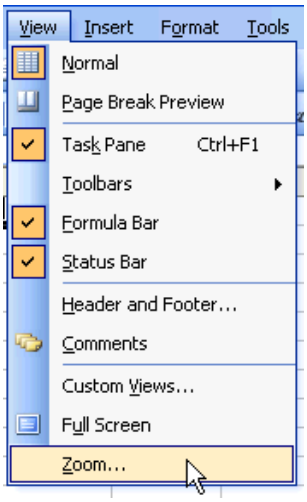
There are many more features here and the instructions for all of it are available in the "Developer's Guide to Excelets" at

http://academic.pgcc.edu/~ssinex/excelets.

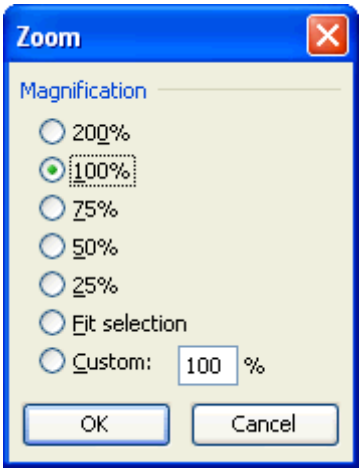
As you explore Excelets, look under the graphs as many tricks are explained here. Logic functions (if statements) add the power to turn items off and on.

Sizing your Excelets to fit the computer screen

If you go to View on the menu bar and select Zoom…



Then the Zoom menu will pop-up and you can size things so that all areas are in the view of your students.



…and now with a shift in pedagogy to get the Google generation pondering:

Write some "what if" questions to get your students exploring with this Excelet.

- What if the sign of "a" changes, how does the curve behave?
- If "h" increases, how does the quadratic function behave?
- As "a" decreases to a smaller and smaller value, how does the function respond?

Students can actually discover how the "a", "h", and "k" coefficients of the vertex form and "a", "b", and "c" of the standard form influences the shape of the quadratic function. Excelets have the potential to evolve your classroom from "chalk-and-talk" to "click-and-think."

Please feel free to contact me with any questions, comments, or problems you may encounter.

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