

Intermediate Excel covers the following topics:

- Multiple Sheets
- Linking Files
- Range Names
- Goal Seek
- Solver
- Scenario Manager
- If() Statements

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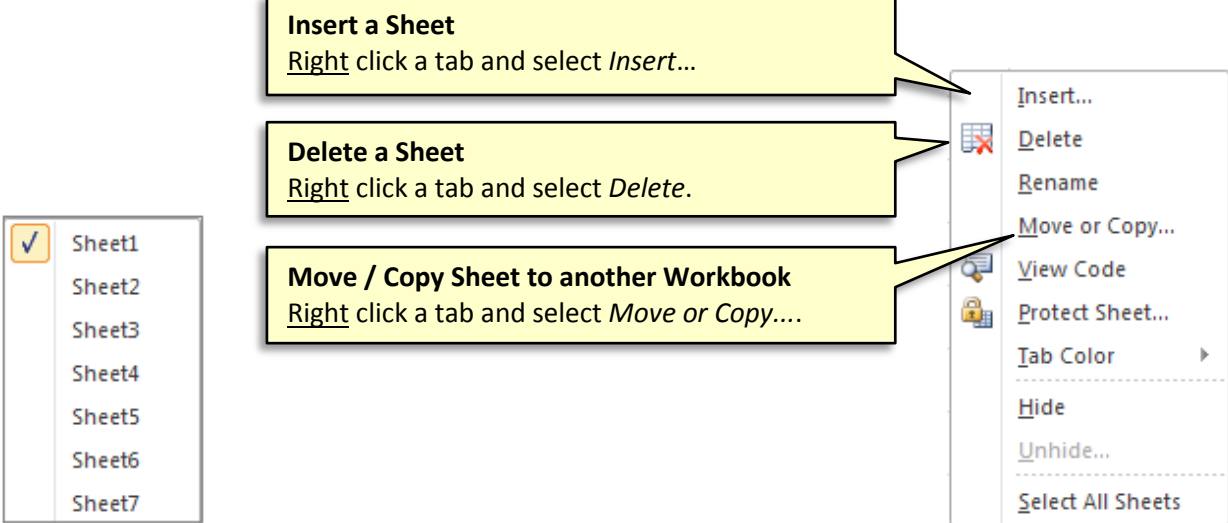
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Navigating Multiple Sheets

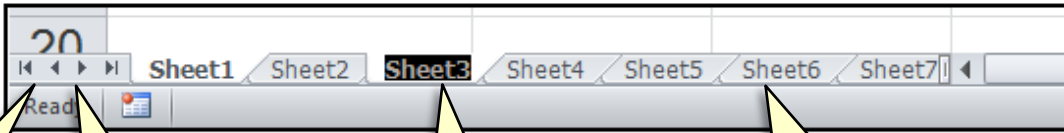
Insert a Sheet
Right click a tab and select *Insert...*

Delete a Sheet
Right click a tab and select *Delete*.

Move / Copy Sheet to another Workbook
Right click a tab and select *Move or Copy...*



The image shows a vertical list of sheet tabs from Sheet1 to Sheet7. To the right is a context menu with the following options: Insert..., Delete, Rename, Move or Copy..., View Code, Protect Sheet..., Tab Color (with a right-pointing arrow), Hide, Unhide..., and Select All Sheets. Three callout boxes point to the 'Insert...', 'Delete', and 'Move or Copy...' options in the menu.



List of Sheets
Right click a scroll arrow to get a list of sheets.

Scroll to Sheets
Click the sheet scroll arrows or use *Control Page Up/Down*.

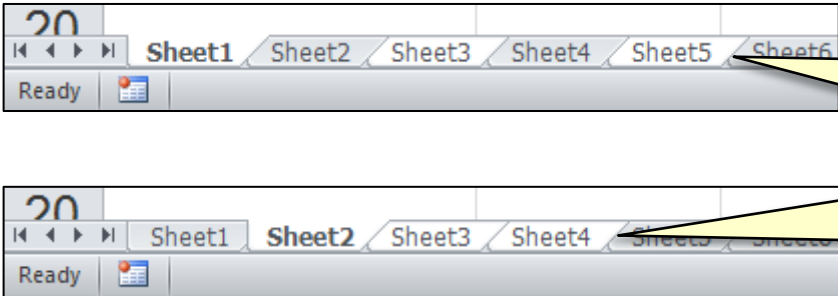
Rename a Sheet
Double click the sheet tab, type a name, then press *Enter*.

Move / Copy a Sheet
Click & drag a tab horizontally to move it. (Hold *Control* while dragging to copy it.)

The image shows a horizontal row of sheet tabs labeled Sheet1 through Sheet7. Sheet3 is currently selected and highlighted. Four callout boxes point to the scroll arrows, the Sheet3 tab, and the Sheet6 and Sheet5 tabs.

Group Sheets

When you group sheets, anything you do on one sheet happens in the same cell on other sheets in the group. This includes formatting, typing, editing, and deleting. The tabs of grouped sheets appear white.



Non-Contiguous Sheets
To group sheets that are non-adjacent: hold down **Control** while clicking their tabs.

Contiguous Sheets
To group adjacent sheets: click the leftmost tab in the group, then hold **Shift** and click the rightmost tab in the group.

The image shows two examples of grouped sheets. The top example shows Sheet1, Sheet3, and Sheet5 grouped together, with their tabs appearing white. The bottom example shows Sheet2, Sheet3, and Sheet4 grouped together, also with white tabs. Callout boxes point to the grouped tabs in both examples.

Ungroup Sheets

To ungroup sheets, either click a tab not in the group or hold **Control** while clicking sheets in the group.

Formulas between Sheets (Same File)

Formulas between separate sheets in the same file are fairly straight forward: simply specify the name of the sheet and the cell address separated by an explanation mark (!):

=SheetName!CellAddress

Examples:

Formula	Effect
=Sheet2!B3	Returns the value in cell B3 of Sheet2.
=Sheet2!B3+Sheet3!G12	Adds the value in B3 on Sheet2 to the value in G12 on Sheet3.
=Sum(Sheet2!B3,Sheet3!G12)	Adds the value in B3 on Sheet2 to the value in G12 on Sheet3.
=Sum(Sheet1:Sheet3!C3)	Adds the value in C3 of sheet1 to the value in C3 of sheet2 to the value in C3 of Sheet3. (In other words, adds all the C3s together from Sheet1 through Sheet3.)
=Sum(Sheet2:Sheet3!B2:B4)	The sum of B2,B3, & B4 in Sheet2 plus the sum of B2, B3, & B4 in Sheet3.

Note that if you are new to Excel, the colon (:) is a range separator and is used to separate the beginning point from the ending point. For example, B2:B4 means include cells B2, B3, and B4. Sheet1:Sheet3 means include Sheet1, Sheet2, and Sheet3.

Handling Spaces and other Special Characters in Sheet Names

If a sheet name contains a space, starts with a number, or contains special characters (aside from an underscore), you must enclose the sheet name in single quotes.

Formula	Effect
= 'Tax Table' !B3	Returns the contents in cell B3 of the Tax Table sheet.
= 'Tax Table' !B3+ 'Emp Rate' !G12	Adds the value in B3 of the Tax Table sheet to the value in G12 of the Emp Rate sheet.
= Sum('Tax Table' !B3, 'Emp Rate' !G12)	Adds the value in B3 of the Tax Table sheet to the value in G12 of the Emp Rate Sheet.
= Sum('Qtr 1:Qtr 4' !C3)	Adds the C3s from the Qtr1 sheet through the Qtr4 sheet. (i.e. Qtr!1+ Qtr!2+Qtr!3+Qtr4)
= Sum('Qtr 1:Qtr 4' !B2:B3)	This adds all the B2s and B3s together from the four quarter sheets. (i.e. 'Qtr 1'!B2+'Qtr 1'!B3+'Qtr 2'!B2+'Qtr 2'!B3+'Qtr 3'!B2+'Qtr 3'!B3+'Qtr 4'!B2+'Qtr 4'!B3)

Exercise: Summing Four Sheets

In this exercise, we would like to sum the sales figures for our four parks (Anaheim, Orlando, Paris, and Toyko) and place their totals in Sheet 5. Specifically, we will sum the numbers in B6:D9 on Sheet1, Sheet2, Sheet3, and Sheet4 and display their totals in B6:B9 on Sheet5.

We will demonstrate two different formulas you can utilize.

Toy	January	February	March	TOTAL
Mouse Ears				0
Tee Shirts				0
Snow Globes				0
Stuffed Toys				0
TOTAL	0	0	0	0

Toy	January	February	March	TOTAL
Mouse Ears	100	200	300	600
Tee Shirts	200	250	300	750
Snow Globes	250	300	325	875
Stuffed Toys	90	125	200	415
TOTAL	640	875	1125	2640

Toy	January	February	March	TOTAL
Mouse Ears	300	425	500	1225
Tee Shirts	350	300	550	1200
Snow Globes	450	500	425	1375
Stuffed Toys	360	200	300	860
TOTAL	1460	1425	1775	4660

Toy	January	February	March	TOTAL
Mouse Ears	100	50	90	240
Tee Shirts	150	60	110	320
Snow Globes	90	80	125	295
Stuffed Toys	80	85	110	275
TOTAL	420	275	435	1130

Toy	January	February	March	TOTAL
Mouse Ears	50	60	70	180
Tee Shirts	50	60	70	180
Snow Globes	50	60	70	180
Stuffed Toys	50	60	70	180
TOTAL	200	240	280	720

Approach 1: Using Basic Math

This method will use simply math with no functions. It would be a desirable method if our figures across the different sheets did not align or we wanted to mix mathematical operators.

1. Open the file: Excel2010_Intermediate.xlsx
2. On Sheet5, click in cell B6.
(We will sum up all the *Mouse Ears* sold in January.)
2. Type the formula below and press Enter.

=Sheet1!B6+Sheet2!B6+Sheet3!B6+Sheet4!B6

3. Copy B6 to fill the remaining blank cells (B6:D9).

Toy	January	February	March	TOTAL
Mouse Ears	550			550
Tee Shirts				0
Snow Globes				0
Stuffed Toys				0
TOTAL	550	0	0	550

TIP: Approach 1 Using Point and Click

If you would like to use point and click to get the result in B6 then follow the instructions below exactly. (i.e. don't press enter until you are told to.)

1. On **Sheet5** click cell **B6**.
2. Type the equals symbol: =
3. Click **Sheet1** then cell **B6** and type a plus sign: +
4. Click **Sheet2** and then cell **B6** and type another plus sign: +
5. Click **Sheet3** and then cell **B6** and type another plus sign: +
6. Click **Sheet4** and then cell **B6** and press **ENTER**.

Approach 2: Using the Sum() Function Across Multiple Sheets

If your data is structured the same on all sheets involved and you wish to perform only a single mathematical operation then, then you can save yourself some typing by using a function such as Sum().

(Note that it is no accident that our 5 sheets are structured the same. Users often design their sheets with what we are about to do in mind. The more sheets involved, the more useful it becomes.)

1. Open: **Excel2010_Intermediate.xlsx**
2. On Sheet5, click in cell B6.
(We will sum up all the *Mouse Ears* sold in January.)
2. Type the formula below and press Enter.

=Sum(Sheet1:Sheet4!B6)

3. Copy B6 to fill the remaining blank cells (B6:D9).

	A	B	C	D	E
1	Mickey's Toys				
2	1st Quarter Sales				
3	Park Totals				
4					
5	Toy	January	February	March	TOTAL
6	Mouse Ears	550	735	960	2245
7	Tee Shirts	750	670	1030	2450
8	Snow Globes	840	940	945	2725
9	Stuffed Toys	580	470	680	1730
10	TOTAL	2720	2815	3615	9150

TIP: Approach 2 Using Point and Click

If you would like to use point and click to get the result in B6 then follow the instructions below exactly.

1. On **Sheet5** click cell **B6**.
2. Type the following: =Sum(
3. Click **Sheet1** and then cell **B6**.
4. Hold down your **SHIFT** key on your keyboard and click the tab for **Sheet4**.
5. Press **ENTER**.

TIP: Approach 2 Using Your Keyboard

If you would like to use keyboard navigation to get the result in B6 then follow these instructions:

1. On **Sheet5** arrow to cell **B6** and type: =Sum(
2. Press **Control Page Up** to go to **Sheet1**.
3. Arrow to cell B6 and press the period (.) on your keyboard.
4. Press **Control Shift Page Down** until you get to **Sheet4**.
5. Arrow to cell **B6** and press **ENTER**.

Formulas between Files (Linking)

Linking allows you to create formulas between completely separate workbooks (i.e. files). Because linking uses a formula, when the data in the file you are linking to changes, the formula will update. The basic grammar of linking is:

=[FileName]SheetName!CellAddress

Examples

Files in Same Folder: =[4Parks.xlsx]Sheet1!\$E\$10

Files on Different Drive or Folder: ='N:\Documentation\Excel\Intermediate Excel\[4Parks.xlsx]Sheet1!\$E\$10

Exercise: Creating Links Using Point and Click

If you know the full path to the file you wish to link to you can type it; however, it is typically much faster to open the file you are linking to and use the point and click method to create the link formula. In this example, we wish to display each park's grand total (E10) from Excel2010_Intermediate.xlsx in a separate file.

1. Open the file Excel2010_Intermediate.xlsx
2. From the menu, click "**File – New – Blank Workbook - Create**" to create a new file.
3. In the new file, create the table shown to the right.
4. Click in cell B2 of the new file.
5. Type an equals sign (=).
6. Click Excel on the Windows Task Bar and then click **Excel2010_Intermediate.xlsx**.

	A	B	C
1	Park	Linked	Static
2	Anaheim		
3	Orlando		
4	Paris		
5	Tokyo		

7. Click "**Sheet1**" (or whatever you renamed it to).
8. Click cell **E10**.
9. Press **Enter**.

	A	B	C	D	E
1	Mickey's Toys				
2	1st Quarter Sales				
3	Park:	Anaheim			
4					
5	Toy	January	February	March	TOTAL
6	Mouse Ears	100	200	300	600
7	Tee Shirts	200	250	300	750
8	Snow Globes	250	300	325	875
9	Stuffed Toys	90	125	200	415
10	TOTAL	640	875	1125	2640
11					

	A	B	C
1	Park	Linked	Static
2	Anaheim	2640	
3	Orlando		
4	Paris		
5	Tokyo		

	A	B	C
1	Park	Linked	Static
2	Anaheim	2640	
3	Orlando	4660	
4	Paris	1130	
5	Tokyo	720	
6			

10. Use the same technique as above to get the totals for the other parks.

Issue: Point and Click Method Not Working!

For whatever reason, the point and click method does not work if you opened the second file in Excel by starting Excel a second time through Window's Start menu. (i.e. "Start – All Programs – MS Office – Excel"). Therefore, when opening the second file, be sure to either double click it or open it using Excel's "File" menu.

Avoiding Broken Links

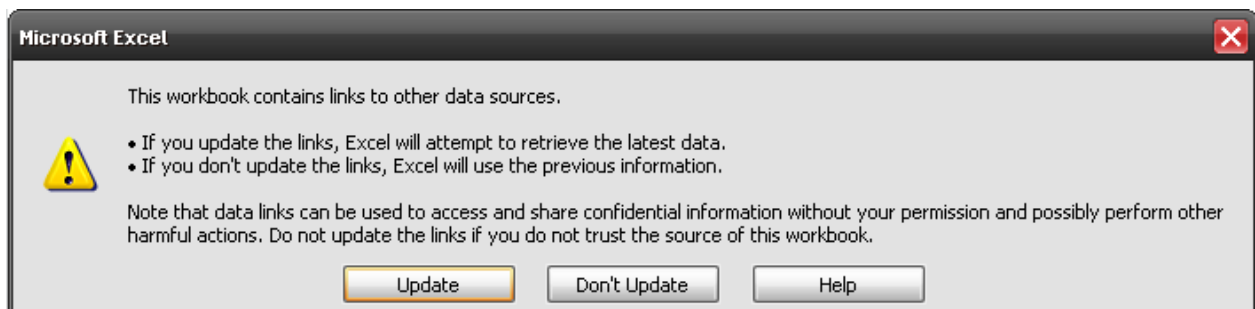
The linking formula refers to content on a specific sheet, in a specific file, in a specific location. If you change any of these things your formula will return an error. Therefore, to avoid broken links:

- Don't change the name of a sheet containing the cell you are linking to.
- Don't change the name of the file containing the cell you are linking to.
- Don't change the location to the file containing the cell you are linking to.

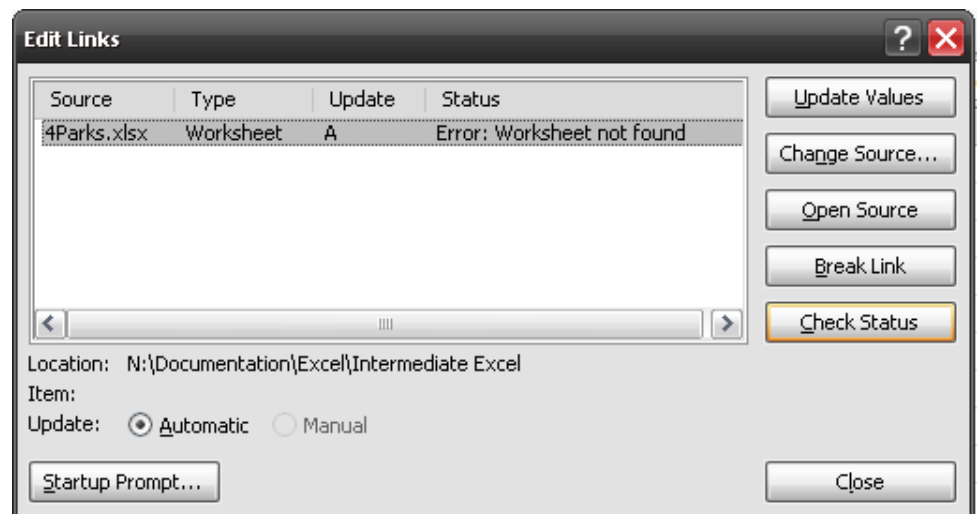
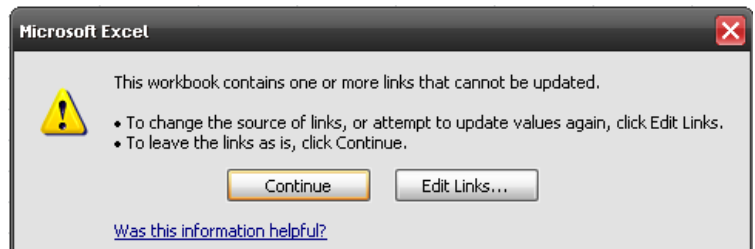
Note that there are times Excel can adjust your links for you. It tries to use relative paths (even though it may be listing the entire path) and can sometimes adjust but to be on the safe side, follow the three rules above and you shouldn't encounter any issues.

Updating Links

When the workbook containing the linking formula and the workbook it is linking to are both open, links update automatically. When you open a file containing links, Excel will ask you weather you wish to update the links of not.



If there are problems with any of the links, you will get the message to the right. Clicking "Edit Links" opens the window below.



Range Names

Range Names allow you to give a cell or group of cells a name of your choosing. These names can then be used in formulas and dialogue boxes. There are several reasons why you may wish to use range names:

- **More Meaningful** – Naming a cell "Total" or "COGS" is a little easier to remember than D25 or G9.
- **Easier when Working between Multiple Sheets** – For the reason above, range names make it easier to work across multiple sheets.
- **Shorter Formulas** – Typing Sum(Data) is a little shorter than typing Sum(B7:G14).
- **Absolute Addresses** – Range Names are absolute. This can help to avoid copy errors.

Naming Guidelines

When naming cells, there are a few rules you will need to be familiar with:

- **Must begin with a Letter** - The first letter of the range name must be a letter or underscore.
- **Allowable Characters** - Remaining name characters can be letters, numbers, periods, and the underscore. Other special characters and spaces are not allowed.
- **No Cell Address Names** – Range names cannot have the same name as a cell address ("A1" for example).
- **Single Letter Names** – Range names can be one letter long but you cannot use "R" or "C".
- **Max Characters** – The maximum number of characters allowed is 255.
- **Not Case Sensitive** – Range named cells are not case sensitive.
- **Duplicate Range Names Same Sheet** – You cannot use the same range name more than once on the same sheet. However, there is an exception: if you hold down *Control* while initially naming non-adjacent cells then you can use the same name in the same sheet.
- **Duplicate Range Names on Different Sheets** – You can use the same range names on separate sheets; however, this can become problematic when performing calculations across different sheets using the these names.
- **Multiple Names for a Range** – You can give a cell or range of cell multiple range names.

Functional Guidelines

- **Name Deletion Error** – If you use a range names in formulas and later delete the range name, any formulas which used the name will display an error..
- **Deleting a Sheet** – If you delete a sheet that contains range names, the range names are also deleted.

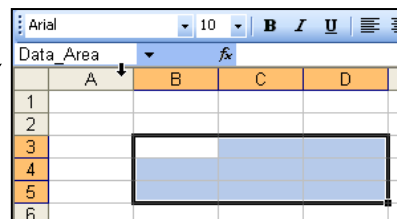
Methods of Naming Ranges

There are two methods of creating named ranges but the end result is the same.

Naming Ranges by Typing in the "Name" Box

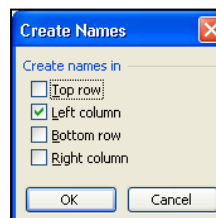
This is useful when naming a block of cells.

- Highlight the cell(s) you wish to name.
- Click in the **Names** box.
- Type a name for the range and press ENTER.



Naming Ranges by Using Existing Text

This method allows you to name cells using the text adjacent to the cells as the names. The text can be to the left, right, above, or below the cells you wish to name. The images to the right show using the text in cells A2:A5 to name the adjacent cells in B2:B5 (i.e. B2 will be named *USA*, B3 will be named *Canada*, etc.). It is under "*Formulas – Create from Selection*".



	A	B
1	Country	Sales
2	USA	200
3	Canada	500
4	Mexico	300
5	UK	110
6		

Example 1: Using the Name Box to Name Blocks of Cells

In this example we will name blocks of data in the 4Parks.xlsx file.

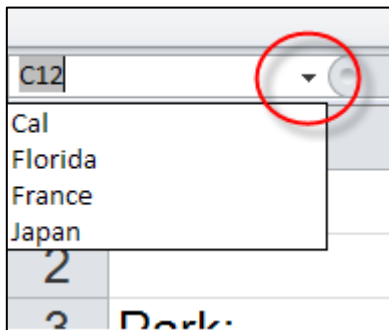
1. Open the **Excel2010_Intermediate** file.
2. On the sheet for the Anaheim park, highlight B6:D9.
3. Click in the *Name* box.
4. Type **Cal** and press *Enter*.
5. Repeat the procedure above to name the cells on the remaining four sheets as follows:

Orlando Park: name B6:B9 **Florida**

Tokyo Park: name B6:B9 **Japan**

Paris Park: name B6:B9 **France**

	A	B	C	D	E
1	Mickey's Toys				
2	1st Quarter Sales				
3	Park:	Anaheim			
4					
5	Toy	January	February	March	TOTAL
6	Mouse Ears	100	200	300	600
7	Tee Shirts	200	250	300	750
8	Snow Globes	250	300	325	875
9	Stuffed Toys	90	125	200	415
10	TOTAL	640	875	1125	2640



If you would like to see if this worked, click the drop down arrow in the upper right corner of the *Name* box. Any names you have created will be listed. Further, clicking one of the names will take you to the range.

	A	B
1	Park	Total
2	Anaheim	
3	Orlando	
4	Paris	
5	Tokyo	

6. Go to a blank sheet (sheet 6 for example).
7. Create the spreadsheet shown.

8. Type the formulas shown below to get each park's total.

	A	B
1	Park	Total
2	Anaheim	=SUM(Cal)
3	Orlando	=SUM(Florida)
4	Paris	=SUM(France)
5	Tokyo	=SUM(Japan)

	A	B
1	Park	Total
2	Anaheim	2640
3	Orlando	4660
4	Paris	1130
5	Tokyo	720

9. If you would like to get the grand total of all parks, try this: **=SUM(Cal,Florida,Japan,France)**

4	Paris	1130
5	Tokyo	=SUM(J
6		SUM(number1, [number2], ...)
7		Japan

TIP: Use "Tab" to Apply a Selected Range Name

As you type a range name Excel will display a list of existing names and formulas. To select a name from the list, arrow down to highlight it and then press **TAB**.

Example 2: Using Existing Text to Name Ranges

Being that most users will label the cell that contains a value, this method allows you to name value cells using the already existing labels. In this example, we will name cell B1 "Cost" and cell B2 "Quantity".

Naming the Cells

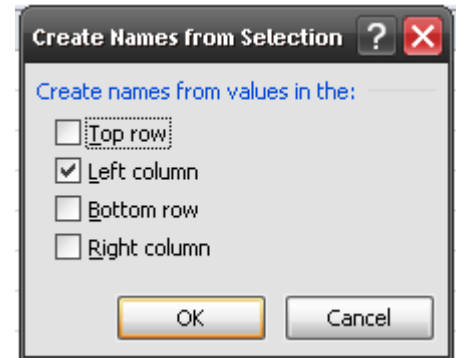
1. Go to any blank sheet.
2. Create the spreadsheet show.
3. Highlight cells A2:B2.
4. Click the "Formulas" tab.
5. Click "Create from Selection".

	A	B
1	Cost	109.25
2	Quantity	10
3	Total	

	A	B
1	Cost	109.25
2	Quantity	10
3	Total	
4		



6. Verify that "Left Column" is checked. (This means that Excel will use the labels in the left column to name the cells on the right.)
7. Click "OK".



Using the Names in a Formula

8. Click in cell B3.
9. Type the following and press enter: **=Cost*Quantity**

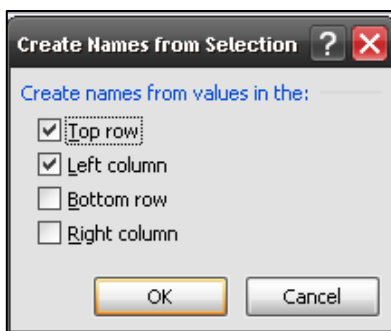
	A	B	C
1	Cost	109.25	
2	Quantity	10	
3	Total	=Cost*Quantity	
4			

Example 3: Name Multiple Cells and Use Intersection Formulas

In this example we will give the same cell two different names and extract a value from the intersection of these two ranges.

1. On any blank sheet, create the spreadsheet shown.
2. Highlight A1:E3.
3. Click the "Formulas" tab then "Create from Selection" then "OK".

	A	B	C	D	E
1		Qtr 1	Qtr 2	Qtr 3	Qtr 4
2	Sales	100	125	130	150
3	Costs	50	60	75	85
4					



Names were created as follows:

Qtr_1: B2:B3
 Qtr_2: C:C3
 Qtr_2: D2:D3
 Qtr_3: E2:E3
 Sales: B2:E2
 Costs: B3:E3

	A	B	C	D	E
1		Qtr 1	Qtr 2	Qtr 3	Qtr 4
2	Sales	100	125	130	150
3	Costs	50	60	75	85
4					

If you place a space between two intersecting ranges in a formula, Excel will return the value in the intersecting cell.

4. To get Sales in the 3rd Quarter, in a blank cell type: **=Qtr_3 Sales** (or =Sales Qtr_3)

Or the Costs in the second quarter: **=Qtr_2 Costs** (or =Costs Qtr_2)

Note the underscores in the quarters. Because range names cannot have spaces, Excel places an underscore where spaces are when creating the names.

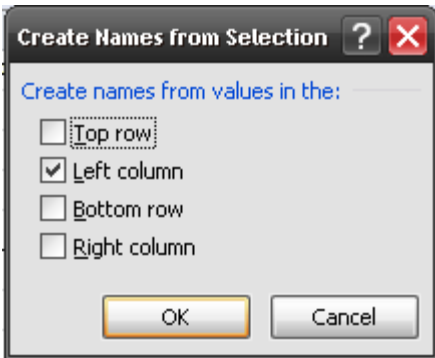
Example 3: Range Names and Absolute Addresses

When you range name a cell and later use its range name in a formula, the cell's address is absolute. This means that if you copy the formula to another cell, the parts of the formula that use range names rather than actual cell address will not shift.

Example: Range Names Working for Us

1. Create the spreadsheet shown.
2. Highlight A2:B6.
3. Press **Control + Shift + F3**
(or "Formulas – Create from Selection")

	A	B	C	D
1	Country	Sales	Percent	Sales Plus Shipping
2	USA	200		
3	Canada	500		
4	Mexico	300		
5	UK	110		
6	Total			
7				



4. Verify that "Left Column" is selected and click "OK".
Excel created the following names:

USA → B2
 Canada → B3
 Mexico → B4
 UK → B5
 Total → B6

5. In cell B6 try the following to get the *Total*:
=Sum(USA:UK)
=Sum(USA,Canada,Mexico,UK)
=USA+Canada+Mexico+UK

- Note that it did not work.
- This does work.
- This works too.

When specifying the *Country*, be sure to use the actual cell address (i.e. B2) and not its range name (i.e. USA).

6. In C2 type: **=B2/Total**
7. Copy C2 down to B5.

	A	B	C	D
1	Country	Sales	Percent	Sales Plus Shipping
2	USA	200	18%	
3	Canada	500	45%	
4	Mexico	300	27%	
5	UK	110	10%	
6	Total	1110		
7				

	A	B	C	D
1	Country	Sales	Percent	Sales Plus Shipping
2	USA	200	=B2/Total	
3	Canada	500		
4	Mexico	300		
5	UK	110		
6	Total	1110		

	A	B	C
1	Country	Sales	Percent
2	USA	200	=B2/Total
3	Canada	500	=B3/Total
4	Mexico	300	=B4/Total
5	UK	110	=B5/Total
6	Total	=SUM(B2:B5)	

In this case, range names work in our favor. When we copy the formula in cell C2 down, we want to keep dividing by B6 (the "Total") to get each country's percent of sales.

Example: Range Names Working Against Us

In the example below we want to add ten dollar to each sale.

	A	B	C	D
1	Country	Sales	Percent	Sales Plus Shipping
2	USA	200	18%	=USA+10
3	Canada	500	45%	
4	Mexico	300	27%	
5	UK	110	10%	
6	Total	1110		

1. In D2 type the following: **=USA+10**

	A	B	C	D
1	Country	Sales	Percent	Sales Plus Shipping
2	USA	200	18%	210
3	Canada	500	45%	210
4	Mexico	300	27%	210
5	UK	110	10%	210
6	Total	1110		

2. Copy D2 down to D5.

	A	B	C	D
1	Country	Sales	Percent	Sales Plus Shipping
2	USA	200	18%	=USA+10
3	Canada	500	45%	=USA+10
4	Mexico	300	27%	=USA+10
5	UK	110	10%	=USA+10
6	Total	1110		

Note that you are getting the same answers. This is because range names are absolute and the country stayed "USA".

	A	B	C	D
1	Country	Sales	Percent	Sales Plus Shipping
2	USA	200	18%	=B2+10
3	Canada	500	45%	510
4	Mexico	300	27%	310
5	UK	110	10%	120
6	Total	1110		

To make this formula workable, you would have to use the cell's real address rather than its range name.

3. In D2 type: **=B2+10**

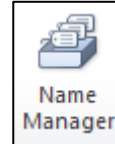
4. Copy D2 down to D5.

You should now be getting the correct answers.

Viewing / Editing / Deleting Range Names

This section covers how to view and manage your range names. Note that if you delete a range name, any formulas using the name you deleted will return an error.

1. Click the "Formulas" tab and then the "Name Manager" button.



You will see a list of all of your named ranges.

New
New is an additional method of creating a range name.

Edit
Click *Edit* to change the name of the selected range or the cells in the range.

Delete a Name
Clicking *Delete* will delete any selected range names on the list. (Hold *Control* or *Shift* to select multiple items.)

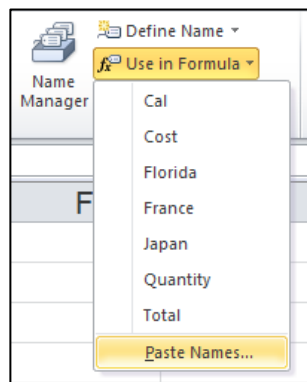
Edit
You can also redefine the cells included in a range here.

Filter
Use this to control which range names are displayed.

Print Range Names

To print a list of range names and the cells they refer to:

1. Click on a blank sheet.
2. Click the "Formulas" tab.
3. Click "Use in Formula" then "Paste names...".
4. Click "Paste List".
5. Print the sheet the names are pasted to.



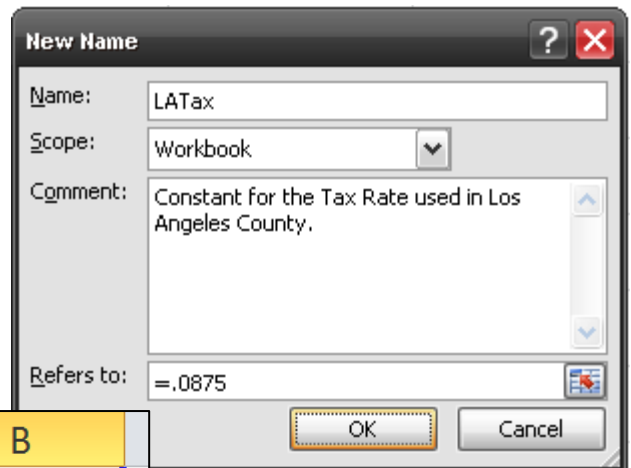
	A	B
1	Cal	=Sheet1!\$B\$6:\$D\$9
2	Cost	=Sheet6!\$B\$1
3	Florida	=Sheet2!\$B\$6:\$D\$9
4	France	=Sheet3!\$B\$6:\$D\$9
5	Japan	=Sheet4!\$C\$12
6	Quantity	=Sheet6!\$B\$2
7	Total	=Sheet6!\$B\$3
8		

Using Named Constants

A Range Name doesn't have to refer to a cell address; it can also contain a constant. For example, if you create a name called "LATax" and define it as $=.0875$, then in a formula you could type: $=10*LATax$ and excel would return 10.875.

Defining the Constant

1. Click the "Formulas" menu tab.
2. Click "Define Name" (or "Name Manager" then "New").
3. Type a "Name" for your constant (e.g. "LATax").
4. Select the *Scope* the name will work within (i.e. a specific sheet only or all sheets in the *Workbook*).
5. In "Refers to", type: $=.0875$
6. Click "OK".



Using the Constant

1. In a blank cell type: $=10*LATax$
Or create this spreadsheet:

	A	B
1	Price	10
2	Taxes	$=B1*LATax$

In either case you should get 0.875
(Meaning the taxes on \$10 in LA County would be .875 cents.)

Using Named Formulas (Relative)

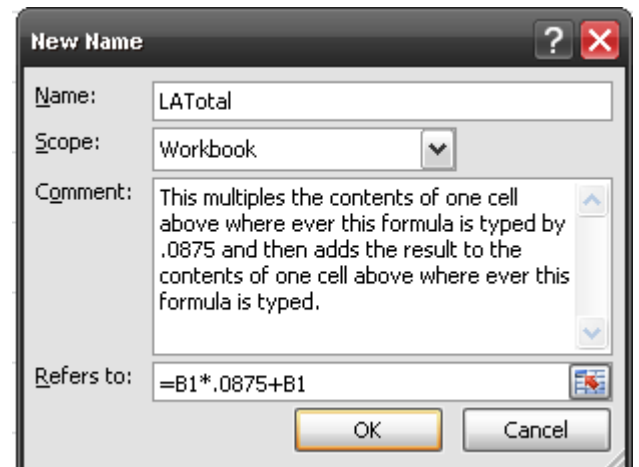
When you create a named relative formula, the formulas will grab cells relative to the position of where you are typing the formula and how you initially created the named formulas. The examples below should explain this more clearly.

We wish to create a formula that will multiply the contents of the cell above the current position of the cursor by a tax rate and then return that result plus the contents of the cell above the current position of the cursor (i.e. Price + Taxes).

	A	B
1	Price	10
2	Price Plus Taxes	
3		

Creating the Named Formula

1. Create the spreadsheet shown.
2. Click in cell B2. (This is important.)
3. From the "Formulas" menu tab click "Define Name".
4. Type a "Name". (This will be used to invoke the formula.)
5. At "Scope", specify if the name can be used throughout any sheet in the workbook or just on a specific sheet.
6. Type any desired "Comment".
7. In "Refers to:", type: $=B1*.0875+B1$
8. Click "OK".



Our formula always grabs the value located one cell above the cursor's current position and substitutes this where the "B1" is in our formula. It does this because when we created our formula, our cursor was one cell below the cell we referred to in our formula. The B1 is just a placeholder not a fixed address.

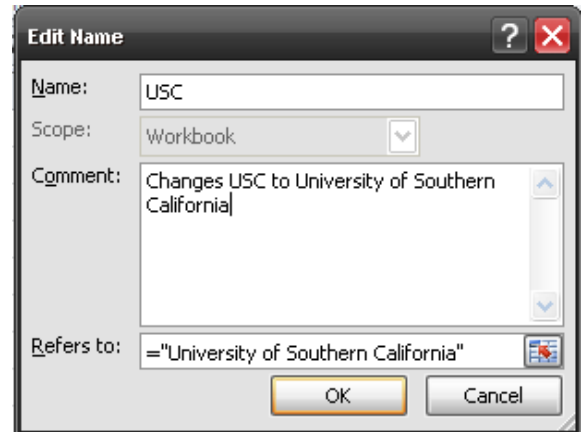
1. Place your cursor in cell B2 and type: $=LATotal$ (Excel should return 10.875)
2. Type 100 in cell C5.
3. Click one cell below C5 and type: $=LATotal$ (Excel should return 108.75)

Using Named Abbreviations

Range name formulas can also be text formulas. This technique allows you create a short range name that returns a long phrase. For example, you might create a range name called "USC" that returns "University of Southern California".

Creating the Name

1. From the "Formulas" menu tab click "Define Name".
2. In the "Name" box, type the letters you wish to use as an abbreviation. In this example we typed: **USC**
(You will be typing this name to invoke the full phrase so keep it short.)
3. If desired, type some comments.
4. In "Refers to", type an equals sign and then the phrase you wish to return enclosed in quotes. For example:
= "University of Southern California"
5. Click "OK" then click "Close".



Using the Name

To use the named formula, simply type the name you assigned it preceded by an equals sign and press enter.

For example: =USC

	A
1	=USC
2	USC
3	

	A	B	C
1	University of Southern California		
2			

Goal Seek

Under the right circumstances, *Goal Seek* allows you to force a formula to return a desired outcome by changing one of the cells used in the formula. For example,

$$\begin{aligned} \text{Rate} \times \text{Hours} &= \text{Gross Pay} \\ \$10 \times 8\text{hrs} &= \$80 \end{aligned}$$

If you wanted Gross Pay to equal \$100 rather than \$80, you could tell Excel to change either the Rate or the Hours to return \$100 and it would do the algebra for you.

Characteristics of Goal Seek

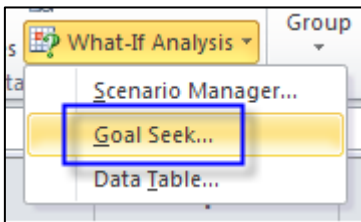
- The cell you are setting to a specific value must contain a formula (e.g. *Gross Pay*)
- The cell you allow Excel to change to achieve your goal must contain a value and must be included in the formula (e.g. *Rate* or *Hours*).
- Goal Seek can only change one data cell. (e.g. It can change either *Rate* or *Hours* but not both.)

Goal Seek Example 1: Finding Overtime Hours

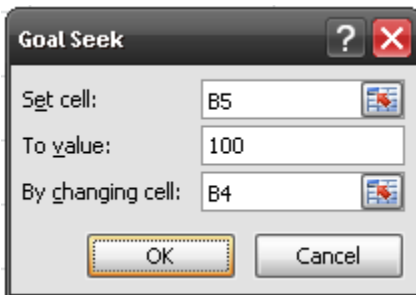
In this example we wish to know how many overtime hours we must work to make our gross pay equal to \$100 rather than \$80.

1. Create the spreadsheet shown to the right.
2. Click in cell **B5**.
3. Click the “**Data**” tab.

	A	B	C
1	Regular Rate	10	
2	Regular Hours	8	
3	Overtime Rate	15	
4	Overtime Hours	0	
5	Gross Pay	=B1*B2+B3*B4	
6			



4. Click “**What-If Analysis**”.
5. Click “**Goal Seek...**”.



6. “**Set Cell**” is the goal cell and should be **B5**.
7. “**To Value**” is your numeric goal; type **100**
8. “**By changing Cell**” contains the Overtime Hours and thus the value you will change to achieve your goal. Specify **B4**.
9. Click “**OK**” then “**OK**” again to keep the answer.

Your Overtime Hours should be 1.333 and your Gross Pay should be \$100.

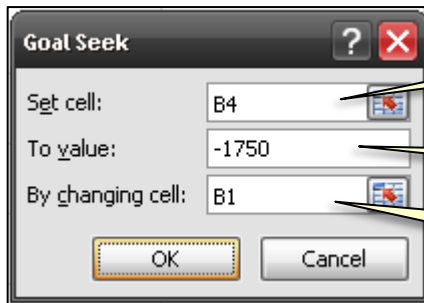
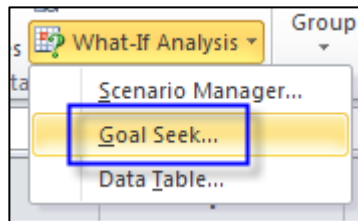
	A	B
1	Regular Rate	10
2	Regular Hours	8
3	Overtime Rate	15
4	Overtime Hours	1.333333
5	Gross Pay	100

Goal Seek Example 2: Finding Loan Amount

In this example we are considering taking out a loan for \$500K at 3.9% Yearly Interest for 30 Years. Using the formula below we discover that our Monthly Payment will be \$2,358.34. Unfortunately, we can only afford \$1,750 per month. What is the largest loan amount we can take out?

	A	B
1	Loan Amount	\$ 500,000.00
2	Yearly Rate	3.90%
3	Years	30
4	Monthly Payment	=PMT(B2/12,B3*12,B1)
5		

1. Create the spreadsheet above.
2. In B4 type: **=PMT(B2/12,B3*12,B1)**
3. Click in cell B4.
4. Click the "Data" tab.
5. Click "What-If Analysis".
6. Click "Goal Seek...".



7. "Set Cell" is our Monthly Payment and should be B4.

8. "To Value" is our goal and is negative 1750

9. "By Changing cell" is the cell we are changing to achieve our goal (Loan Amount) and should be B1.

10. Click "OK" and then "OK" again to keep the solution.

Your monthly payment should go to -\$1,750 and your Loan Amount should have gone to \$371,023.53 so you could achieve your goal.

	A	B
1	Loan Amount	\$371,023.53
2	Yearly Rate	3.90%
3	Years	30
4	Monthly Payment	(\$1,750.00)
5		

Solver

Solver is similar to Goal Seek in that Excel will return your desired outcome by changing data cells; however, it is much more powerful than Goal Seek. Unlike Goal Seek, Solver can change multiple cells to achieve your desired outcome (e.g. you can change both Rate and Hours), utilize constraints (e.g. Overtime Hours can't be greater than 16.) It can also return a minimum and maximum value.

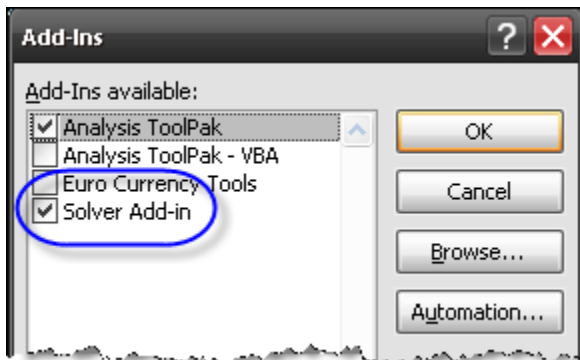
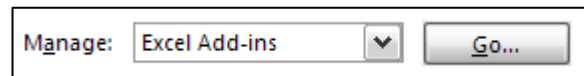
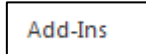
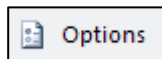
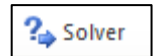
Characteristics of Solver

- The cell you are setting to a specific value, minimizing, or maximizing, must contain a formula (e.g. *Gross Pay*)
- The cell(s) you allow Excel to change to achieve your goal must be included in the formula (e.g. *Rate* or *Hours*). Unlike Goal Seek, it can contain a value or a formula. Note that the formula will be overwritten with a value.)
- You cannot use Solver across multiple sheets.

Loading the Solver Add-in

Solver comes with Excel but it is an "Add-in" and you may have to add it to your menu. To check:

1. Click the "Data" tab.
2. If you see the "Solver" button on the far right then you are good; otherwise, proceed to step 3.
3. If you don't see Solver, then click the "File" tab.
4. Click "Options" in the lower left.
5. Click "Add Ins".
6. Click "Go".



7. Check the "Solver Add-in".
8. Click "OK".

Note that you may have to restart Excel to make the *Solver* button appear under the *Data* tab.

Solver Exercise Part 1 - Building our Model

Our company manufactures two types of golf bags: Standard and Deluxe. We make \$9 profit off of every Standard bag and \$15 profit off of every Deluxe bag. For now, demand is much higher than the number of golf bags we can produce. We are constrained by the number of hours each of our departments can work per month.

	A	B	C	
1	Production Characteristics			
2				
3				
4				
5				
6				
7	Model			
8		Profit	Number of Bags Made	Total
9	Standard Bags:	\$ 9.00		
10	Deluxe Bags:	\$ 15.00		
11	Grand Total			
12				

	Cutting and Dying	Sewing	Finishing	Inspection & Packaging
Standard Bag Hours Per Dept:	0.70	0.50	1.00	0.10
Deluxe Bag Hours Per Dept:	2.00	0.83	0.67	0.25
Max Hours Per Dept Per Month:	630.00	600.00	708.00	135.00

Profit per Bag
This is the amount of profit we make off of each bag.

Bags per Month
These two cells will contain the number of *Standard* and *Deluxe* bags we will be making per month. They are our **variable** cells.

Actual Production Hours
We will use this area to calculate the total number of hours it takes in each department to make a given number of bags.

Total Profit
We will multiple our Profit by the Number of Bags made to get our total profit. This is the cell we wish to **maximize**.

Production Characteristics
The top two rows show the number of hours it takes one bag to go through each department. For example, it takes a standard bag .7 hours in *Cutting and Dying*, .5hrs in *Sewing*, 1 hr. in *Finishing* and .10 hours in *Inspection and Packaging*. The second row shows the same information for Deluxe bags.

Max Hours per Month
This row shows the maximum hours per month each department can work.

1. Estimating the Number of bags:

- a. Go to the "Solver" sheet.
- b. In cells C9 and C10 type 10 and 10.

(Note that we don't have to have anything here but it makes creating our formulas less error prone if we have a starting point for the estimated number of bags we are making.)

	Number of Bags Made
00	10
00	10

2. Calculate the Departmental Hours for All Bags:

We wish to multiply the number of *Standard* bags made by how long it takes a *Standard* bag in Cutting and dying and then copy right.

- a. In cell **D9** type the following and press enter:
 $=\$C9*D3$

Note that the \$ in front of the C is there so the number of bags does not shift right when we copy. We did not put it in front of the 9 because we wish to copy down later and we do what that to shift.

- b. Copy D9 to E9, F9, and G9.

	A	B	C	D	E
1	Production Characteristics				
2				Cutting and Dying	Sewing
3		Standard Bag Hours Per Dept:		0.70	0.5
4		Deluxe Bag Hours Per Dept:		2.00	0.8
5		Max Hours Per Dept Per Month:		630.00	600.0
6					
7	Model				
8		Profit	Number of Bags Made		
9	Standard Bags:	\$ 9.00	10	=C9*D3	
10	Deluxe Bags:	\$ 15.00	10		
11	Grand Total				

	Profit	Number of Bags Made					Total	
8								
9	Standard Bags: \$ 9.00	10	7.00	5.00	10.00	1.00		
10	Deluxe Bags: \$ 15.00	10						
11	Grand Total							

- c. Copy D9 to D19, E9 to E10, F9 to F10, and G9 to G10.

	Profit	Number of Bags Made					Total	
8								
9	Standard Bags: \$ 9.00	10	7.00	5.00	10.00	1.00		
10	Deluxe Bags: \$ 15.00	10	20.00	8.33	6.67	2.50		
11	Grand Total							
12								

3. Calculate the Profits

We will now multiply our number of bags by the amount of profit we make per bag.

- a. In cell **H9** type the following and press enter: $=B9*C9$
 This is the total profit for *Standard* bags.

	Profit	Number of Bags Made					Total	
8								
9	Standard Bags: \$ 9.00	10	7.00	5.00	10.00	1.00	=B9*C9	
10	Deluxe Bags: \$ 15.00	10	20.00	8.33	6.67	2.50		
11	Grand Total							
12								

- b. Copy cell **H9** down to cell **H10**.
 This is the total profit for *Deluxe* bags.

- c. Click in cell **H11** and type: $=H9+H10$
 This is our total profit and the cell we wish to maximize.

	Total
1.00	\$ 90.00
2.50	\$ 150.00
	=H9+H10

4. Sum Total Number of Bags made and Hours for Each Department:

a. Highlight C11 through G11.

7	Model							
8		Profit	Number of Bags Made					Total
9	Standard Bags:	\$ 9.00	10	7.00	5.00	10.00	1.00	\$ 90.00
10	Deluxe Bags:	\$ 15.00	10	20.00	8.33	6.67	2.50	\$ 150.00
11	Grand Total							\$ 240.00
12								

b. On your keyboard, press **Alt =** (or click Autosum)

7	Model							
8		Profit	Number of Bags Made					Total
9	Standard Bags:	\$ 9.00	10	7.00	5.00	10.00	1.00	\$ 90.00
10	Deluxe Bags:	\$ 15.00	10	20.00	8.33	6.67	2.50	\$ 150.00
11	Grand Total		20	27.00	13.33	16.67	3.50	\$ 240.00
12								

Solver Exercise Part 2 - Using Solver to Maximize Profit

Our model is now complete. If you change the number of bags being made (C9 & C10), the total profit should change (H11) as do the number of hours each department works (D11:G11). We need to tell Solver about the following:

Constraint Cells
These cells contain the maximum number of hours each department can work per month. They are used in part of our constraint.

1	Production Character							
2			Cutting and Dying	Sewing	Finishing	Inspection & Packaging		
3	Standard Bag Hours Per Dept:		0.70	0.50	1.00	0.10		
4	Deluxe Bag Hours Per Dept:		2.00	0.83	0.67	0.25		
5	Max Hours Per Dept Per Month:		630.00	600.00	708.00	135.00		
6								
7	Model							
8		Profit	Number of Bags Made					Total
9	Standard Bags:	\$ 9.00	10	7.00	5.00	10.00	1.00	\$ 90.00
10	Deluxe Bags:	\$ 15.00	10	20.00	8.33	6.67	2.50	\$ 150.00
11	Grand Total		20	27.00	13.33	16.67	3.50	\$ 240.00
12								

Variable Cells
These cells contain the number *Standard* and *Deluxe* bags we are making. Solver will be adjusting the contents of these cells to maximize our profit.

Constraint Cells
These cells contain the total number of hours each department works given the number of bags being made. Each one must be less than the Max hours given in the table above.

Set Objective Cell
This contains our total profit and is the cell we are attempting to maximize. It contains a formula that includes the number of bags being made.

1. Click in cell H11.
2. Click the "Data" tab and then "Solver".



3. Set Objective
This is the cell we are attempting to maximize and should be H11.

4. To:
Select "Max".

5. Set Variable Cells
These are the cells solver is allowed to change to maximize our profit. Select C9:C10.

6. Set Constraints
These are our hourly constraints that prevent us from making unlimited bags.
a. Click the "Add" button and see below.

6b. Specify that D11 <= D5
6c. Click "Add".

Cutting and Dying Set	
	0.70
	2.00
	630.00
	6
of	
le	
10	7.00
10	20.00
20	27.00

6d. Specify that
E11 <=E5

6e. Click **"Add"**.

Add Constraint

Cell Reference: Constraint:

OK Add Cancel

d		
g	Sewing F	
D	0.50	
D	0.83	
D	600.00	
D		
D	5.00	
D	8.33	
D	13.33	

6f. Specify that
F11 <=F5

6g. Click **"Add"**.

Add Constraint

Cell Reference: Constraint:

OK Add Cancel

	Finishing	
	1.00	
	0.67	
	708.00	
	10.00	
	6.67	
	16.67	

6h. Specify that
G11 <=G5

6i. Click **"Add"**.

Add Constraint

Cell Reference: Constraint:

OK Add Cancel

	Inspection & Packaging	
	0.10	
	0.25	
	135.00	
	1.00	
	2.50	
	3.50	

6j. Specify that Cell Reference has C9:C19.
6k. Set the operator to **"int"**.
(This prevents numbers with decimals.)

6l. Click **"OK"**.

Add Constraint

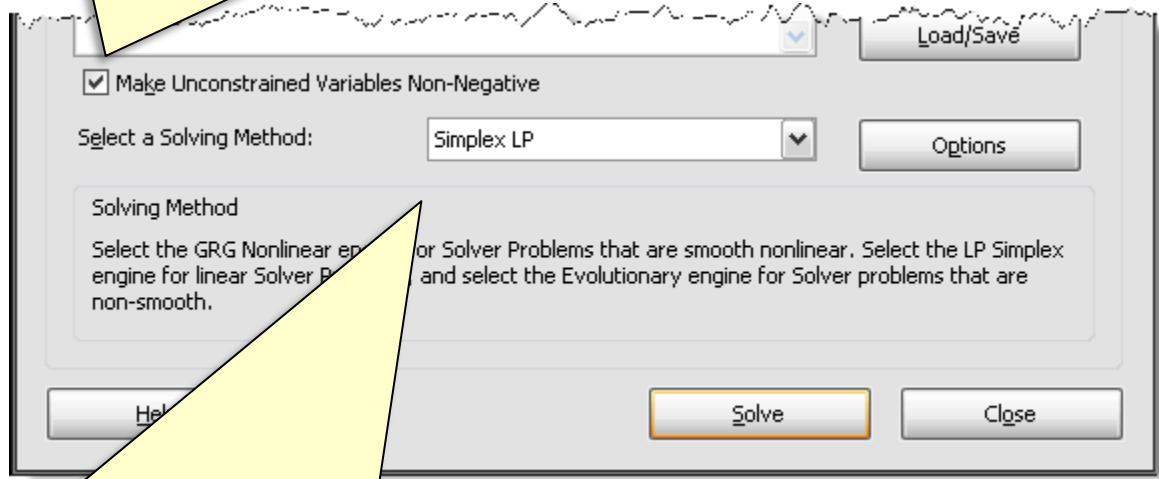
Cell Reference: Constraint: integer

OK Add Cancel

	Number of Bags Made	
	10	
	10	
	20	

7. Make Unconstrained Variables Non-Negative

Checking this specifies that all decision variable cells without stated lower limits should be given lower limits of zero.



8. Select a Solving Method: Select Simplex LP (GRG Nonlinear works too) They are described below:

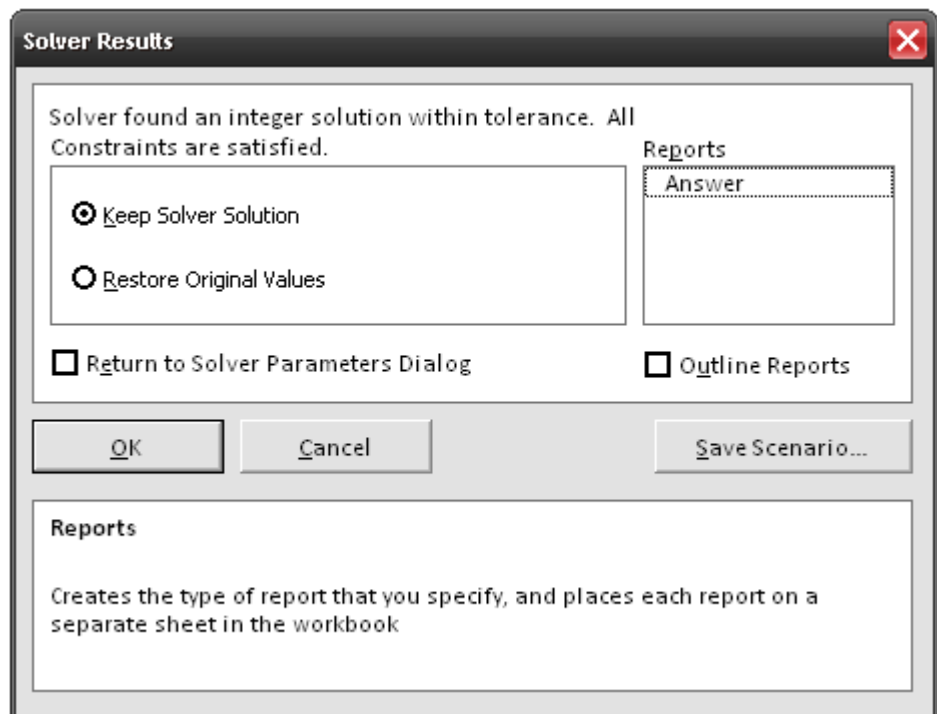
Simplex LP – Use this for linear models. (Linear models create straight lines. If your equations contain no exponents, logs, or absolute values then it is probably a linear model.)

GRG Nonlinear Engine – Use this for smooth nonlinear models. (Nonlinear functions often involve variables that are raised to a power or multiplied or divided by other variables. They may also use transcendental functions such as exp, log, sine and cosine.)

Evolutionary – Select the Evolutionary engine for non-linear models that are not smooth.

9. Click “Solve”.

10. Solver should find a solution. To keep the solution click “OK”.



	A	B	C	D	E	F	G	H
1	Production Characteristics							
2				Cutting and Dying	Sewing	Finishing	Inspection & Packaging	
3	Standard Bag Hours Per Dept:			0.70	0.50	1.00	0.10	
4	Deluxe Bag Hours Per Dept:			2.00	0.83	0.67	0.25	
5	Max Hours Per Dept Per Month:			630.00	600.00	708.00	135.00	
6								
7	Model							
8		Profit	Number of Bags Made					Total
9	Standard Bags:	\$ 9.00	650	455.00	325.00	650.00	65.00	\$ 5,850.00
10	Deluxe Bags:	\$ 15.00	87	174.00	72.50	58.00	21.75	\$ 1,305.00
11	Grand Total		737	629.00	397.50	708.00	86.75	\$ 7,155.00
12								
13								

Scenario Manager

Scenario Manager allows you to take multiple snapshots of your data that you can save and return to at any time. You can also display the different snapshot scenarios in a side-by-side comparison. **Note that you cannot use Scenario Manager with values across multiple sheets.** In this example, we will compare different car purchase options.

1. Create the spreadsheet shown below.

	A	B
1	Auto Model	BMW 325i
2	Price	50000
3	Est. Tax and Licence	=B2*0.13
4	Total	=B2+B3
5	Down Payment	5000
6	Amount Financed	=B4-B5
7	Yearly Rate	0.03
8	Loan Years	5
9	Monthly Payments	=PMT(B7/12,B8*12,B6)
10		

	A	B
1	Auto Model	BMW 325i
2	Price	\$ 50,000
3	Est. Tax and Licence	\$ 6,500
4	Total	\$ 56,500
5	Down Payment	\$ 5,000
6	Amount Financed	\$ 51,500
7	Yearly Rate	3%
8	Loan Years	5
9	Monthly Payments	(\$925.39)

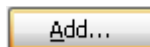
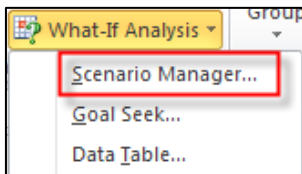
About the Changing Cells

When using Scenario Manager, you name a scenario, specify the cells whose values you will be changing, and then specify the values. In most cases, your changing cells will always contain values or labels but not formulas. (The changing cells can contain formulas but because Scenario Manager will replace the formulas with values or labels and thus your model may no longer be useful.)

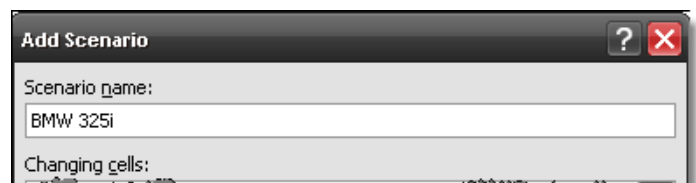
In our example, our changing cells are all of our value cells and are indicated in the image to the right. We will be changing *Auto Model*, *Price*, *Down Payment*, *Yearly Rate*, and *Loan Years*.

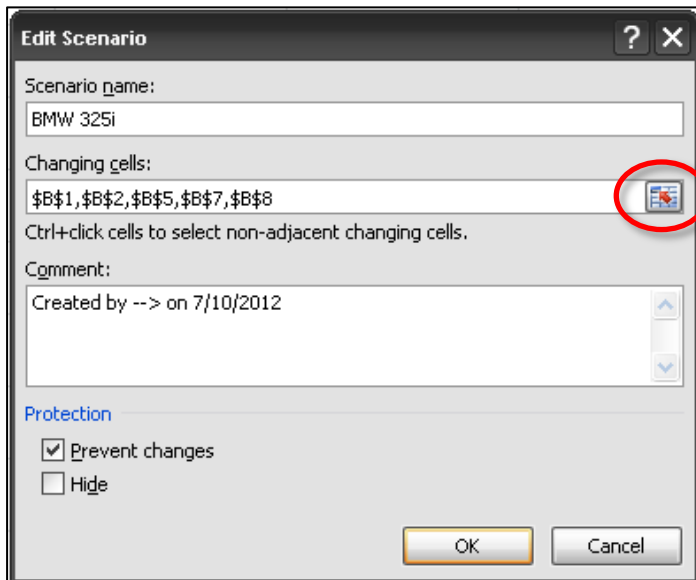
	A	B
1	Auto Model	BMW 325i
2	Price	\$ 50,000
3	Est. Tax and Licence	\$ 6,500
4	Total	\$ 56,500
5	Down Payment	\$ 5,000
6	Amount Financed	\$ 51,500
7	Yearly Rate	3%
8	Loan Years	5
9	Monthly Payments	(\$925.39)

2. Click the "Data" tab in the menu.
3. Click "What-If Analysis" then "Scenario Manager..."



4. Click the "Add" button to create a new scenario.
5. Type a name for your first scenario in "Scenario name". (BMW 325i in this example.)





We now need to specify the cells whose content we will be changing.

6. Click the collapse button for "Changing Cells".
7. Click cell B1.
8. Hold **Control** and click **B2, B5, B7, and B8**.

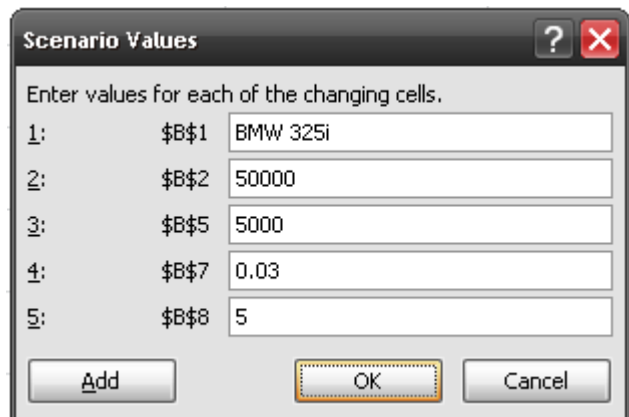
	A	B
1	Auto Model	BMW 325i
2	Price	\$ 50,000
3	Est. Tax and Licence	\$ 6,500
4	Total	\$ 56,500
5	Down Payment	\$ 5,000
6	Amount Financed	\$ 51,500
7	Yearly Rate	3%
8	Loan Years	5
9	Monthly Payments	(\$925.39)



9. Click the floating expand button to return to the dialogue box.

The dialogue box shown to the right will open. It is in this box that you will type your new values for the cells indicated.

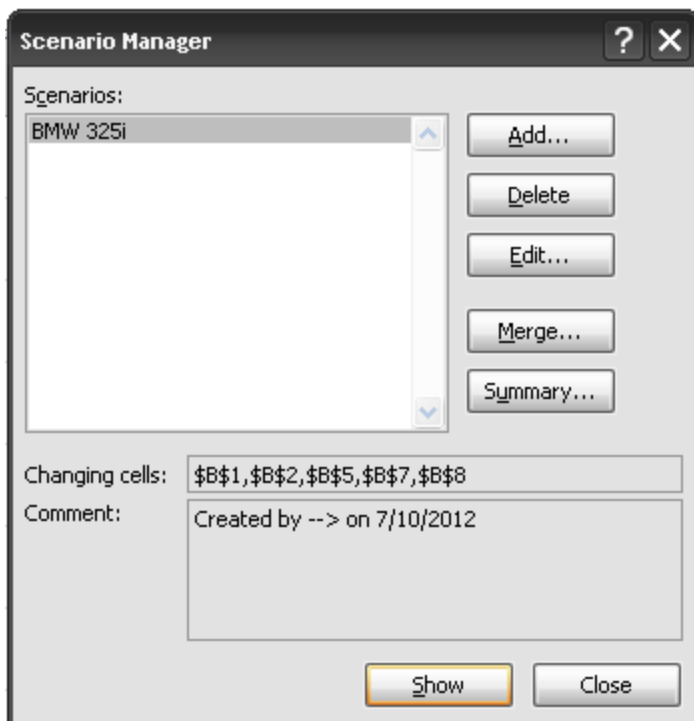
10. Click "OK" to accept the existing values.



You have just created your first scenario. You can create more by clicking the "Add" button and then switch between the different scenarios by selecting the scenarios from the list and then clicking "Show".

However, in the image above you will notice that cell addresses are listed. Using Scenario Manager will be easier if we replace those with more descriptive labels. We can do this by assigning range names to the changing cells.

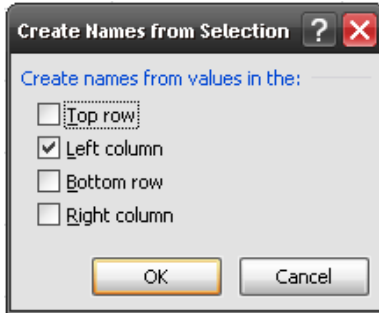
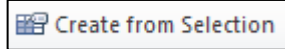
11. Click "Close" to close Scenario Manager.



Using Range Names

We will assign range names to B1, B2, B5, B7, and B8 using the labels to their lefts.

12. Highlight the ranges as shown: A1:B2, A5:B5, A7:B8 (Hold **Control** to select multiple non-adjacent cells.) (Note that it doesn't look like A7 is selected but it is.)
13. Click the **"Formulas"** menu tab.
14. Click **"Create From Selection"**.
15. Check only **"Left column"** and then click **"OK"**.



	A	B
1	Auto Model	BMW 325i
2	Price	\$ 50,000
3	Est. Tax and Licence	\$ 6,500
4	Total	\$ 56,500
5	Down Payment	\$ 5,000
6	Amount Financed	\$ 51,500
7	Yearly Rate	3%
8	Loan Years	5
9	Monthly Payments	(\$925.39)

Creating More Scenarios

Now that we have created range names, making more scenarios will be easier.

16. Click the **"Data"** menu tab.
17. Select **"What-if Analysis"** and then **"Scenario Manager"**.
18. Click the **"Add"** button to create another scenario.
19. Type a name for the new scenario (e.g. Lexus ES).

Note that there is no need to change the *Changing Cells*. We will use the same changing cells as our first scenario.

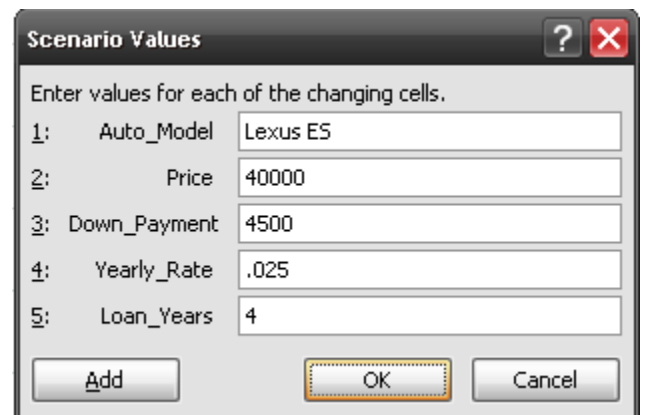
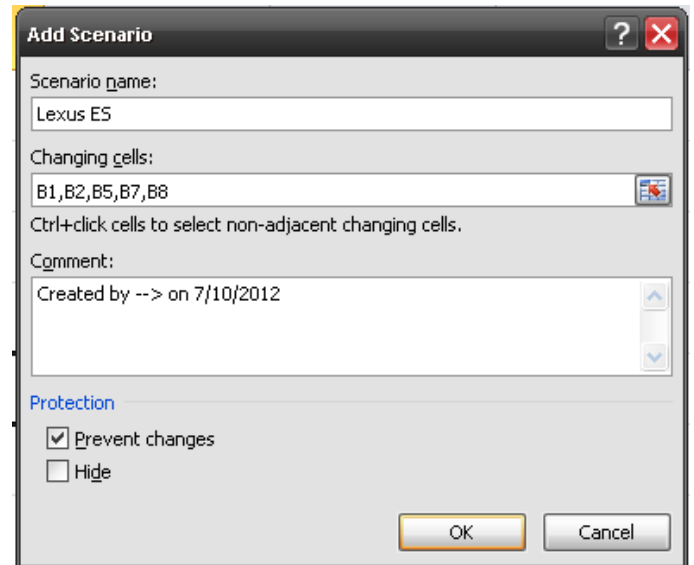
20. Click **"OK"**.

(Note the display of labels rather than cell addresses.)

21. Input the Lexus data:
Auto Model: Lexus ES, Price: 40000, Down Payment: 4500,
Yearly Rate: .025, Loan Years: 4

At this point you can click **"Add"** to make more scenarios or you can click **"OK"** to view all of your scenarios.

22. Click **"OK"**.



Switching Between Scenarios

To make your spreadsheet display the data saved in a scenario, there are two steps:

	A	B	C	D
1	Auto Model	BMW 325i		
2	Price	\$ 50,000		
3	Est. Tax and Licence	\$ 6,500		
4	Total	\$ 56,500		
5	Down Payment	\$ 5,000		
6	Amount Financed	\$ 51,500		
7	Yearly Rate	3%		
8	Loan Years	5		
9	Monthly Payments	(\$925.39)		

Scenario Manager

Scenarios:
BMW 325i
Lexus ES

Buttons: Add..., Delete, Edit..., Merge..., Summary...

Changing cells: Auto_Model, Price, Down_Payment, Yearly_Rate, Loan_Years
Comment: Created by --> on 7/10/2012

Buttons: Show, Close

a. Click the name of the scenario whose data you wish to display.

b. Click "Show".

Edit a Scenario


- Click the name of the scenario.
- Click the "Edit" button.

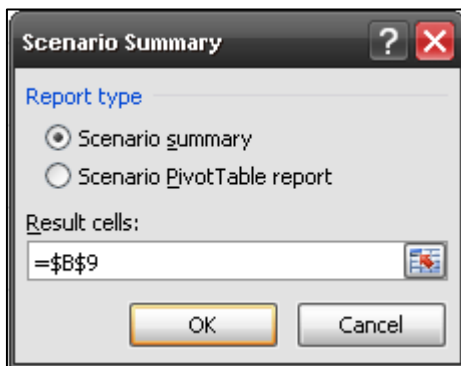
Delete a Scenario

- Click the name of the scenario.
- Click the "Delete" button.

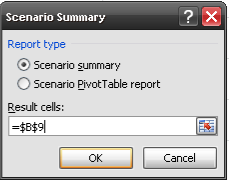
Display Scenarios Side-by-Side

To display your scenarios side-by-side:

- Open Scenario Manager (**Data – What-if Analysis – Scenario Manager**).
- Click the "Summary" button. 
- Click the collapse button for "Results Cell" and select "B9". (This will be displayed below all of our scenarios.)
- Click "OK".



	A	B	C	D
1	Auto Model	BMW 325i		
2	Price	\$ 50,000		
3	Est. Tax and Licence	\$ 6,500		
4	Total	\$ 56,500		
5	Down Payment	\$ 5,000		
6	Amount Financed	\$ 51,500		
7	Yearly Rate	3%		
8	Loan Years	5		
9	Monthly Payments	(\$925.39)		



Excel will display your changing cells and the results cells for each scenario in a side-by-side comparison.

	1	2					
1	2	A	B	C	D	E	F
	1						
	2	Scenario Summary					
	3				Current Values:	BMW 325i	Lexus ES
	5	Changing Cells:					
	6	Auto_Model	BMW 325i	BMW 325i	BMW 325i	Lexus ES	
	7	Price	\$ 50,000	\$ 50,000	\$ 50,000	\$ 40,000	
	8	Down_Payment	\$ 5,000	\$ 5,000	\$ 5,000	\$ 4,500	
	9	Yearly_Rate	3%	3%	3%	3%	
	10	Loan_Years	5	5	5	4	
	11	Result Cells:					
	12	\$B\$9	(\$925.39)	(\$925.39)	(\$925.39)	(\$920.39)	
	13	Notes: Current Values column represents values of changing cells at					
	14	time Scenario Summary Report was created. Changing cells for each					
	15	scenario are highlighted in gray.					
	16						

Note that our Yearly Rate for Lexus ES displays as 3% but it is really 2.5%. This can be easily changed with formatting.

IF() Statements

“If” logic allows a formula to return different results based upon whether a condition is true or false. For example, you can have a formula that divides a loan amount by 2 but only if the loan amount is greater than 10,000. While there are several methods of creating “If” logic in Excel, this section covers how to create “If” logic using Excel’s IF() function.

The IF() function is made up of three parts: A **Condition** section that contains an equation that evaluates to either true or false; a **True** section whose content is only returned if the *Condition* was true; and a **False** section whose content is only returned if the *Condition* was false. For example: If Loan Amount is greater than 10,000, then return the Loan Amount/2; otherwise, return zero. The syntax of an IF() statement is below.

=IF(Condition,True,False)

Condition

This is an equation that produces either a *True* or *False* result. It can use cell addresses, values, labels, formulas, range names, and functions.

Examples:

- A2>=B10
- A2<100
- Average(B1:B10)<500
- B3="Leased"
- G1<>H6
- A1+G6*(100*F9)=1000
- IsBlank(A1)
- AND(B1>5,G10="Sold",F4>20)

True

If the *Condition* evaluates to *True*, the code in this section is returned. It can contain a label, value, cell address, formula, function, or range name.

Examples:

- "VIP"
- 100
- A10
- B3-B9*10
- Average(A1:A10)

False

If the *Condition* evaluates to *False*, the code in this section is returned. It can also contain a label, value, cell address, formula, function, or range name.

Examples:

- "VIP"
- 100
- A10
- B3-B9*10
- Average(A1:A10)

Example 1: Returning Values or Cell Addresses

In this example, we have a list of our employee’s names and their total hours for the day. Of their total hours, we wish to list anything less than or equal to 8 hours in column C and any overtime hours in column D.

1. In cell C2 type:
=IF(B2>8,8,B2)
2. Copy the formula down. You shouldn’t have any value in column C greater than 8.

To get Overtime hours:

3. In cell D2 type:
=IF(B2>8,B2-8,0)
4. Copy the formula down. You should have any remaining overtime hours.

	A	B	C	D
1	Employee	Total Hours	Regular Hours	Overtime Hours
2	Jan	10	=IF(B2>8,8,B2)	
3	Marsha	5	5	
4	Peter	0	0	
5	Bobby	12	8	
6	Cindy	8	8	
7	Greg	4	4	

IF(B2>8,8,B2) This states that if what is in B2 is greater than 8, then return an 8; otherwise, return what is in cell B2.

IF(B2>8,B2-8,0) This states that if what is in B2 is greater than 8, then subtract 8 from B2; otherwise, return zero.

Example 2: Returning Text or Using Text as a Criteria

When referring to a cell containing text or you wish to return text (except for cell addresses), the text must be enclosed in quotes. In this example, we wish to subtract 10k from the list price of any address in Zone "A". All other prices should be listed as "Not on Sale".

	A	B	C	D	E	F
1	Address	List Price	Zone	Discount Price		
2	300 Morningglory Circle	\$ 525,000	A	=IF(C2="A",B2-10000,"Not on Sale")		
3	100 Wisteria Lane	\$ 400,000	A	390000		
4	1313 Cemetery Lane	\$ 625,000	C	Not on Sale		
5	1313 Mockingbird Heights	\$ 325,000	B	Not on Sale		
6	742 Evergreen Terrace	\$ 250,000	A	240000		
7	4222 Clinton Way	\$ 900,000	B	Not on Sale		
8						

1. Go to the "If_Text" sheet.
2. in cell D2 type: **=IF(C2="A",B2-10000,"Not on Sale")**
3. Press Enter and copy the formulas down.

Don't type a comma when typing the 10,000. IF() will think you are going to the next section.

This states: If the Zone (C2) is "A", then subtract 10,000 from the List Price (B2); otherwise, return "Not on Sale".

Example 3: Nesting Functions

Any of the three sections of an IF() function can contain functions. In this example, if the profit of a movie is greater than the average profit we wish to return the word "Buy"; otherwise, we wish to return the word "Lease". When doing this one, be sure to make the average range absolute or you will get the wrong answers.

	A	B	C
1	Movie	Profit	Buy or Lease
2	Fried Green Tomatoes	\$ 50,879,690	=IF(B2>AVERAGE(B\$2:B\$10),"Buy","Lease")
3	Four Weddings and a Funeral	\$ 73,625,300	Lease
4	Far and Away	\$ 79,583,800	Buy
5	The Hand That Rocks the Cradle	\$ 65,740,380	Lease
6	Thelma and Louise	\$ 76,580,120	Lease
7	Basic Instinct	\$ 91,837,580	Buy
8	A Few Good Men	\$ 89,765,780	Buy
9	Sleepless in Seattle	\$ 76,538,270	Lease
10	Unforgiven	\$ 89,383,780	Buy
11			

1. Go to the "If_Avg" sheet.
2. in cell C2 type: **=IF(B2>Average(B\$2:B\$10),"Buy","Lease")**
3. Press Enter and copy the formulas down.

Alternative Solution: Range Name Profit Area B2:B10

Try this again but first give B2:B10 the range name of: Profit

It has the advantage of not having to worry about the absolute addresses.

The new formula would be: **=IF(B2>Average(Profit),"Buy","Lease")**

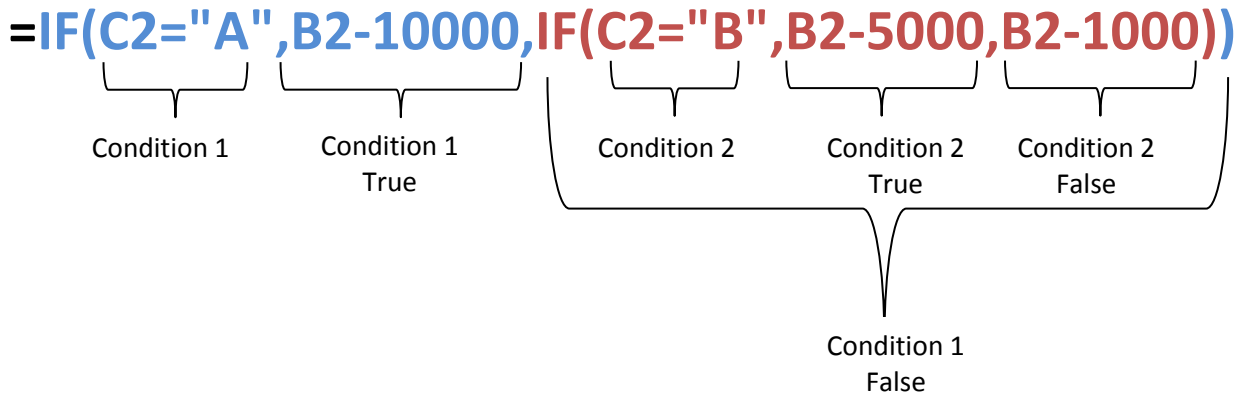
Example 4: Nested If Statements

A single IF() statement allows for two possible outcomes, but what if there are more possibilities? In this example if an address is in Zone A, we wish to knock 10K of the list price; Zone B gets 5K knocked off the list price, and any other zone gets 1K knocked off the list price. These are three possible outcomes. To solve this, we will use nested IF() statements.

	A	B	C	D	E	F	G
1	Address	List Price	Zone	Discount Price			
2	300 Morningglory Circle	\$ 525,000	A	=IF(C2="A",B2-10000,IF(C2="B",B2-5000,B2-1000))			
3	100 Wisteria Lane	\$ 400,000	A	390000			
4	1313 Cemetery Lane	\$ 625,000	C	624000			
5	1313 Mockingbird Heights	\$ 325,000	B	320000			
6	742 Evergreen Terrace	\$ 250,000	A	240000			
7	4222 Clinton Way	\$ 900,000	B	895000			

A nested IF() statement involves placing an additional IF() functions either in the True or False section of the first IF() function. (I see the second IF() function placed in the False section the most often. This allows you to create multiple possibilities but you can also place it in the True section. Placing the second IF() in the True section is one method of creating an "AND" condition; however, I find using the AND() function a less confusing approach.)

1. Go to the "Nested_If" sheet.
2. In D2 type: **=IF(C2="A",B2-10000,IF(C2="B",B2-5000,B2-1000))**
3. Press Enter and copy the formula down.



What is important to understand about the formula above is that the second IF() statement is in false section of the first if statement and therefore only gets read if the first if statement is false. In English, this would read:

If the Zone is A, then subtract 10K from the List price; otherwise, if the Zone is B, subtract 5K from the list price; otherwise, subtract 1K from the list price.

Here is an example that assigns an A, B, C, D or F to students based on a standard curve:

=IF(B2<60,"F",IF(B2<70,"D",IF(B2<80,"C",IF(B2<90,"B","A"))))

Going the other way also works.

=IF(B2>89,"A",IF(B2>79,"B",IF(B2>69,"C",IF(B2>59,"D","F"))))

What is important to understand is that Excel reads from left to right and stops reading the statement as soon as it finds a match. You can nest up to 7 IF() statements but if you find yourself using any more than three you might wish to consider using VLookup() or an array function.

	A	B	C
1	Student	Score	Grade
2	Peter	89	B
3	Jan	63	D
4	Marsha	100	A
5	Greg	72	C
6	Bobby	50	F
7	Cindy	98	A
8	Darrin	89	B
9	Samantha	100	A
10	Keith	42	F
11	Laurie	95	A
12	Tracy	75	C
13	Danny	72	C
14	Jeanie	100	A
15	Tony	88	B

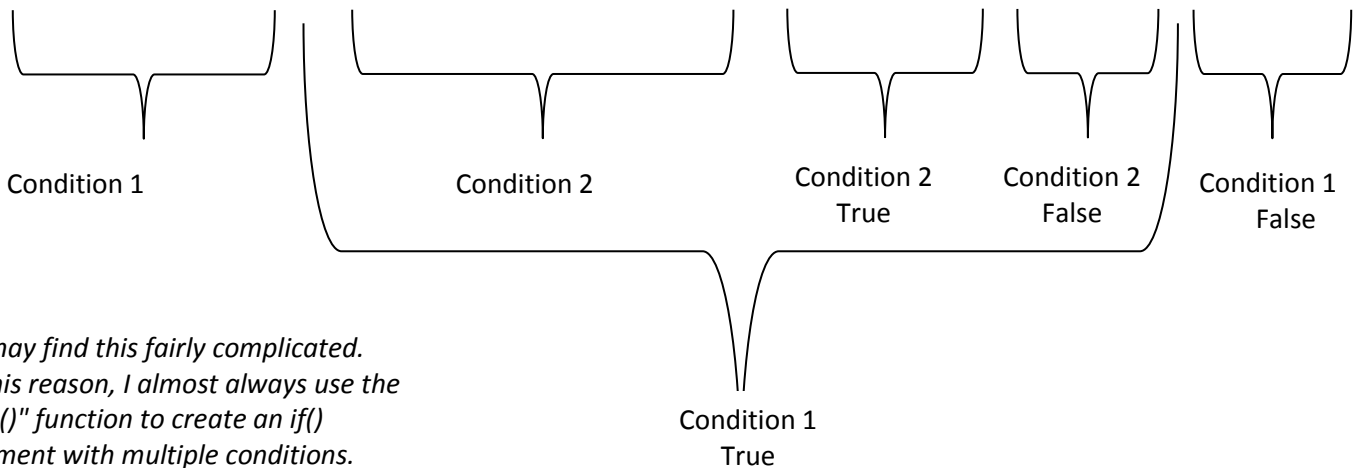
Example 4: Nesting IF() to Create an "AND" Condition

As mentioned above, you can create an "AND" condition by placing the second IF() statement within the "True" section of the first IF() statement. In the example below, if a movie made over 75 million AND it was released after June 1, 1993, we wish to purchase it; otherwise, we wish to lease it. To accomplish this with nested IF() statements, you would:

1. Click the "IF_Nested_AND()" sheet.
2. In D2 type: `=IF(B2>75000000,IF(C2>DATE(1993,6,1),"Purchase","Lease"),"Lease")`
3. Press Enter and copy down.

	A	B	C	D
1	Movie	Profit	Year	Buy or Lease
2	Fried Green Tomatoes	\$ 50,879,690	12/27/1996	<code>=IF(B2>75000000,IF(C2>DATE(1993,6,1),"Purchase","Lease"),"Lease")</code>
3	Four Weddings and a Funeral	\$ 73,625,300	11/15/1994	Lease
4	Far and Away	\$ 79,583,800	12/1/1993	Purchase
5	The Hand That Rocks the Cradle	\$ 65,740,380	12/1/1993	Lease
6	Thelma and Louise	\$ 76,580,120	11/15/1993	Purchase
7	Basic Instinct	\$ 91,837,580	10/15/1993	Purchase
8	A Few Good Men	\$ 89,765,780	10/15/1993	Purchase

`=IF(B2>75000000,IF(C2>DATE(1993,6,1),"Purchase","Lease"),"Lease")`



You may find this fairly complicated. For this reason, I almost always use the "AND()" function to create an if() statement with multiple conditions.

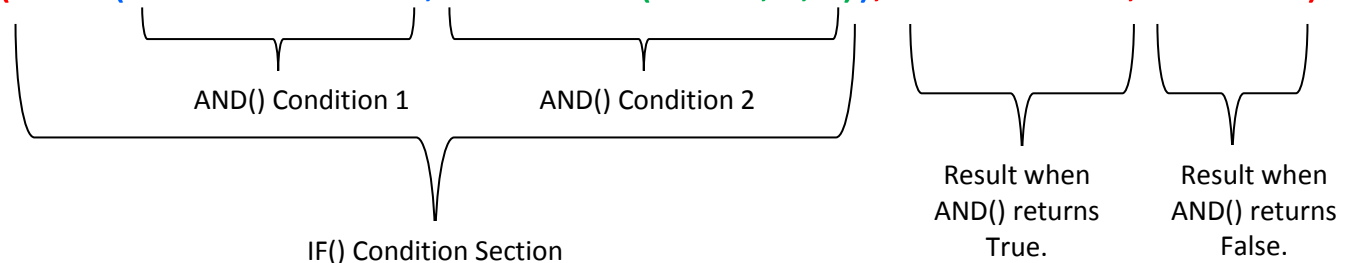
Example 5: Using AND() to Create Multiple Conditions:

AND() is a fairly simple function to use: You give it multiple conditions and if every one of them is true, it returns *true* but if any one of them is false, it returns *false*. Because AND() returns either True or False, you can place it in the *Condition* section of an IF() statement to determine whether IF()'s *true* or *false* section will activate.

Syntax of the AND() Function: `=AND(Condition1,Condition2,Condition3, ...)`
 Syntax in an If() Statement using AND(): `=IF(AND(Condition1,Condition2,Condition3,...),True,False)`

Here is the same example as above but this time we are using AND() in the condition section of our IF() statement:

`=IF(AND(B2>75000000,C2>DATE(1993,6,1)),"Purchase","Lease")`



Example 6: "OR" Conditions

To create an "OR" condition in an IF() statement, use the "OR()" function. Like AND(), it returns either "True" or "False" but for OR() to return true, only one of its conditions has to be true. OR() only returns false when all of its conditions are false.

Syntax of the OR() Function: **=OR(Condition1,Condition2,Condition3,...)**

Syntax in an IF() Statement Using OR(): **=IF(OR(Condition1,Condition2,Condition3,...),True,False)**

In this example we wish to display "Domestic" if the MFG is Ford or Chrysler and "Foreign" if the MFG is anyone else.

	A	B	C
1	MFG	MODEL	Foreign or Domestic
2	honda	accord	=IF(OR(A2="Ford",A2="Chrysler"),"Domestic","Foreign")
3	honda	civic	Foreign
4	ford	mustang	Domestic
5	toyota	Rav 4	Foreign
6	honda	accord	Foreign
7	ford	explorer	Domestic
8	ford	mustang	Domestic
9	toyota	camary	Foreign
10	chrysler	crossfire	Domestic
11	nissan	maxima	Foreign
12	nissan	altima	Foreign

1. Go to the "IF_OR()" sheet.
2. In C2 type: **=IF(OR(A2="Ford",A2="Chrysler"),"Domestic","Foreign")**
3. Press enter and copy down.

=IF(OR(A2="Ford",A2="Chrysler"),"Domestic","Foreign")

