

# Advanced Microsoft Excel 2007: Reporting Tools

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## **Getting Started**

Today we'll be talking about some of the advanced features of Microsoft Excel at an. This class continues on from where our *Functions, Formulas, and Graphs* class ends. It does require that you have a good understanding of how Excel works, including cell references, functions and formulas, and sorting.

Topics we cover are: Pivot tables and the "What If" analysis tools of goal seeking, scenarios, and data tables. If you have not taken our *Functions, Formulas, and Graphs*, it is highly recommended before taking this class.

## Advanced Reporting Functions: Pivot Tables and Charts

For more advanced analysis of data, including summary and trending, Excel includes the functionality of pivot tables and charts.

### **Pivot Tables**

#### *What is it?*

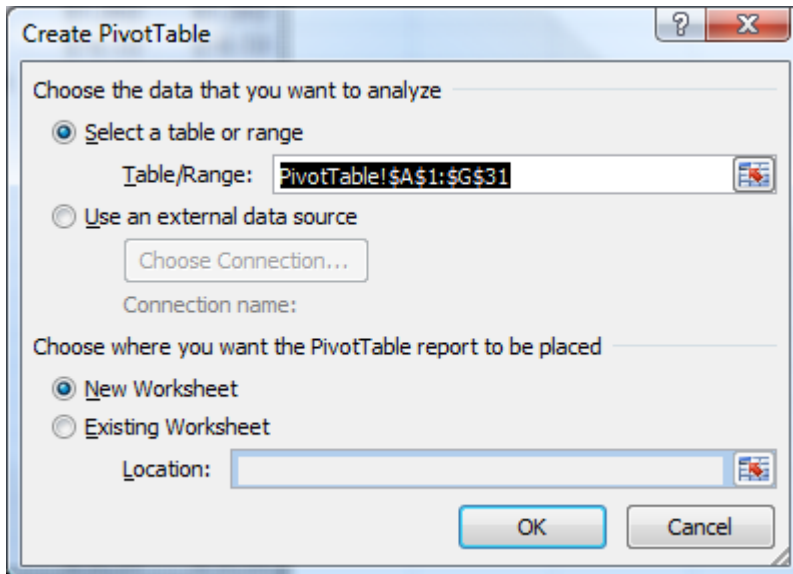
A PivotTable allows you to combine and compare large amounts of data in an interactive report. You can choose to see different summaries of the source data, as well as get detailed information on specific areas that you're interested in. You would use a PivotTable when you wanted to analyze related totals or be able to switch between summary-type data and detailed data for a large data set.

#### *Creating one*

To create a PivotTable, you must first have the data you wish to analyze. Give some thought to what you're trying to accomplish with the data (what questions are you trying to answer, what trends are you trying to see, etc).

Select the range of cells that contains the data you wish to analyze. You can type in the cell references of the range, or use your mouse to select the area in the background. (As with the chart wizard, Excel will take a guess at what you want to use, but you will want to double check it). If you have column headers, include them in your selection – it will not affect your outcome, and will make it easier to select data later on. Click **Next**.

There is a wizard that will walk you through the creation process. Begin by clicking the **Insert** menu, then **PivotTable and PivotChart Reports**. Step 1 is to choose where the data you wish to analyze exists (the default option is the local Excel spreadsheet), and whether you want to create a PivotTable or a PivotChart. Click **Next**.



Next, choose whether you want to create a new worksheet for the PivotTable, or if you want to insert it into the existing worksheet. Click **OK**

You have now created a worksheet area for your PivotTable, including a list of fields that are available. Drag the fields from the list window into the outlined area, and Excel will summarize/calculate the data automatically as you do so.

The three main areas of the screen that you will use are the “row fields,” “column fields,” and “data items”. Row fields and column fields are grouping levels, while data items are the entries that will be actually counted/summed up/etc.

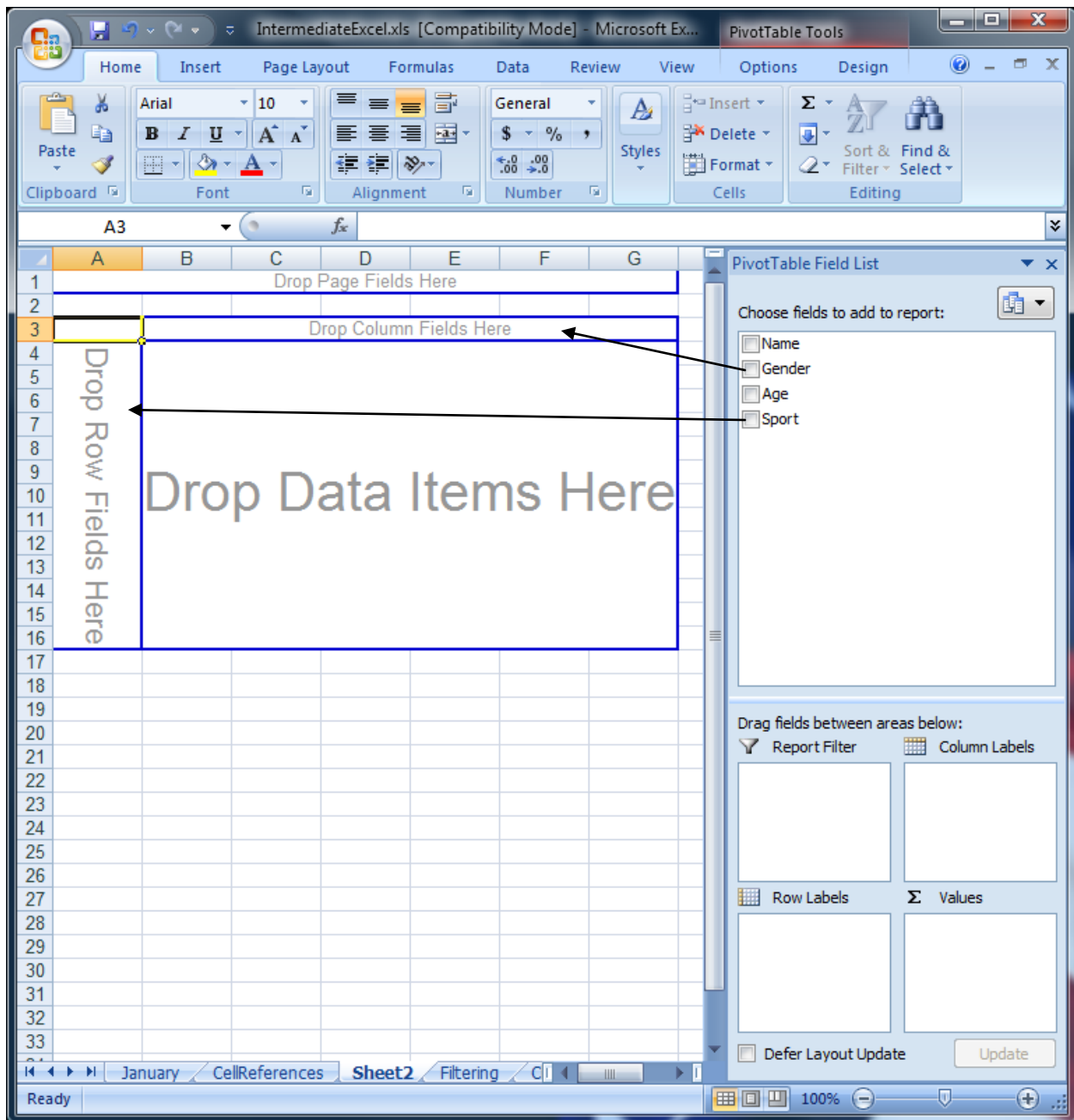
Let’s look at a demonstration of a simple row-based Pivot Table. Using our “Filtering” worksheet, we’re going to figure out how many boys and girls play each sport.

The original sheet looks like this:

|    | A           | B             | C          | D            |  |
|----|-------------|---------------|------------|--------------|--|
| 1  | <b>Name</b> | <b>Gender</b> | <b>Age</b> | <b>Sport</b> |  |
| 2  | Adam        | M             | 11         | Soccer       |  |
| 3  | Brad        | M             | 11         | Baseball     |  |
| 4  | Helen       | F             | 11         | Softball     |  |
| 5  | Laura       | F             | 11         | Softball     |  |
| 6  | Emily       | F             | 12         | Softball     |  |
| 7  | Janet       | F             | 12         | Softball     |  |
| 8  | Joseph      | M             | 12         | Baseball     |  |
| 9  | Melissa     | F             | 12         | Soccer       |  |
| 10 | David       | M             | 13         | Baseball     |  |
| 11 | Elise       | F             | 13         | Soccer       |  |
| 12 |             |               |            |              |  |

We know that we’re going to want to group by the “Gender” and “Sport” columns, and count the number of different names within each combination of gender/sport.

First, we go through the steps of creating the PivotTable wizard, choosing to get the data from the existing spreadsheet, using cells A1:D13, and to create a new worksheet for the PivotTable. That looks something like this:



Because we want to group our expenses by the “Sport” field, click and drag “Sport” from the Field List into the area that says “Drop Row Fields Here”. Excel will automatically list out all the different types of entries we created in the “Sport” column of the original spreadsheet.

|   | A                     | B                       | C | D | E | F | G |
|---|-----------------------|-------------------------|---|---|---|---|---|
| 1 | Drop Page Fields Here |                         |   |   |   |   |   |
| 2 |                       |                         |   |   |   |   |   |
| 3 |                       | Drop Column Fields Here |   |   |   |   |   |
| 4 | Sport                 | Drop Data Items Here    |   |   |   |   |   |
| 5 | Baseball              |                         |   |   |   |   |   |
| 6 | Soccer                |                         |   |   |   |   |   |
| 7 | Softball              |                         |   |   |   |   |   |
| 8 | Grand Total           |                         |   |   |   |   |   |

Next, we also want to count by gender within each sport, so click and drag “Gender” from the Field List into the “Drop Column Fields Here”.

|   | A                     | B      | C | D           |
|---|-----------------------|--------|---|-------------|
| 1 | Drop Page Fields Here |        |   |             |
| 2 |                       |        |   |             |
| 3 |                       | Gender |   |             |
| 4 | Sport                 | F      | M | Grand Total |
| 5 | Baseball              |        |   |             |
| 6 | Soccer                |        |   |             |
| 7 | Softball              |        |   |             |
| 8 | Grand Total           |        |   |             |

Finally, we’re able to have the spreadsheet count the unique names that fall into each of these groupings. Drag the field “Name” from the field list into the “Drop Data Items Here” area of the screen.

|   | A                     | B      | C | D           |
|---|-----------------------|--------|---|-------------|
| 1 | Drop Page Fields Here |        |   |             |
| 2 |                       |        |   |             |
| 3 | Count of Name         | Gender |   |             |
| 4 | Sport                 | F      | M | Grand Total |
| 5 | Baseball              |        | 3 | 3           |
| 6 | Soccer                | 2      | 1 | 3           |
| 7 | Softball              | 4      |   | 4           |
| 8 | Grand Total           | 6      | 4 | 10          |

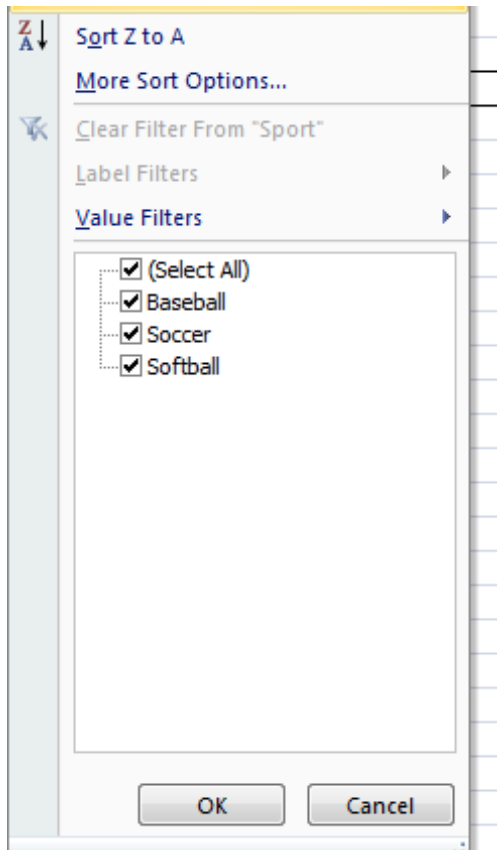
Since we deliberately worked with a small data set, you can confirm the results by doing the same calculations by hand:

- 3 boys who play baseball (Brad, David, Joseph)
- 2 girls who play soccer (Elise, Melissa)
- 1 boys who play soccer (Adam)
- 4 girls who play softball (Janet, Emily, Laura, Helen)
- 6 girls overall (Janet, Emily, Laura, Helen, Elise, Melissa)
- 4 boys overall (Adam, David, Joseph, and Brad)

### ***Adding or removing a field***

You can also add or remove fields once you have created a PivotTable, should your needs change.

The easiest way to remove an entry is to click the drop down box for that field. If you click the dropdown box for “Sport” you will see the following: (like auto filtering)



\*\*\*Uncheck the box for baseball and it will no longer display.

|   | A             | B      | C | D           |
|---|---------------|--------|---|-------------|
| 1 |               |        |   |             |
| 2 |               |        |   |             |
| 3 | Count of Name | Gender |   |             |
| 4 | Sport         | F      | M | Grand Total |
| 5 | Soccer        | 2      | 1 | 3           |
| 6 | Softball      | 4      |   | 4           |
| 7 | Grand Total   | 6      | 1 | 7           |
| 8 |               |        |   |             |

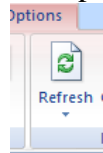
To add one of the field values back in, simply follow the same steps as removing it, but instead add the checkmark to display the value.

### ***Refreshing the pivot table***

One caveat about pivot tables: if your source data changes, the pivot table will not see that change until you refresh the pivot table. This means that if you have a spreadsheet of sales figures for a given month, and create a pivot table, you will need to refresh the pivot table each time you change the original sales figures (adding in new ones, changing existing ones, etc).

You can manually refresh the pivot table one of three ways:

1. Right-click in the pivot table and choose “**Refresh**” from the context menu
2. Click on the pivot table, choose the **OPTIONS** ribbon, then **Refresh**

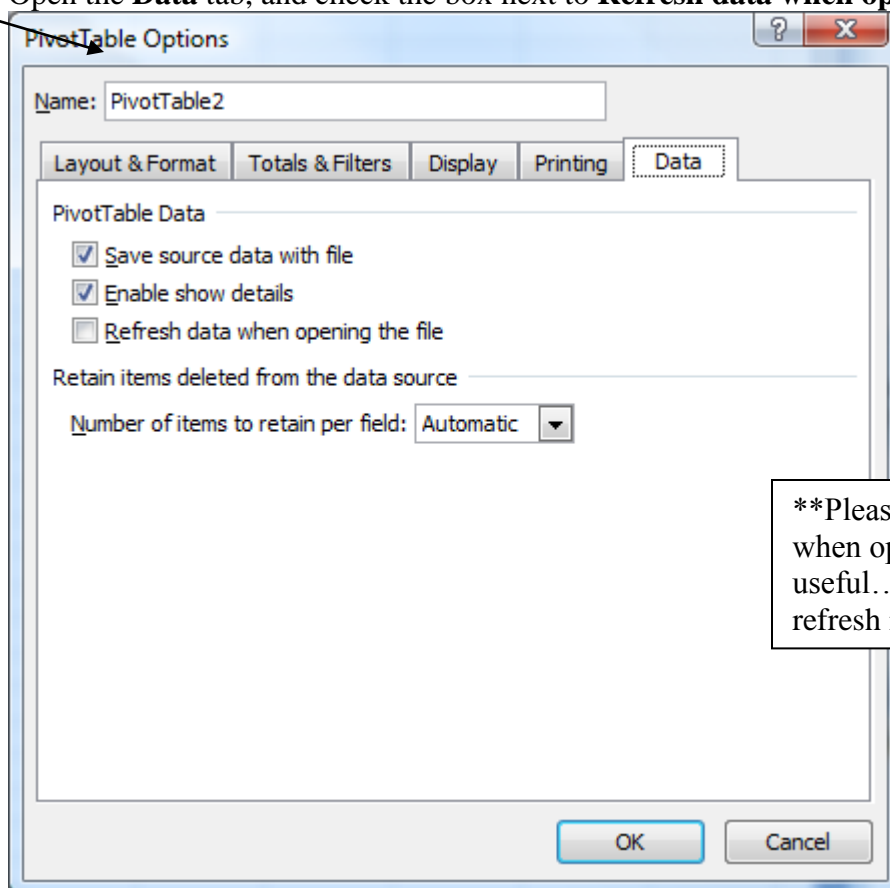


- a.
3. Click the “Refresh Data” icon in the tool bar (looks like a red exclamation mark)

As another option, you can set up the pivot table to automatically refresh when you open it.

1. Click on the pivot table, choose the **OPTIONS** ribbon, then **Refresh**

1. Open the **Data** tab, and check the box next to **Refresh data when opening the file**



\*\*Please note...the “Refresh data when opening the file” is not that useful...it’s easier just to click the refresh icon.

Practice assignment: Use the data in the worksheet titled “PivotTable” to create a PivotTable that shows how much you spent in each category of household expenses. Break it out by month (but allow the grand totals to show as well).

Let’s highlight the area...drop Category into field row...and month into column field. See what we spent = actual amount – drop into data fields – looks like below results.

One way to do it would end up looking like this (but this isn’t the only way):

| Sum of Actual | Month      |            |             |
|---------------|------------|------------|-------------|
| Category      | January    | February   | Grand Total |
| Car           | \$347.44   | \$58.30    | \$405.74    |
| Entertainment | \$25.49    | \$35.74    | \$61.23     |
| Groceries     | \$246.92   | \$279.26   | \$526.18    |
| Maintenance   | \$27.50    | \$98.22    | \$125.72    |
| Mortgage      | \$1,042.00 | \$1,042.00 | \$2,084.00  |
| Utilities     | \$253.84   | \$258.69   | \$512.53    |
| Grand Total   | \$1,943.19 | \$1,772.21 | \$3,715.40  |

## What-if Analysis Tools (Goal Seeking, Scenarios , and Data Tables)

### Goal Seeking

Goal Seeking is part of the “what-if” analysis tools built into Excel. You would use this feature when you know the result you want from a formula, but not the input values that the formula needs to get that result. For example, if you knew you wanted to save \$500,000 in the next ten years, you could create a scenario to figure out how much you needed to save each month, or what effect the interest rate may have on your progress.

To use goal seek, first create the formula that you want to work with, an empty cell to hold your solution, and any data you need to use in your calculation.

Let’s do a simple example: pretend you own a bakery, and want to make \$5,000 in sales. Your pastries are \$.80 each. How many would you need to sell to make your sales goal?

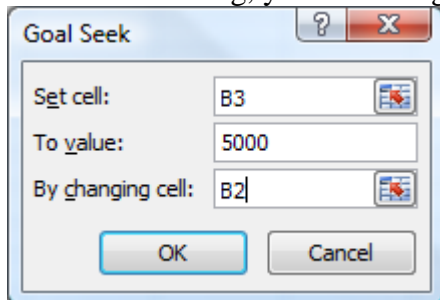
Change to the worksheet called “GoalSeeking1”. For your sales total cell (B3), create a formula that multiplies the price per pastry and the number of pastries sold ( $=B1*B2$ ). Fill in \$.80 for the “price per pastry”.

|   | A                | B      |
|---|------------------|--------|
| 1 | Price per Pastry | \$0.80 |
| 2 | Number Pastries  |        |
| 3 | Sales Total      | \$0.00 |
| 4 |                  |        |

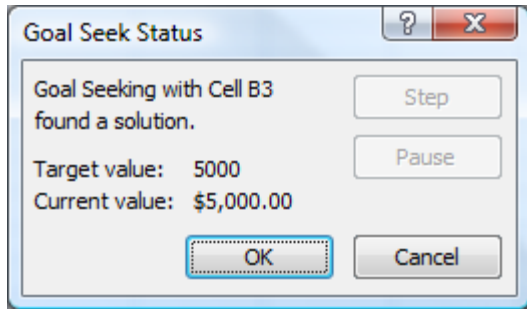
Now run the “Goal Seeking” tool. You want to set your sales total (B3) to the value of 5,000, by changing the number of pastries sold (B2).

Then click **Data** ribbon, **What-If Analysis->Goal Seek..** In the **Set Cell** box, enter the cell reference for the formula you created. Complete the **To Value** box with the result you want (either a number or a cell reference), and the **By Changing Cell** box should contain the cell reference of the value you want to adjust.

\*\*In Goal Seeking, you can change only 1 variable.



Click the **OK** button to run the scenario; you will get a confirmation message when it is complete:



Click **OK** again to return to the normal screen, and see the number of pastries you would have to sell (6,250 – better get baking!).

You could use this tool on any formula, regardless of how simple or complex, as long as you are only trying to change a single variable.

## Scenarios

Scenarios are a more complex “what if” tool, created by linking together multiple variable cells, containing one or more formulas. You can also create reports based on scenarios, and have Excel save them.

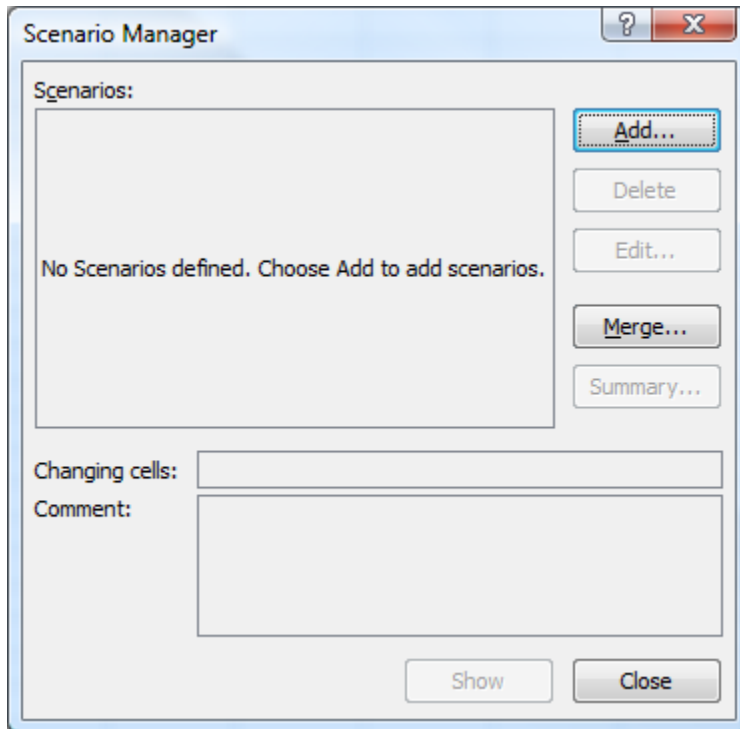
Let’s continue our example of the bakery; you’ve decided to branch out from just pastries and sell coffee as well. You’re going to sell plain coffee for \$1.25 per cup, and Mochas for \$2.50 per cup.

Change to the worksheet called “Scenario1”. You can see that in addition to the pastry sales, we have a similar section for cups of coffee and mochas. The formulas to calculate the subtotal of sales have already been entered into B3, B7, and B11. In Cell B14, add a formula to add together the three subtotals ( $=B3+B7+B11$ ).

|    | A                    | B      |
|----|----------------------|--------|
| 1  | Price per Pastry     | \$0.80 |
| 2  | Number Pastries      |        |
| 3  | Subtotal             | \$0.00 |
| 4  |                      |        |
| 5  | Price per cup coffee | \$1.25 |
| 6  | number cups coffee   |        |
| 7  | Subtotal             | \$0.00 |
| 8  |                      |        |
| 9  | Price per cup mocha  | \$3.00 |
| 10 | number cups mocha    |        |
| 11 | subtotal             | \$0.00 |
| 12 |                      |        |
| 13 |                      |        |
| 14 | Sales                | \$0.00 |

Now let's create two scenarios; a best-case and a worst-case.

To create a scenario, you first must create a spreadsheet that contains the formula(s) you're going to give different values to. Then click **Data** ribbon, **What-If Analysis->Scenario Manager..** . The Scenario Manager window will open. Any scenarios you've already created will be displayed. To create a new one, click **Add**.

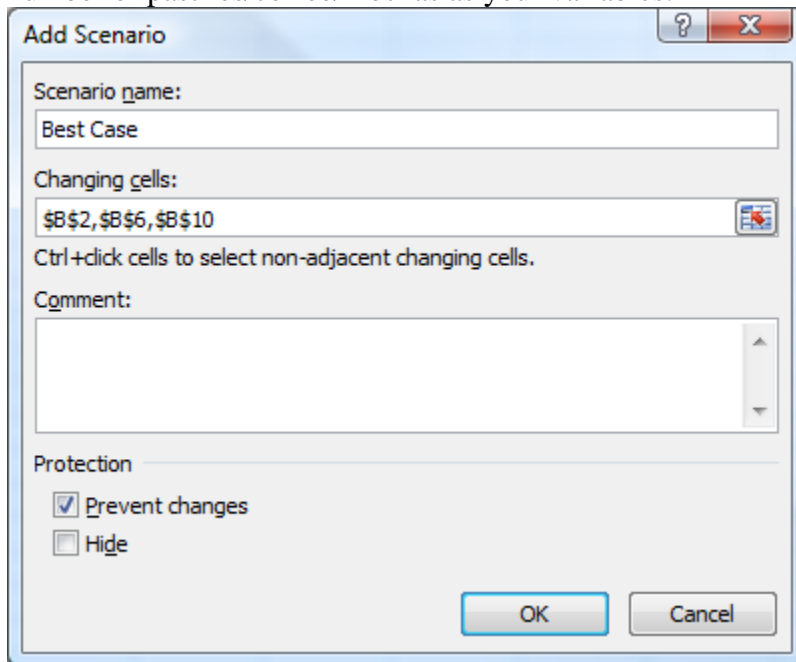


Give the scenario a meaningful name. In the **Changing Cells** box (b2,b6,b10), enter any cells that are variable (numbers – not formulas) and you wish to change when running your scenario (you can type the names separated by commas, or hold down the **Ctrl** key while clicking on the cells.) Click **OK** to add it to your scenarios manager.

The **Scenarios Value** dialog box will come up, and ask you to enter the values you wish to run. Click **OK** to return to the Scenario Manager screen, and **OK** again to return to your spreadsheet. You can create multiple scenarios on a worksheet.

## Scenario 1 (“Best Case”)

Go through the scenario creation process for the best-case, using the cell references for the number of pastries/coffee/mochas as your variables.



**Add Scenario**

Scenario name:  
Best Case

Changing cells:  
\$B\$2,\$B\$6,\$B\$10

Ctrl+click cells to select non-adjacent changing cells.

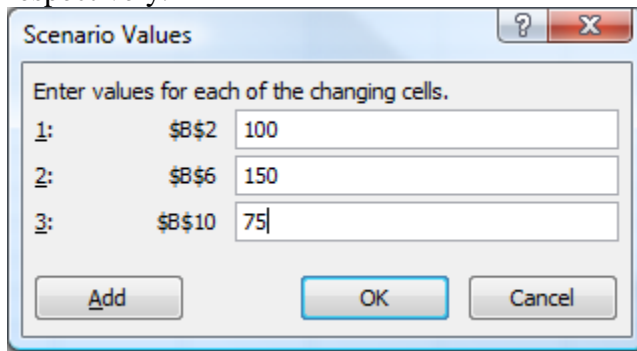
Comment:

Protection

Prevent changes  
 Hide

OK Cancel

Use the values 100, 150, and 75 for the number of pastries (B2), coffees (B6), and mochas (B10) respectively.



**Scenario Values**

Enter values for each of the changing cells.

|    |         |     |
|----|---------|-----|
| 1: | \$B\$2  | 100 |
| 2: | \$B\$6  | 150 |
| 3: | \$B\$10 | 75  |

Add OK Cancel

Scenario 2 (“Worst Case”) – click Add button

Return to the Scenario Manager and repeat the process. This time name it “Worst Case” and use the values 50, 25, and 10 for your scenario values.

Scenario name:  
Wrose Case

Changing cells:  
B2,B6,B10

Ctrl+click cells to select non-adjacent changing cells.

Comment:

Protection  
 Prevent changes  
 Hide

OK Cancel

\*Will automatically use input from last scenario.

Enter values for each of the changing cells.

|    |         |    |
|----|---------|----|
| 1: | \$B\$2  | 50 |
| 2: | \$B\$6  | 25 |
| 3: | \$B\$10 | 10 |

Add OK Cancel

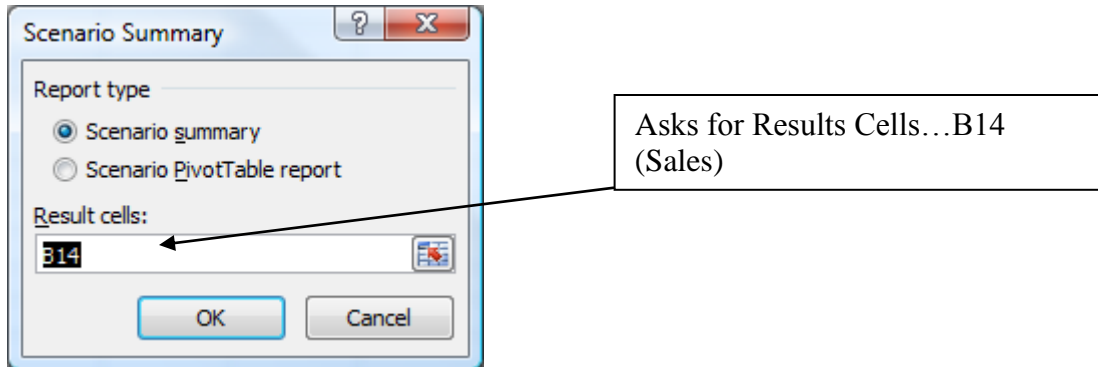
\*Type in worst case scenario numbers...both best and worst will be displayed.

## Creating Scenario Reports

Creating a Scenario Report will create a new worksheet in the workbook that shows you the inputs and results of all the scenarios you have that use the same input cells.

To run a Scenario Summary report, you must have at least one scenario already created in the worksheet. Click **Data** ribbon, **What-If Analysis...>Scenario Manager**, and the Scenario Manager will appear. Click the **Summary** button.

The Scenario Summary options box will appear. For a basic report, choose “Scenario Summary”. Choose which cell contains the results, and click OK.



A new worksheet will be added to your workbook (usually called “Scenario Summary”) that shows you the results of your different scenarios.

|    | A | B  | C               | D         | E          | F |
|----|---|--|-----------------|-----------|------------|---|
| 1  |   |  |                 |           |            |   |
| 2  |   | <b>Scenario Summary</b>  |                 |           |            |   |
| 3  |   |  | Current Values: | Best Case | Wrose Case |   |
| 5  |   | <b>Changing Cells:</b>   |                 |           |            |   |
| 6  |   | \$B\$2   | 50              | 100       | 50         |   |
| 7  |   | \$B\$6   | 25              | 150       | 25         |   |
| 8  |   | \$B\$10  | 15              | 75        | 15         |   |
| 9  |   | <b>Result Cells:</b>   |                 |           |            |   |
| 10 |   | \$B\$14  |                 |           |            |   |
| 11 |   | Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for eac scenario are highlighted in gray. |                 |           |            |   |
| 12 |   |  |                 |           |            |   |
| 13 |   |  |                 |           |            |   |

\*You can edit the Changing Cells (\$B\$2...) and rename them accordingly:  
Pastry  
Coffee  
Mocha

Click the **Reset** button.

**\*Create a Scenario Summary report for the two scenarios already created.**

## Creating a data table (one-input)

Data tables are another “what-if” tool, made up of a range of cells that show how changing certain values in a formula affects the outcome. This is a shortcut for calculating multiple variations all at once and showing the results together.

When you create a one-variable data table, the input values must be either in a single column or a single row. You must also create a formula that you want to run the values through, and it must

refer to an input cell. In this case, an input cell is a “placeholder” cell on the worksheet, so that the values from your data table can be substituted in its place.

To create a one-input data table: Type the list of values you want to substitute (keeping them in a single column or single row). Create the formula you want to use. For column-oriented data tables, type the formula in the row above the first value and one cell to the right. For row-oriented tables, type the formula in the column to the left of the first value and one row below.

Once you’ve created the table of values and formula(s), select the range of cells that includes both. Click **Data** ribbon, **What-If Analysis->Data table**. For a column-oriented table, enter the input cell reference in the **Column input cell** box. For a row-oriented table, enter the input cell reference in the **Row input cell** box.

\*In your example workbook, change to the worksheet called “OneInputTable”. We’ve created an example of how your interest rate would affect the monthly payments on a car loan. Column C contains some different interest rate values that we’re going to test out, with our input cell being B4 and the payment calculating formula in D3.

\*Select the range of cells that contain the values and formula (C3:D4), then click **Data** ribbon, **What-If Analysis->Data table**. Since it’s a column-oriented table, enter the input cell reference (B4) into the **column input cell** box.

|   | A                 | B        | C             | D        | E | F | G | H |
|---|-------------------|----------|---------------|----------|---|---|---|---|
| 1 | Car Loan Analysis |          |               | Payments |   |   |   |   |
| 2 |                   |          | InterestRates |          |   |   |   |   |
| 3 | Down Payment      | None     |               | \$525.05 |   |   |   |   |
| 4 | Interest Rate     | 9.50%    | 15.00%        | \$594.75 |   |   |   |   |
| 5 | Term (months)     | 60       | 6.50%         | \$489.15 |   |   |   |   |
| 6 | Loan Amount       | \$25,000 | 9.25%         | \$522.00 |   |   |   |   |

Data Table

Row input cell:

Column input cell:

OK Cancel

\*Click **OK** to perform the calculations. The “Payments” column will fill in automatically with your monthly payments for each of the different interest rates.

|   | A                 | B        | C             | D        |
|---|-------------------|----------|---------------|----------|
| 1 | Car Loan Analysis |          |               | Payments |
| 2 |                   |          | InterestRates |          |
| 3 | Down Payment      | None     |               | \$525.05 |
| 4 | Interest Rate     | 9.50%    | 15.00%        | \$594.75 |
| 5 | Term (months)     | 60       | 6.50%         | \$489.15 |
| 6 | Loan Amount       | \$25,000 | 9.25%         | \$522.00 |

Once you've created a data table, it will automatically recalculate if you change values.

\*Replace some of the values in column C with different interest rates (make sure they're in percentage form...i.e.: 15% to 11%), and watch how the payments change.

## Creating a data table (two-input)

You can also create a data table to calculate results with two variables changing, instead of just one. To continue our example of a car loan, let's say you want to consider different lengths of loans (3 year, 4 year, 5 year) as well as different interest rates.

Like a one-input data table, you'll begin by creating a table that contains the values you want to analyze. This time, however, you'll need to make sure to put one variable in columns, and the other in rows. You will also need to make a second input cell (so there's one for each variable), and make sure your formula references both.

Once you've built the formula and values, select the cells that contain them. Click **Data** ribbon, **What-If Analysis->Data table**. This time, complete both the **column input cell** and **row input cell** boxes with the appropriate value.

\*Change to the worksheet called **TwoInputTable**. It looks similar to before, with some minor changes. Cell C3 now contains the formula, which references both of our input cells: B4 (interest rate) and B5 (months). We've also added values in D3, E3, and F3 for the different loan terms (months) we want to evaluate, while the different interest rates remain in column C (C4, C5, and C6).

Select the appropriate range of cells (C3:F6). Click **Data** ribbon, **What-If Analysis->Data table**, and complete the **column input cell** (B4) and **row input cell** (B5) appropriately.

|    | A                 | B        | C        | D  | E  | F  |
|----|-------------------|----------|----------|----|----|----|
| 1  | Car Loan Analysis |          |          |    |    |    |
| 2  |                   |          |          |    |    |    |
| 3  | Down Payment      | None     | \$525.05 | 36 | 48 | 60 |
| 4  | Interest Rate     | 9.50%    | 15.00%   |    |    |    |
| 5  | Term (months)     | 60       | 6.50%    |    |    |    |
| 6  | Loan Amount       | \$25,000 | 9.25%    |    |    |    |
| 7  |                   |          |          |    |    |    |
| 8  |                   |          |          |    |    |    |
| 9  |                   |          |          |    |    |    |
| 10 |                   |          |          |    |    |    |
| 11 |                   |          |          |    |    |    |
| 12 |                   |          |          |    |    |    |
| 13 |                   |          |          |    |    |    |
| 14 |                   |          |          |    |    |    |
| 15 |                   |          |          |    |    |    |
| 16 |                   |          |          |    |    |    |

Data Table

Row input cell: \$B\$5

Column input cell: \$B\$4

OK Cancel

\*Has to include the formula...substitutes the original interest rate in BT to =...36,48 and 60.

Click **OK**, and the values will fill in.

|   | A                        | B        | C        | D        | E        | F        |
|---|--------------------------|----------|----------|----------|----------|----------|
| 1 | <b>Car Loan Analysis</b> |          |          |          |          |          |
| 2 |                          |          |          |          |          |          |
| 3 | Down Payment             | None     | \$525.05 | 36       | 48       | 60       |
| 4 | Interest Rate            | 9.50%    | 15.00%   | \$866.63 | \$695.77 | \$594.75 |
| 5 | Term (months)            | 60       | 6.50%    | \$766.23 | \$592.87 | \$489.15 |
| 6 | Loan Amount              | \$25,000 | 9.25%    | \$797.91 | \$625.10 | \$522.00 |
| 7 |                          |          |          |          |          |          |

As with the one-input table, once you've built the formulas and created the table function, you can modify your input values if you want to run different numbers without rebuilding the whole thing.

### **Conclusion**

You should now have a fairly solid understanding of the most commonly-used tools provided by Excel to do data manipulation and analysis:

- Use pivot tables to create summary or trend-style reports on large data sets
- Predict the future (...well, sort of) by making use of "What If" scenario tools:
  - o goal seeking lets you know what it would take to reach a milestone
  - o scenarios show you how different combinations of factors will play out
  - o data tables let you substitute a variety of values and compare the results side-by-side