Excel Simulations - 1

[1]

We are going to look at a number of ways Excel can be used to create worksheet simulations that help students visualize concepts. The first type of simulation we will create will use a formula to calculate the data points to be plotted. The second simulation uses experimental data to produce its plot.

The formula example will have two variables although you could use any number of variables. Each variable cell will be connected to a slider bar that changes its value. The variables are then used by formulas to create a range of data that is graphed. To run the simulation you move the slider bars which alters the variables producing new range values and updating the graph.

The experimental example will use three variables although again you could use any number. Experimental data is placed in a numbered range and the variables select a subset of this data. To run the simulation you move the slider bar which alters what values the variables contain and updates the graph.

Type this into Microsoft Excel. The current value of variable 1 is 288 and variable 2 is 76. We are going to divide our variables by the values on row four (1000 and 100). The values in row five (50 and 2) will be used as starting values for our formulas.

[2]

Type text and numbers
[3] Format the cells that contain constants.

Enter $=A6-B6$ in cell C6. We are going to subtract the value generated by variable one by the value generated by variable two.

Enter $=A5*(A$2/A$4+1)$ in cell A6. Currently this formula divides 288 by 1000 adds one and multiplies by 50. The reason for using the dollar signs in front of the row numbers is to ensure the row numbers don’t change when the formula is copied.

Select A6 to C6 and then drag fill handle to copy the formulas down to row 15.

[10] Change the format of all cells in the first three columns.
Make the cell format Number with 0 places after the decimal.

Select the numbers you want to make into a graph.

[14] Select 3-D line chart.

[16] Delete the legend.
[17] Increase the size of the chart.

[18] Select wall.

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[22] Add a scroll bar.
[23] View properties of the selected scroll bar object.

[24] Set the linked cell to A2 (variable 1) and the maximum value it can contain as 300.
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[25] Add a second scroll bar under the first one.

[26] Set the second scroll bars linked cell as B2 (variable 2) and the maximum value it can contain as 200.
Drag the scroll bars to change the variable values.

The formula results change and a new graph is displayed. Switch to sheet2 where we will create another type of dynamic graph.
Enter the text and formulas on sheet2. This type of dynamic graph can be used when you want to display values that have been recorded during an experiment.

(1) Type text and numbers

Use the fill handle to number the series.
Use the growth trend function on variable one.

Complete the series for variable two and three. Note variable two and three are linear.
Add a formula that looks up the value in the table based on cell A2. This vertical lookup command has four parts: lookup cell ($A2$), table area ($A4:D14$), column selected (2) and exact match (TRUE). Excel matches values in the first row of the table with the lookup cell and returns the selected column value.

Copy the formula to columns C and D.
[35] In cell C2 change the 2 in the formula to a 3.

[36] In cell D2 change the 2 in the formula to a 4.
[37] Insert the scroll bar that will be linked to cell A2.

[38] Change the properties of the scroll bar.
Set the scroll bar linked cell as A2 and the maximum value it can contain as 10.

Turn design mode off and close the Control Toolbar. Select cells B2 to D2 as the cell to be used for the creation of a chart.
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[41] Insert Chart.

[42] Select a cone chart.
Chart the data by columns.

Turn off the legend.
Drag the scroll bar to alter cell A2. The formulas in cells B2 to D2 will recalculate and a new graph will be drawn.

Stop the scale from changing. Because the scale automatically updates it is difficult sometimes to see changes take place on the graph.
[47] Turn off automatic scaling to prevent the graph from jumping around.

[48] Drag the scroll bar box down.
Note the value for variable one is off the chart because we have set scale to manual.