

**Lesson Plan**

*Rev. 03/20*

Microsoft Excel: What-if Analysis

1. **Introduction**

 **Content:**

* Housekeeping
* Introductions
1. **Class Learning Objectives**

By the end of this class, you will be able to:

* Define What-if Analysis.
* Use Goal Seek to find a value which meet a condition.
* Use one and two variable Data Tables to see a range of values.
1. **Vocabulary**

**Learning Objective:** Define What-if Analysis.

**Contents:**

* *What is What-If Analysis?*
	+ What-If Analysis is an Excel tool that allows you to find exactly what numbers you need to make a condition work.
	+ With What-If Analysis, you first calculate a formula, based on the input from variables A, B, and C. You can then ask “What happens to the result if I change the value of variable A?”
	+ There are 3 different sub tools under the What-if Analysis. We are going to look at 2 in this class. Goal Seek and Data Table.
1. **What-If Analysis (Goal Seek)**

**Learning Objective:** Use Goal Seek to find a value which meets a condition.

**Contents:**

* Goal Seek allows you to find exactly what number you need to make a condition work.
* It works with a single variable in a single equation.

**Activity:** Open the file “What-if Analysis” from the desktop.

**Activity:** Let’s use Goal Seek to see what minimum grade is needed on the 5th test to achieve a final class grade of 80%.

* Go to the Test Grades worksheet.
	+ First we need to set up a formula that will give us the average of Tests 1- 5.
* Select cell B7.
* Click on the AutoSum options button in the Editing group on the Home tab.
* Select Average.
	+ Cell B7 should now show 79.25.
	+ We can enter different numbers in cell B6, until B7 averages 80, but there is a more efficient way.
	+ This is where Goal Seek saves the day!
* Click on the Data tab.
* Click on the What-If Analysis drop down menu.
	+ In Excel 2016, it is in the Forecast group.
	+ In Excel 2013, it’s in the Data tools group.
* Click on Goal Seek.
* Fill in the dialog box.
	+ Set Cell: click on B7. Make sure it shows as an absolute cell reference ($B$7)
	+ To Value: 80. Type “80” in this cell.
	+ By changing cell: B6. Click on B6. Make sure it shows as an absolute cell reference ($B$6)
* Click OK, and watch Excel work its magic. B6 should display 83.
* Click OK.

**Conclusion**: A grade of 83 is needed on the fifth test to achieve a final grade of 80%.

**Activity***:* Find how expensive a house can be and still have a $1,500 payment/month.

* Go to the Loan Payments worksheet.
* Here is a Table showing Loan breakdowns.
* Click on What-If Analysis in the Data tab.
* Click on Goal Seek.
* Fill in the dialog box.
	+ Set Cell: B6
		- Where the table has the monthly payment
	+ To value: -1,500.
		- The amount we want for a monthly payment.
		- The number is negative since it represents a payment.
		- If you type in a positive number here, the equation will not work.
	+ By changing Cell: B3
		- Goal Seek will change the cell with the principle to answer the question.
* Click OK.
* Use Ctrl + z or Undo to reset the table.

**Comprehension Check:** Use Goal Seek to find out the price a car can be to make monthly payments of $450.

* On the same worksheet, use the column with car information to answer the question.

**Time permitting:**

**Comprehension Check***:* Use Goal Seek to find what interest rate (APR) is needed to keep car payments under $500/month.

* On the same worksheet, use the column with car information to answer the question.
1. **What-if Analysis (Data Table)**

**Learning Objective:** Use a One and Two Variable Data Table to see a range of values.

**Contents:**

* We may want to see a whole range of values instead of just one number.
* We used the Payment function to figure out monthly payments on a 30 year loan for a $300,000 house at 5.5% APR.
* Let’s see what the monthly payment would be on the same house at different APRs.
* Note that we are only changing one Variable, in this case the APRs.
* Data Table results are created as an array formula, which is a special formula that Excel treats as a unit. This means that you cannot move or delete part of the results. If you need to work with the data table results, you must first select the entire results range.

**Activity:** Create a One Variable Data Table for house payments at various APRs.

* Go to the House Payments worksheet.
* We are making our new Table using the information in the Data Table.
* Investigate the Data Table
	+ Click on each cell in the B column (B2-B8).
	+ We have values in all of the cell in column B, except two B5 & B6
	+ Notice there are values in the cell vs. the formulas in the formula bar.
	+ Click on B5.
		- B5 has a formula to calculate Monthly Interest, which is the APR/ 12
	+ Click on B6.
		- B6 has a formula to calculate the Monthly Payment, which is PMT
	+ Click on the insert function button (Fx) next to formula bar.
		- Move the pop up box to see the data table if needed.
	+ It has a spot for the Rate, Number of Payments, and Present Value. (We will ignore Future Value and Type for this Class)
	+ The function PMT is a negative number because this is money coming out of an account.
	+ Close pop up box.

**Fill in the New Table**

* Let’s fill in the new table.
* Select cell B12 and type =B6 (This refers to the monthly payment cell). Click Enter.
* Place the Header “Mo. Payment” in the cell above it, in B11. Refer to Data Table.
* Adding the input values:
	+ To add the percentage column, start one cell down and one cell to the left of the cell containing the formula.
	+ This will show the monthly payment changes at various yearly APR’s.
* Click in A13.
* Type 2.50%
* C lick in A14.
* Type 2.75%
	+ After typing 2 rates, select both rates and use the fill handle
	+ Autofill to finish adding rates up to 6.25% in cell A28.
* Click on A11. Add the Header “APR”.
	+ Per Data table: Start Rate is 2.5%, using increments of 025%.

**Using What-if Analysis**

* Select the range A12:B28.
* Click on What-If Analysis on the Data Tab.
* Select Data Table. Move the pop up box as needed.
* Click in the Column Input Cell field.
	+ The APR values are all in one column.
* Click in the cell containing Data Table’s APR value.
	+ In this case, cell B4.

Note: this is a one variable data table so we leave the Row input cell blank

* Click OK.
* Click outside the table to unselect it.
* Change the payment format the dollars.
	+ Select just the monthly payments, B13-B28.
	+ In the Home tab, from the Number group, select Currency.

Conclusion: To pay less than $1500 a month, the APR needs to be 4.25% or less.

**Note:** the formula bar indicates that the cells contain an array formula. Therefore, you cannot delete a single result. To delete the results, select the range B13:B17 and press Delete.

**Activity:**Create a Two Variable Data Table for investment returns.

* Go to the Investment Returns worksheet.
* Review Data Table.
* Click on B8. Note it has a formula referencing the Final Balance.
* Select the range of your data table. Note the formula is in the selected cell range.
	+ In this case, B8-H44.
* Click on What-If Analysis on the Data Tab.
* Select Data Table. Move pop-up box if necessary.
* Click in the Row Input Cell field.
	+ We need to tell Excel which part of the formula we want applied to the row values in the Data Table. The rates of return are across the row of our empty table. See row 8, C8-G8
* So go back to the data table to find the cell. Click in the cell containing the Data Table’s Rate of Return value.
	+ In this case, cell B3.
* Click in the Column Input Cell field.
	+ Now we need to tell Excel which part of the formula we want applied to the column values in the Data Table. We have Years of Compounding in the column. See column B from B9 on down.
* So go back to the data table to find the cell.
* Click in the cell containing the Data Table’s Years to Compound value.
	+ In this case, cell B4.
* Click OK.
* Expand the columns if you get number signs (###).

**Conclusion:** with a steady rate of 9%, in 40 years your original investment will grow to $31,409.42.

**Activity:**

* Change a percentage rate in the rates of return row.
* In Home Tab‘s number group, use Increase decimals button to preclude rounding up.
* Note that the table is still interactive and the values will update.
1. **Note**
* We don’t cover the What If Scenario Manager feature because it has limitations on formatting and does not auto-update values if any of your variables change. Goal Seek and Data Table are more useful in a wider number of scenarios.
1. **Wrap Up**
* Do you have any questions?
* Access additional learning resources at our Technology Education webpage: [www.vbgov.com/tech-ed](http://www.vbgov.com/tech-ed) (Also under Adults)
* Lynda.com demonstration
1. Go to VBPL website: [www.VBgov.com/libraries](http://www.VBgov.com/libraries) -> Find Materials -> Research & Articles -> A to Z Resources
2. Scroll down and click on Lynda.com
3. Enter library card number and pin number into appropriate boxes
4. You will need to finish account setup with your name and email address
5. Locate Search bar across top of page and enter subject
6. Notice list of suggested courses in middle of page with course descriptions and related courses tab
7. Use filter options on the left side of page to narrow results by skill level and subject
8. Use + button to add courses to your playlist
* **Homework** – you can practice your new skills by playing around with one of the templates in the File tab of the ribbon.
* Google search – for text-based or video instructions
	+ - Go to Google.com
		- Type in the appropriate terms – for example: format cell excel 2013
* Check the online calendar of upcoming classes
* For assistance with specific projects, you can schedule a Tech Help session at the library
* Please complete evaluations and turn them in before leaving.
* Thanks for coming!