XL1001 – Advance Data Management and Analysis using Excel

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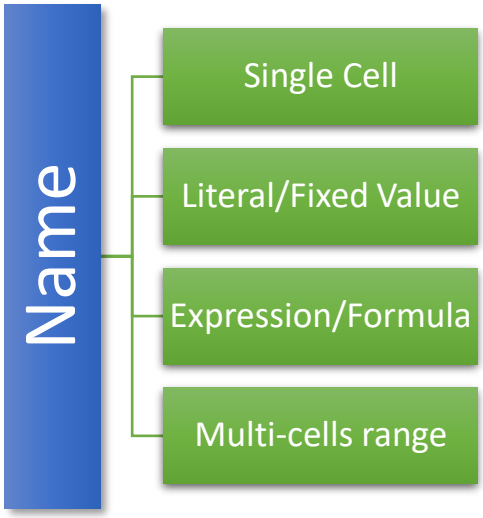
Module 1 – *Using Names*

What is Name?

In Excel, you can create names that refer to a single cell, a group of cells on the worksheet, a specific value, or a formula. After you define Excel names, you can use the names in a formula, instead of using a constant value or cell references.



An Excel name can't contain space characters, and there are other rules to follow when you're creating a name.

The first character of a name must be a

- letter
- underscore (_)
- backslash (\).

Subsequence characters in the name can be

- letters
- numbers
- periods
- underscore characters

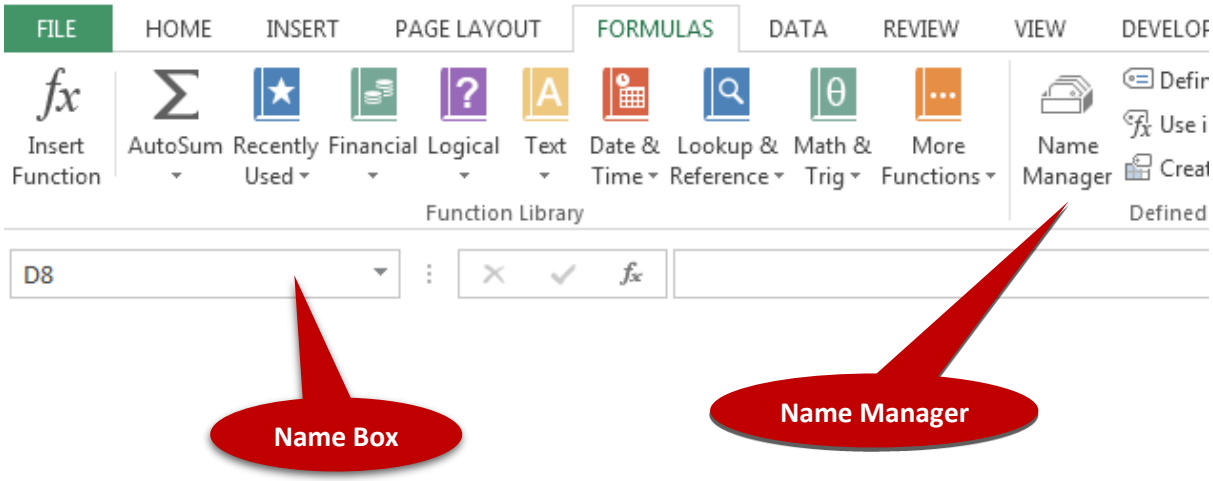
Spaces are not allowed as part of a name.

Names can contain uppercase and lowercase letters. But Excel does not distinguish between them. For example, North and NORTH are treated as the same name.

Names cannot be the same as a cell reference, such as A2, A$35 or R2D2.

You cannot use **C**,**c**,**R** or **r** as a defined name -- they are used as selection shortcuts.

To create names:



The advantages of using Names

There are few advantages when using names:

1. Can make the formulas easier to understand
2. Address independent. Make workbook maintenance easier
3. Single point of reference. Any future changes impact will be minimized.
4. The name will be utilized by other aspects of excel and will make those aspects better, for instance better scenarios summary and clearer solver constraints.

Name for single cell

EX1.1: *Housing Loan*

In this exercise you will learn how to use name to represent single cell.

1. Insert a new worksheet
2. Change the worksheet name to **Housing Loan**.

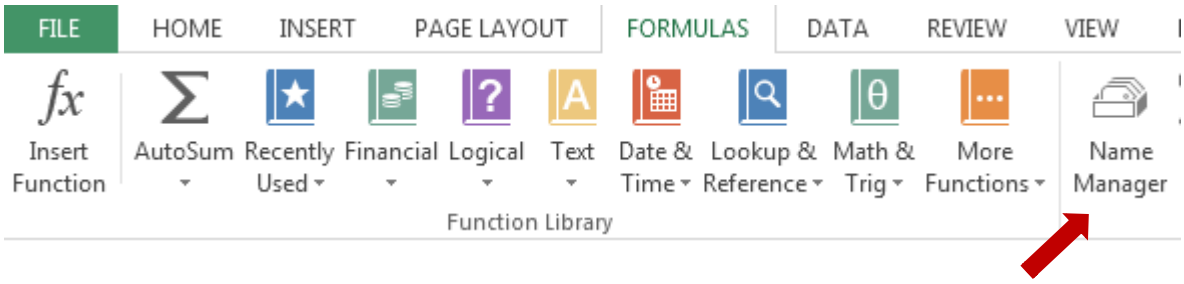
3. Prepare the worksheet as below:

	A	B	C	D	E	F	G	H
1								
2			House Price:	$ 100,000.00				
3			Loan Percentage:	90%				
4			Loan Amount:	$ 90,000.00				
5			Down Payment:	$ 10,000.00				
6			Annual Rate:	4.50%				
7			Duration:	30	Years			
8			Monthly Installment:	$ 456.02				
9			Min Net Income:	$ 1,368.05				
10			Total Payment:	$ 164,166.04				
11			Financial Cost:	$ 74,166.04				
12								
13								

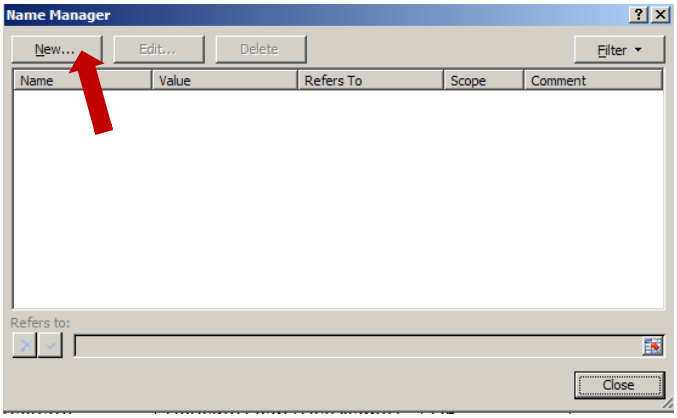
=D2*D3
=D2-D4
=PMT(D6/12,D7*12,-D4)
=3*D8
=D8*D7*12
=D10-D4

4. Copy worksheet **Housing Loan**, and rename the copy as **Housing Loan (Use Name)**.

5. Switch to worksheet **Housing Loan (Use Name)**.
6. Select the **Formulas** Tab and then click **Name Manager** button.



7. You should able to see the following dialog box, click the **New...** button



8. Create the following names for the active worksheet.

Name	Scope	Reference
HousePrice	Housing Loan (Use Name)	D2
LoanPercentage	Housing Loan (Use Name)	D3
LoanAmount	Housing Loan (Use Name)	D4
DownPayment	Housing Loan (Use Name)	D5
AnnualRate	Housing Loan (Use Name)	D6
DurationInYears	Housing Loan (Use Name)	D7
MonthlyInstallment	Housing Loan (Use Name)	D8
MinNetIncome	Housing Loan (Use Name)	D9
TotalPayment	Housing Loan (Use Name)	D10
FinancialCost	Housing Loan (Use Name)	D11

9. Change the cells value to the following:

	A	B	C	D	E
1					
2			**House Price:**	100000	
3			**Loan Percentage:**	0.9	
4			**Loan Amount:**	=HousePrice*LoanPercentage	
5			**Down Payment:**	=HousePrice-LoanAmount	
6			**Annual Rate:**	0.045	
7			**Duration:**	30	Years
8			**Monthly Installment:**	=PMT(AnnualRate/12,DurationInYears*12,-LoanAmount)	
9			**Min Net Income:**	=3*MonthlyInstallment	
10			**Total Payment:**	=MonthlyInstallment*DurationInYears*12	
11			**Financial Cost:**	=TotalPayment-LoanAmount	
12					

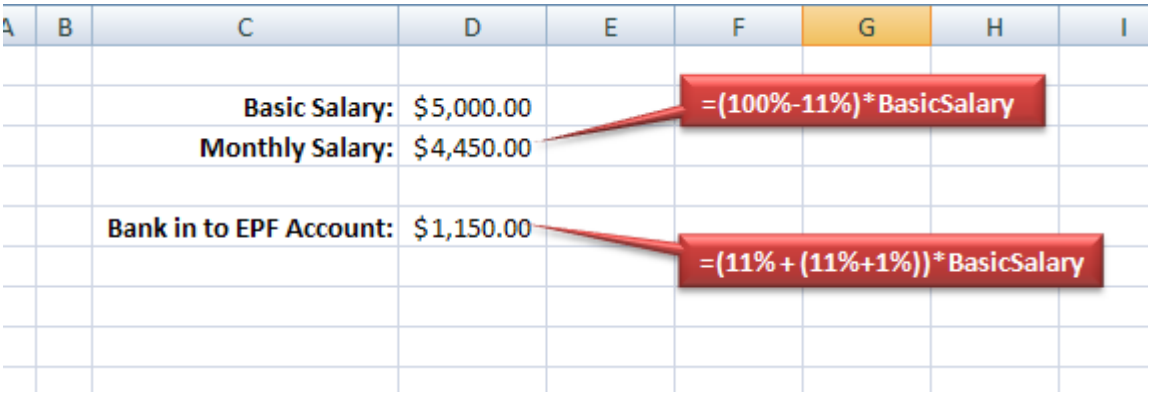
Name for literal value and expression

EX1.2: *Payroll*

In this exercise you will learn how to use name to represent literal value and expression.

Assuming you contribute 11% of your salary to EPF account, and your employer contributes 1% more.

1. Insert a new worksheet
2. Change the worksheet name to **Payroll**.
3. Declare a local name called **BasicSalary** refers to cell D2
4. The worksheet will be as below:



5. Declare the following names for the active worksheet:

Name	Scope	Reference
EPFEmployee	Workbook	=11%
EPFEmployer	Payroll	=EPFEmployee+1%

6. Change the worksheet by using newly created names. Now the worksheet show be as below:

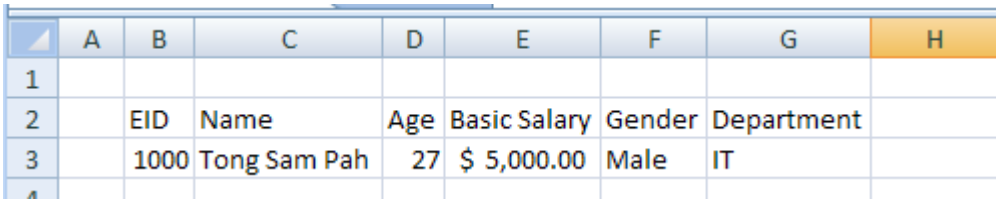
	A	B	C	D
1				
2			**Basis Salary:**	5000
3			**Monthly Salary:**	=(100%-EPFEmployee)*BasisSalary
4				
5			**Bank in to EPF Account:**	=(EPFEmployee+EPFEmployer)*BasisSalary
6				

Name for multi-cells range

EX1.3: *Employee*

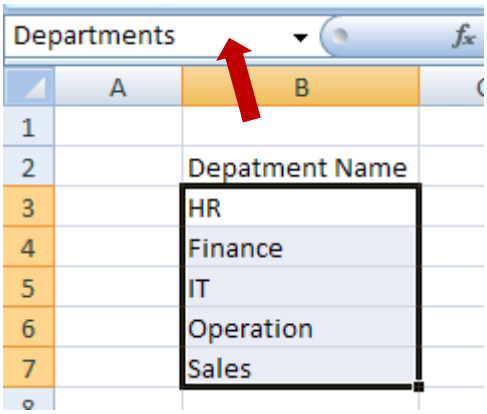
In this exercise you will learn more how to apply name to multi cells range.

1. Insert a new worksheet
2. Change the worksheet name to **Empoyee**.
3. Prepare the worksheet as below:

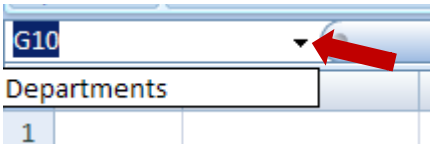


	A	B	C	D	E	F	G	H
1								
2		EID	Name	Age	Basic Salary	Gender	Department	
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	

4. Create a new worksheet, and give it a name **Lists**.
5. In the Lists worksheet
   a. Enter the data as shown
   b. Select cell B3:B7
   c. Click on the name box and type **Departments** followed by **Enter**.



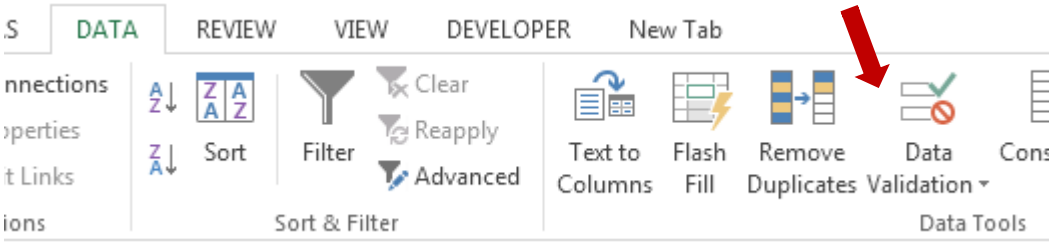
You just created a workbook scope name called **Departments** represents range B3:B7. While in the Lists worksheet, click the name box drop down, you should be able to see the name from the drop down list.



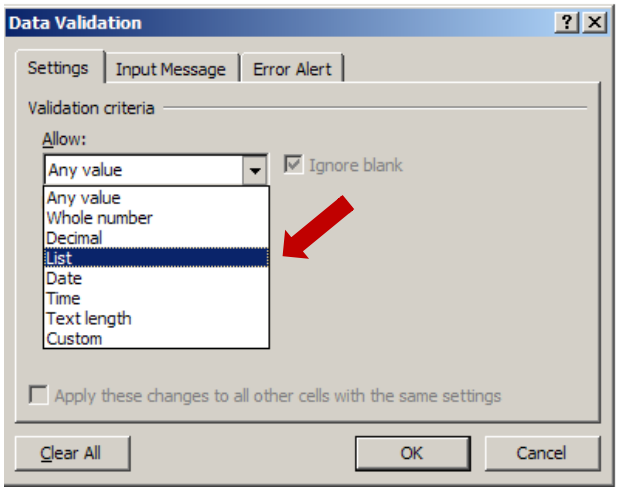
6. Switch to Employee worksheet, click cell G3

	A	B	C	D	E	F	G
1							
2		EID	Name	Age	Basic Salary	Gender	Department
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT

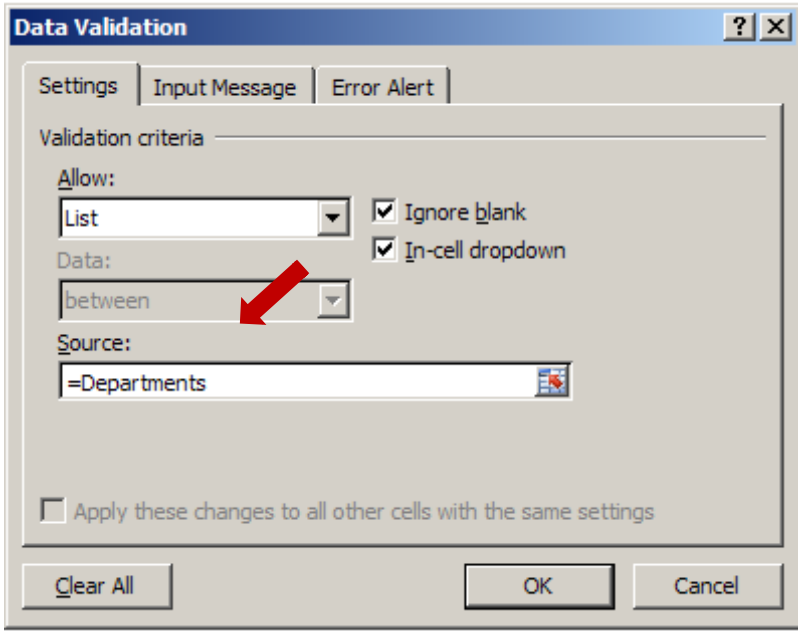
7. Select tab **Data** and click **Data Validation** button.



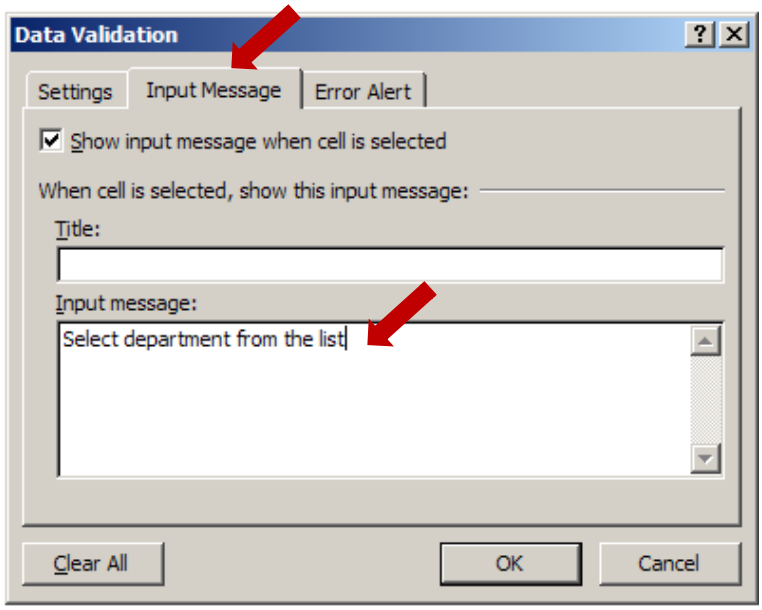
8. In the dialog box, select Allow: **List** option



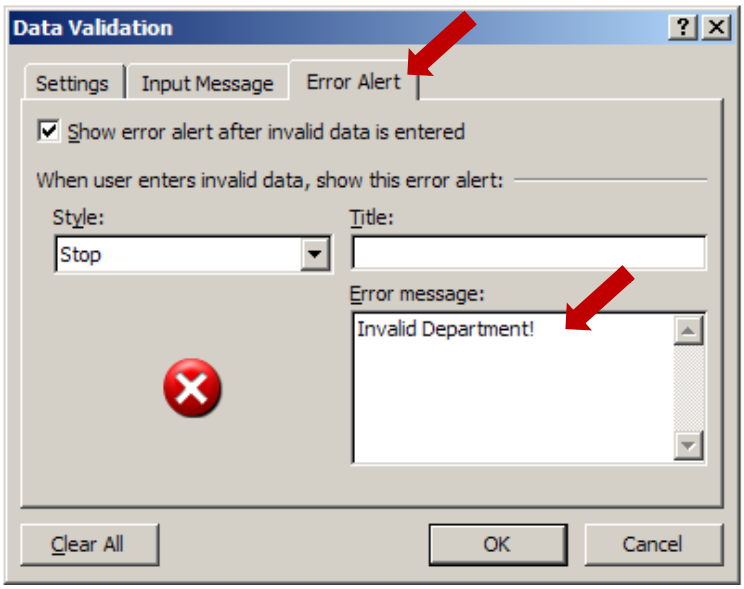
9. Key in the source as below:



10. Select the **Input Message** tab from the dialog box. Key in the input message a below:

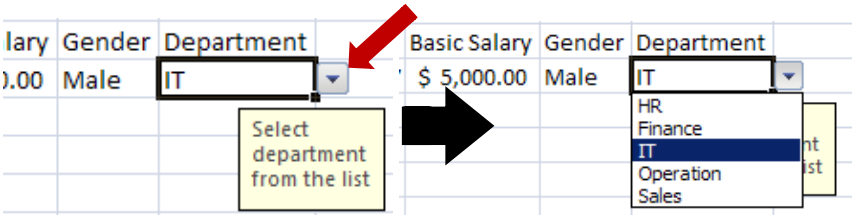


11. Select **Error Alert** tab from the dialog box. Key in the Error message as below:



12. Press **OK** to end the dialog box.

13. Back to worksheet, click on dropdown button:



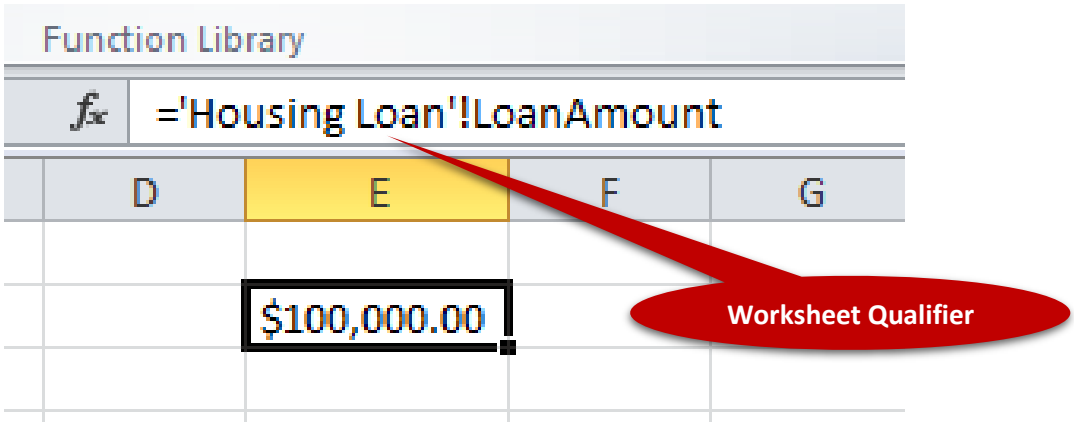
Name Scoping, ambiguity and conflict resolution

Name scope can be either

- Worksheet
- Workbook

The name under worksheet scope only can be referred within the worksheet without qualifier

The name under workbook scope can be referred within the entire workbook without qualifier



Ground rule: Name must be unique under the same scope.

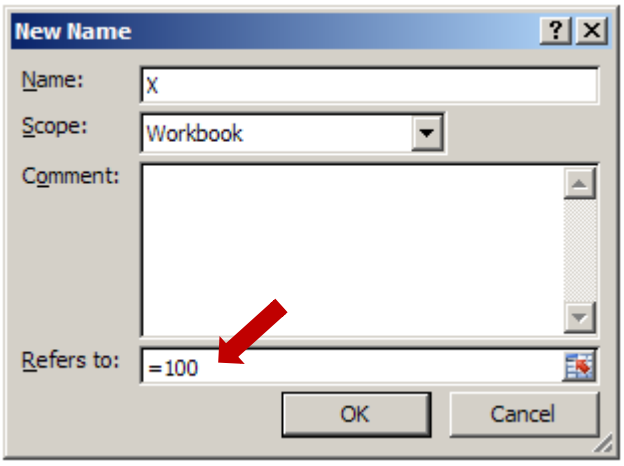
For example, you can't declare same names under same worksheet. However you can declare one name under workbook scope, and at the same time the same name under worksheet scope.

If ambiguity occurs, worksheet scope will shadow workbook scope. But this rule can be overwritten by using qualifier.

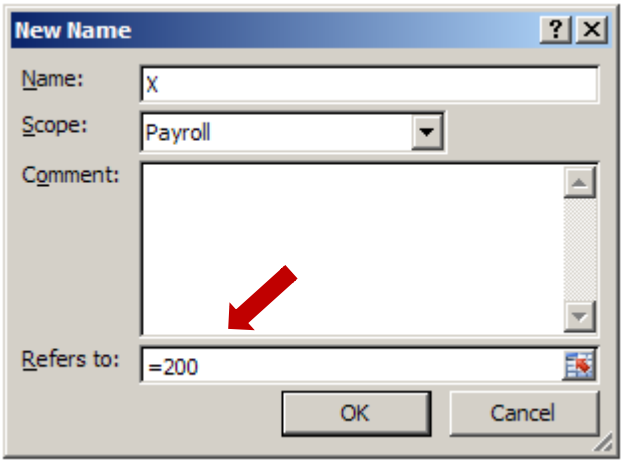
EX1.4: *Naming conflict resolution*

In this exercise you will learn how naming ambiguously is resolved.

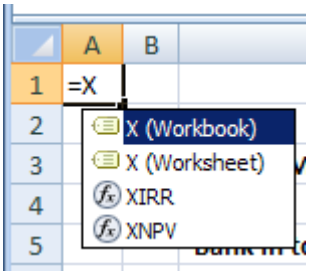
1. Create a name **X** with workbook scope with value 100.



2. Create a local name **X** under worksheet **Payroll** with value 200.



3. Under cell A1 of worksheet Payroll, type "=X"



4. Press **ESC** to cancel the entry

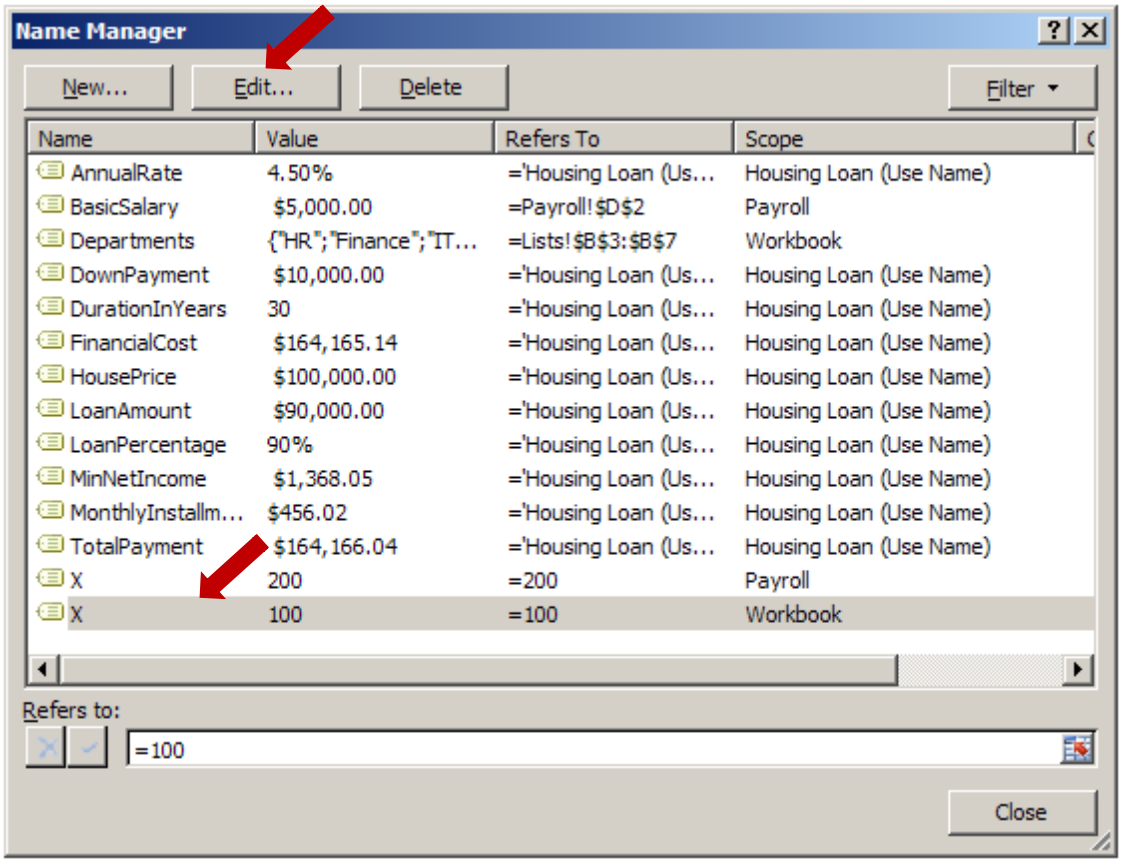
Modify Name

The name and it reference can be changed only by using name manager. But the name scope can't be modified. The only way to change the scope is delete it and create again with the new scope.

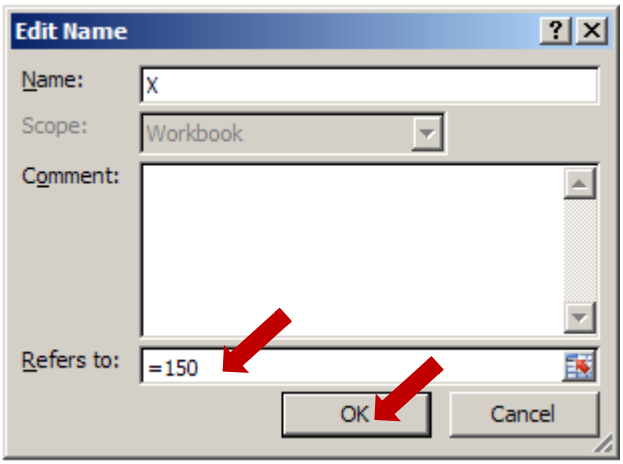
EX1.5: *Modify Name*

In this exercise, you will learn how to modify names

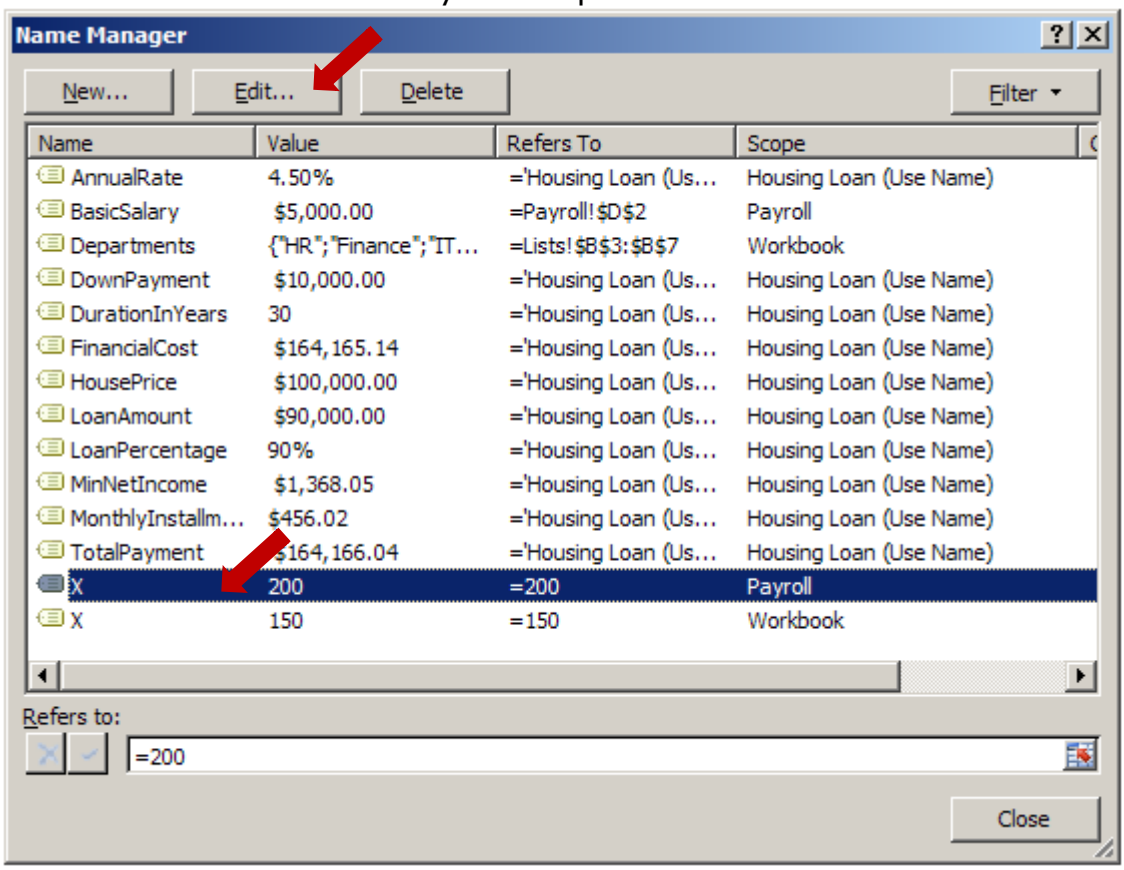
1. Run the **Name Manager**, select the workbook scope X, click **Edit...**



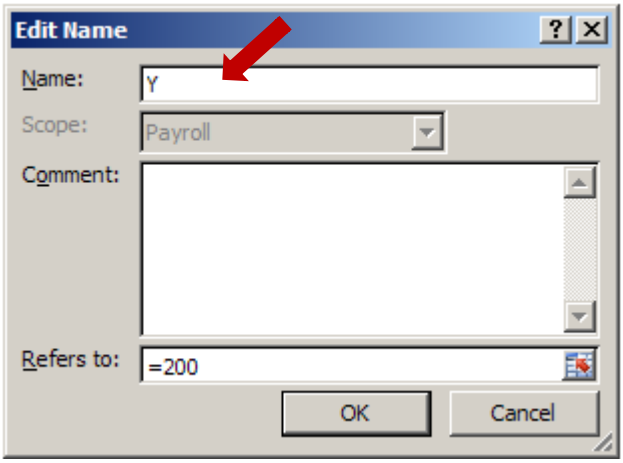
2. Change the value to 150, click OK.



3. Select name **X** under the Payroll Scope. Select **Edit...**



4. Change the name to **Y**.



5. Discuss how to change the scope of name **X** to scope of **Housing Loan** worksheet?

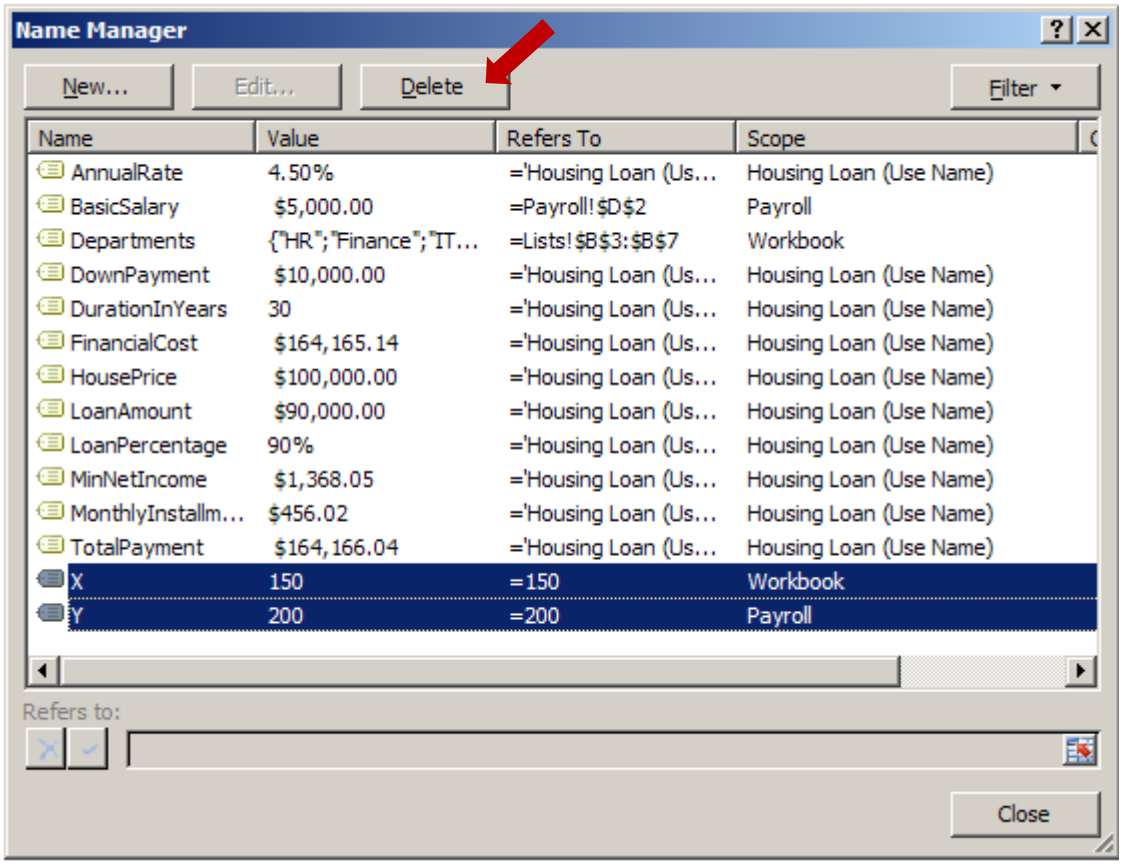
Delete Name

Name can be deleted by using Name Manager.

EX1.6: *Delete Name*

In this exercise, you will learn how to delete names

1. Run **Name Manager**.
2. Select names **X** and **Y**. (Control Click for multiple select)



3. Press **Delete**.

Module 2 – *Using Table Features*

Tables began as lists in the menu before version 2007, but they've become more powerful in the Ribbon versions. Converting a data range into a table extends functionality, which you can then use to work more efficiently and effectively. Here's a look at why you should consider using a table instead of an ordinary data range.

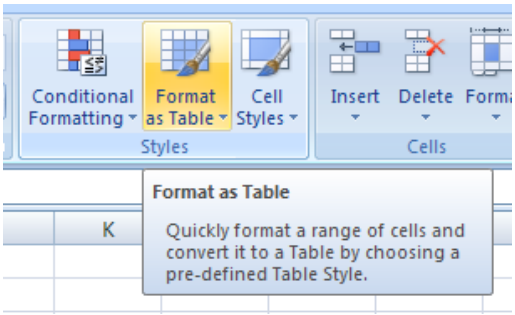
Bear in mind that as handy as tables are, they don't accommodate all of Excel's features. For example, you can't use Excel's Subtotal feature with tables. When you need a feature that tables don't support, temporarily convert the table into a range.

Some main benefits of using Table advantages over name ranges:

1. Easy sorting and filtering
2. Quick formatting
3. Effortless data entry
4. Automatic nomenclature
5. Quick totals
6. Always visible headers
7. Formula autofill
8. Dynamic charts
9. One-click select
10. Can allow access to various parts of the table

Creating a Table

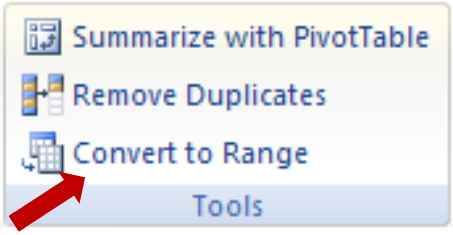
Select the data range, then from the **Home** tab select:



Common practice is try not to format the cell before apply table. The existing cell format will disturb the table color scheme.

Delete Table

1. Right-click the table, point to Table, and then click **Convert to Range**.
2. On the **Design** tab, in the **Tools** group, click **Convert to Range**.

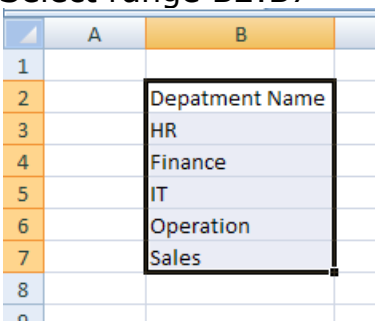


Caution that after convert to range, although the table is removed, but the format still remain.

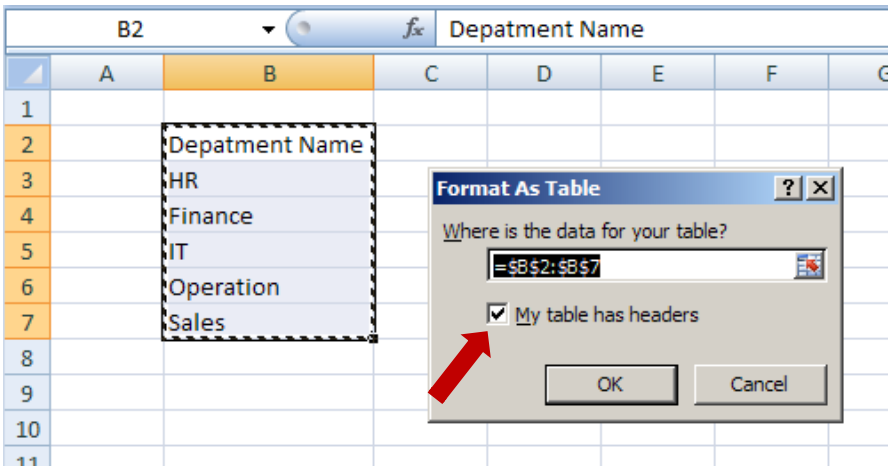
EX2.1: *Create Table*

In this exercise, you will learn how to create table

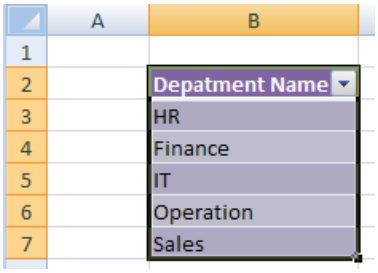
1. Switch to worksheet **Lists**.
2. Select range B2:B7



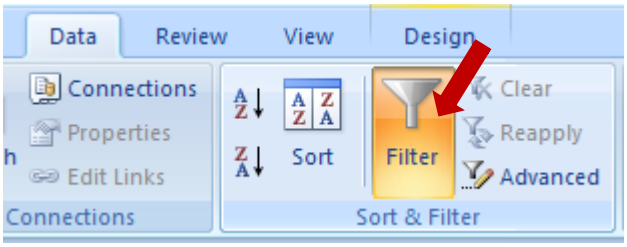
3. Select **Home** tab. Click **Format as Table** button. Select the table style you prefer.
4. Make sure that **My table has headers** in the dialog box is checked. Press **OK**.



5. Table is created.



6. To turn off the filter. Unselect the **Filter** option under **Data** tab.

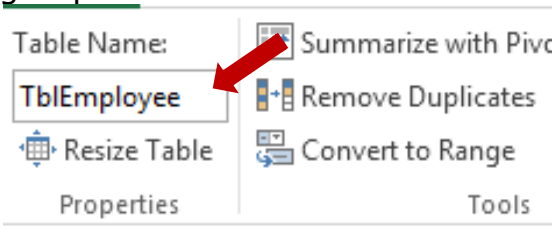


Change Table Name

When the table is created, it is given default name as **Table#**. Where **#** is number starts from 1 onward. But this default name is not meaningful to many applications. Therefore, normally is advisable to change it.
There are various ways to change name

1. Use Name Manager (Refer to next exercise)

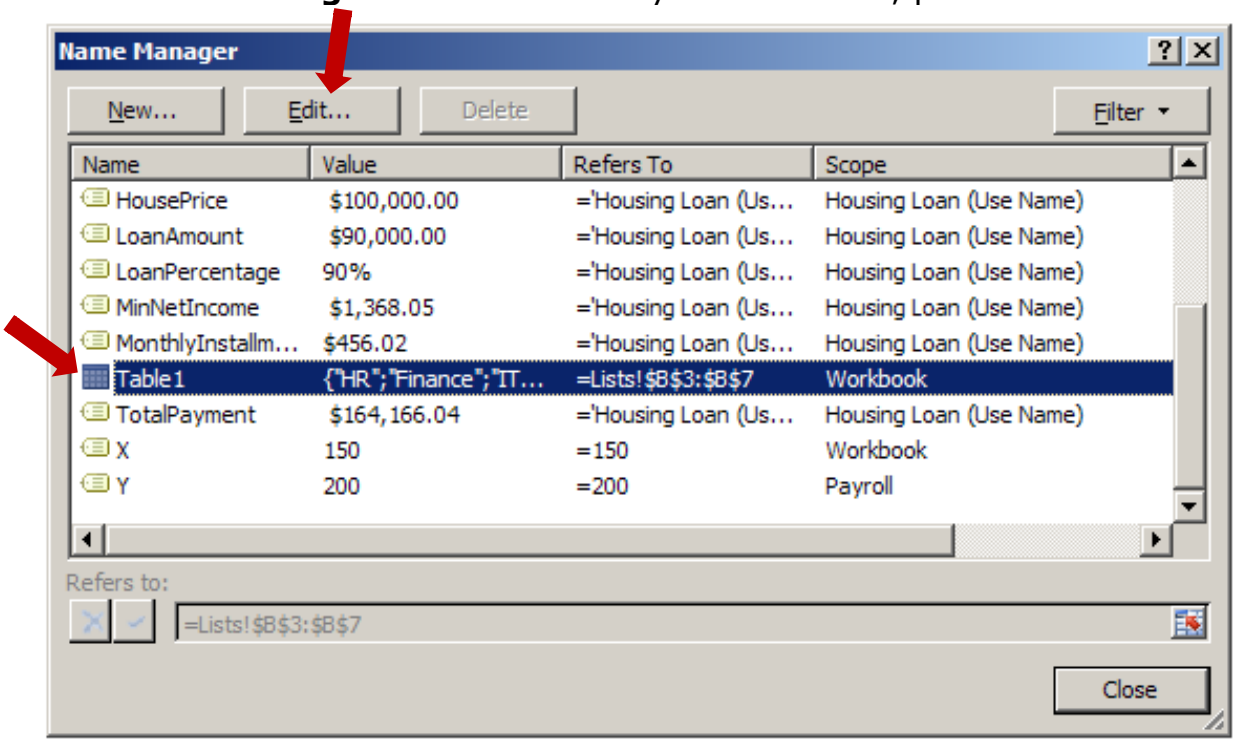
2. Select any part of the table, on the **Design** tab, in the **Properties** group:



EX2.2: *Rename Table*

Continue from previous exercises, in this exercise, you will learn how to rename table

1. Run **Name Manager**. Select the newly created table, press **Edit...**

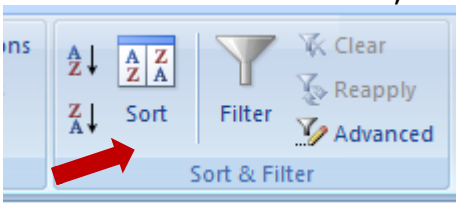


2. Change the name to **TblDepartment**.

3. Take note that only table name can be modified. Table cannot be deleted via Name Manager, and Tables always have workbook scope.

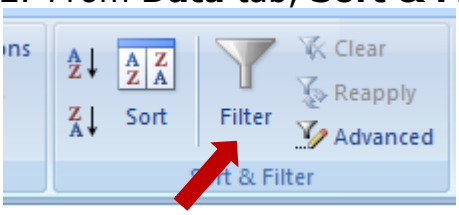
Sorting a Table

1. Right click any table column, select **Sort** and followed by the sort option
2. From Data ribbon tab, **Sort & Filter** group:



Filtering a Table

1. Right click any table column, select **Filter** and followed by the sort option
2. From **Data** tab, **Sort & Filter** group:

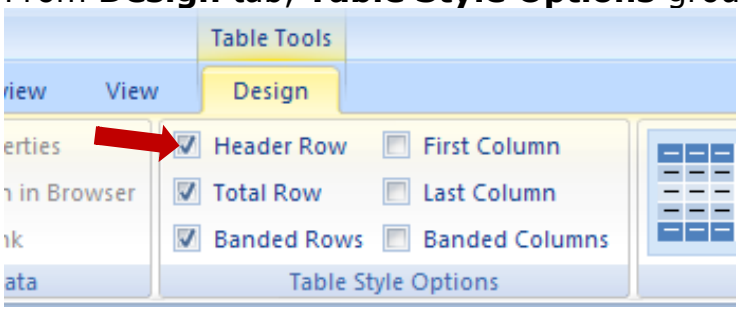


Working with the Total Row

You can use Total Row to apply aggregate function to individual column in the table.

1. Right click table, select **Table** and followed by **Totals Row** option

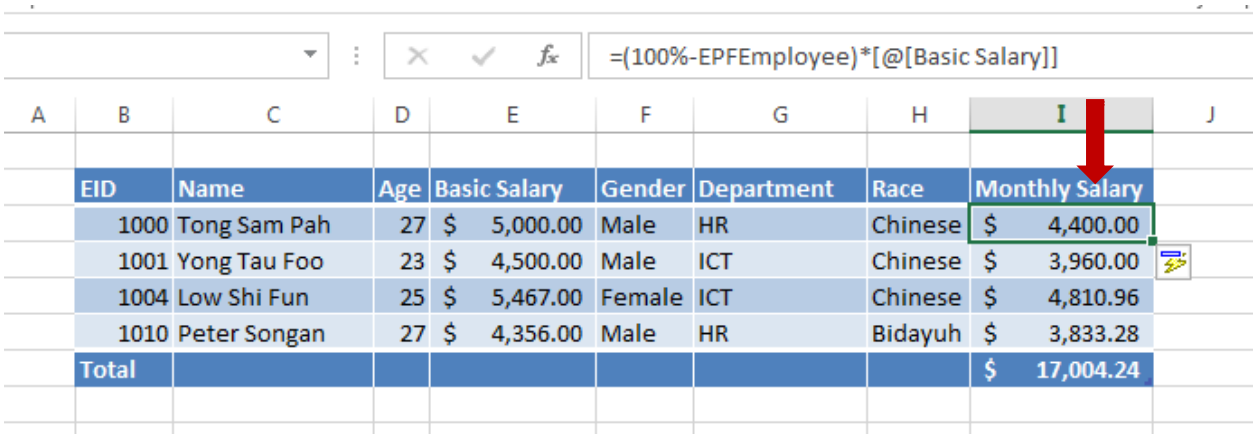
2. From **Design** tab, **Table Style Options** group:



3. Alternatively, you can use right-click option:

Creating a Calculated Column

New table columns can be created. These columns can derive value by referring to other columns in the same table. We call these columns as **Calculated Column**.



EID	Name	Age	Basic Salary	Gender	Department	Race	Monthly Salary
1000	Tong Sam Pah	27	$ 5,000.00	Male	HR	Chinese	$ 4,400.00
1001	Yong Tau Foo	23	$ 4,500.00	Male	ICT	Chinese	$ 3,960.00
1004	Low Shi Fun	25	$ 5,467.00	Female	ICT	Chinese	$ 4,810.96
1010	Peter Songan	27	$ 4,356.00	Male	HR	Bidayuh	$ 3,833.28
Total							$ 17,004.24

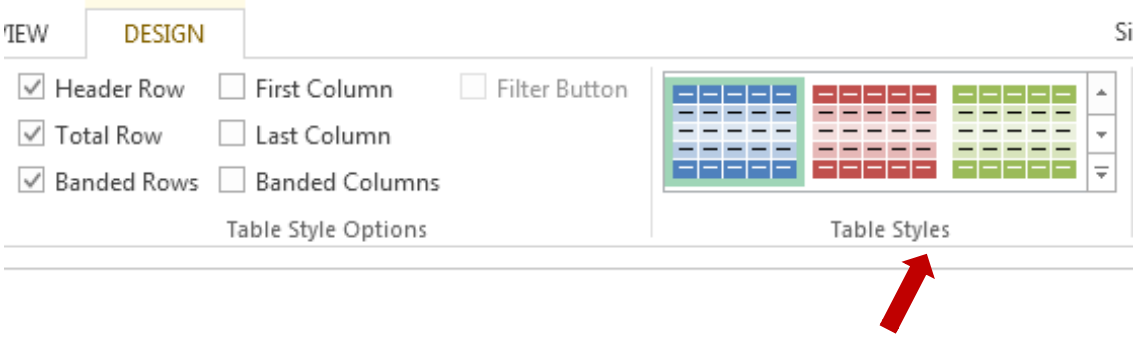
You will experience how to create this kind of columns later in other exercises.

Formatting a Table

Table can apply preset style to save efforts in formatting data. Before create table advisable to clear all formatting of the range. Otherwise the existing format will disturb the selected style.

To change table style, go to **Home** tab, select style from **Format as Table** under **Styles** group.

The other way is change the style from the **Design** tab, select style under **Table Styles** group.



Referring to different parts of table

Once table is created, data from table can be referred in the cell formula.

We can refer to various part of the table:

Part	Example
Table Data	TblEmployee
Table Header	TblEmployee[**#Headers**]
Table Totals Row	TblEmployee[**#Totals**]
Entire Table	TblEmployee[**#All**]
Entire Column	TblEmployee[***Gender***]

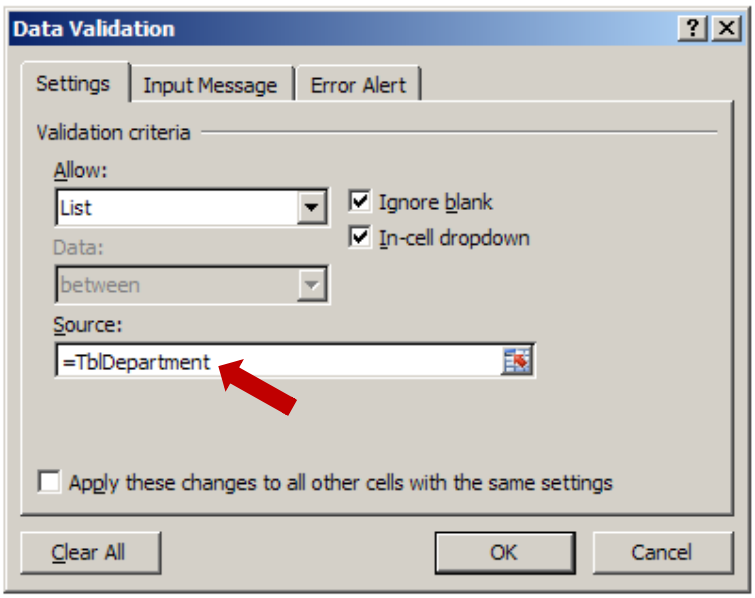
EX2.3: *Use Table Data in validation (Part-1)*

The parts of table can be considered as range in many cases. Refer to worksheet **Lists**, we created both name **Departments** and table data **TblDepartment**. Both are referring to range B3:B7.

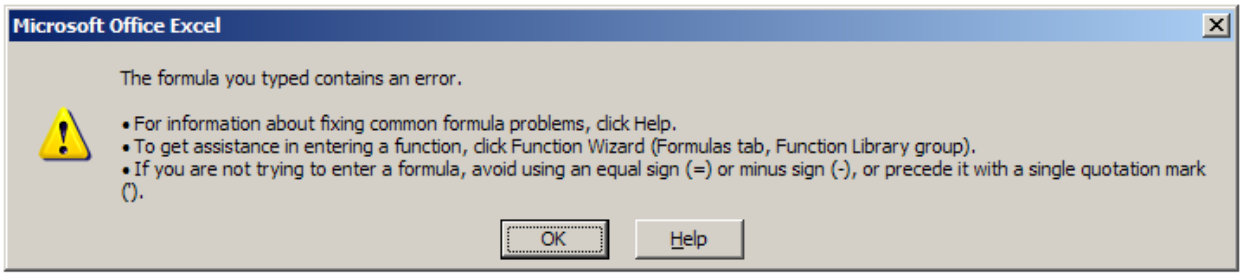
Previously we applied named range (**Departments**)validation of cell G3 under **Employee** worksheet. Since **Departments** and **TblDepartment** both refer to same range, can we substitute **Departments** with **TblDepartment** in the list data validation of cell G3 under **Employee** worksheet?

Let's give it a try:

1. Switch to worksheet **Employee**.
2. Select **Data** tab, select **Data Validation**.
3. Change the **Source** under **Settings** tab to "=TblDeppartment", press **OK**.

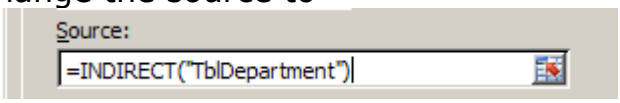


4. You will receive the following error message:



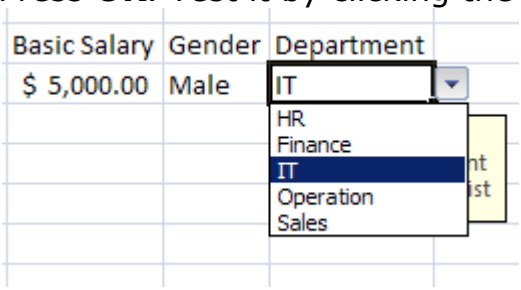
Although named range and table parts can be use interchangeable in many cases, however this case will fail. Table cannot be used **directly** under validation source.

5. Since table data cannot be use directly, we can use **indirectly**. Try change the source to



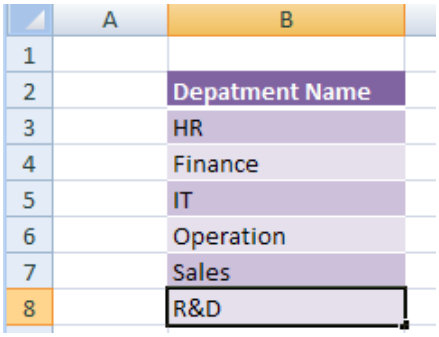
Beware that the **TblDepartment** must be enclosed in a pair of double quote marks.
INDIRECT is one of the complex functions from Excel.

6. Press **OK**. Test it by clicking the dropdown button



7. Now, delete the **Departments** name from **Name Manager**. Test the validation again.

8. Switch to **Lists** worksheet, select cell B7 (Sales),press **Tab** key, key in **R&D**.



9. Switch back to Employee worksheet, test the validation again.

The advantage of using table data for validation compare to named range is, if the list of data change in future, table data approach does not require to modify the reference from **Name Manager** as needed by the named range approach.

Use Table Data in validation (Part-2)

The previous approach is adequate when the table only consists of one column. But tables in Excel can consist of multiple columns.

So, what is the impact to the previous approach?

Assuming we need to add more data (columns) to the **TblDepartment** table.

1. Who is the department head?
2. How many employees in the each department?

Let's try the following steps:

1. Switch to **Lists** worksheet. Select cell C2 and type **Head** then press enter.

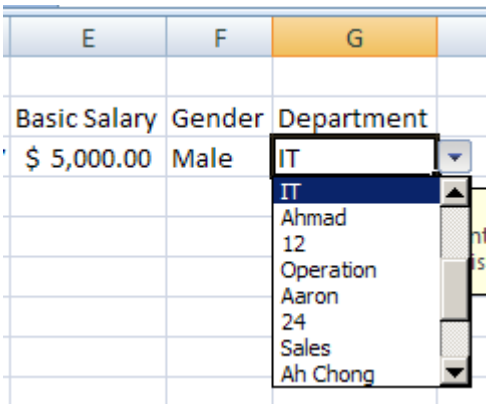
	A	B	C
1			
2		Depatment Name	Head
3		HR	
4		Finance	
5		IT	
6		Operation	
7		Sales	
8		R&D	

New column is inserted automatically (if cell C3:C8 are empty)

2. Add another column with header **No. of Employees**. Complete the data as below:

	A	B	C	D
1				
2		Depatment Name	Head	No. of Employees
3		HR	Ali	5
4		Finance	Abu	7
5		IT	Ahmad	12
6		Operation	Aaron	24
7		Sales	Ah Chong	35
8		R&D	Azizi	8

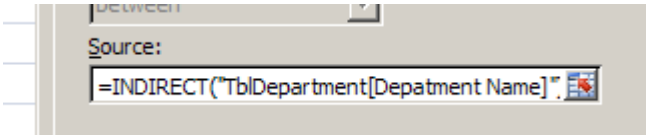
3. Now, switch **Employee** worksheet to the validation again.



Can you explain why you received the above validation list?

4. Now while selecting cell G3, select **Data** tab, click **Data Validation**.

5. Change the source to **=INDIRECT("TblDepartment[Depatment Name]")**.



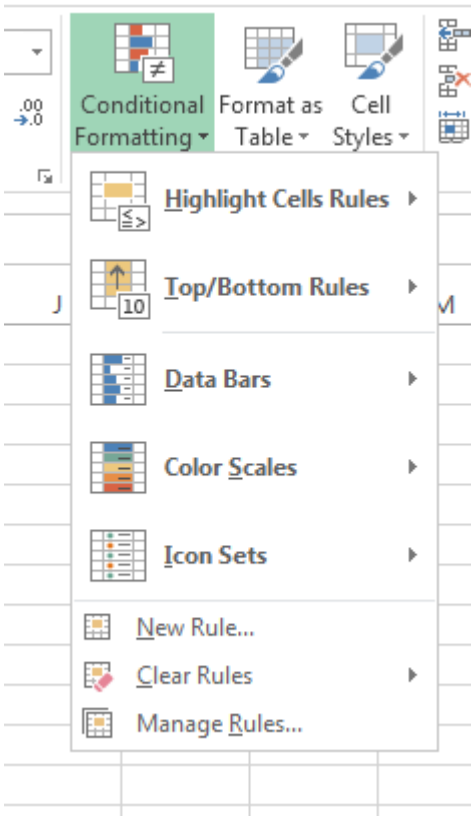
6. Press **OK**. Test the validation again.

7. Discuss why it is a good practice to include column header in the validation rule even for the single column table?

Module 3 – *Working with Formatting*

Applying Conditional Formatting

Conditional formatting allows you to automatically apply formatting—such as colors, icons, and data bars—to one or more cells based on the cell value. To do this, you'll need to create a conditional formatting rule.



Formatting based on Cells Values

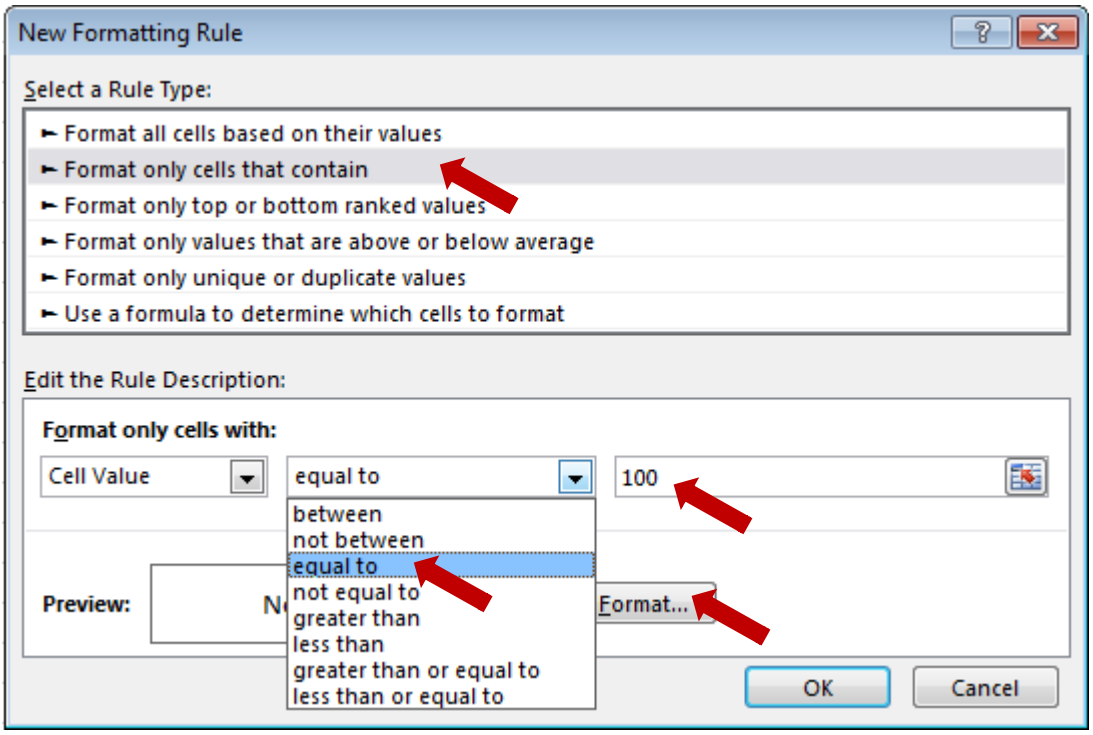
Color code your data will provide special visual effect in analyzing data. You can let Excel show format of your choice when data fulfill certain criteria.

To do this, Select

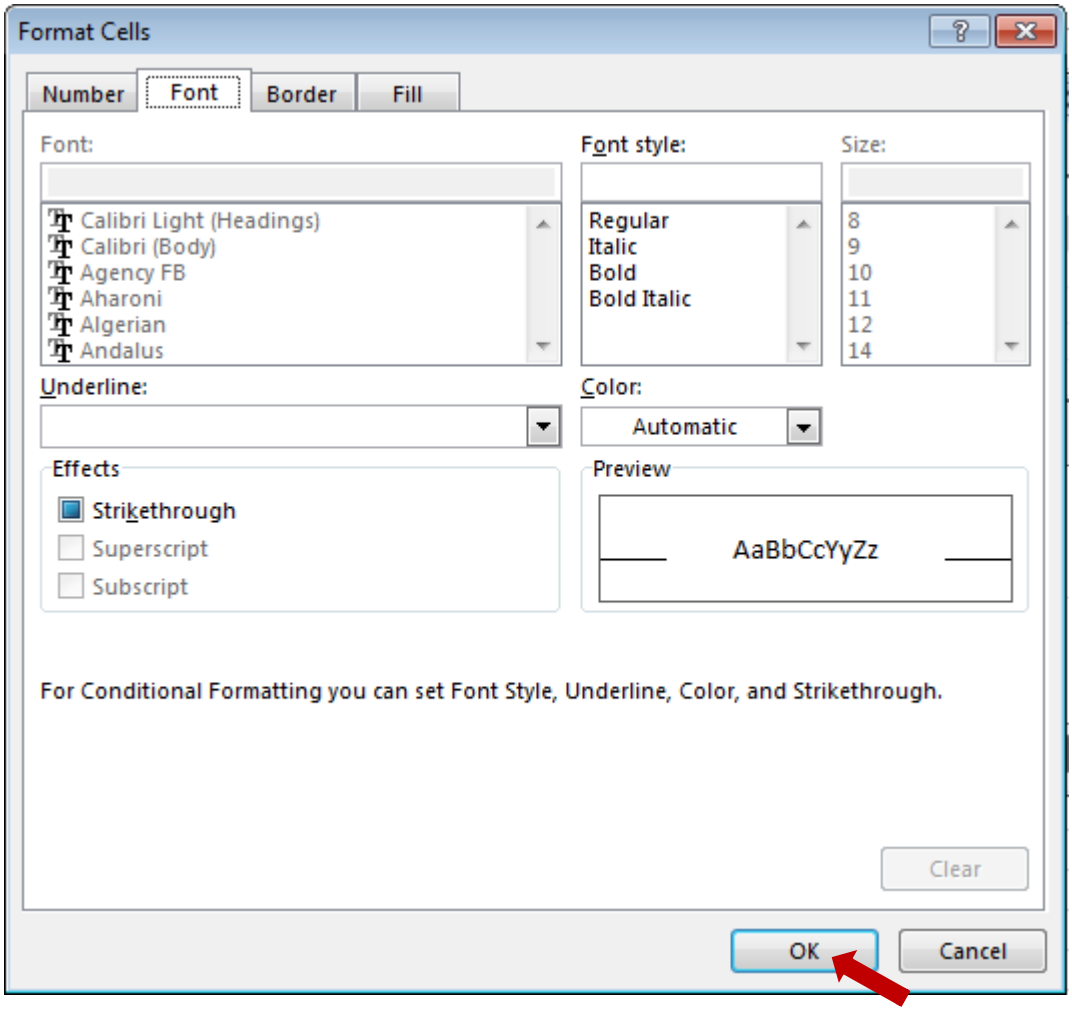
Home Tab ⟶ Conditional Formatting⟶ New Rule…

Under **New Formatting Rule** dialog box,

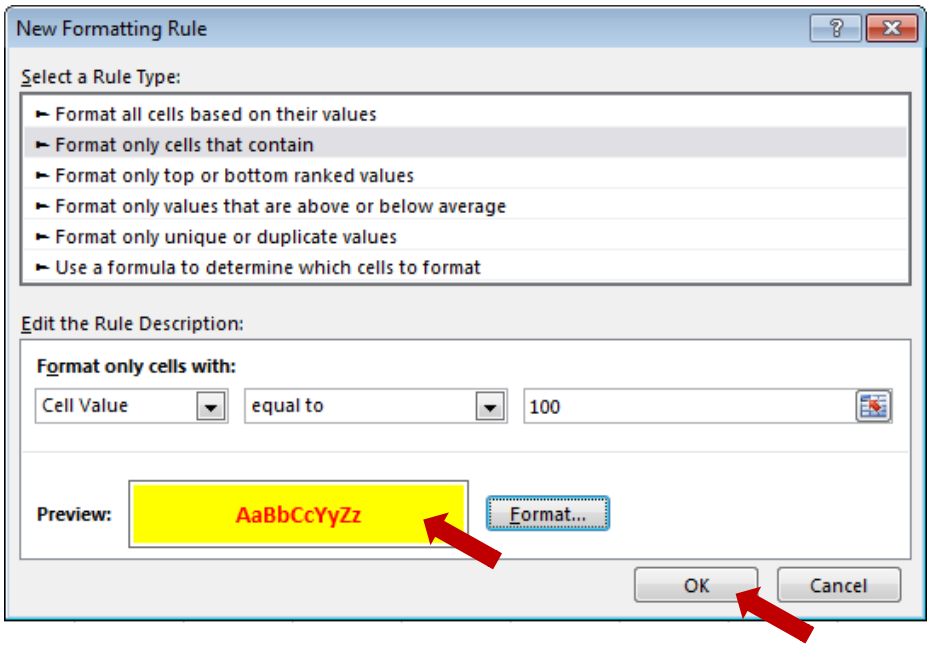
1) Select **Format only cell that contain**
2) Select **equal to**
3) Key in the value
4) Press **Format…** button



Now you can decide the format that you want.



Press **OK** to complete the formatting.



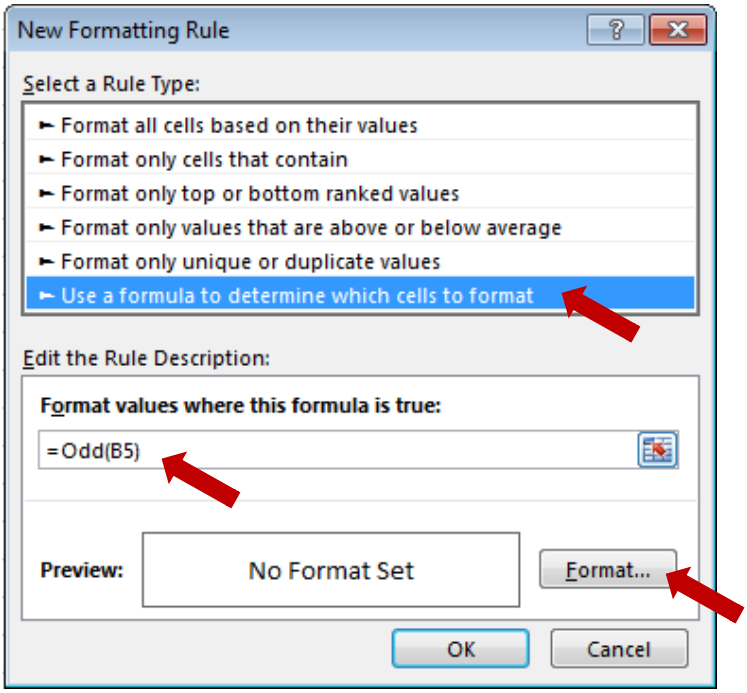
Ensure that the preview format is what you want, press **OK** to End.

Formatting based on Formula

If the conditional options provided are not sufficient to handle some special situations, you can use formula to decide the formatting.

Under **New Formatting Rule** dialog box,

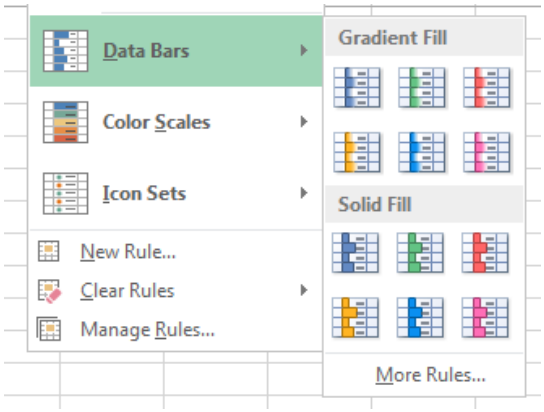
1) Select **Use a formula to determine which cells to format**
2) Key in the formula (The formula must return True or False)
3) Press **Format...** button



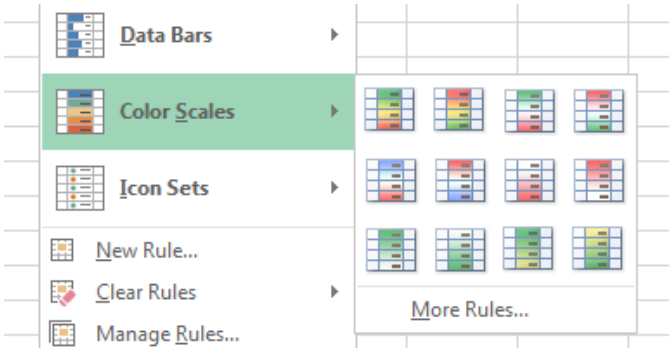
Other Conditional Formatting (bars, scales, icons)

Condition Formatting in Excel also provides some others attractive formatting options such as

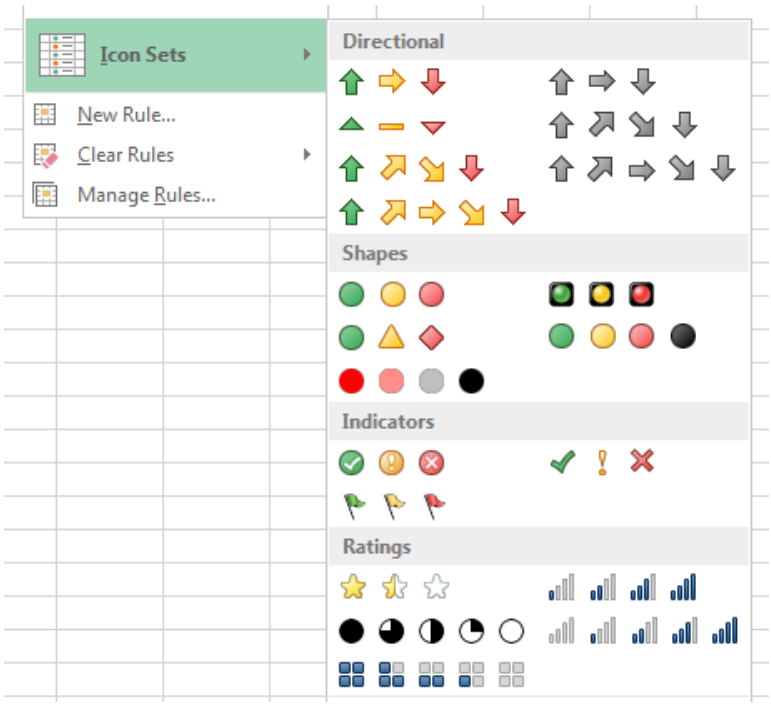
Data Bars



Color Scales



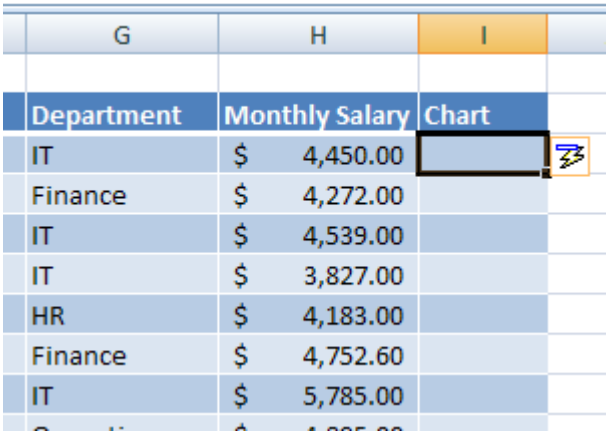
Icon Sets



EX3.1: *Using Data Bar*

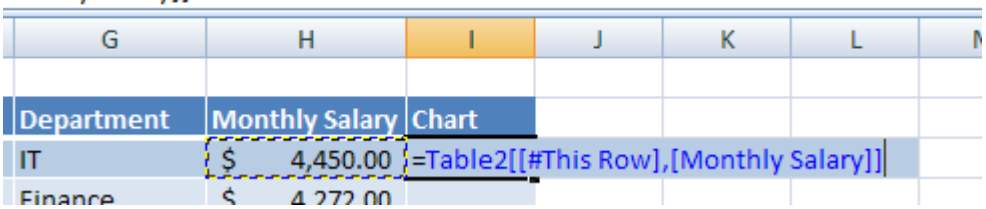
In this exercise you will learn how to use Data Bar Conditional Formatting.

1. Under **Employee** worksheet, select cell I2 then type header **Chart**. Press **Enter**. A new column is created.



Department	Monthly Salary	Chart
IT	$ 4,450.00	
Finance	$ 4,272.00	
IT	$ 4,539.00	
IT	$ 3,827.00	
HR	$ 4,183.00	
Finance	$ 4,752.60	
IT	$ 5,785.00	

2. While under cell I3, type **=** then select cell H3.

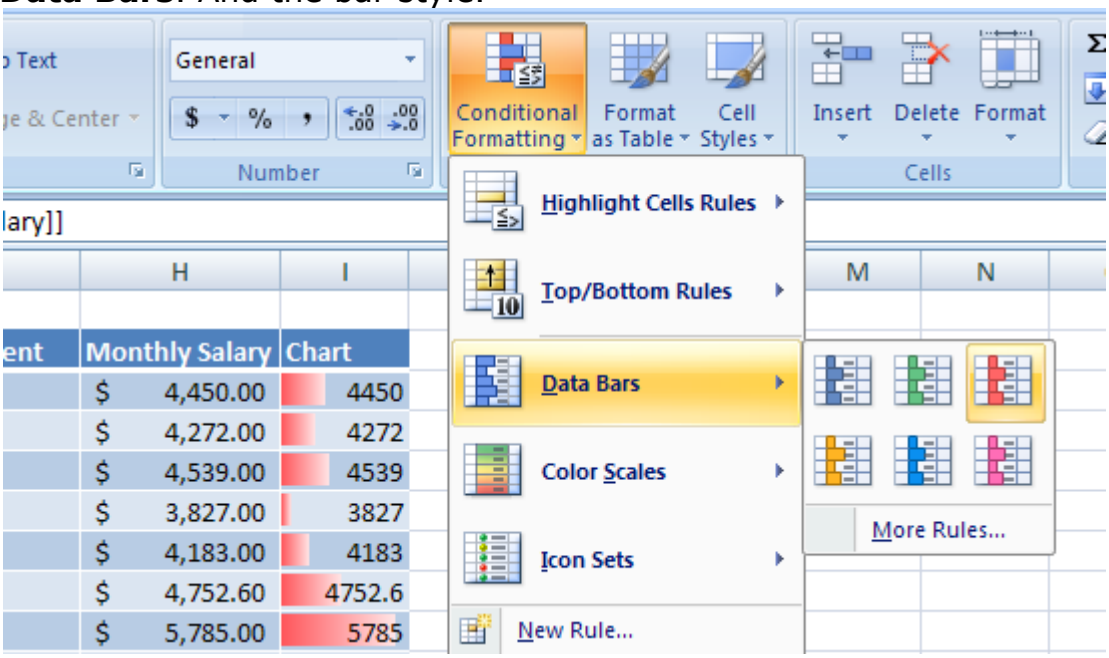


Department	Monthly Salary	Chart
IT	$ 4,450.00	=Table2[[#This Row],[Monthly Salary]]

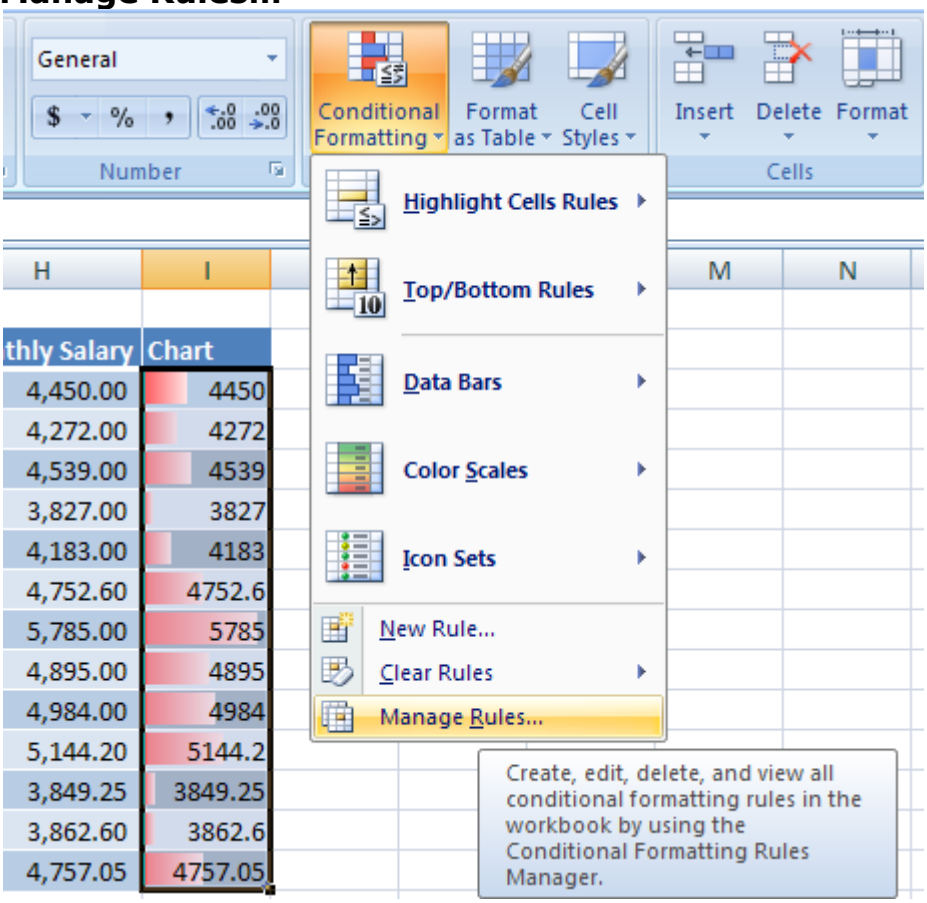
3. Press **Enter**.

EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary	Chart
1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	$ 4,450.00	4450
1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance	$ 4,272.00	4272
1005	Low Mee	26	$ 5,100.00	Female	IT	$ 4,539.00	4539
1008	Low Shi Fun	24	$ 4,300.00	Female	IT	$ 3,827.00	3827
1010	Ali	29	$ 4,700.00	Male	HR	$ 4,183.00	4183
1012	Abu	35	$ 5,340.00	Male	Finance	$ 4,752.60	4752.6
1015	Ahmad	40	$ 6,500.00	Male	IT	$ 5,785.00	5785
1017	Aaron	32	$ 5,500.00	Male	Operation	$ 4,895.00	4895
1020	Ah Chong	28	$ 5,600.00	Male	Sales	$ 4,984.00	4984
1022	Azizi	30	$ 5,780.00	Male	R&D	$ 5,144.20	5144.2
1028	Shila Hamzah	25	$ 4,325.00	Female	Sales	$ 3,849.25	3849.25
1030	Narayanan	27	$ 4,340.00	Male	Finance	$ 3,862.60	3862.6
1032	Fatimah	26	$ 5,345.00	Female	Sales	$ 4,757.05	4757.05

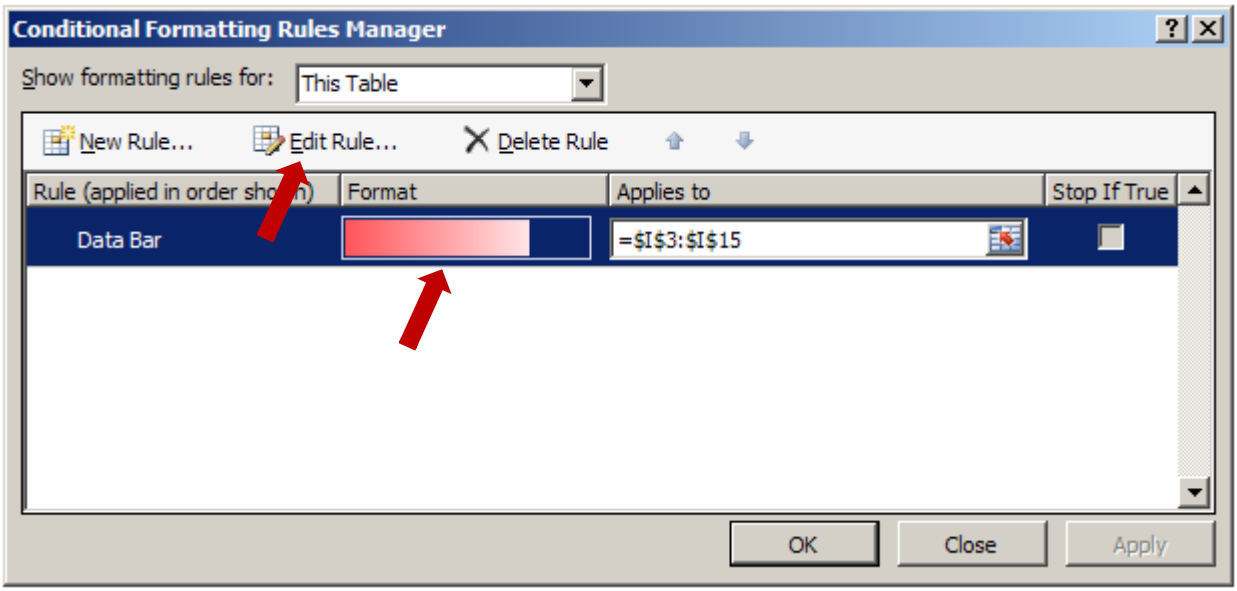
4. Select range I3:I15, select **Home** tab, **Conditional Formatting**, **Data Bars**. And the bar style.



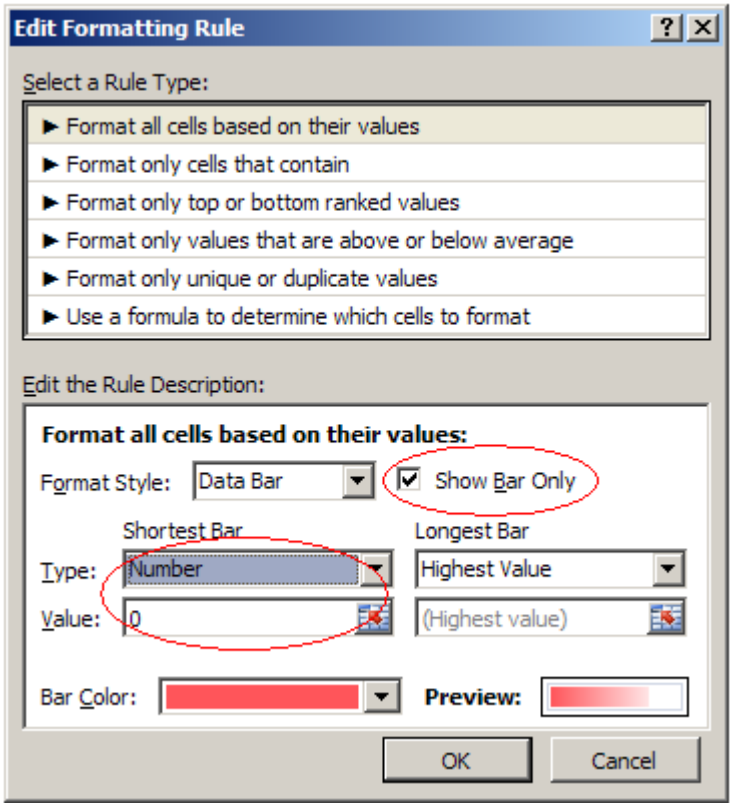
5. While still selecting range I3:I15, select **Conditional Formatting**, **Manage Rules...**



6. In the dialog box, select Data Bar format then click **Edit Rule…**



7. In the next dialog box. Change the setting below:



8. Press **OK**. Back to previous dialog box, press **Apply** then **OK** to end the dialog box.

9. Discuss your final result.

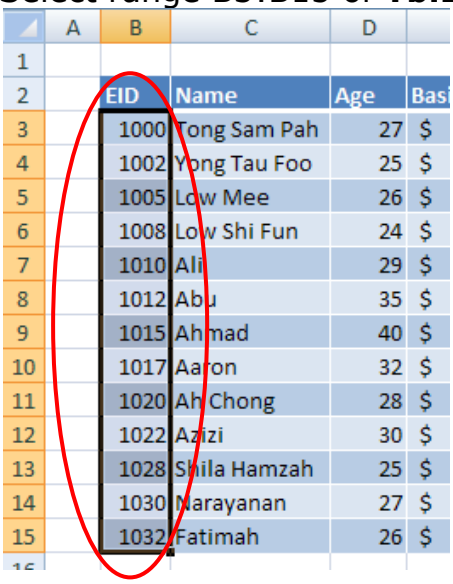
EX3.2: *Detect Duplicate data*

Imaging your tabular data consists of thousands of row, and some column must have unique value. How can you detect duplicate value entered?

In this exercise you will learn how to detect duplicate values during data entry by using conditional formatting.

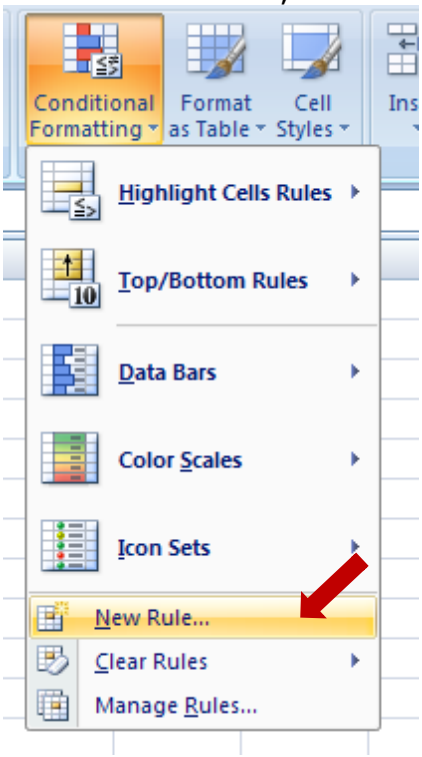
1. Switch to **Employee** worksheet.

2. Select range B3:B15 of **TblEmployee**.

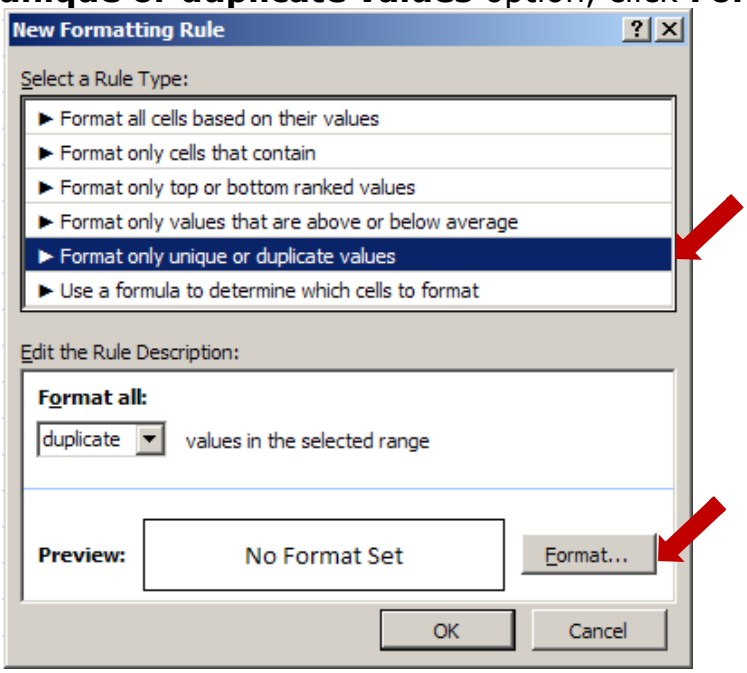


	A	B	C	D	
1					
2		EID	Name	Age	Bas
3		1000	Tong Sam Pah	27	$
4		1002	Yong Tau Foo	25	$
5		1005	Low Mee	26	$
6		1008	Low Shi Fun	24	$
7		1010	Ali	29	$
8		1012	Abu	35	$
9		1015	Ahmad	40	$
10		1017	Aaron	32	$
11		1020	Ah Chong	28	$
12		1022	Azizi	30	$
13		1028	Shila Hamzah	25	$
14		1030	Narayanan	27	$
15		1032	Fatimah	26	$

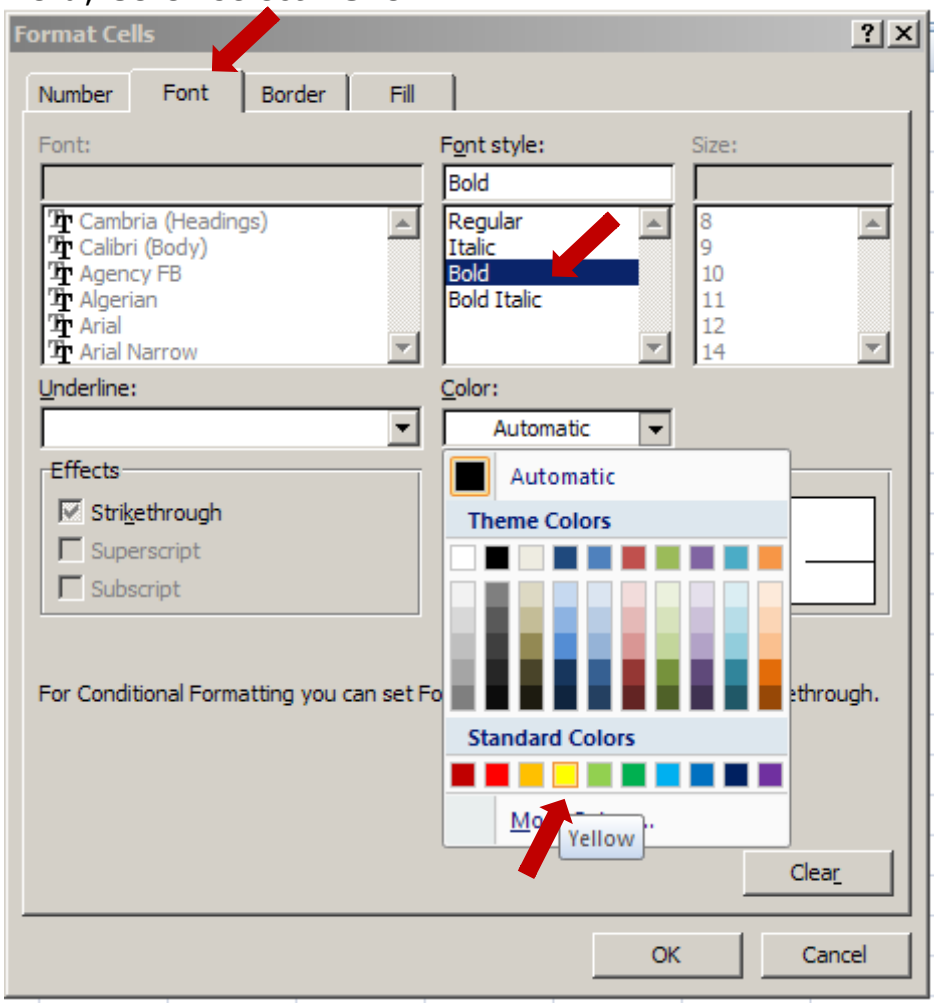
3. Select **Home** tab, **Conditional Formatting**, **New Rules...**



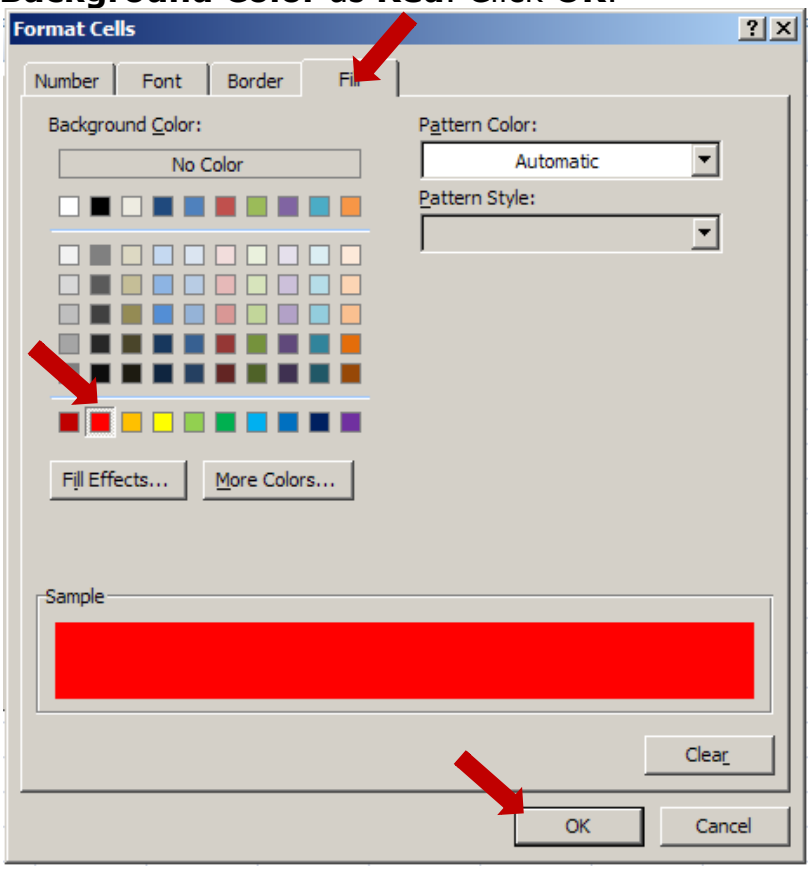
4. In the **New Formatting Rule** dialog box, select **Format only unique or duplicate values** option, click **Format...** button



5. In the **Format Cells** dialog box, select **Font** tab, **Font style** click **Bold**, **Color** select **Yellow**.



6. While still in the **Format Cells** dialog box, select **Fill** tab, select **Background Color** as **Red**. Click **OK**.



7. Click **OK** again to end the **Format Cells** dialog box.

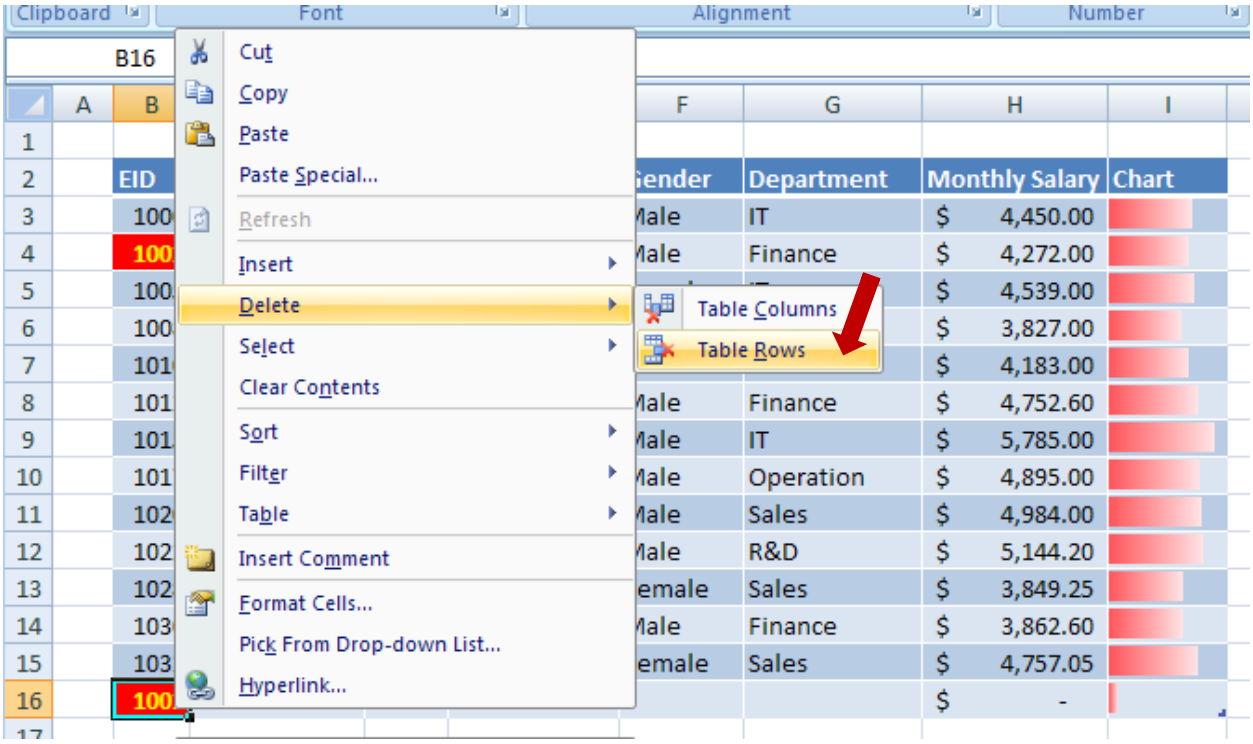
8. Try to add new row by intentionally key in existing EID.

	A	B	C	D	E	F	G	H	I
1									
2		EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary	Chart
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	$ 4,450.00	
4		1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance	$ 4,272.00	
5		1005	Low Mee	26	$ 5,100.00	Female	IT	$ 4,539.00	
6		1008	Low Shi Fun	24	$ 4,300.00	Female	IT	$ 3,827.00	
7		1010	Ali	29	$ 4,700.00	Male	HR	$ 4,183.00	
8		1012	Abu	35	$ 5,340.00	Male	Finance	$ 4,752.60	
9		1015	Ahmad	40	$ 6,500.00	Male	IT	$ 5,785.00	
10		1017	Aaron	32	$ 5,500.00	Male	Operation	$ 4,895.00	
11		1020	Ah Chong	28	$ 5,600.00	Male	Sales	$ 4,984.00	
12		1022	Azizi	30	$ 5,780.00	Male	R&D	$ 5,144.20	
13		1028	Shila Hamzah	25	$ 4,325.00	Female	Sales	$ 3,849.25	
14		1030	Narayanan	27	$ 4,340.00	Male	Finance	$ 3,862.60	
15		1032	Fatimah	26	$ 5,345.00	Female	Sales	$ 4,757.05	
16		1002						$ -	

9. Discuss your observation.

	A	B	C	D	E	F	G	H	I
1									
2		EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary	Chart
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	$ 4,450.00	
4		1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance	$ 4,272.00	
5		1005	Low Mee	26	$ 5,100.00	Female	IT	$ 4,539.00	
6		1008	Low Shi Fun	24	$ 4,300.00	Female	IT	$ 3,827.00	
7		1010	Ali	29	$ 4,700.00	Male	HR	$ 4,183.00	
8		1012	Abu	35	$ 5,340.00	Male	Finance	$ 4,752.60	
9		1015	Ahmad	40	$ 6,500.00	Male	IT	$ 5,785.00	
10		1017	Aaron	32	$ 5,500.00	Male	Operation	$ 4,895.00	
11		1020	Ah Chong	28	$ 5,600.00	Male	Sales	$ 4,984.00	
12		1022	Azizi	30	$ 5,780.00	Male	R&D	$ 5,144.20	
13		1028	Shila Hamzah	25	$ 4,325.00	Female	Sales	$ 3,849.25	
14		1030	Narayanan	27	$ 4,340.00	Male	Finance	$ 3,862.60	
15		1032	Fatimah	26	$ 5,345.00	Female	Sales	$ 4,757.05	
16		1002						$ -	

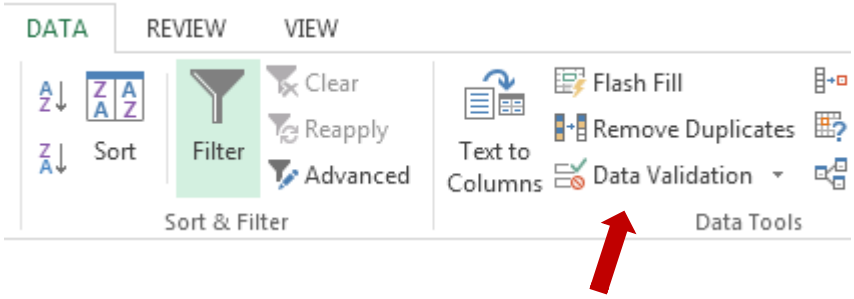
10. Delete the newly created row by right click the new row, then select **Delete**, **Table Rows**.



Module 4 – *Working with Data Validation*

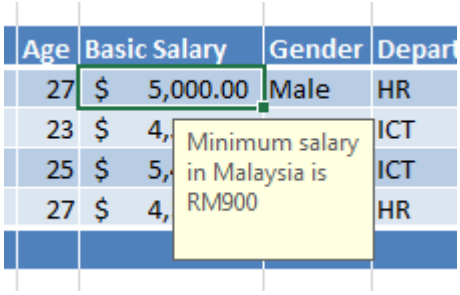
Using Data Validation

It is a good practice to prevent user enter unacceptable data by using Data Validation.



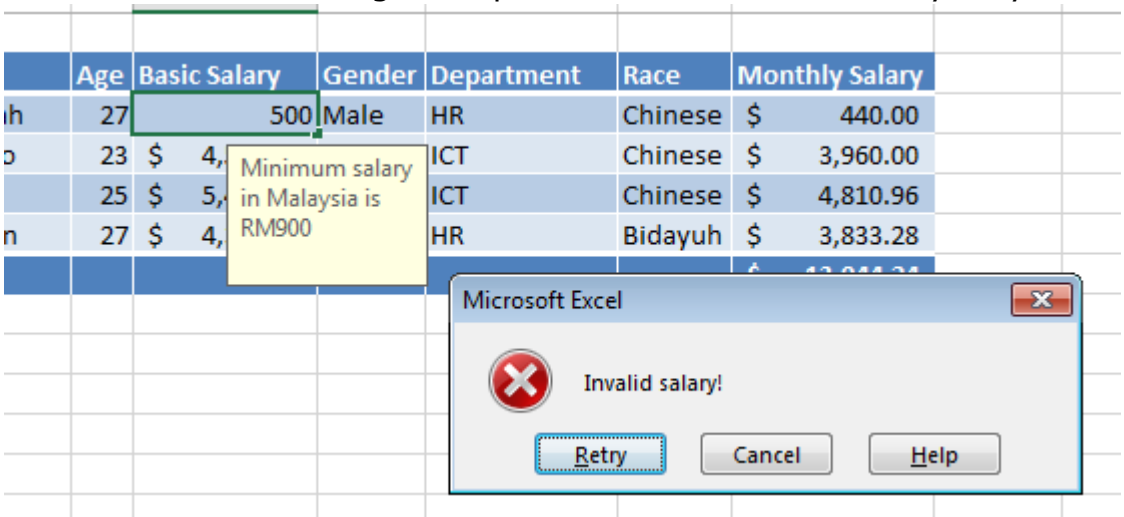
Entry guide

You can provide guide during user enter data.



Custom Error Message

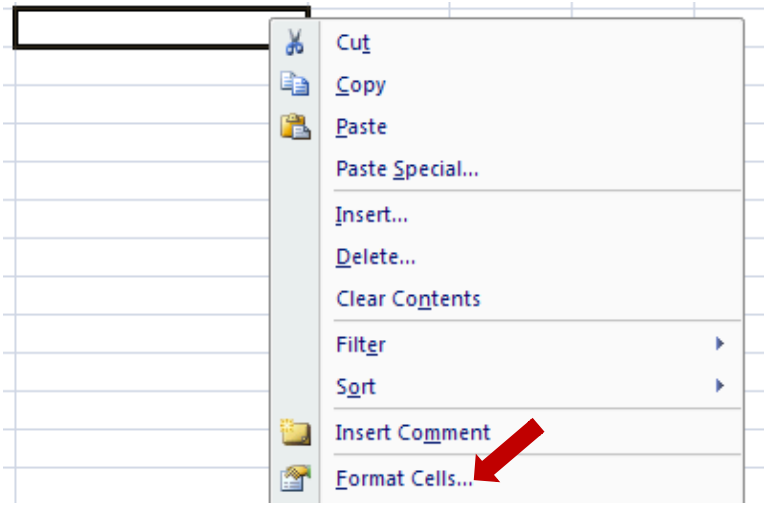
Customize error message is important to let user know why they are wrong.



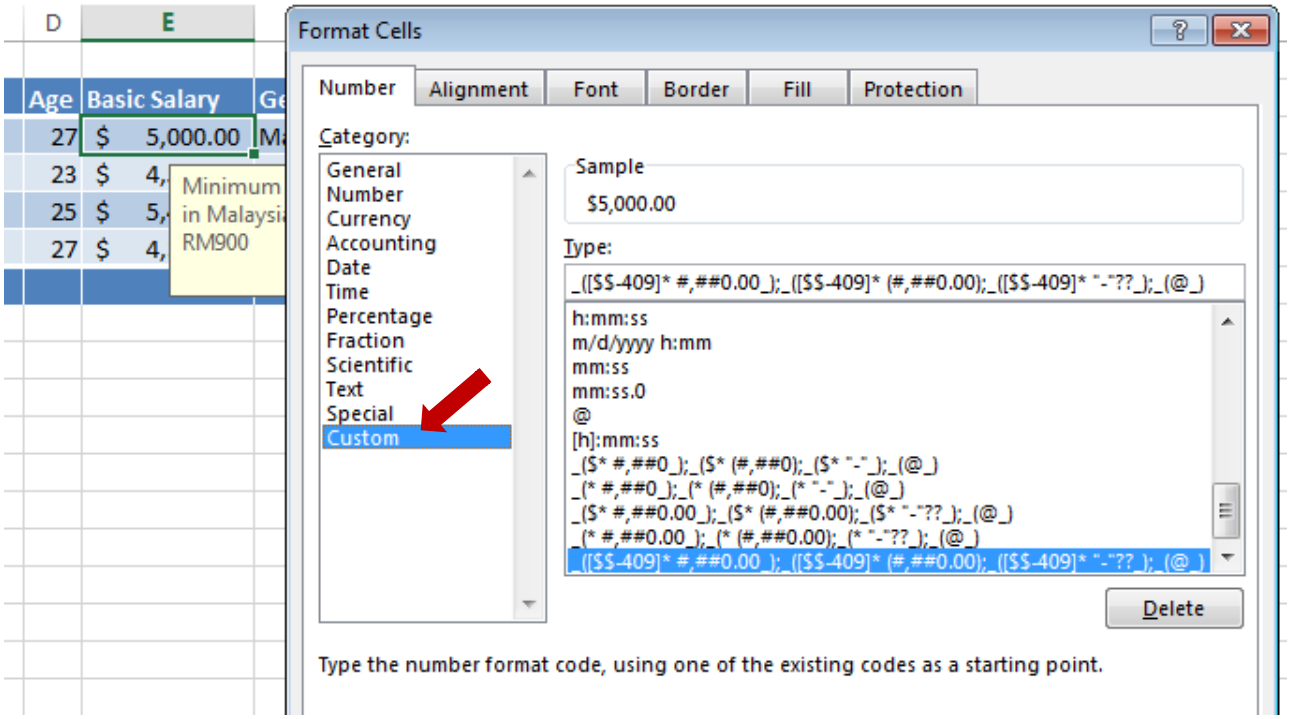
Creating and Using Custom Formats

Besides predefined format, custom formats can be defined for special cases.

1. Right-click on the cell(s)
2. Select **Format Cells...**



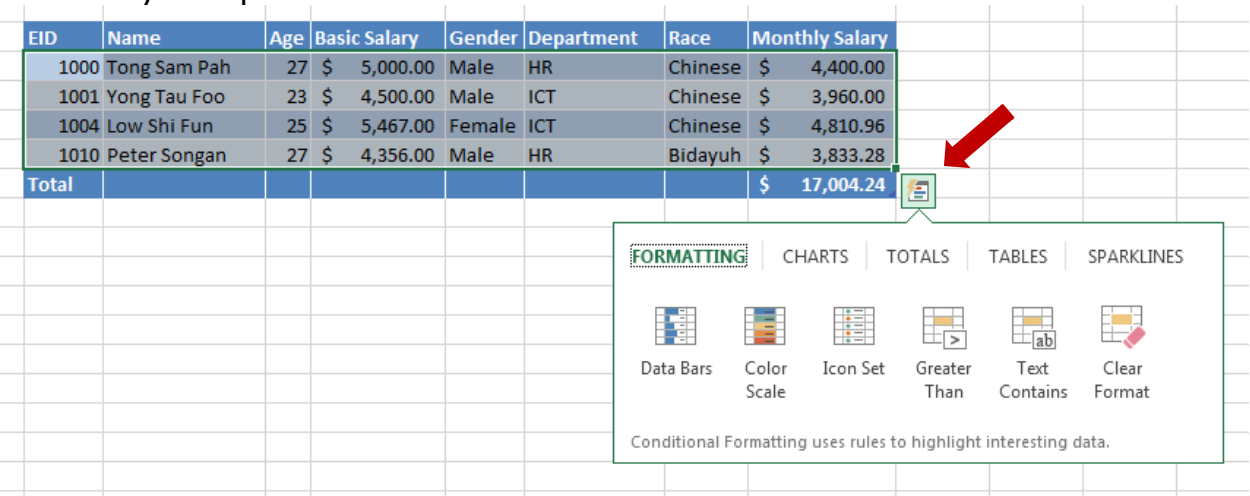
3. In the **Format Cells** dialog box, select **Custom** format



Using the Quick Analysis Tool

You can use the new Quick Analysis Tool in Excel to easy add conditional formatting, charts, totals, and tables to an Excel spreadsheet.

- New feature that lets you access data analysis tools easily
- Microsoft's research showed that many Excel users were simply not aware of the data analysis tools available in Excel
- Many users are reluctant to create charts or tables in Excel because they are worried about being to modify them later
- The Quick Analysis Tool puts data analysis features at your fingertips, as well as options for modifying these elements after you add them to your spreadsheet



Using Table for Validation

Common practice is to design validation rules for one row in the table. Every new row created later will automatically inherit the same validation.

Exception cases where data validation will fail

Validation on take effect during user entry. But there are few scenarios validations will not take action. For example:

- Copy and paste
- Value assign by VBA code

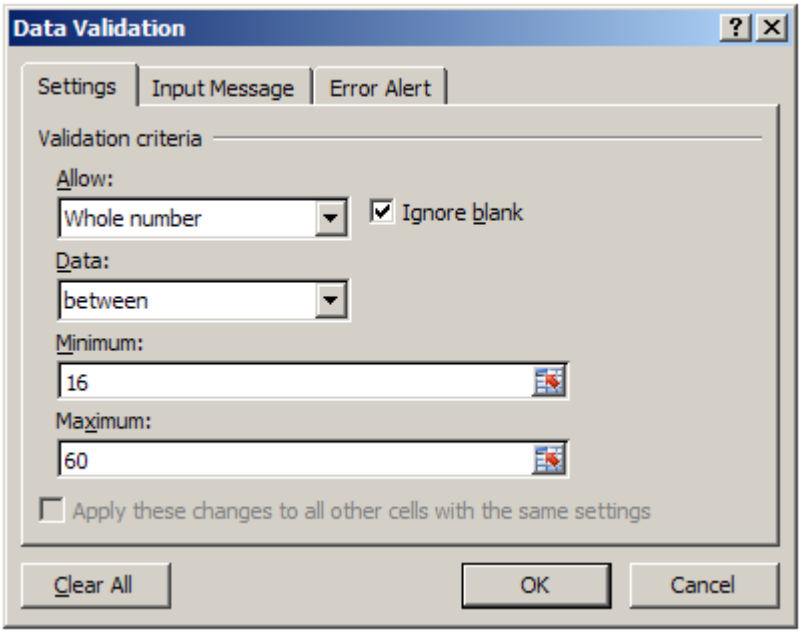
EX4.1: *Various types of validation*

"Garbage in garbage out" means is data is incorrect, information will be invalid.

During data entry, it is very common data entered wrongly. To prevent invalid data, we can use data validation.

This exercise will provide different data validation alternatives

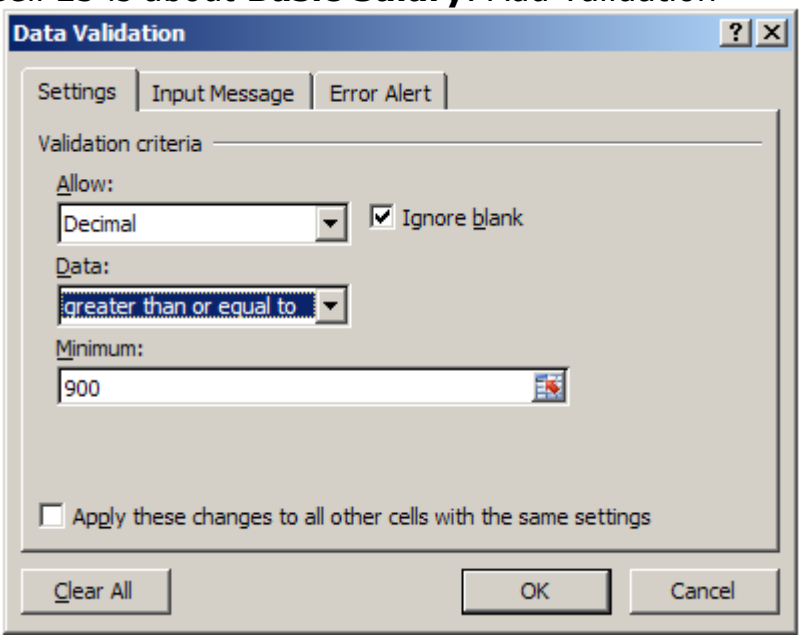
1. Switch to **Employee**.
2. Cell D3 is about **Age**. Add validation



Input guide: Valid age to be employee in Malaysia is in between 16 to 60 (inclusive)

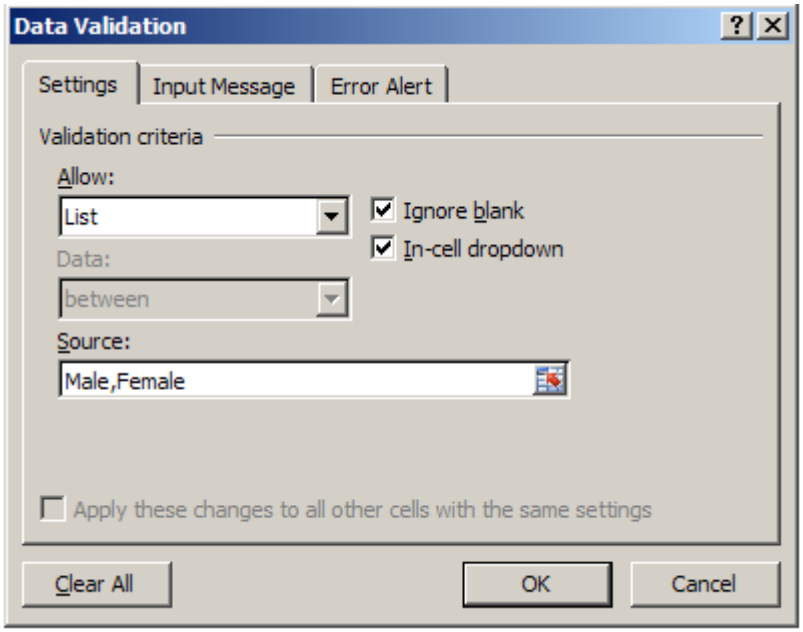
Error Message: Invalid Employee Age!

3. Cell E3 is about **Basic Salary**. Add validation



Input guide: Minimum salary in Malaysia is $900
Error Message: Invalid Basic Salary!

4. Cell F3 is about **Gender**. Add validation



Input guide: Select gender from the list.
Error Message: Invalid Gender!

EX4.2: *Adding calculated column*

In this exercise you will learn how to add calculated column in the table.

1. Highlight cell B2:G3 of **Employee** worksheet.

	A	B	C	D	E	F	G
1							
2		EID	Name	Age	Basic Salary	Gender	Department
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT
4							

2. Create a new table (with headers). Change the table name as **TblEmployee**.

3. Hide the filter buttons.

	A	B	C	D	E	F	G
1							
2		EID	Name	Age	Basic Salary	Gender	Department
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT
4							

4. Select cell G3, press **Tab** to create a new row.

	A	B	C	D	E	F	G
1							
2		EID	Name	Age	Basic Salary	Gender	Department
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT
4							
5							

5. Complete the table data below:

	A	B	C	D	E	F	G
1							
2		EID	Name	Age	Basic Salary	Gender	Department
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT
4		1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance
5		1005	Low Mee	26	$ 5,100.00	Female	IT
6		1008	Low Shi Fun	24	$ 4,300.00	Female	IT
7		1010	Ali	29	$ 4,700.00	Male	HR
8		1012	Abu	35	$ 5,340.00	Male	Finance
9		1015	Ahmad	40	$ 6,500.00	Male	IT
10		1017	Aaron	32	$ 5,500.00	Male	Operation
11		1020	Ah Chong	28	$ 5,600.00	Male	Sales
12		1022	Azizi	30	$ 5,780.00	Male	R&D
13		1028	Shila Hamzah	25	$ 4,325.00	Female	Sales
14		1030	Narayanan	27	$ 4,340.00	Male	Finance
15		1032	Fatimah	26	$ 5,345.00	Female	Sales

6. Select cell H2, type header **Monthly Salary**. Press **Enter**.

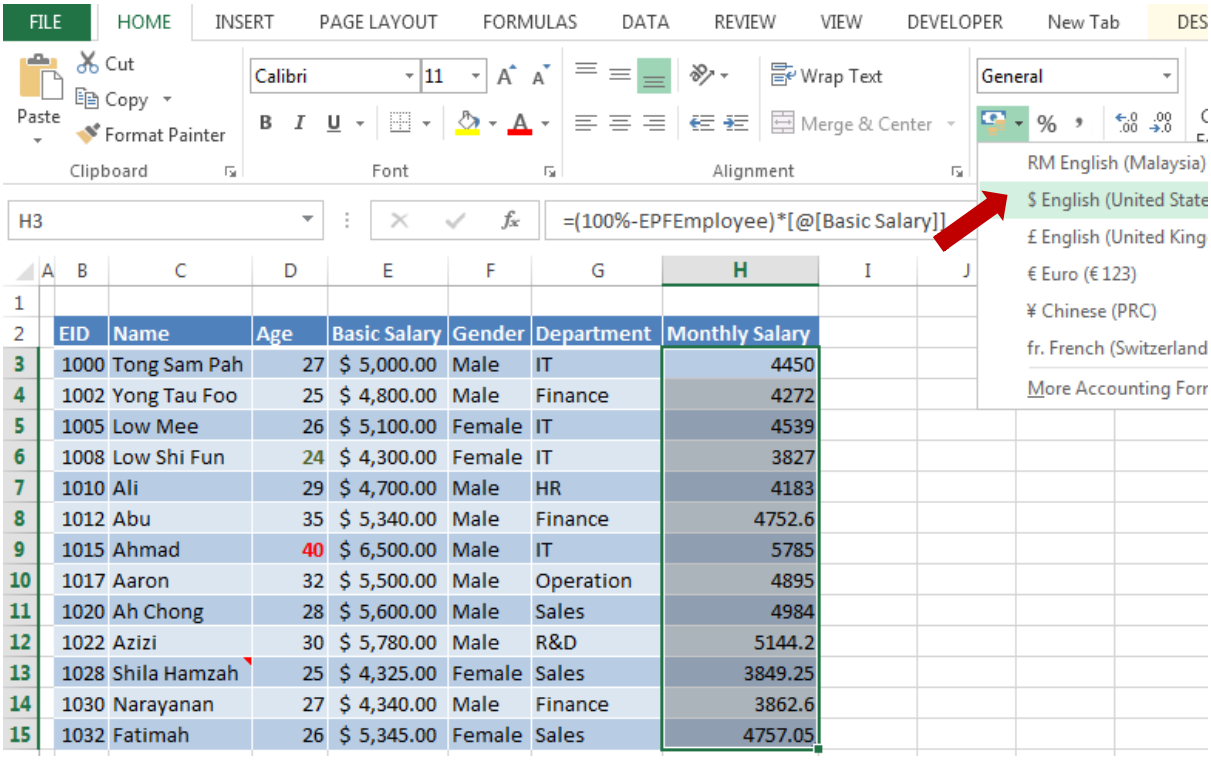
7. Select cell H3, and key the following (but don't press enter yet)

	A	B	C	D	E	F	G	H	I	J
1										
2		EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary		
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	=(100%-EPFEmployee)*		
4		1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance			

8. While still in the entry, select cell E3. You should get the following:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2		EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary					
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	=(100%-EPFEmployee)*Table2[[#This Row],[Basic Salary]]					

9. Press **Enter** to confirm the formula.



	A	B	C	D	E	F	G	H	I	J
1										
2		EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary		
3		1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	4450		
4		1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance	4272		
5		1005	Low Mee	26	$ 5,100.00	Female	IT	4539		
6		1008	Low Shi Fun	24	$ 4,300.00	Female	IT	3827		
7		1010	Ali	29	$ 4,700.00	Male	HR	4183		
8		1012	Abu	35	$ 5,340.00	Male	Finance	4752.6		
9		1015	Ahmad	40	$ 6,500.00	Male	IT	5785		
10		1017	Aaron	32	$ 5,500.00	Male	Operation	4895		
11		1020	Ah Chong	28	$ 5,600.00	Male	Sales	4984		
12		1022	Azizi	30	$ 5,780.00	Male	R&D	5144.2		
13		1028	Shila Hamzah	25	$ 4,325.00	Female	Sales	3849.25		
14		1030	Narayanan	27	$ 4,340.00	Male	Finance	3862.6		
15		1032	Fatimah	26	$ 5,345.00	Female	Sales	4757.05		

10. Select range H3:H15, Select **Home** tab, select **$** (currency format).

Module 5 – *Prevent invalid entry with Controls*

To prevent user making mistake during data entry always a good strategy in improving quality of the workbook. In this module you will learn how to use form controls and some special techniques to construct less error prune and high quality worksheet for data entry.

What is Controls?

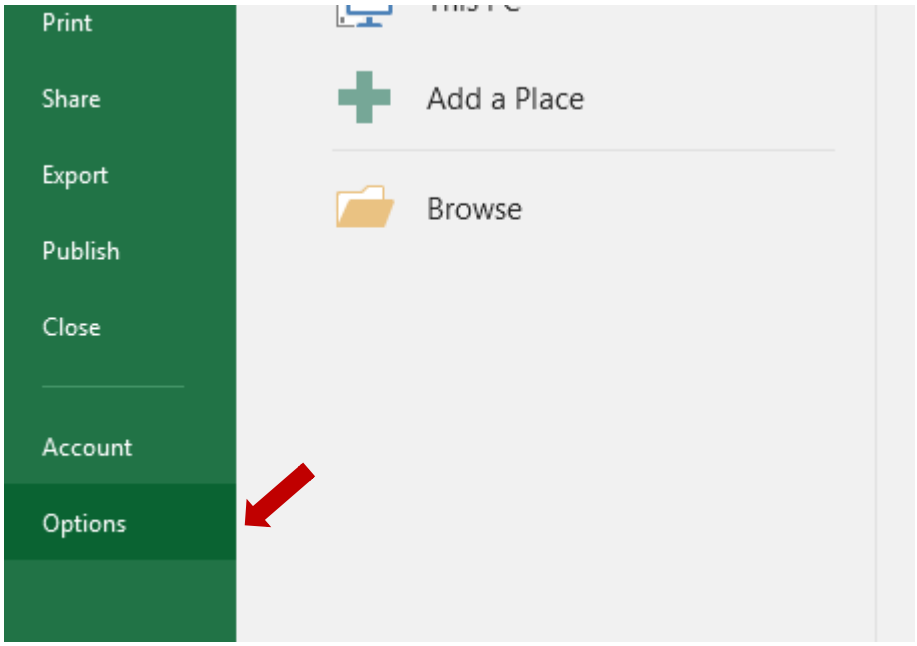
Worksheet with Form and ActiveX controls. A worksheet is a type of form that enables you to enter and view data on the grid, and there are several control-like features already built-in to Excel worksheets, such as comments and data validation.

You use Form controls when you want to easily reference and interact with cell data without using VBA code, and when you want to add controls to chart sheets. For example, after you add a list box control to a worksheet and linking it to a cell, you can return a numeric value for the current position of the selected item in the control. You can then use that numeric value in conjunction with the INDEX function to select different items from the list.

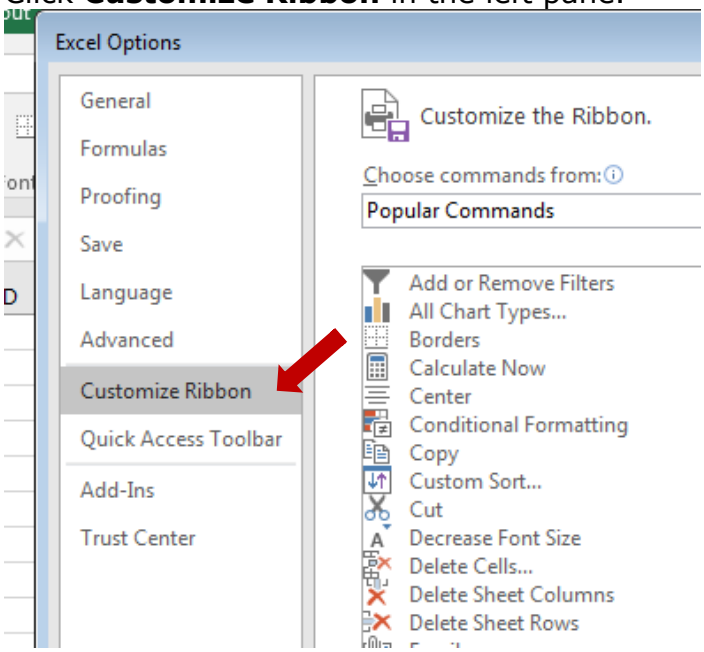
The following methods show how to use list boxes, combo boxes, spin buttons, and scroll bars. The examples use the same list, cell link, and Index function.

To use the form controls in Excel 2010, you have to enable the Developer tab. To do this, follow these steps:

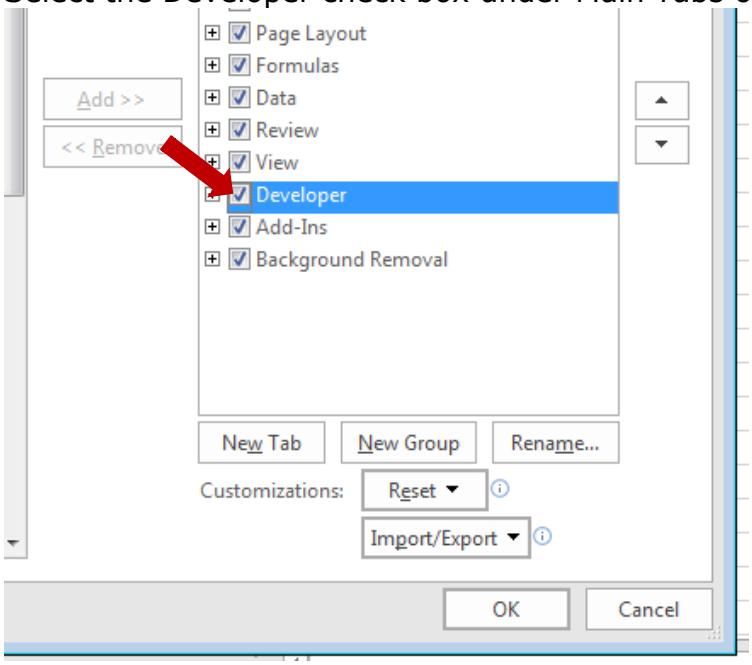
1. Just Click **File**, and then click **Options**.



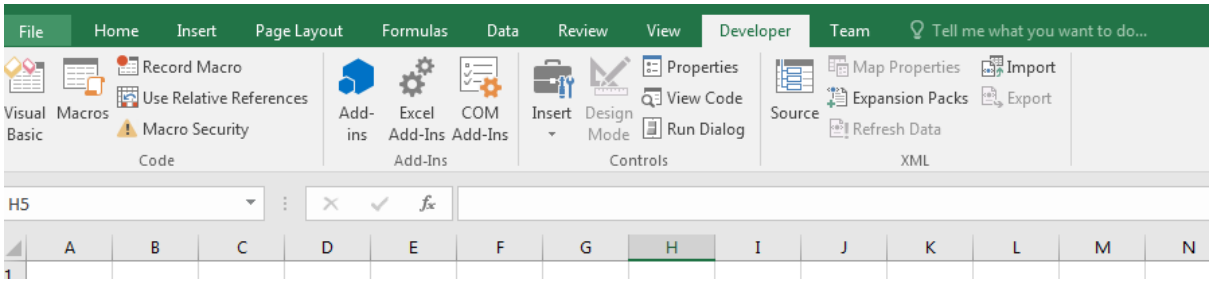
2. Click **Customize Ribbon** in the left pane.



3. Select the Developer check box under Main Tabs on the right, and then click **OK**.



4. Back to worksheet view, now you should be able to see the Developer Tab.

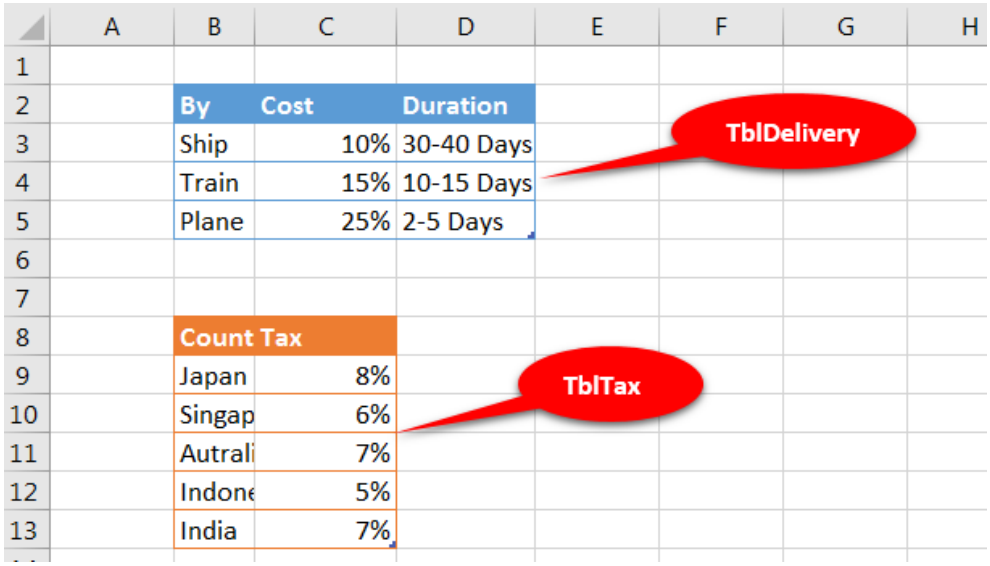


Problems with text entry.

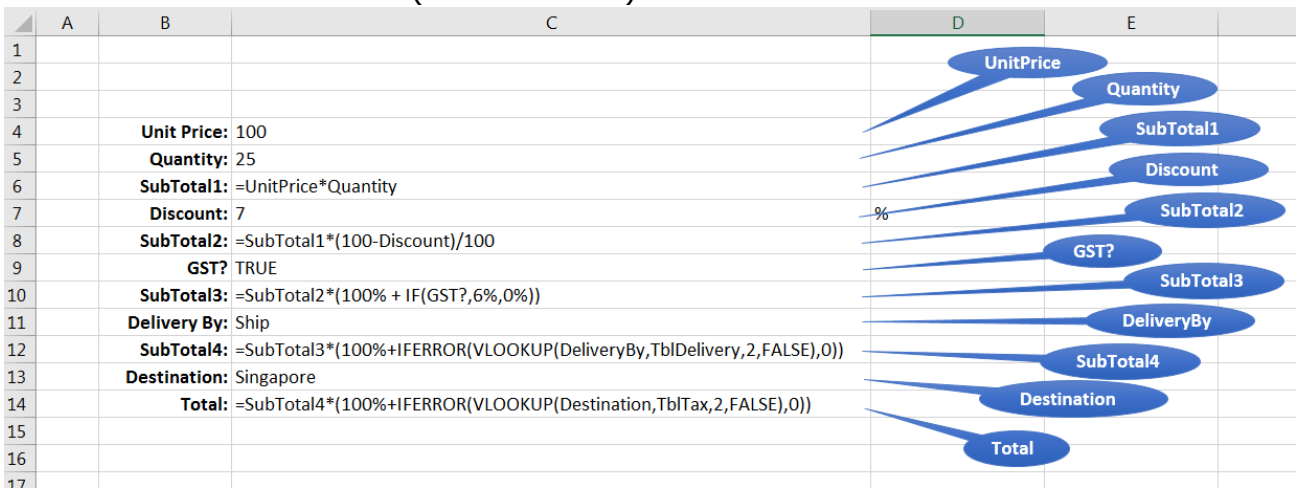
Let's consider a scenario where you are required to create a model to calculate the total cost of an oversea order. The order needs to consider the following:

1) Include Unit Price
2) Include Quantity
3) Consider Discount
4) Some products need to include GST
5) Product has different mode of delivery with different cost.
6) Different destination countries have different tax percentage.

Prepare a new worksheet "Tables" and create 2 new tables as shown below:



Create a new Worksheet with "Data Entry". Prepare the worksheet to hold the calculation model as below (Formula View):

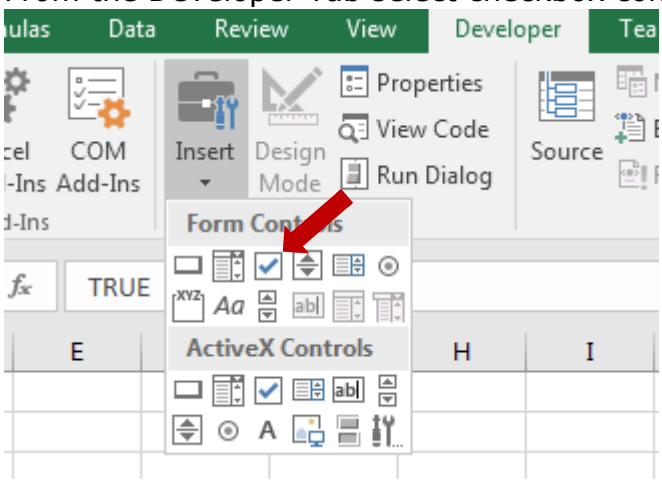


Discuss with the class, what are the possible mistake users will make during data entry for this model?

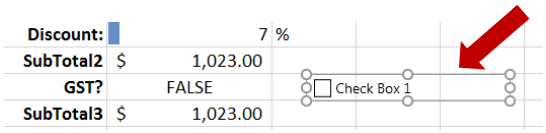
How are you going to improve the model based on what you have learnt so far?

Handle Yes/No value with Check-Box

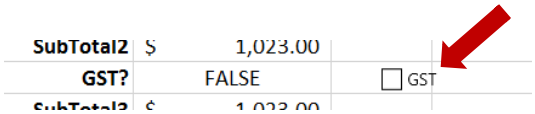
From the Developer Tab select checkbox control:



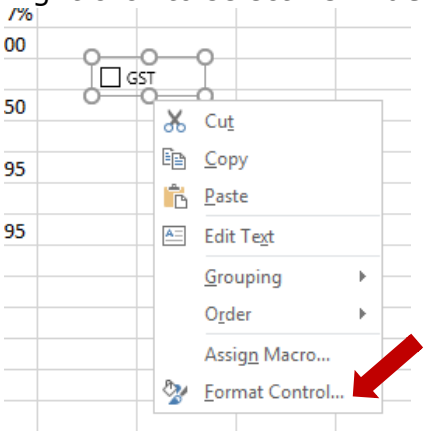
Drag select to create the check box beside GST cell:



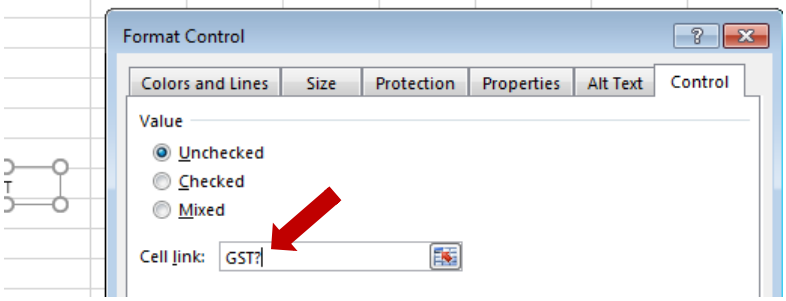
Double click the check box caption and rename it as:



Right click to select **Format Control...**



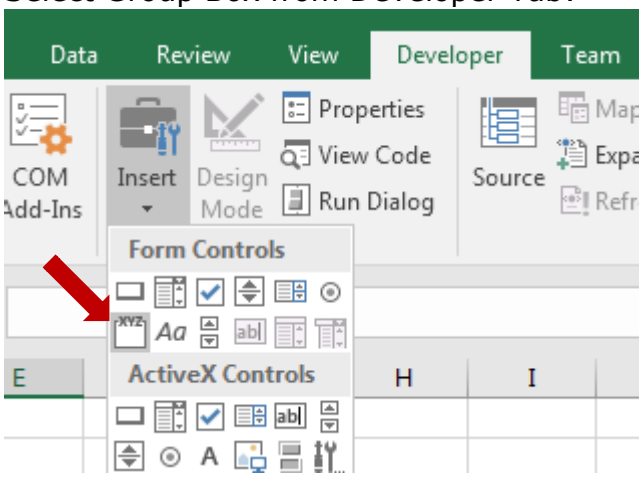
In cell link, type the **GST?**



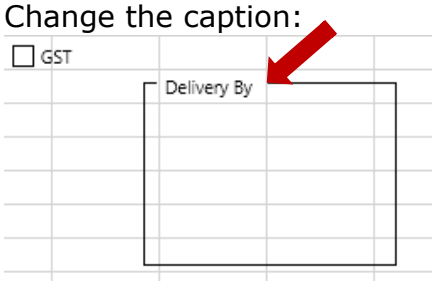
Unselect the check box by clicking any other place in the worksheet, then select the check box to observe what happening.

Select one out of many with Radio-Button

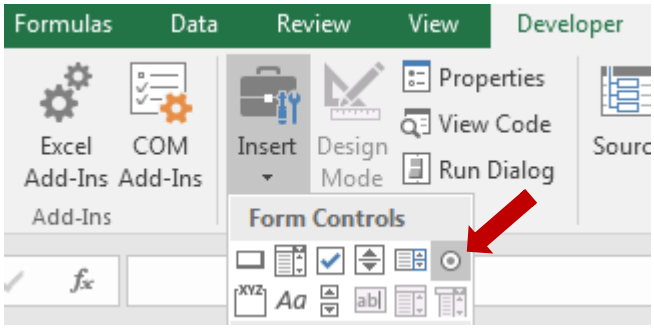
Select Group Box from Developer Tab:



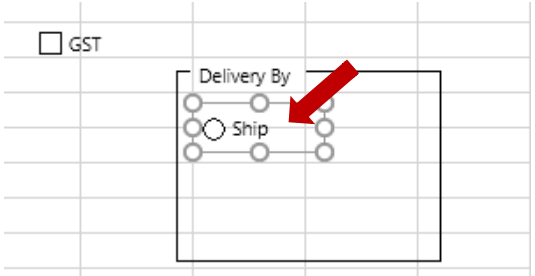
Change the caption:



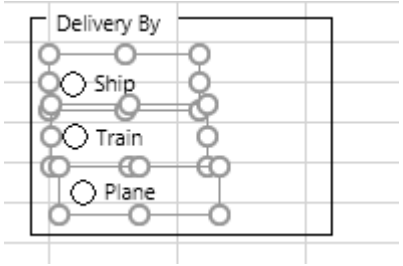
Select Radio Button:



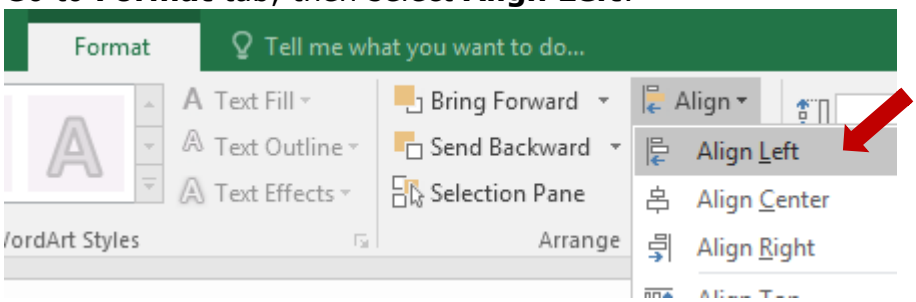
Create by dragging inside the group box, and change the caption:



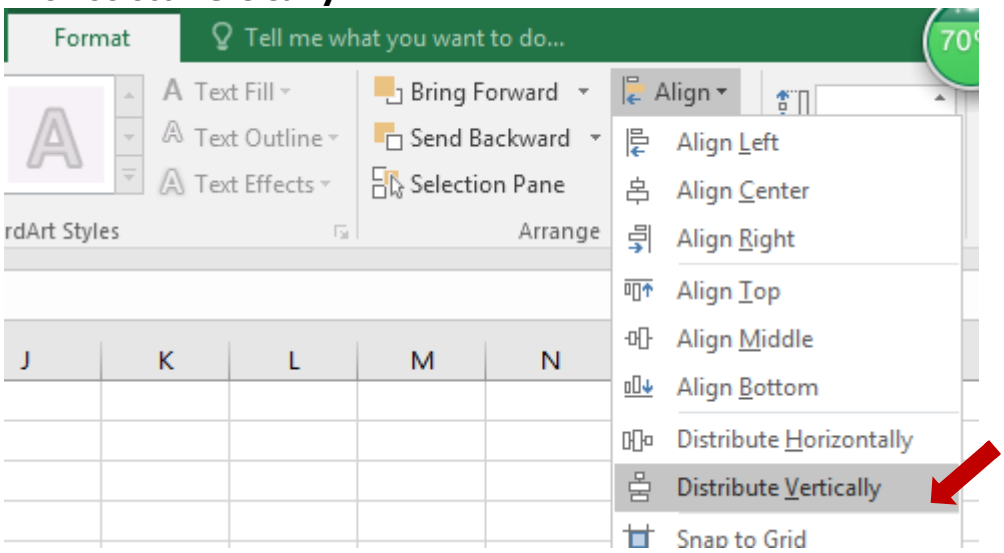
Repeat for the other two delivery modes, then Control + Right Click to select one by one:



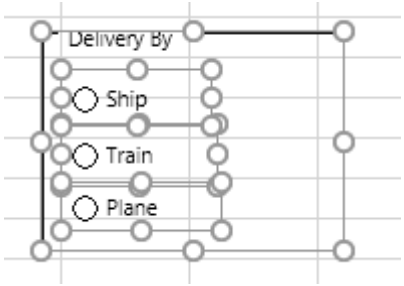
Go to **Format** tab, then select **Align Left**:



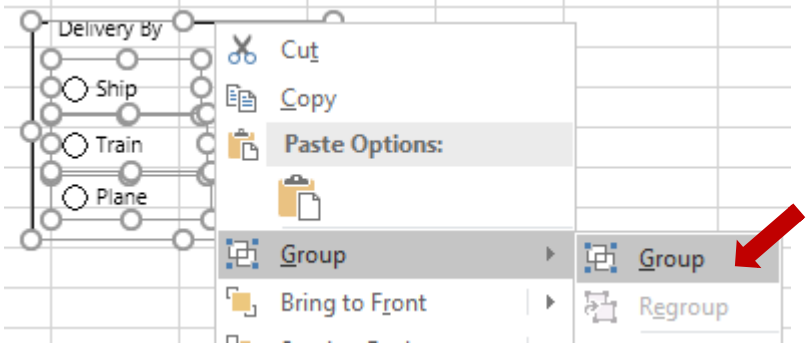
Then select **Vertically**:



While the radio button still under selection, Control + Right Click to select the group box as well:

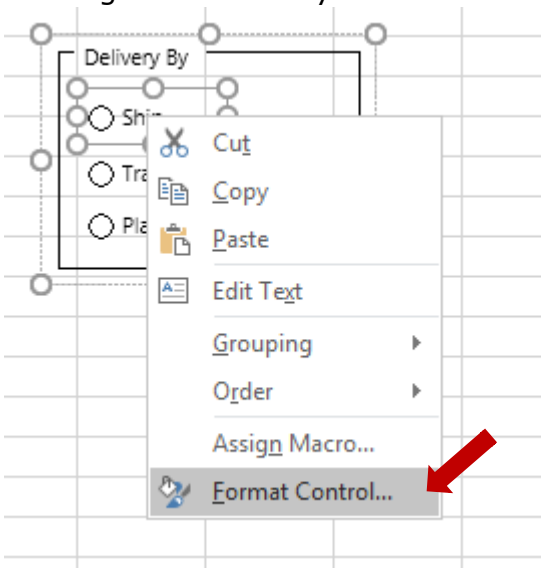


While under selection, right click to select **Group**:

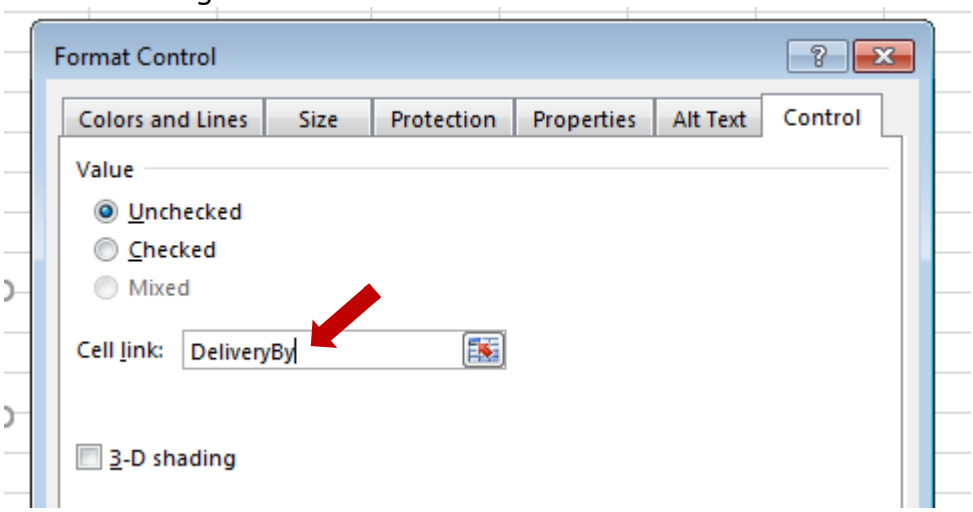


You need to do this step slowly. As new comer, you might need to practice many times. The purpose of grouping radio button under group box so that you can have multiple set of radio buttons in the same worksheet. Without group box and grouping, all radio buttons under the worksheet are considered belong to the same group.

Now right click on any radio button in the group, select **Format Controls...**



Now, type in **DeliveryBy** name in to the Cell link under Control Tab of Format Control Dialog box:



Press **OK**.
Unselect the radio button group by clicking elsewhere.
Now select the radio button option. Discuss your observation.

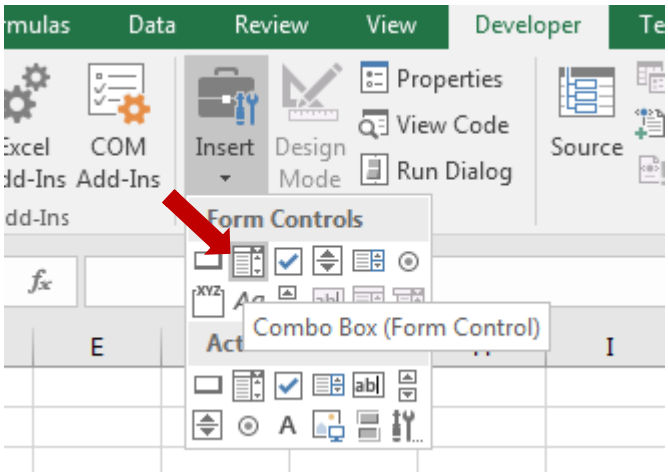
Change the formula of cell SubTotal4 to:

```
=SubTotal3*(100%+IFERROR(VLOOKUP(INDEX(TblDelivery[By],DeliveryBy),TblDelivery,2,FALSE),0))
```

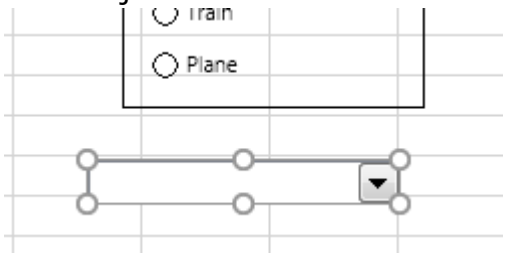
Use Combo-Box and List-Box

If there are too many options to choose from, perhaps radio button is not adequate. Combo box and list box also offer user to select one out of many options by using lesser space.

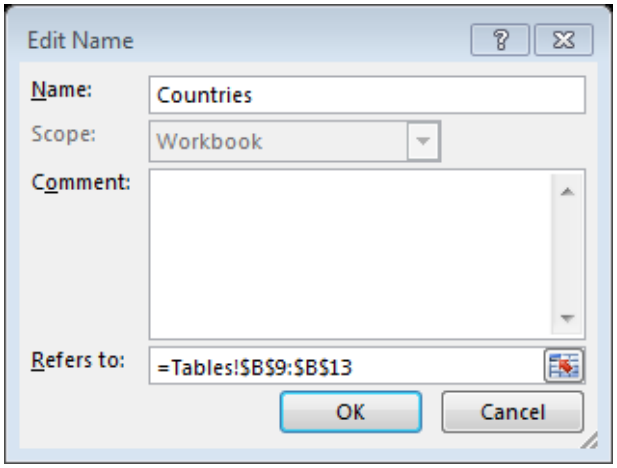
Select Combo Box from the Developer Tab:



Place it just under the radio button group:



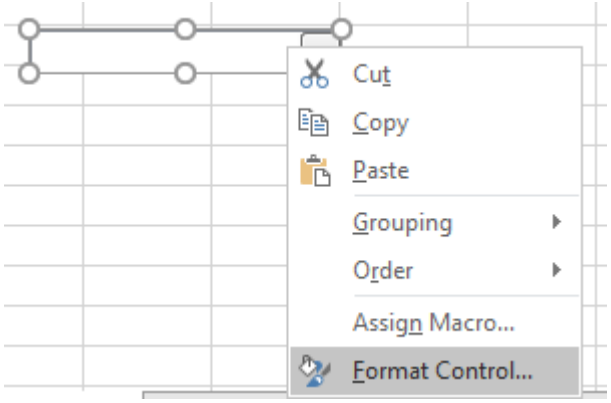
Create a new Name:



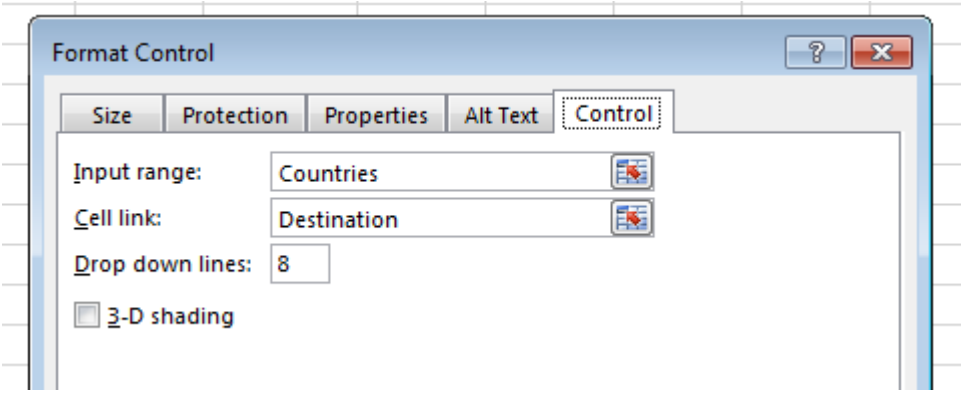
Change the formula of cell Total to:

```
=SubTotal4*(100%+IFERROR(VLOOKUP(INDEX(Tables!$B$9:$B$13,Destination),Tables!$B$9:$C$13,2,FALSE),0))
```

Right click on the combo box, and select the **Format Control...**



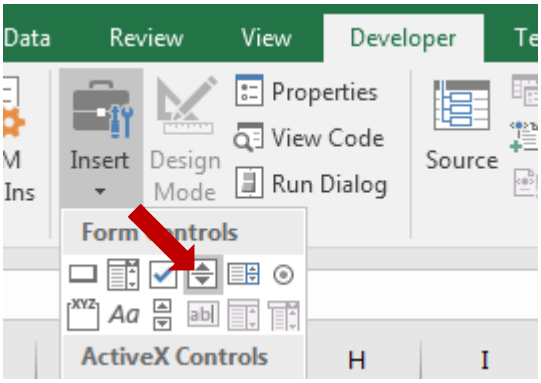
In the Control tab of Format Control dialog box, fill in the **Input range** and **Cell link** as below:



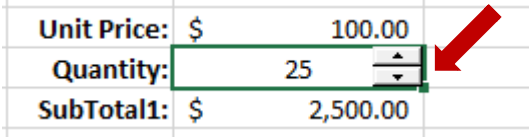
Now select elsewhere, then click on the drop down button of the combo-box. Make Select any country and observe what will happen? If any problem, discuss How to fix it?

Increase and decrease value with Spin Button

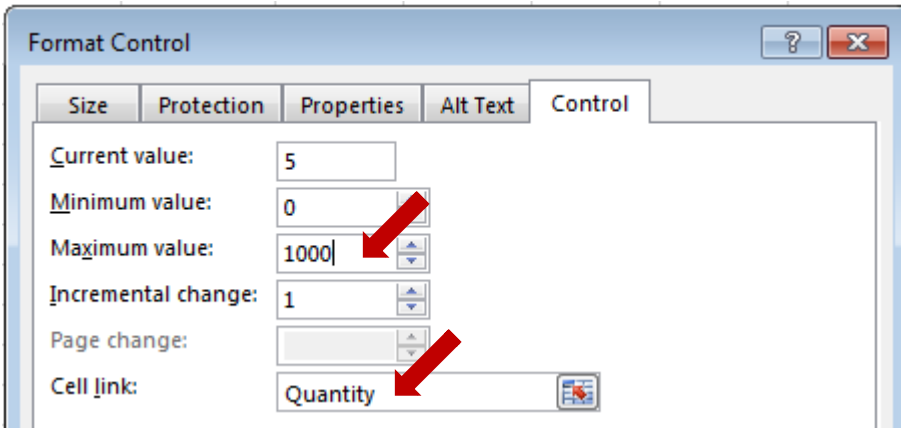
Select Spin Button from Developer Tab:



Centralize cell **Quantity**, and place the Spin Button as shown below:

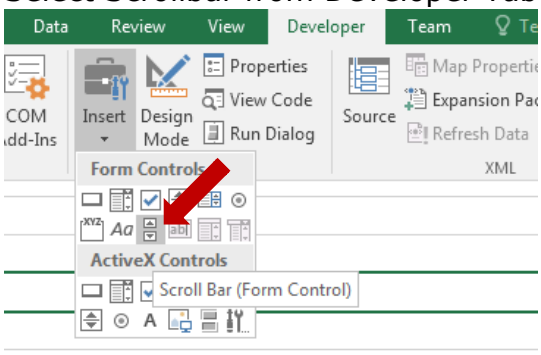


Under the **Format Control** of this Spin Button, set the following:

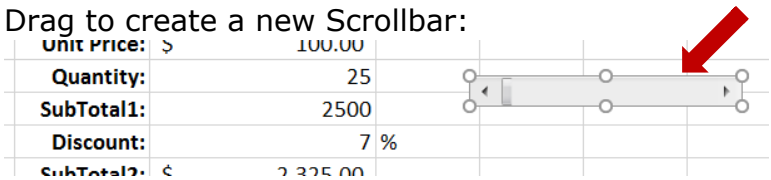


Increase and decrease value with Scrollbar

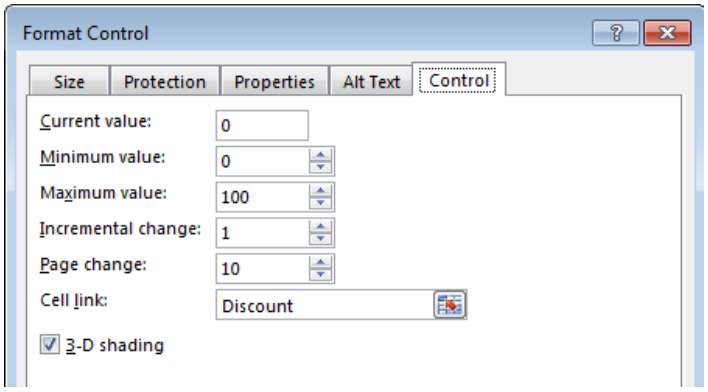
Select Scrollbar from Developer Tab:



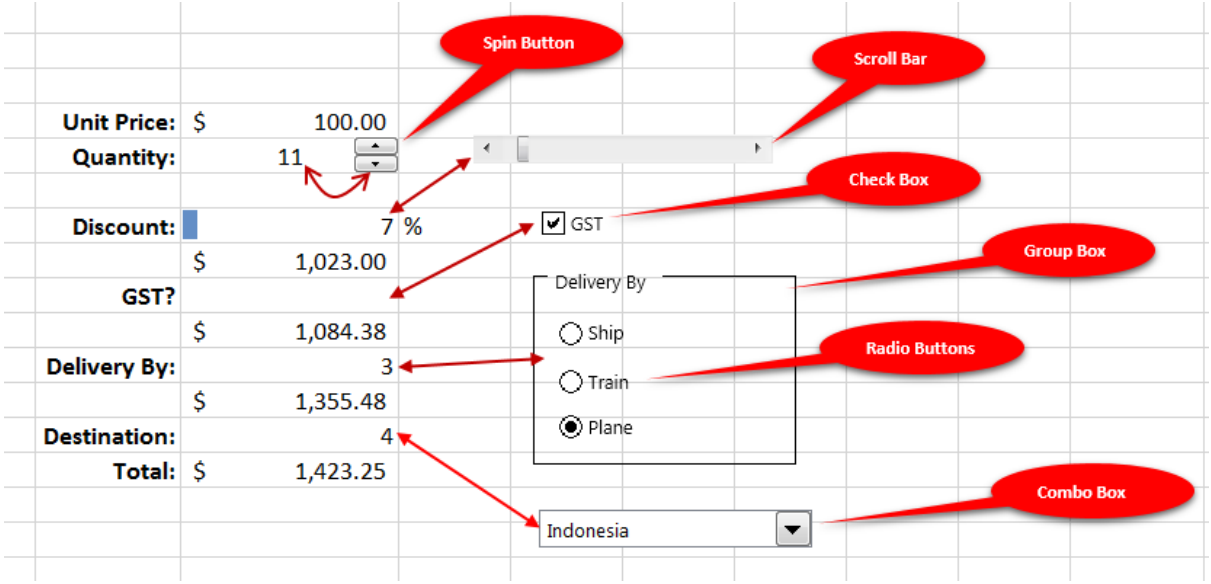
Drag to create a new Scrollbar:



Format the Scrollbar:

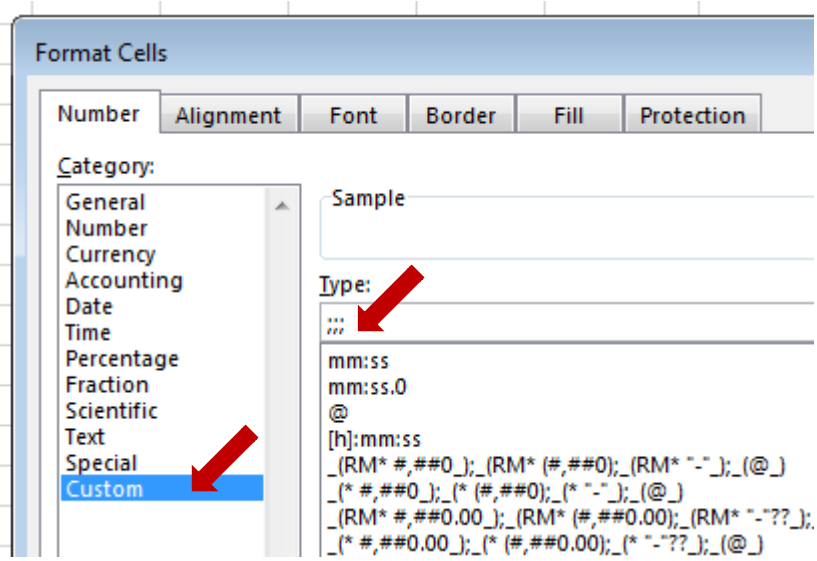


Now you completed in adding all necessary controls. Below are the relationships between controls and the link cells:



Techniques to hide cell values

To hide the cell value from display, you can format the cell as below:

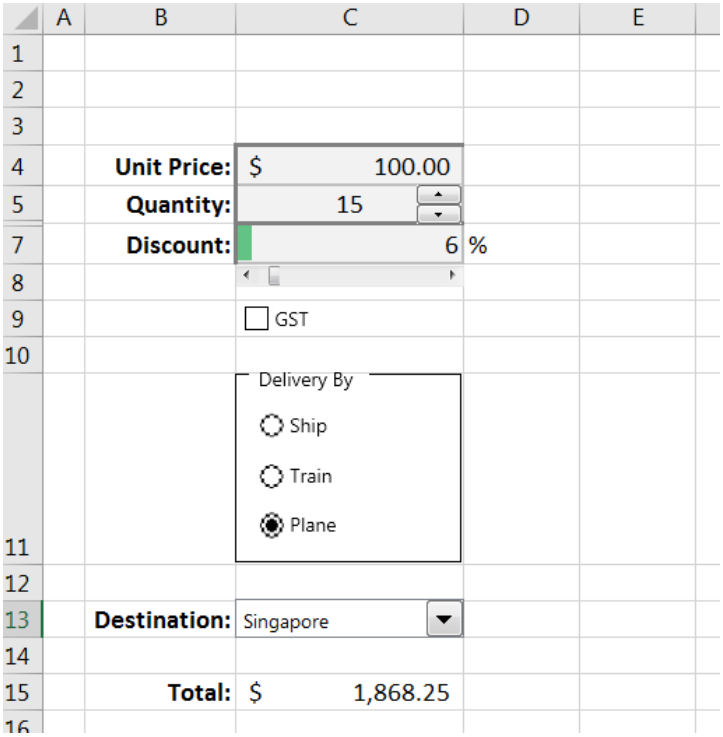


Techniques to prevent user direct data entry

You can do the following:

1) Lock all cells in the worksheet.
2) Those cell you want the user to change or use by control via cell links unlock it.
3) Hide the link cells and other cell value for intermediate calculation.
4) Place controls to cover those link cells.
5) Protect the worksheet with password.

By applying this techniques, the final result is as below:



Different between Form and ActiveX Controls

Form controls are simple. But ActiveX controls provide more attributes and programming capabilities.

One major difference that is important to know is that ActiveX controls show up as objects that you can use in your code- try inserting an ActiveX control into a worksheet, bring up the VBA editor (ALT + F11) and you will be able to access the control programmatically. You can't do this with form controls (macros must instead be explicitly assigned to each control), but form controls are a little easier to use. If you are just doing something simple, it doesn't matter which you use but for more advanced scripts ActiveX has better possibilities.

ActiveX is also more customizable.

The Form controls are baked into Excel itself. The ActiveX controls are loaded from separate DLLs. You can add extra ActiveX controls, not Form controls

Module 6 – *Important Functions*

Excel provides many built in functions to make your life easier. In this module we will explore some of the important functions that commonly used in managing data.

TEXT Function

The TEXT function converts a numeric value to text and lets you specify the display formatting by using special format strings. This function is useful in situations where you want to display numbers in a more readable format, or you want to combine numbers with text or symbols. For example, suppose cell A1 contains the number 23.5. To format the number as a dollar amount, you can use the following formula:

```
=TEXT(A1,"$0.00")
```

In this example, Excel displays $23.50.

You can also format numbers by using the commands in the Number group on the Home tab of the Ribbon. However, these commands work only if the entire cell is numeric. If you want to format a number and combine it with other text, the TEXT function is the best option. For example, you can add text to the preceding formula:

```
=TEXT(A1,"$0.00") & " per hour"
```

Excel displays $23.50 per hour.

The TEXT function syntax has the following arguments:

TEXT(value, format_text)

- **value** Required. A numeric value, a formula that evaluates to a numeric value, or a reference to a cell containing a numeric value.
- **format_text** Required. A numeric format as a text string enclosed in quotation marks, for example "m/d/yyyy" or "#,##0.00". See the following sections for specific formatting guidelines.

IF

Use the IF function, one of the logical functions, to return one value if a condition is true and another value if it's false.

IF(logical_test, value_if_true, [value_if_false])

For example:

=IF(A2>B2,"Over Budget","OK")

=IF(A4=500,B4-A4,"")

ERROR Function

The Excel Error.Type function receives an error value and returns an integer, that tells you the type of the supplied error.

The syntax of the function is:

ERROR.TYPE(error_val)

Where the supplied error_val is a value (or a reference to a cell containing a value), that you want to return the error type of.

The integers returned by the Excel Error.Type function, and their corresponding error types are listed in the table below:

1	#NULL!
2	#DIV/0!
3	#VALUE!
4	#REF!
5	#NAME?
6	#NUM!
7	#N/A
#N/A	Anything else

The following spreadsheets show four examples of the Error.Type function.

Formulas:

	A	B
1	#VALUE!	=ERROR.TYPE(A1)
2	#REF!	=ERROR.TYPE(A2)
3		=ERROR.TYPE(1/A3)
4	10	=ERROR.TYPE(A4)

Results:

	A	B
1	#VALUE!	3
2	#REF!	4
3		2
4	10	#N/A

LOGICAL Function

Excel logical functions include the boolean operators and conditional tests, which will be an essential part of many working spreadsheets.

Boolean Operator Functions	
AND	Tests a number of user-defined conditions and returns TRUE if ALL of the conditions evaluate to TRUE, or FALSE otherwise
OR	Tests a number of user-defined conditions and returns TRUE if ANY of the conditions evaluate to TRUE, or FALSE otherwise
XOR	Returns a logical Exclusive Or of all arguments (New in Excel 2013)
NOT	Returns a logical value that is the opposite of a user supplied logical value or expression (ie. returns FALSE is the supplied argument is TRUE and returns TRUE if the supplied argument is FALSE)

Example

The following spreadsheets show three examples of the Excel And function.

Formulas:

	A	B	C
1	5	10	=AND(A1>0, A1<B1)
2	5	10	=AND(A2>0, A2<B2, B2>12)
3	5	10	=AND(A3<0, A3>B3, B3>12)

Results:

	A	B	C
1	5	10	TRUE
2	5	10	FALSE
3	5	10	FALSE

Note that, in the above example spreadsheet:

- the function in cell C1 evaluates to TRUE, as BOTH of the supplied conditions are TRUE;
- the function in cell C2 evaluates to FALSE, as the third condition, B2>12, is FALSE;
- the function in cell C3 evaluates to FALSE, as ALL of the supplied conditions are FALSE.

VLOOKUP and HLOOKUP functions

VLookup is Excel look up function for tabular data range. It always lookups from the first column of the tabular data range from top-down (Therefore so called vertical lookup). The function caller can specifies the data from which column should be return upon successful lookup.

Basically VLookup has two very different types of matching during the lookup process.

1. Exact Match
2. Approximate/Closest Match

The usage of these matching is very different.

VLookup Syntax & Rules

Syntax: VLOOKUP(*lookup_value*, *table_array*, *col_index*, *range_lookup*)

Parameter	Description
Lookup_value	The value to search in the first column of the table array (array: Used to build single formulas that produce multiple results or that operate on a group of arguments that are arranged in rows and columns. An array range shares a common formula; an array constant is a group of constants used as an argument.). Lookup_value can be a value or a reference. If lookup_value is smaller than the smallest value in the first column of table_array, VLOOKUP returns the #N/A error value.
Table_array	Two or more columns of data. Use a reference to a range or a range name. The values in the first column of table_array are the values searched by lookup_value. These values can be text, numbers, or logical values. Uppercase and lowercase text are equivalent.
Col_index_num	The column number in table_array from which the matching value must be returned. A col_index_num of 1 returns the value in the first column in table_array; a col_index_num of 2 returns the value in the second column in table_array, and so on. If col_index_num is: • Less than 1, VLOOKUP returns the #VALUE! error value. • Greater than the number of columns in table_array, VLOOKUP returns the #REF! error value.

Range_lookup	A logical value that specifies whether you want VLOOKUP to find an exact match or an approximate match: • If TRUE or omitted, an exact or approximate match is returned. If an exact match is not found, the next largest value that is less than lookup_value is returned. The values in the first column of table_array must be placed in ascending sort order; otherwise, VLOOKUP may not give the correct value. For more information, see Sort data. • If FALSE, VLOOKUP will only find an exact match. In this case, the values in the first column of table_array do not need to be sorted. If there are two or more values in the first column of table_array that match the lookup_value, the first value found is used. If an exact match is not found, the error value #N/A is returned.

Remarks:

- When searching text values in the first column of table_array, ensure that the data in the first column of table_array does not have leading spaces, trailing spaces, inconsistent use of straight (' or ") and curly (` or ‟) quotation marks, or nonprinting characters. In these cases, VLOOKUP may give an incorrect or unexpected value.
- When searching number or date values, ensure that the data in the first column of table_array is not stored as text values. In this case, VLOOKUP may give an incorrect or unexpected value. For more information, see Convert numbers stored as text to numbers.
- If range_lookup is FALSE and lookup_value is text, then you can use the wildcard characters, question mark (?) and asterisk (*), in lookup_value. A question mark matches any single character; an asterisk matches any sequence of characters. If you want to find an actual question mark or asterisk, type a tilde (~) preceding the character.

VLookup Example with an Exact Match

When the parameter **Range_lookup** value is set to **False**, VLOOKUP will only find an exact match.

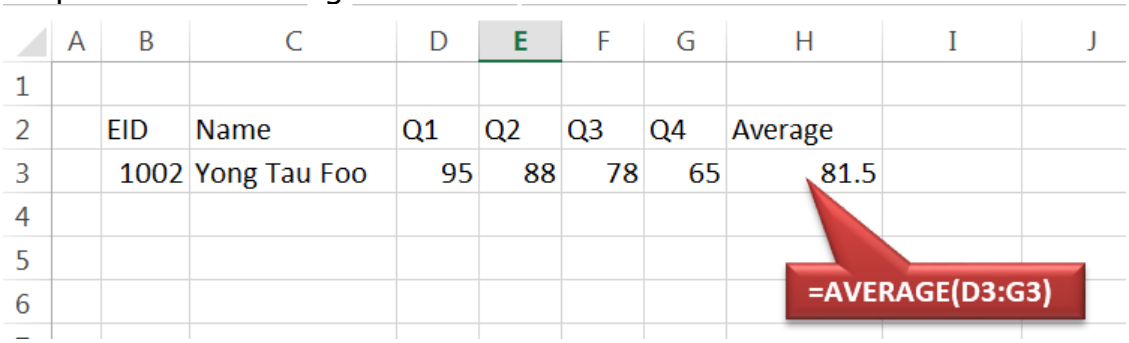
EX6.1: *VLookup (Exact Match)*

In this exercise you will learn how to use VLookup exact match to retrieve data from other table.

Consider the case where company need to know the KPI of each employee. A new table will be created.

1. Create a new worksheet with name **KPI**.

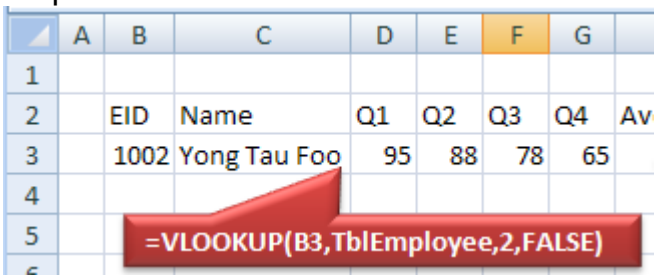
2. Prepare the following table



	A	B	C	D	E	F	G	H	I	J
1										
2		EID	Name	Q1	Q2	Q3	Q4	Average		
3		1002	Yong Tau Foo	95	88	78	65	81.5		
4										
5										
6										

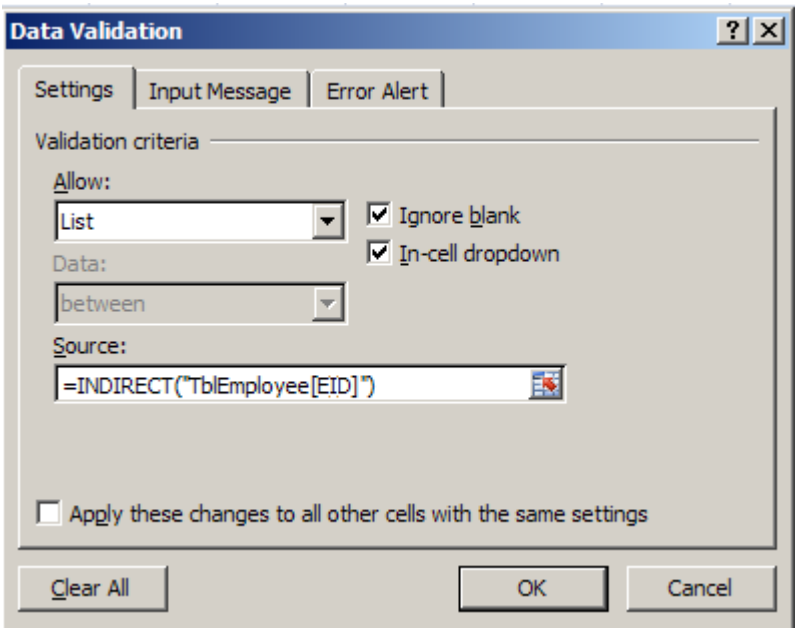
3. Discuss what are the issues if the user needs to key in employee name?

4. Prepare a column formula for cell C3

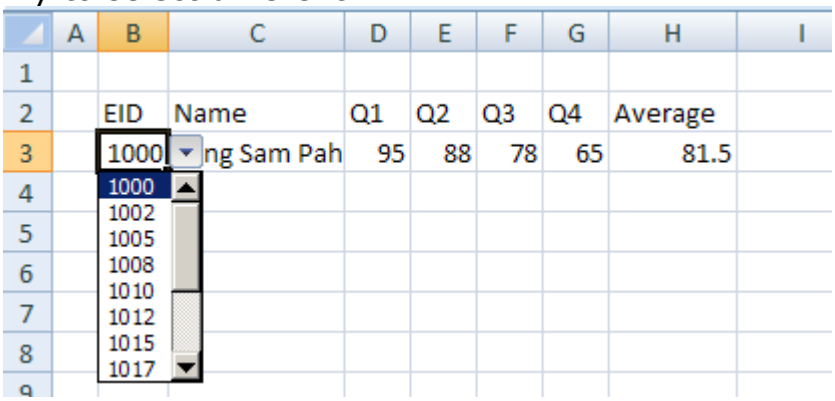


	A	B	C	D	E	F	G	
1								
2		EID	Name	Q1	Q2	Q3	Q4	Av
3		1002	Yong Tau Foo	95	88	78	65	
4								
5								

5. Add data validation to cell B3



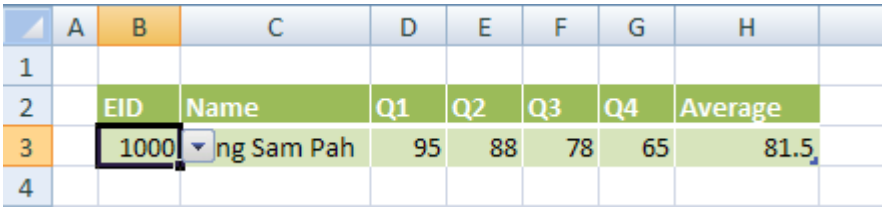
6. Try to select different EID



7. Discuss your observation

8. Try to delete cell B3's value. Discuss your observation

9. Convert the tabular data to table and name it as **TblKPI**.



10. Try to add few new record, identify any problem occurs and suggest solution.

11. How to highlight duplicate EID selection?

VLookup Example with the Closest Match

When the parameter **Range_lookup** value is set to **True**, VLOOKUP will perform approximate match.

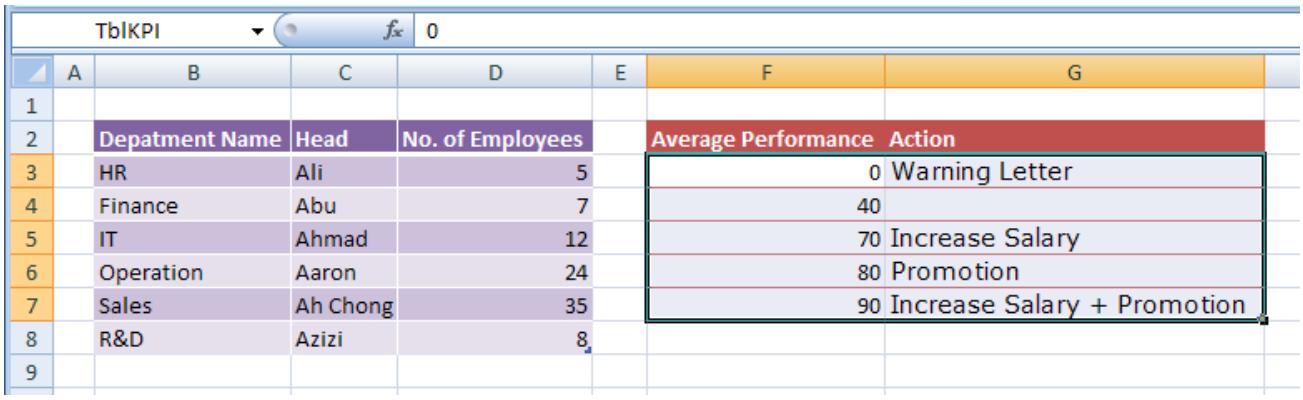
EX6.2: *VLookup (Approximate Match)*

From the previous created table **TblKPI**, the management needs to make decision about the average performance of each employee based on the table below:

Average Performance	Action
Below 40%	Warning Letter
40% to less than 70%	(No Action)
70% to less than 80%	Increase Salary
80% to less than 90%	Promotion
90% onward	Increase Salary + Promotion

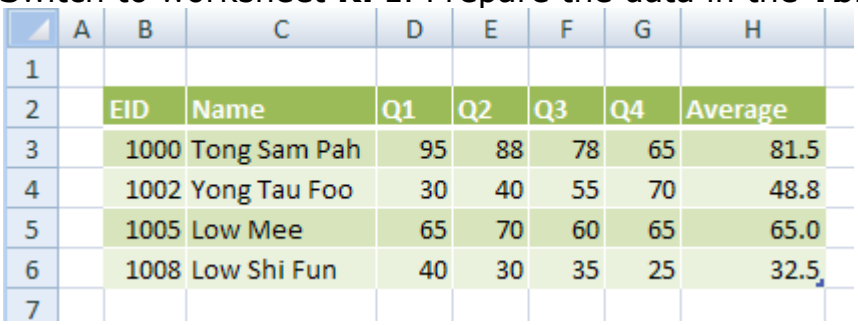
A new column with header **Action** will be added to TblKPI. The value of this column will be derived from column **Average** and the abovementioned table.

1. Create a new table with name **TblAction** under worksheet **Lists**.



	A	B	C	D	E	F	G
1							
2		Depatment Name	Head	No. of Employees		Average Performance	Action
3		HR	Ali	5		0	Warning Letter
4		Finance	Abu	7		40	
5		IT	Ahmad	12		70	Increase Salary
6		Operation	Aaron	24		80	Promotion
7		Sales	Ah Chong	35		90	Increase Salary + Promotion
8		R&D	Azizi	8			
9							

2. Switch to worksheet **KPI**. Prepare the data in the **TblKPI** table.

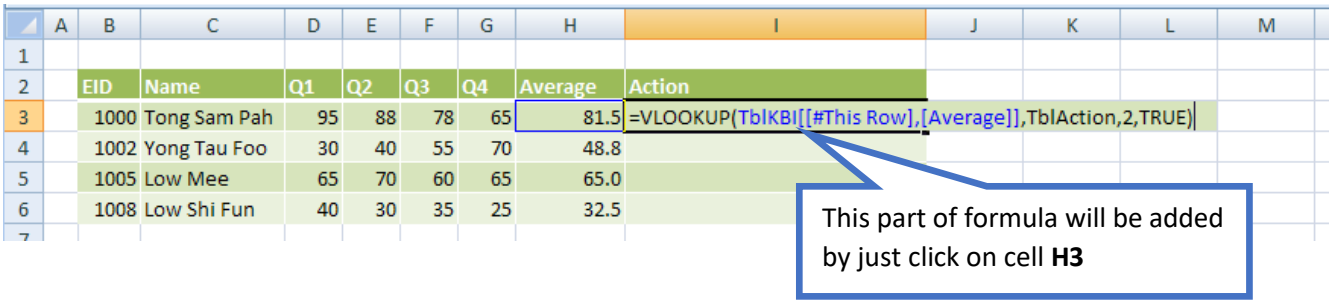


	A	B	C	D	E	F	G	H
1								
2		EID	Name	Q1	Q2	Q3	Q4	Average
3		1000	Tong Sam Pah	95	88	78	65	81.5
4		1002	Yong Tau Foo	30	40	55	70	48.8
5		1005	Low Mee	65	70	60	65	65.0
6		1008	Low Shi Fun	40	30	35	25	32.5
7								

3. Add new column **Action** to table **TblKPI** under worksheet **KPI**.

EID	Name	Q1	Q2	Q3	Q4	Average	Action
1000	Tong Sam Pah	95	88	78	65	81.5	
1002	Yong Tau Foo	30	40	55	70	48.8	
1005	Low Mee	65	70	60	65	65.0	
1008	Low Shi Fun	40	30	35	25	32.5	

4. Add column formula to column **Action** of table **TblKPI**.



5. Discuss your observation.

6. Select cell I6, press **TAB** key to generate new row.

EID	Name	Q1	Q2	Q3	Q4	Average	Action
1000	Tong Sam Pah	95	88	78	65	81.5	Promotion
1002	Yong Tau Foo	30	40	55	70	48.8	
1005	Low Mee	65	70	60	65	65.0	
1008	Low Shi Fun	40	30	35	25	32.5	Warning Letter
	#N/A					#DIV/0!	#DIV/0!

Beware that we still have these few problems.

Fix Your VLookup Error

Sometime we want to silent about unsuccessful lookup or error generated from calling the VLookup function. In Excel 2007 you can use the following approaches:

1. Check the data before calling VLookup

2. Let the VLookup generate error and substitute the error with something else.

EX6.3: *Hiding VLookup Error*

As you realized, there are imperfection from the VLookup column formulas from the previous exercises. In this exercise, you will learn how to apply the mentioned two VLookup error handling approaches.

1. Replace column formula from cell **C3** to

```
=IF(TblKBI[[#This Row],[EID]]<>"",VLOOKUP(B3,TblEmployee,2,FALSE),"")
```

2. Replace column formula from cell **H3** to

```
=IFERROR(AVERAGE(TblKBI[[#This Row],[Q1]:[Q4]]),"")
```

3. Replace column formula from cell **I3** to

```
=IFERROR(VLOOKUP(TblKBI[[#This Row],[Average]],TblAction,2,TRUE),"")
```

4. Discuss your observation

What is HLookup?

The HLookup function behave similar to VLookup. The different is instead of lookup from the first column vertically, HLookup will lookups the tabular data from the first row horizontally.

Due to the nature of tabular data, VLookup is more commonly use.

COUNT related Functions

The Excel Count and the Excel Counta functions both count the number of values within a supplied set of values or range of cells.

The two functions differ in the following ways:

- The Count function returns the count of numeric values (includes numbers and dates);
- The Counta function returns the count of all non-blank values (includes numbers, dates, text values, logical values and errors).

The Excel Count function returns the count of numeric values in a supplied set of cells or values. This count includes both numbers and dates.

The syntax of the function is:

COUNT(value1, [value2], ...)

Where the arguments, value1, [value2], etc, can be any values, arrays of values, or references to cell ranges.

In recent versions of Excel (2007 and later), you can enter up to 255 value arguments to the Excel Count function, each of which may be an array of cells or values. However, in Excel 2003, the function can only handle up to 30 arguments.

Numbers and dates are always counted as numeric values by the Excel Count function. However, text representations and logical values are counted differently, depending on whether they are supplied as a value in a range of cells, or if they are supplied directly to the function.

The table below summarises which values are and which are not treated as numeric values by the Excel Count function:

	Value Within a Range of Cells	**Value Supplied Directly to Function**
Numbers	ARE counted	ARE counted
Dates	ARE counted	ARE counted
Logical Values	NOT counted	ARE counted
Text Representations of Numbers & Dates	NOT counted	ARE counted
Other Text	NOT counted	NOT counted
Errors	NOT counted	NOT counted

Example 1 - Values Supplied from a Range of Worksheet Cells
In the following spreadsheet, the Count function is used to return the number of numeric values in one or more supplied ranges of cells.

Formulas:

	A	B	C
1	5	0	=COUNT(A1:A5)
2	text		=COUNT(A1:A5, B1)
3	FALSE		=COUNT(A1:B5)
4	01/01/2015		
5	#N/A	10	

Results:

	A	B	C
1	5	0	2
2	text		3
3	FALSE		4
4	01/01/2015		
5	#N/A	10	

Note that, in the above example:

- The numbers and the date 01/01/2015 are counted by the function.
- The text value "text", the logical value FALSE, and the error value #N/A are not counted by the function.
- The empty cells are not counted by the function.

Example 2 - Values Supplied Directly to the Excel Count Function

In the following spreadsheet, the Excel Count function is used to count the number of numeric values in sets of values supplied directly to the function.

Formulas:

	A
1	=COUNT(100, DATE(2015,1,1))
2	=COUNT("100", "01/01/2015", FALSE)
3	=COUNT("text", #N/A)

Results:

	A
1	2
2	3
3	0

Note, in the above example:

- The number 100 and the date 01/01/2015 are counted by the function.
- The text representations of the number "100" & the date, "01/01/2015", and the logical value FALSE, are counted by the function.
- The text string "text" and the error #N/A are not counted by the function.

The Excel Counta function returns the number of non-blanks within a supplied set of cells or values.

The syntax of the function is:

COUNTA(value1, [value2], ...)

Where the arguments, value1, [value2], etc, can be any values, arrays of values, or references to cell ranges.

In recent versions of Excel (2007 and later), you can enter up to 255 value arguments to the Excel Counta function, each of which may consist of any number of cells or values. However, in Excel 2003 and earlier, the function can only handle up to 30 arguments.

Note that, if a cell contains an empty text string or a formula that returns an empty text string, this cell is counted as a non-blank by the Counta function.

Example 1 - Values Supplied from a Range of Worksheet Cells

In the following spreadsheet, the Counta function is used to return the number of non-blank cells in one or more supplied cell ranges.

Formulas:

	A	B	C
1	1		=COUNTA(A1:A6)
2	2	TRUE	=COUNTA(A1:A6, B1:B2)
3	#N/A		
4			
5			
6	text		

Results:

	A	B	C
1	1		4
2	2	TRUE	5
3	#N/A		
4			
5			
6	text		

Example 2 - Values Supplied Directly to the Excel Counta Function

In the following spreadsheet, the Excel Counta function is used to return the number of non-blank values within a set of values that is supplied directly to the function.

Formula:

	A
1	=COUNTA("text", 1, 2)
2	

Result:

	A
1	3
2	

The Excel Countblank function returns the number of blank cells in a supplied range.

The syntax of the function is:

COUNTBLANK(range)

Where the range argument specifies the range of cells in which you want to count blank cells.

Note that, if a cell contains an empty text string or a formula that returns an empty text string, this cell is counted as a blank by the Countblank function.

Examples

In the spreadsheets below, the Excel Countblank function is used to calculate the number of blank cells in two different cell ranges.

Example 1:

	A	B	C	D
1	1	text		=COUNTBLANK(A1:B5)
2	2	TRUE		
3				
4	4	6		
5		5		

- Gives the result **3**.

Example 2:

	A	B	C	D
1	1	text		=COUNTBLANK(A3:D5)
2	2	TRUE		
3				
4	4	6		
5		5		

- Gives the result **9**.

The Excel Countif function returns the number of cells within a supplied range, that satisfy a given criteria.

The syntax of the function is:

COUNTIF(range, criteria)

Where the function arguments are as follows:

Range	The range of cells that should be tested against the supplied criteria and counted if the criteria is satisfied.
Criteria	A user-defined condition that is tested against each of the cells in the supplied range.

The supplied criteria can be either:

- a numeric value (which may be an integer, decimal, date, time, or logical value) (eg. 10, 01/01/2008, TRUE)

or

- a text string (eg. "Text", "Monday")

or

- an expression (eg. ">12", "<>0").

Note that if your criteria is a text string or an expression, this must be supplied to the function in quotes.

Also note that the Excel Countif function is not case-sensitive. So, for example, the text strings "TEXT" and "text" will be considered to be equal.

Example 1

The following example shows the Excel Countif function used to count cells containing text strings, numerical values, dates or logical values in the data spreadsheet on the right.

	A	B	C	D
1	Sunday	07-Sep-2008	0	TRUE
2	Monday	08-Sep-2008	2.1	TRUE
3	Wednesday	10-Sep-2008	2	TRUE
4	Thursday	11-Sep-2008	3	FALSE
5	Wednesday	17-Sep-2008	2.5	FALSE
6	Tuesday	23-Sep-2008	3	FALSE
7	Wednesday	24-Sep-2008	6	FALSE
8	Sunday	05-Oct-2008	4	FALSE
9	Saturday	11-Oct-2008	0	FALSE

The format and results of the functions are shown in the spreadsheets below.

Formulas:

	A
11	=COUNTIF(A1:A9, "Wednesday")
12	=COUNTIF(A1:A9, "<>Wednesday")
13	=COUNTIF(B1:B9, ">01/10/2008")
14	=COUNTIF(C1:C9, 0)
15	=COUNTIF(C1:C9, ">=3")
16	=COUNTIF(D1:D9, TRUE)

Results:

	A
11	3
12	6
13	2
14	2
15	4
16	3

Example 2

In the example below, the Excel Countif function is used to identify duplicates in a column containing reference numbers. The function works by counting the number of times the reference number in column A of the current row has occurred so far.

Note that the function in this example uses a combination of relative and absolute cell references, so that, as the formula is copied down column B of the spreadsheet, the reference to A$2:A2 is automatically updated to A$2:A3 in row 3, A$2:A4 in row 4, etc.

This ensures that only the repeated instances of a duplicate value are highlighted. I.e. The function does not highlight the first instance of a value.

Formulas:

	A	B
1	Ref	
2	AAA111	=COUNTIF(A$2:A2, A2)
3	BBB222	=COUNTIF(A$2:A3, A3)
4	CCC333	=COUNTIF(A$2:A4, A4)
5	AAA111	=COUNTIF(A$2:A5, A5)
6	DDD444	=COUNTIF(A$2:A6, A6)
	.	.
	.	.
	.	.
7		

Results:

	A	B
1	Ref	
2	AAA111	1
3	BBB222	1
4	CCC333	1
5	AAA111	2
6	DDD444	1
	.	.
	.	.
	.	.
7		

In the above example the Excel Countif function has, as expected, identified the duplicate reference in cell A5 of the spreadsheet.

The Excel Countifs function returns the number of entries (within one or more supplied arrays), that satisfy a set of given criteria.

The function is new in Excel 2007, and so is not available in earlier versions of Excel.

The syntax of the Countifs function is:

COUNTIFS(criteria_range1, criteria1, [criteria_range2, criteria2], ...)

Where the function arguments are as follows:

criteria_range1 [criteria_range2], ...	Arrays of values (or ranges of cells containing values) to be tested against the respective criteria1, [criteria2], ... (The supplied criteria_range arrays must all have the same length
criteria1, [criteria2], ...	The conditions to be tested against the values in criteria_range1, [criteria_range2], ...

Up to 127 pairs of criteria_range and criteria arguments can be supplied to the function.

Each of the supplied criteria can be either:

- a numeric value (which may be an integer, decimal, date, time, or logical value) (eg. 10, 01/01/2008, TRUE)

or

- a text string (eg. "Name", "Sunday")

or

- an expression (eg. ">12", "<>0").

Note that if your criteria is a text string or an expression, this must be supplied to the function in quotes.

Also note that the Excel Countifs function is not case-sensitive. So, for example, the text strings "TEXT" and "text" will be considered to be equal.

Examples

The spreadsheet below shows a set of exam results for a class of students.

The Countifs function can be used to find the number of rows in the data set that satisfy conditions relating to the subject, score and gender.

	A	B	C	D
1	**Name**	**Gender**	**Subject**	**Score**
2	Anne	Female	Maths	63%
3	Anne	Female	English	78%
4	Anne	Female	Science	39%
5	Carl	Male	Maths	55%
6	Carl	Male	English	71%
7	Carl	Male	Science	51%
8	Kath	Female	Maths	78%
9	Kath	Female	English	81%
10	Kath	Female	Science	49%
11	Tony	Male	Maths	35%
12	Tony	Male	English	69%
13	Tony	Male	Science	65%

This is shown in the examples below.

Example 1

If we want to know how many female test scores were greater than 60%, we could use the following formula:

=COUNTIFS(B2:B13, "Female", D2:D13, ">60%")

which gives the result 4.

In this example, the formula has counted the number of rows where:

- The entry in column B is equal to "Female"

and

- The entry in column D is greater than "60%".

Example 2

If we want to know how many science tests scores were less than 50%, we could use the formula:

=COUNTIFS(C2:C13, "Science", D2:D13, "<50%")

which gives the result 2.

SUM related functions

The Excel SUM function adds together a supplied set of numbers and returns the sum of these values.

The syntax of the function is:

SUM(number1, [number2], ...)

where the number arguments are a set of numbers (or arrays of numbers) that you want to find the sum of.

In current versions of Excel (Excel 2007 and later), you can enter up to 255 number arguments to the Excel Sum function, but in Excel 2003, the function can only handle up to 30 arguments. However, each argument can consist of an array of values or a range of cells, each of which can contain many values.

Numbers and dates are always counted as numeric values by the Excel Sum function. However, text representations and logical values are handled differently, depending on whether they are values stored in the cells of your spreadsheet, or they are supplied directly to the function.

The table below summarises which values are included in the Excel Sum Function calculation, and which values are ignored or result in errors:

	Value Within a Range of Cells	Value Supplied Directly to Function
Numbers	Included	Included
Dates	Included	Included
Logical Values	Ignored	Included (True=1; False=0)
Text Representations of Numbers & Dates	Ignored	Included
Other Text	Ignored	#VALUE! Error
Errors	Error	Error

Examples

The following spreadsheets show the Excel Sum function used to calculate the sum of the numbers 5, 6, 7, 8 & 9. In each of the five examples, the numbers are supplied to the Sum function in a different way.

Formulas:

	A	B
1	5	=SUM(5, 6, 7, 8, 9)
2	6	=SUM({5,6,7}, 8, 9)
3	7	=SUM(A1, A2, A3, A4, A5)
4	8	=SUM(A1, A2, A3, "8", "9")
5	9	=SUM(A1:A5)

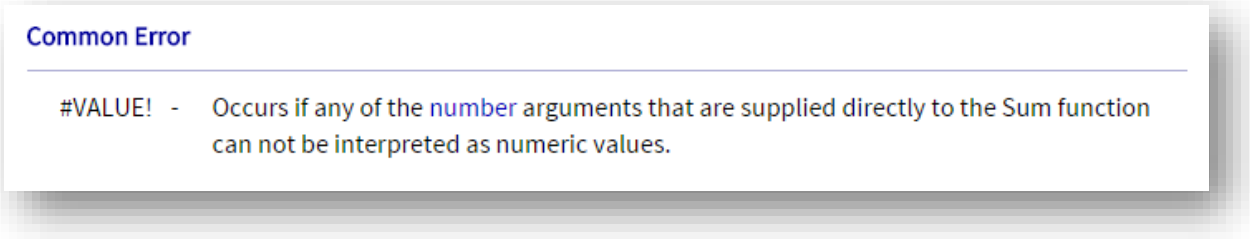
Results:

	A	B
1	5	35
2	6	35
3	7	35
4	8	35
5	9	35

Note that, in the above example spreadsheets:

- Each argument to the Sum function can be supplied as a single value or cell, or as an array of values or cells (note that in cell B2, the argument {5,6,7} is an array of numbers);
- When supplied directly to the function, text representations of numbers are included in the Sum calculation (see the example in cell B4).

If you get an error from the Excel Sum Function, this is likely to be the #VALUE! error:



There are also conditional version of Sum related functions:

Conditional Sums	
SUMIF	Adds the cells in a supplied range, that satisfy a given criteria
SUMIFS	Adds the cells in a supplied range, that satisfy multiple criteria (New in Excel 2007)

SUMPRODUCT

The Excel SumProduct function returns the sum of the products of the corresponding values in a set of supplied arrays.

The format of the function is:

SUMPRODUCT(array1, [array2], [array3], ...)

where the array arguments are one or more arrays of numeric values that you want to sum the products of.

Note that:

- All of the supplied arrays must have the same dimensions;
- If just one array is supplied, the function returns the sum of the values in that array.
- Non-numeric values in the supplied arrays are treated as the value zero;
- In current versions of Excel (Excel 2007 and later), you can provide up to 255 arrays of values to the SumProduct function, but in Excel 2003, the function can only handle up to 30 arrays of values;
- Arrays that are supplied directly to the SumProduct function should be surrounded by curly braces, with values in the same row separated by a comma and each row separated by a semicolon. An example of a vertical array is shown in cells C3 and C4 of the 'Formulas' spreadsheet below.

Examples

The spreadsheets on the right show 3 examples of the SumProduct function.

Formulas:

	A	B	C
1	Array 1	Array 2	Sumproduct
2	1	5	=SUMPRODUCT(A2:A4, B2:B4)
3	2	6	=SUMPRODUCT(A2:A4, B2:B4, {2; 4; 1})
4	3	4	=SUMPRODUCT(A2:A4, B2:B4, {2; 4; "text"})

Results:

	A	B	C	D
1	Array 1	Array 2	Sumproduct	
2	1	5	29	*= 1x5 + 2x6 + 3x4*
3	2	6	70	*= 1x5x2 + 2x6x4 + 3x4x1*
4	3	4	58	*= 1x5x2 + 2x6x4 + 3x4x0*
5				*(note "text" is treated as 0)*

Note that:

- The examples in cells C3 and C4 show how the array arguments can be supplied directly, to the function, as well as in the form of arrays of cells;
- The "text" value in cell C4 is treated as the value 0 by the Sumproduct function.

DATE & TIME functions

Excel Date and Time Functions, which can be used to extract information from, and perform operations on, Excel dates and times.

The functions listed below are grouped into categories, to help you to find the function you need. Note that some of the functions are new to Excel 2010 or Excel 2013, so are not available in earlier versions of Excel.

Creating Dates & Times	
DATE	Returns a date, from a user-supplied year, month and day
TIME	Returns a time, from a user-supplied hour, minute and second
DATEVALUE	Converts a text string showing a date, to an integer that represents the date in Excel's date-time code
TIMEVALUE	Converts a text string showing a time, to a decimal that represents the time in Excel

Current Date & Time	
NOW	Returns the current date & time
TODAY	Returns today's date

Extracting The Components of a Time	
HOUR	Returns the hour part of a user-supplied time
MINUTE	Returns the minute part of a user-supplied time
SECOND	Returns the seconds part of a user-supplied time

Extracting The Components of a Date	
DAY	Returns the day (of the month) from a user-supplied date
MONTH	Returns the month from a user-supplied date
YEAR	Returns the year from a user-supplied date
WEEKNUM	Returns an integer representing the week number (from 1 to 53) of the year from a user-supplied date
ISOWEEKNUM	Returns the ISO week number of the year for a given date (New in Excel 2013)
WEEKDAY	Returns an integer representing the day of the week for a supplied date

Performing Calculations with Dates	
EDATE	Returns a date that is the specified number of months before or after an initial supplied start date
EMONTH	Returns a date that is the last day of the month which is a specified number of months before or after an initial supplied start date
WORKDAY	Returns a date that is a supplied number of working days (excluding weekends & holidays) ahead of a given start date
WORKDAY.INTL	Returns a date that is a supplied number of working days (excluding weekends & holidays) ahead of a given start date, using supplied parameters to specify weekend days (New in Excel 2010)
DAYS	Calculates the number of days between 2 dates (New in Excel 2013)
DAYS360	Calculates the number of days between 2 dates, based on a 360-day year (12 x 30 months)
NETWORKDAYS	Returns the number of whole networkdays (excluding weekends & holidays), between two supplied dates
NETWORKDAYS.INTL	Returns the number of whole networkdays (excluding weekends & holidays), between two supplied dates, using parameters to specify weekend days (New in Excel 2010)
YEARFRAC	Calculates the fraction of the year represented by the number of whole days between two dates

EX6.4: *Simplified Age Calculation in Excel*

The simplest way to calculate age in Excel is to subtracting the current date from the birth date and divide this result by 365.25 (the average number of days in a year). This resulting value is then truncated to an integer using the Excel Int function. This is shown below:

	A	B
1	Birth Date:	21-Nov-1960
2	Current Date:	01-Jan-2011
3	Age:	=INT((B2-B1) / 365.25)

While the above formula works in over 99% of cases, inaccuracies are introduced, due to the 'average' day count of 365.25. For example, if the birth date is 01-Mar-2000 and the current date is 01-Mar-2010, the above formula gives the incorrect age 9, when the correct age is 10.

Similar inaccuracies can also occur if you use the most frequent day count of 365. Therefore, if you want 100% accuracy in you Excel age calculation, you need to use the following, more complex formula.

Accurate Age Calculation in Excel

Although the following formula may appear to be complicated, this level of complexity is necessary if you want to accurately calculate age in Excel. The formula uses the Excel date functions, along with a nested Excel If function:

	A	B
1	Birth Date:	21-Nov-1960
2	Current Date:	01-Jan-2011
3	Age:	=YEAR(B2) - YEAR(B1) - IF(MONTH(B2) > MONTH(B1), 0, IF(MONTH(B2) < MONTH(B1), 1, IF(DAY(B2) < DAY(B1), 1, 0)))

The above formula initially calculates the number of years between the current date and the birth date. However, the resulting value needs to be adjusted, depending on whether the birthday has passed during the current year. To do this, we have used the Excel If function to first check if the current month is less than or greater than the month of the birth date. If the month is the same, the days of the month are compared, to determine whether the birthday has been passed during the current year.

Use of the Today Function to Automatically Update an Age Calculation in Excel

If you want your age formula to update automatically, depending on the current date, this can be done using the Excel Today function. This function simply returns the current date. Therefore, if you replace the value in cell B2 of the above spreadsheet, with the formula =TODAY(), the age formula in cell B3 will update automatically with the current date.

Alternatively, you could replace every reference to cell B2 with the Today function, so that the Excel age calculation formula becomes:

```
=YEAR( TODAY() ) - YEAR(B1) - IF( MONTH( TODAY() ) > MONTH(B1), 0,
                                IF( MONTH( TODAY() ) < MONTH(B1), 1,
                                IF( DAY( TODAY() ) < DAY(B1), 1, 0 ) ) )
```

Information Functions (ISNA, ISEVEN, ISERR…)

These functions mainly provide information about the contents of cells, such as data type, although Excel has also included functions that will return information about the formatting and location of cells.

The functions have been grouped into categories, to help you to find the function you need. Selecting a function name will take you to a full description of the function with examples of use.

Error Information Functions	
ISERROR	Tests if an initial supplied value (or expression) returns an error and if so, returns TRUE; Otherwise returns FALSE
ISERR	Tests if an initial supplied value (or expression) returns an error (EXCEPT for the #N/A error) and if so, returns TRUE; Otherwise returns FALSE
ISNA	Tests if an initial supplied value (or expression) returns the Excel #N/A error and if so, returns TRUE; Otherwise returns FALSE
ERROR.TYPE	Tests a supplied value and returns an integer relating to the supplied value's error type

Numerical Information Functions	
ISNUMBER	Tests if a supplied value is a number, and if so, returns TRUE; Otherwise, returns FALSE.
ISEVEN	Tests if a supplied number (or expression) is an even number, and if so, returns TRUE; Otherwise, returns FALSE.
ISODD	Tests if a supplied number (or expression) is an odd number, and if so, returns TRUE; Otherwise, returns FALSE.
N	Converts a non-number value to a number, a date to a serial number, the logical value TRUE to 1 and all other values to 0

Function Returning a Constant Value	
NA	Returns the Excel #N/A error

Other Data Type Functions	
ISBLANK	Tests if a supplied cell is blank (empty), and if so, returns TRUE; Otherwise, returns FALSE
ISLOGICAL	Tests if a supplied value is a logical value, and if so, returns TRUE; Otherwise, returns FALSE
ISTEXT	Tests if a supplied value is text, and if so, returns TRUE; Otherwise, returns FALSE
ISNONTEXT	Tests if a supplied value is text, and if it is NOT, returns TRUE; Otherwise, returns FALSE
ISREF	Tests if a supplied value is a reference, and if so, returns TRUE; Otherwise, returns FALSE
ISFORMULA	Tests if a supplied cell contains a formula and if so, returns TRUE; Otherwise, returns FALSE (New in Excel 2013)
TYPE	Returns information about the data type of a supplied value

General Information Functions	
CELL	Returns information about the contents, formatting or location of a given cell
SHEET	Returns the sheet number relating to a supplied reference (New in Excel 2013)
SHEETS	Returns the number of sheets in a reference (New in Excel 2013)
INFO	Returns information about the the current operating environment

Note that some of the Information functions are new in Excel 2013 and so are not available in earlier versions of Excel.

Below are more details of few of these functions

The Excel ISNA function tests if an initial supplied expression (or value) returns the Excel #N/A Error, and if so, returns TRUE; Otherwise the function returns FALSE.

The format of the function is:

ISNA(value)

Where the value argument is the expression or value to be tested.

The following spreadsheets show several examples of the Excel Isna function.

Formulas:

	A	B
1		=ISNA(536)
2		=ISNA("text")
3		=ISNA(#N/A)
4		=ISNA(10+5)
5		=ISNA(VLOOKUP(10, A1:A7, 1, 0))
6	#N/A	=ISNA(A6)
7	#DIV/0!	=ISNA(A7)
8		=ISNA(A8)

Results:

	A	B
1		FALSE
2		FALSE
3		TRUE
4		FALSE
5		TRUE
6	#N/A	TRUE
7	#DIV/0!	FALSE
8		FALSE

The above examples use different argument types, including:

- Simple values (see cells B1 - B3);
- Expressions (see cells B4 & B5);
- Cell references (see cells B6 - B8).

Note also that, in the above examples:

- Although the expression in cell A7 is an error, this is not the #N/A error, so the Isna function in cell B7 returns FALSE.
- In cell B5, the VLookup function cannot find the value '10' in column A of the spreadsheet, and so returns the #N/A error. Therefore, the Isna function returns TRUE.

The Excel Iserror function tests if an initial supplied expression (or value) returns an Excel Error, and if so, returns the logical value TRUE; Otherwise the function returns FALSE.

The syntax of the function is:

ISERROR(value)

Where the value argument is the expression or value to be tested.

The following spreadsheets show several examples of the Excel Iserror function.

Formulas:

	A	B
1		=ISERROR(559)
2		=ISERROR("text")
3		=ISERROR(#N/A)
4		=ISERROR(225/0)
5		=ISERROR(225/5)
6	#N/A	=ISERROR(A6)
7		=ISERROR(A7)

Results:

	A	B
1		FALSE
2		FALSE
3		TRUE
4		TRUE
5		FALSE
6	#N/A	TRUE
7		FALSE

In the examples above, the arguments to the Iserror function calls are:

- Simple values in cells B1 - B3;
- Expressions in cells B4 & B5 (note the division by zero in cell B4 will produce the #DIV/0! error);
- Cell references in cells B6 & B7.

Module 7 – *Data Filtering and Grouping*

If your worksheet contains a lot of content, it can be difficult to find information quickly. Filters can be used to narrow down the data in your worksheet, allowing you to view only the information you need.

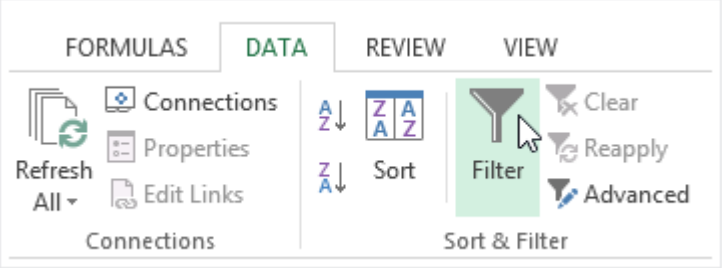
To filter data:

In following example, we'll apply a filter to an equipment log worksheet to display only the laptops and projectors that are available for checkout.

1. In order for filtering to work correctly, your worksheet should include a **header row**, which is used to identify the name of each column. In our example, our worksheet is organized into different columns identified by the header cells in row 1: ID#, Type, Equipment Detail, and so on.

	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
2	3000	Camera	Saris Lumina Digital Camera	12-May-13	15-May-13	Shannon Nguyen
3	3005	Camera	Saris Zoom Z-60 Digital Camera	27-Jul-13	06-Aug-13	Sela Shepard
4	3070	Camera	Omega PixL Digital Camcorder	06-Oct-13		Min Seung
5	1021	Laptop	15" EDI SmartPad L200-3	15-Sep-13	01-Oct-13	Sofie Ragnar
6	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-13	16-Aug-13	Hank Sorenson
7	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-13	15-Aug-13	Jennifer Weiss
8	1025	Laptop	15" EDI SmartPad L200-4X	26-Sep-13	04-Oct-13	Min Seung
9	1031	Laptop	17" Saris X-10 Laptop	04-Oct-13		Nick Ortiz
10	1032	Laptop	17" Saris X-10 Laptop	19-Sep-13		Stanley Geyer
11	1033	Laptop	17" Saris X-10 Laptop	24-Sep-13	26-Sep-13	George D'Agosta

2. Select the **Data** tab, then click the **Filter** command.



3. A **drop-down arrow** The drop-down arrow will appear in the header cell for each column.

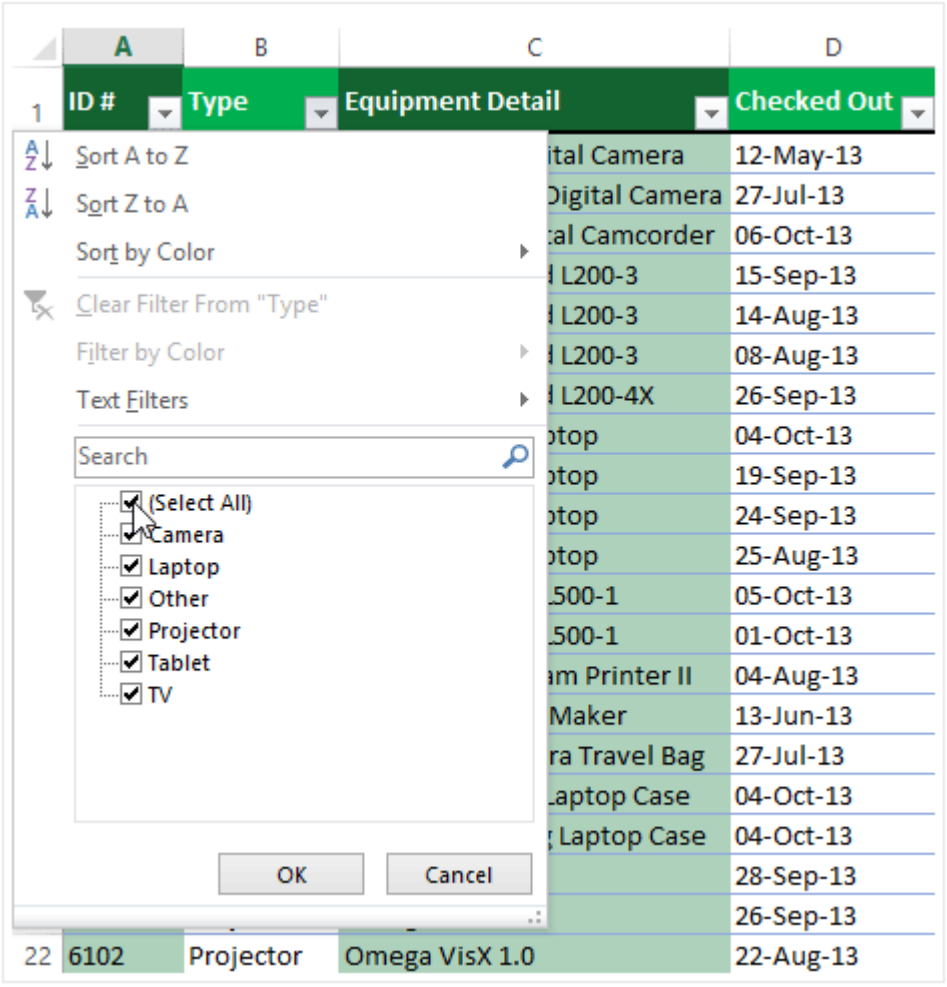
4. Click the **drop-down arrow** for the column you want to filter. In our example, we will filter column **B** to view only certain types of equipment.

	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
2	3000	Camera	aris Lumina Digital Camera	12-May-13	15-May-13	Shannon Nguyen
3	3005	Camera	n Z-60 Digital Camera	27-Jul-13	06-Aug-13	Sela Shepard
4	3070	Camera	Omega PixL Digital Camcorder	06-Oct-13		Min Seung
5	1021	Laptop	15" EDI SmartPad L200-3	15-Sep-13	01-Oct-13	Sofie Ragnar
6	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-13	16-Aug-13	Hank Sorenson
7	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-13	15-Aug-13	Jennifer Weiss
8	1025	Laptop	15" EDI SmartPad L200-4X	26-Sep-13	04-Oct-13	Min Seung
9	1031	Laptop	17" Saris X-10 Laptop	04-Oct-13		Nick Ortiz
10	1032	Laptop	17" Saris X-10 Laptop	19-Sep-13		Stanley Geyer
11	1033	Laptop	17" Saris X-10 Laptop	24-Sep-13	26-Sep-13	George D'Agosta

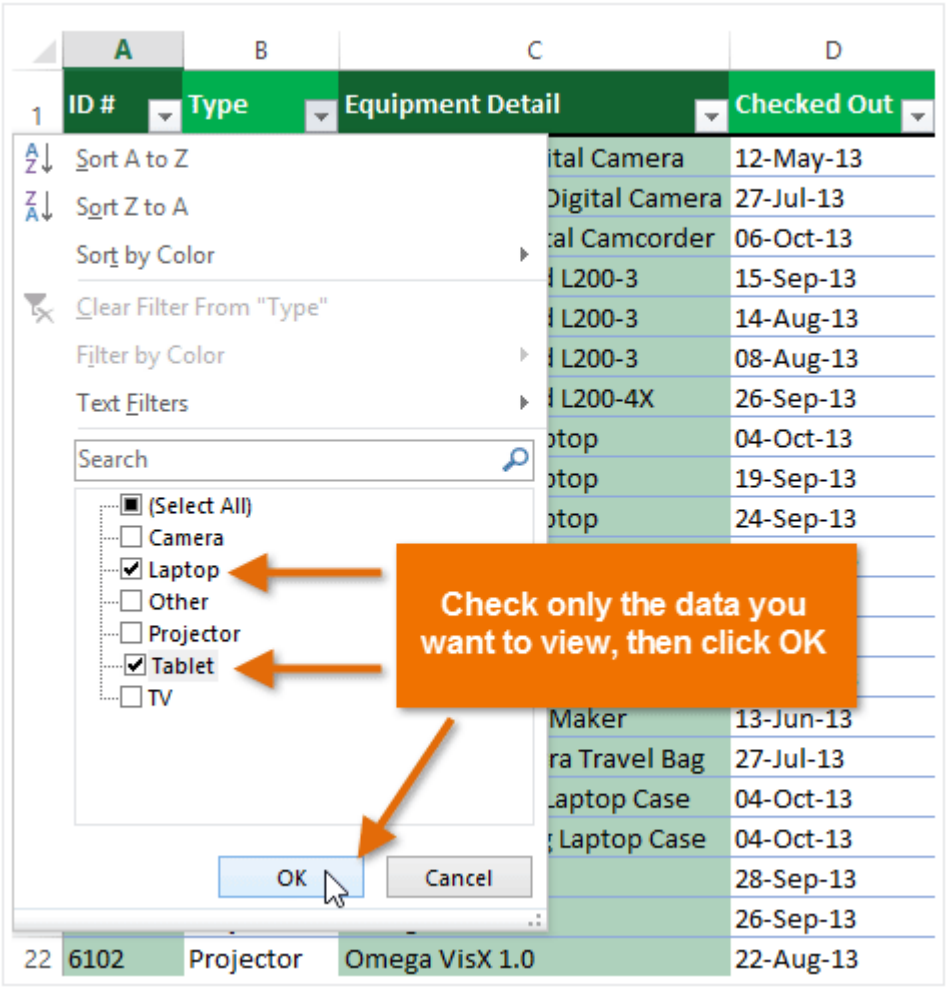
Type:
(Showing All)

5. The **Filter menu** will appear.

6. **Uncheck** the box next to **Select All** to quickly deselect all data.



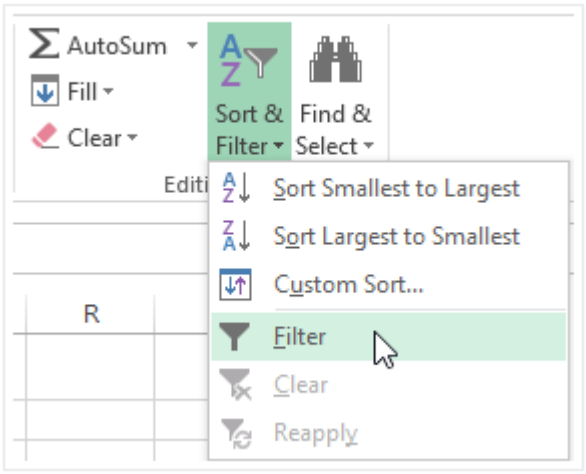
7. **Check** the boxes next to the data you want to filter, then click **OK**. In this example, we will check **Laptop** and **Tablet** to view only those types of equipment.



8. The data will be **filtered**, temporarily hiding any content that doesn't match the criteria. In our example, only laptops and tablets are visible.

	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
5	1021	Laptop	15" EDI SmartPad L200-3	15-Sep-13	01-Oct-13	Sofie Ragnar
6	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-13	16-Aug-13	Hank Sorenson
7	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-13	15-Aug-13	Jennifer Weiss
8	1025	Laptop	15" EDI SmartPad L200-4X	26-Sep-13	04-Oct-13	Min Seung
9	1031	Laptop	17" Saris X-10 Laptop	04-Oct-13		Nick Ortiz
10	1032	Laptop	17" Saris X-10 Laptop	19-Sep-13		Stanley Geyer
11	1033	Laptop	17" Saris X-10 Laptop	24-Sep-13	26-Sep-13	George D'Agosta
12	1034	Laptop	17" Saris X-10 Laptop	25-Aug-13	27-Aug-13	Jay Peralta
26	1011	Tablet	Saris SlimTab Pro	04-Aug-13		Jay Peralta
27	1012	Tablet	Saris SlimTab Pro	29-Sep-13		August Zorn
31						
32						

Filtering options can also be accessed from the **Sort & Filter** command on the **Home** tab.



To apply multiple filters:

Filters are **cumulative**, which means you can apply **multiple filters** to help narrow down your results. In this example, we've already filtered our worksheet to show laptops and projectors, and we'd like to narrow it down further to only show laptops and projectors that were checked out in August.

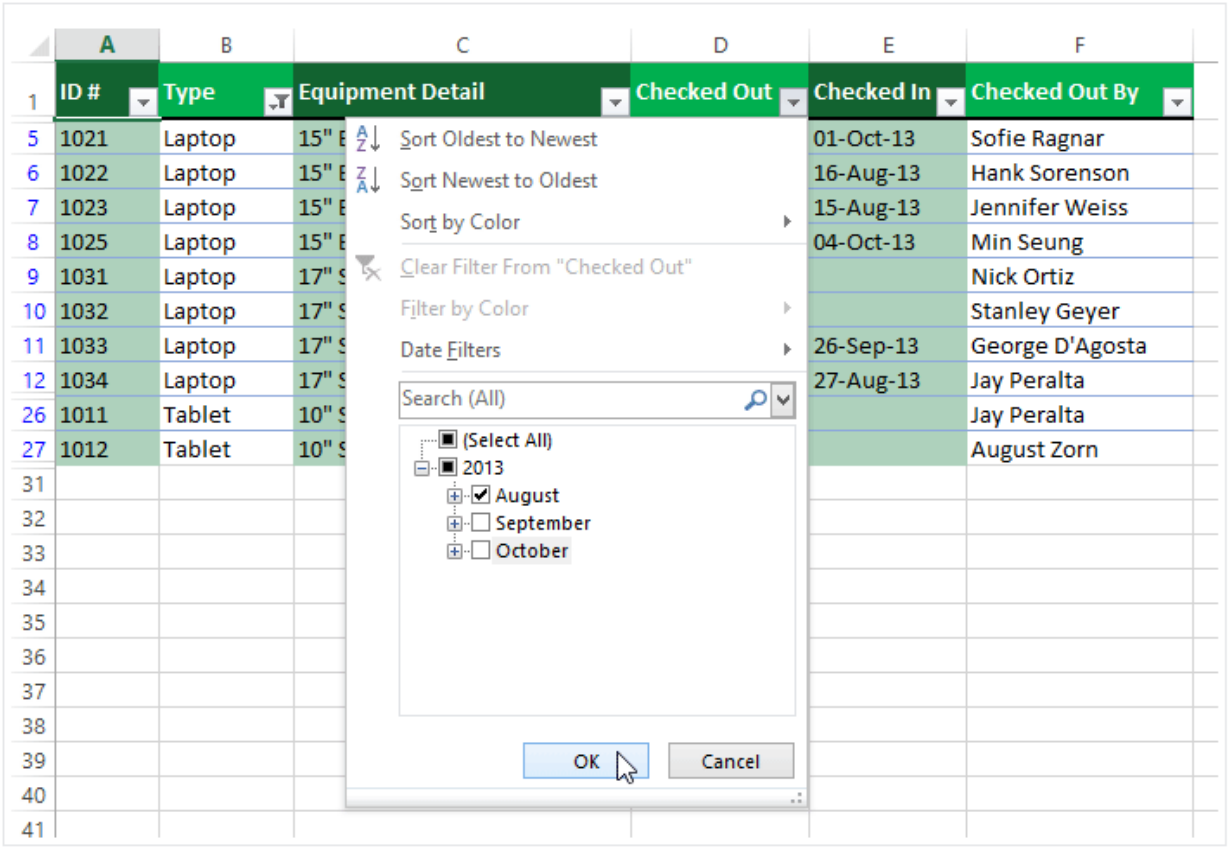
1. Click the **drop-down arrow** for the column you want to filter. In this example, we will add a filter to column **D** to view information by date.

	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
5	1021	Laptop	15" EDI SmartPad L200-3	15-Sep-13		Sofie Ragnar
6	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-13		Hank Sorenson
7	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-13	15-Aug-13	Jennifer Weiss
8	1025	Laptop	15" EDI SmartPad L200-4X	26-Sep-13	04-Oct-13	Min Seung
9	1031	Laptop	17" Saris X-10 Laptop	04-Oct-13		Nick Ortiz
10	1032	Laptop	17" Saris X-10 Laptop	19-Sep-13		Stanley Geyer
11	1033	Laptop	17" Saris X-10 Laptop	24-Sep-13	26-Sep-13	George D'Agosta
12	1034	Laptop	17" Saris X-10 Laptop	25-Aug-13	27-Aug-13	Jay Peralta
26	1011	Tablet	Saris SlimTab Pro	04-Aug-13		Jay Peralta
27	1012	Tablet	Saris SlimTab Pro	29-Sep-13		August Zorn
31						
32						

Checked Out: (Showing All)

2. The **Filter menu** will appear.

3. **Check** or **uncheck** the boxes depending on the data you want to filter, then click OK. In our example, we'll uncheck everything except for August.



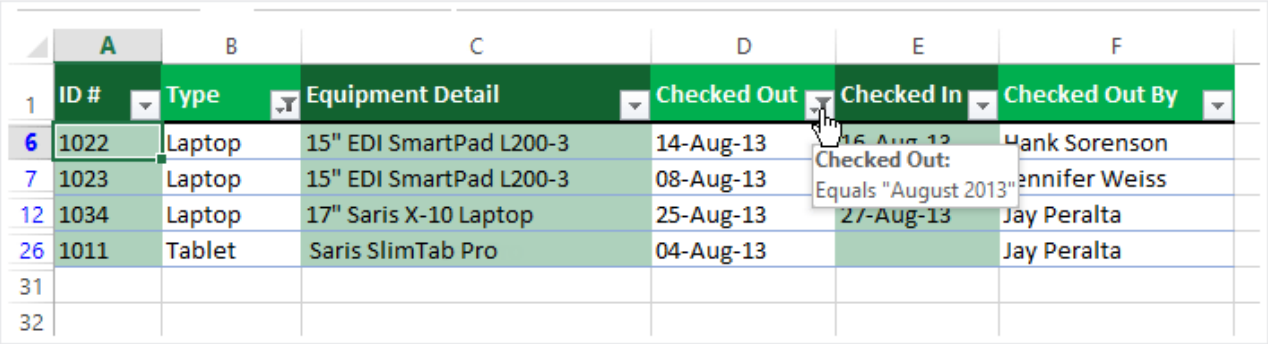
4. The new filter will be applied. In our example, the worksheet is now filtered to show only laptops and tablets that were checked out in August.

	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
6	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-13	16-Aug-13	Hank Sorenson
7	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-13	15-Aug-13	Jennifer Weiss
12	1034	Laptop	17" Saris X-10 Laptop	25-Aug-13	27-Aug-13	Jay Peralta
26	1011	Tablet	Saris SlimTab Pro	04-Aug-13		Jay Peralta

To clear a filter:

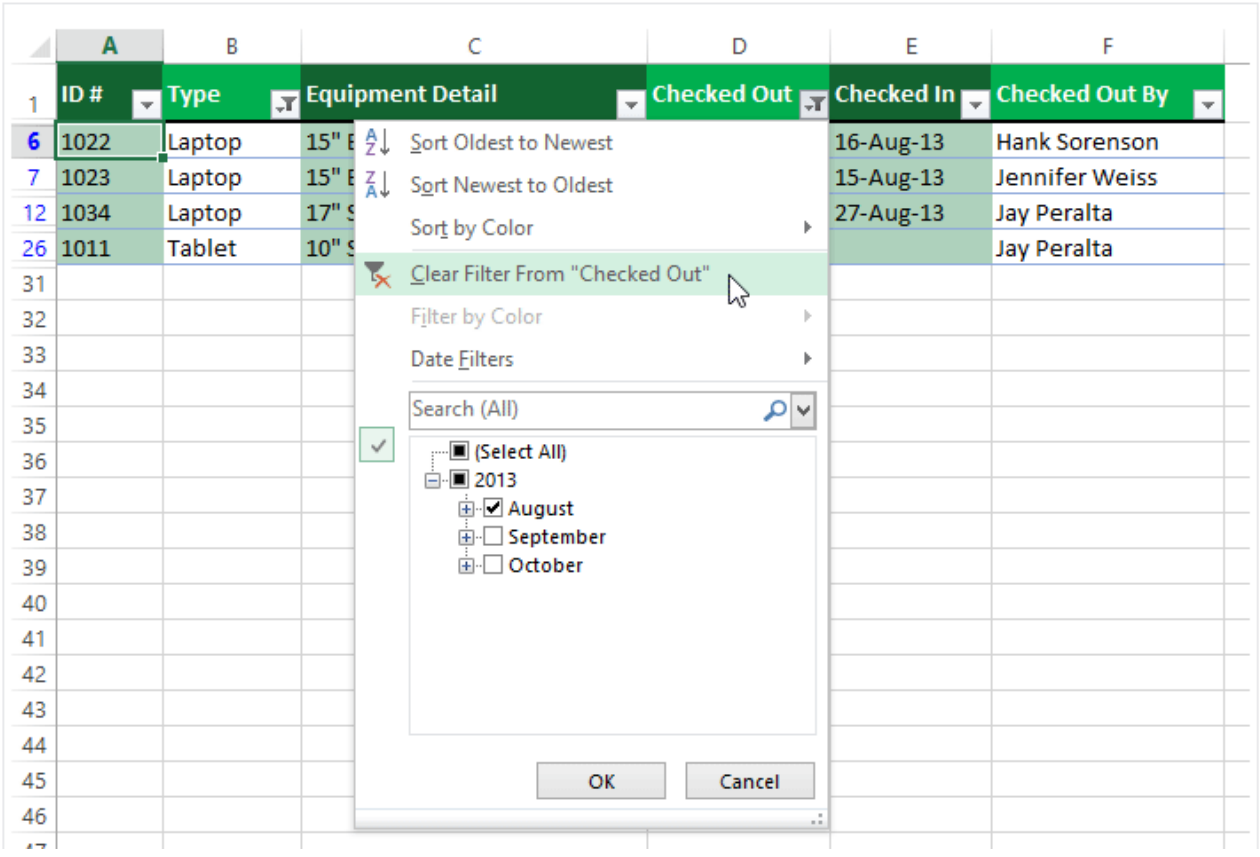
After applying a filter, you may want to remove—or **clear**—it from your worksheet so you'll be able to filter content in different ways.

1. Click the drop-down arrow for the filter you want to clear. In our example, we'll clear the filter in column D



2. The **Filter menu** will appear.

3. Choose **Clear Filter From [COLUMN NAME]** from the Filter menu. In our example, we'll select **Clear Filter From "Checked Out"**.

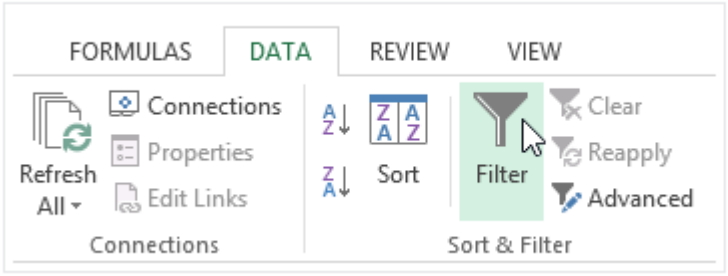


4. The filter will be cleared from the column. The previously hidden data will be displayed.

	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
5	1021	Laptop	15" EDI SmartPad L200-3	15-Sep-13		Sofie Ragnar
6	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-13		Hank Sorenson
7	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-13	15-Aug-13	Jennifer Weiss
8	1025	Laptop	15" EDI SmartPad L200-4X	26-Sep-13	04-Oct-13	Min Seung
9	1031	Laptop	17" Saris X-10 Laptop	04-Oct-13		Nick Ortiz
10	1032	Laptop	17" Saris X-10 Laptop	19-Sep-13		Stanley Geyer
11	1033	Laptop	17" Saris X-10 Laptop	24-Sep-13	26-Sep-13	George D'Agosta

Checked Out:
(Showing All)

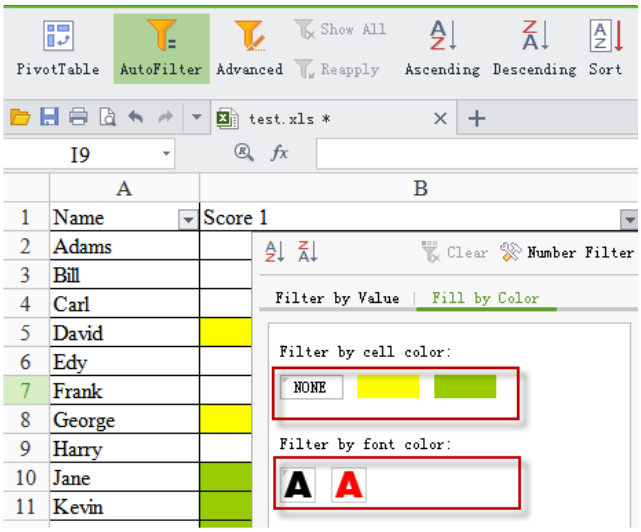
To remove all filters from your worksheet, click the Filter command on the Data tab.



Filter By Color, Filter by Icon Sets

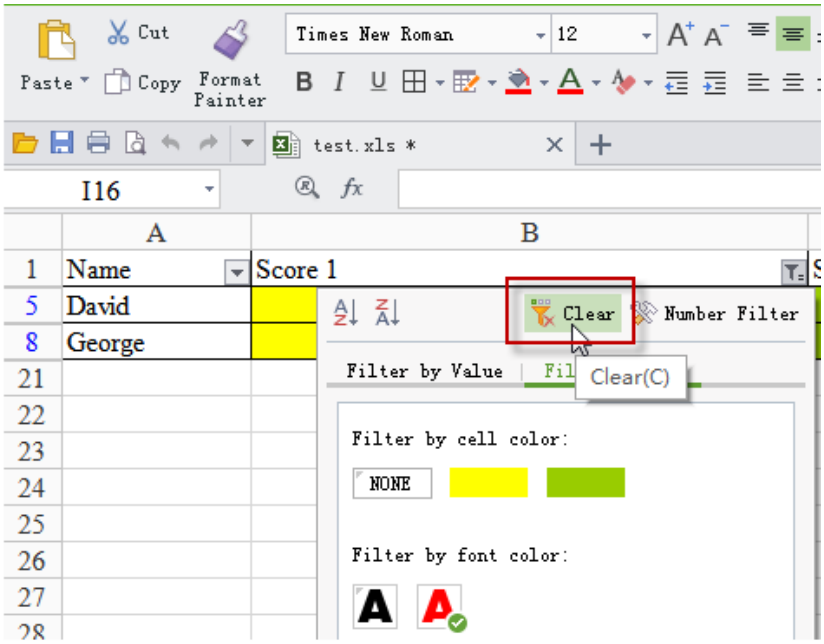
Follow these steps to filter data by cell color / font color.

1. Open a worksheet with Spreadsheets 2013.
2. Select the range of cells you want to filter.
3. Go to Home or Data tab, click on Autofilter.
4. Click on the drop-down arrow in each cell of the first line in the selected range. In the autofilter option dialog, click on Filter by Color.



You can either filter the data by cell color or font color, in case you have formatted the cells by both cell color and font color.

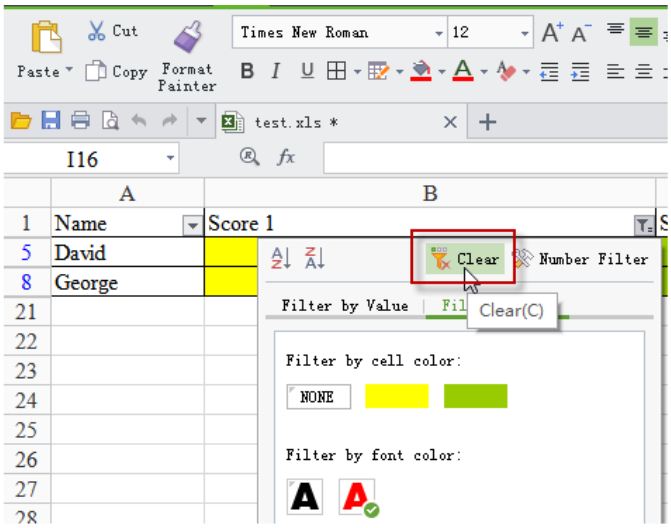
Click one color from the above font color and cell color list. For example, select the font color of Red. You will see the data is filtered like below:



Remove Color Filter

If you want to remove the color filter you have applied to the worksheet data, follow these steps to clear the filter from the worksheet.

1. Click on the autofilter icon in the column header.
2. In the autofilter option dialog, click on Clear.



The filter is removed. If you want to reapply the filter, please go to Home or Data tab, click on AutoFilter option and choose Reapply from the drop-down list.

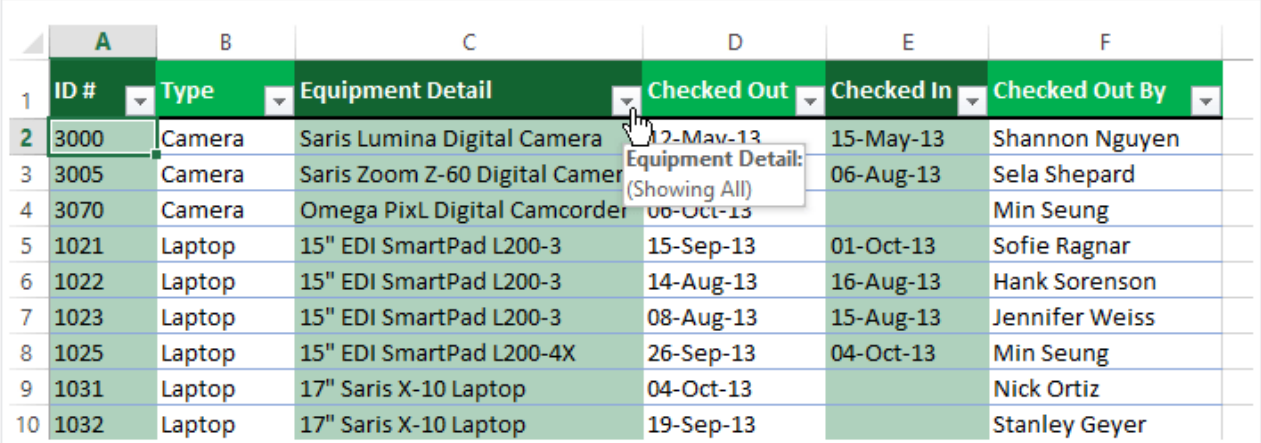
Advanced Filter

If you need to filter for something specific, basic filtering may not give you enough options. Fortunately, Excel includes many advanced filtering tools, including search, text, date, and number filtering, which can narrow your results to help find exactly what you need.

To filter with search:

Excel allows you to search for data that contains an exact phrase, number, date, and more. In our example, we'll use this feature to show only Saris brand products in our equipment log.

1. Select the **Data** tab, then click the **Filter** command. A **drop-down arrow** will appear in the header cell for each column. Note: If you've already added filters to your worksheet, you can skip this step.



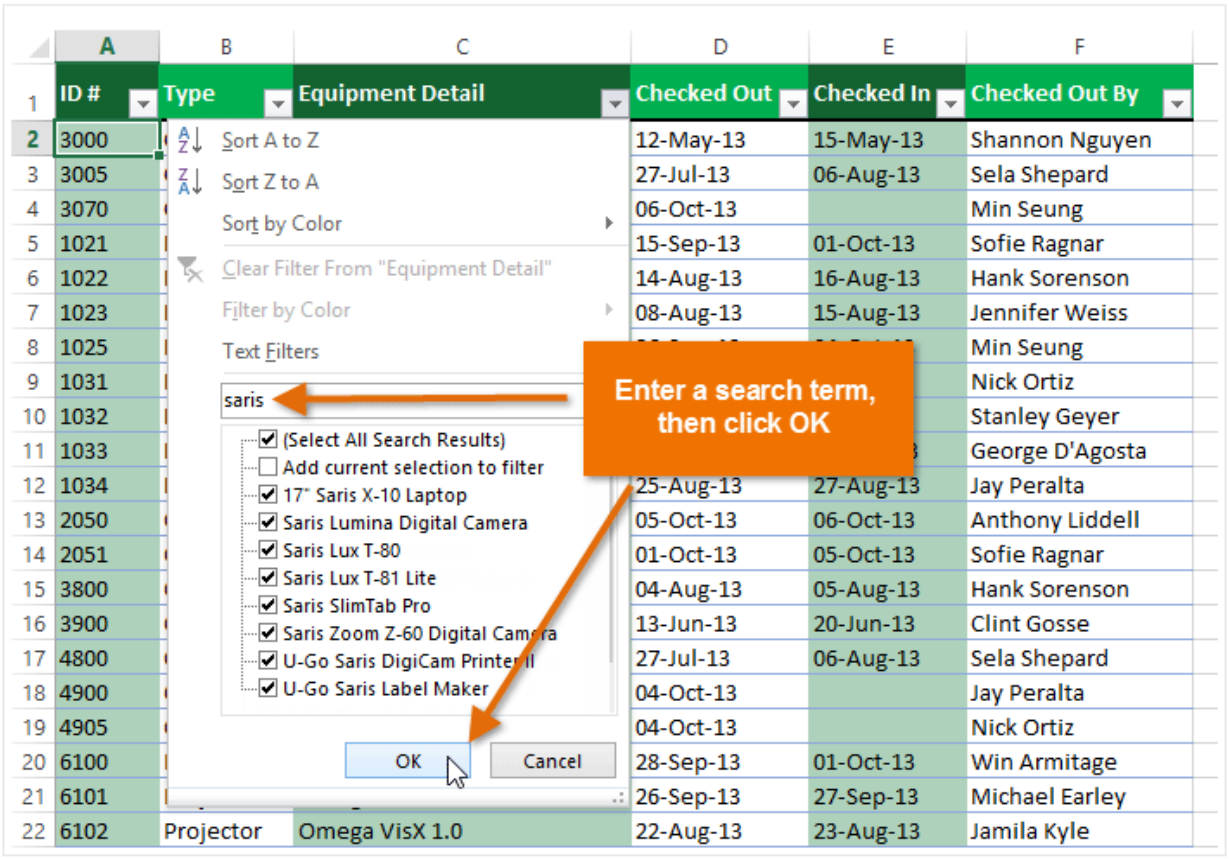
	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
2	3000	Camera	Saris Lumina Digital Camera	12-May-13	15-May-13	Shannon Nguyen
3	3005	Camera	Saris Zoom Z-60 Digital Camer		06-Aug-13	Sela Shepard
4	3070	Camera	Omega PixL Digital Camcorder	06-Oct-13		Min Seung
5	1021	Laptop	15" EDI SmartPad L200-3	15-Sep-13	01-Oct-13	Sofie Ragnar
6	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-13	16-Aug-13	Hank Sorenson
7	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-13	15-Aug-13	Jennifer Weiss
8	1025	Laptop	15" EDI SmartPad L200-4X	26-Sep-13	04-Oct-13	Min Seung
9	1031	Laptop	17" Saris X-10 Laptop	04-Oct-13		Nick Ortiz
10	1032	Laptop	17" Saris X-10 Laptop	19-Sep-13		Stanley Geyer

Equipment Detail:
(Showing All)

2. Click the **drop-down arrow** for the column you want to filter. In our example, we'll filter column **C**.

3. The **Filter menu** will appear. Enter a **search term** into the **search box**. Search results will appear automatically below the **Text Filters** field as you type. In our example, we'll type **saris** to find all Saris brand equipment.

4. When you're done, click **OK**.



	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
2	3000			12-May-13	15-May-13	Shannon Nguyen
3	3005			27-Jul-13	06-Aug-13	Sela Shepard
4	3070			06-Oct-13		Min Seung
5	1021			15-Sep-13	01-Oct-13	Sofie Ragnar
6	1022			14-Aug-13	16-Aug-13	Hank Sorenson
7	1023			08-Aug-13	15-Aug-13	Jennifer Weiss
8	1025					Min Seung
9	1031					Nick Ortiz
10	1032					Stanley Geyer
11	1033					George D'Agosta
12	1034			25-Aug-13	27-Aug-13	Jay Peralta
13	2050			05-Oct-13	06-Oct-13	Anthony Liddell
14	2051			01-Oct-13	05-Oct-13	Sofie Ragnar
15	3800			04-Aug-13	05-Aug-13	Hank Sorenson
16	3900			13-Jun-13	20-Jun-13	Clint Gosse
17	4800			27-Jul-13	06-Aug-13	Sela Shepard
18	4900			04-Oct-13		Jay Peralta
19	4905			04-Oct-13		Nick Ortiz
20	6100			28-Sep-13	01-Oct-13	Win Armitage
21	6101			26-Sep-13	27-Sep-13	Michael Earley
22	6102	Projector	Omega VisX 1.0	22-Aug-13	23-Aug-13	Jamila Kyle

5. The worksheet will be filtered according to your search term. In our example, the worksheet is now filtered to show only Saris brand equipment.

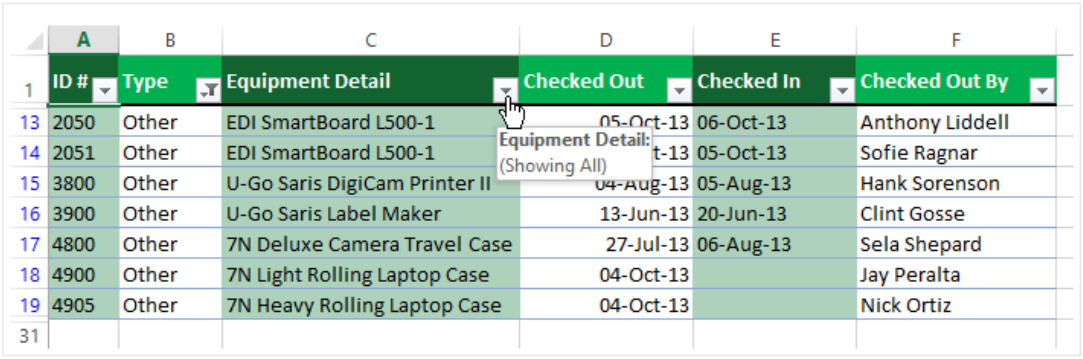
	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
2	3000	Camera	Saris Lumina Digital Camera	12-May-13	15-May-13	Shannon Nguyen
3	3005	Camera	Saris Zoom Z-60 Digital Camera	27-Jul-13	06-Aug-13	Sela Shepard
9	1031	Laptop	17" Saris X-10 Laptop	04-Oct-13		Nick Ortiz
10	1032	Laptop	17" Saris X-10 Laptop	19-Sep-13		Stanley Geyer
11	1033	Laptop	17" Saris X-10 Laptop	24-Sep-13	26-Sep-13	George D'Agosta
12	1034	Laptop	17" Saris X-10 Laptop	25-Aug-13	27-Aug-13	Jay Peralta
15	3800	Other	U-Go Saris DigiCam Printer II	04-Aug-13	05-Aug-13	Hank Sorenson
16	3900	Other	U-Go Saris Label Maker	13-Jun-13	20-Jun-13	Clint Gosse
23	6200	Projector	Saris Lux T-80	01-Sep-13	04-Sep-13	Jolie Chaturvedi
24	6301	Projector	Saris Lux T-81 Lite	10-Sep-13		Marques Herndon
25	6302	Projector	Saris Lux T-81 Lite	08-Sep-13	15-Sep-13	Dean Sorenson
26	1011	Tablet	Saris SlimTab Pro	04-Aug-13		Jay Peralta
27	1012	Tablet	Saris SlimTab Pro	29-Sep-13		August Zorn
31						
32						

To use advanced text filters:

Advanced text filters can be used to display more specific information, such as cells that contain a certain number of characters, or data that excludes a specific word or number. In our example, we've already filtered our worksheet to only show items with Other in the Type column, but we'd like to exclude any item containing the word case.

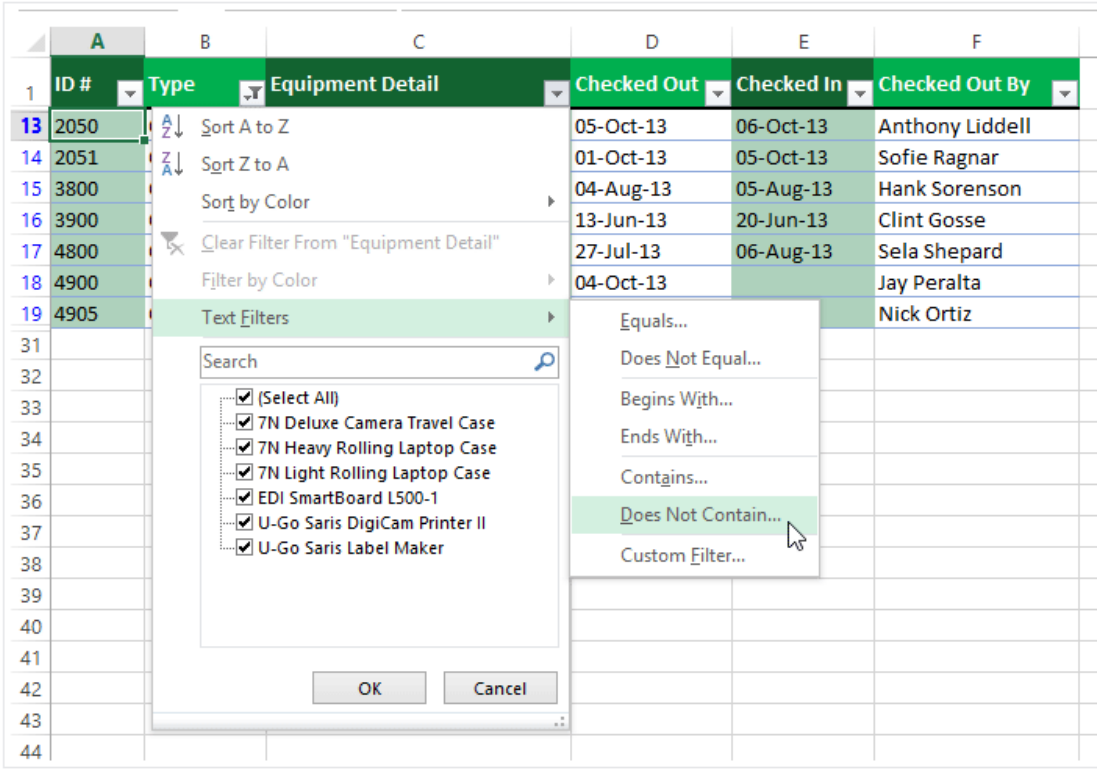
1. Select the **Data** tab, then click the **Filter** command. A **drop-down arrow** will appear in the header cell for each column. Note: If you've already added filters to your worksheet, you can skip this step.

2. Click the **drop-down ar**row for the column you want to filter. In our example, we'll filter column **C**.



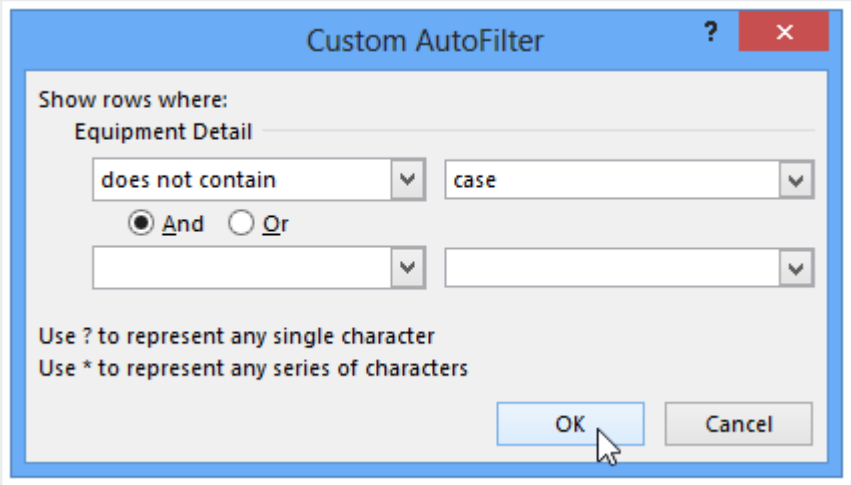
	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
13	2050	Other	EDI SmartBoard L500-1	05-Oct-13	06-Oct-13	Anthony Liddell
14	2051	Other	EDI SmartBoard L500-1	t-13	05-Oct-13	Sofie Ragnar
15	3800	Other	U-Go Saris DigiCam Printer II	04-Aug-13	05-Aug-13	Hank Sorenson
16	3900	Other	U-Go Saris Label Maker	13-Jun-13	20-Jun-13	Clint Gosse
17	4800	Other	7N Deluxe Camera Travel Case	27-Jul-13	06-Aug-13	Sela Shepard
18	4900	Other	7N Light Rolling Laptop Case	04-Oct-13		Jay Peralta
19	4905	Other	7N Heavy Rolling Laptop Case	04-Oct-13		Nick Ortiz
31						

3. The **Filter menu** will appear. Hover the mouse over **Text Filters**, then select the desired text filter from the drop-down menu. In our example, we'll choose **Does Not Contain...** to view data that does not contain specific text.



	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
13	2050			05-Oct-13	06-Oct-13	Anthony Liddell
14	2051			01-Oct-13	05-Oct-13	Sofie Ragnar
15	3800			04-Aug-13	05-Aug-13	Hank Sorenson
16	3900			13-Jun-13	20-Jun-13	Clint Gosse
17	4800			27-Jul-13	06-Aug-13	Sela Shepard
18	4900			04-Oct-13		Jay Peralta
19	4905					Nick Ortiz

4. The **Custom AutoFilte**r dialog box will appear. Enter the **desired text** to the right of the filter, then click **OK**. In our example, we'll type **case** to exclude any items containing this word.



5. The data will be filtered by the selected text filter. In our example, our worksheet now displays items in the **Other** category that do not contain the word **case**.

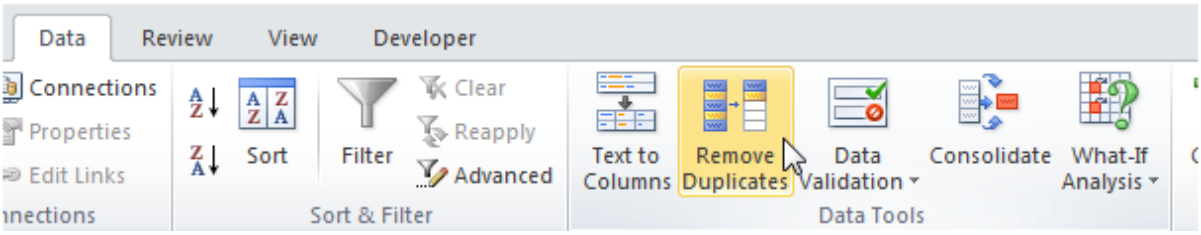
	A	B	C	D	E	F
1	ID #	Type	Equipment Detail	Checked Out	Checked In	Checked Out By
13	2050	Other	EDI SmartBoard L500-1	05-Oct-13	06-Oct-13	Anthony Liddell
14	2051	Other	EDI SmartBoard L500-1	01-Oct-13	05-Oct-13	Sofie Ragnar
15	3800	Other	U-Go Saris DigiCam Printer II	04-Aug-13	05-Aug-13	Hank Sorenson
16	3900	Other	U-Go Saris Label Maker	13-Jun-13	20-Jun-13	Clint Gosse
31						

Remove Duplicates

In some situation duplicate data can cause problem to your information.

To remove duplicates in Excel.

1. Select your data
2. Click any single cell inside the data set
3. On the Data tab, click Remove Duplicates.



Subtotal

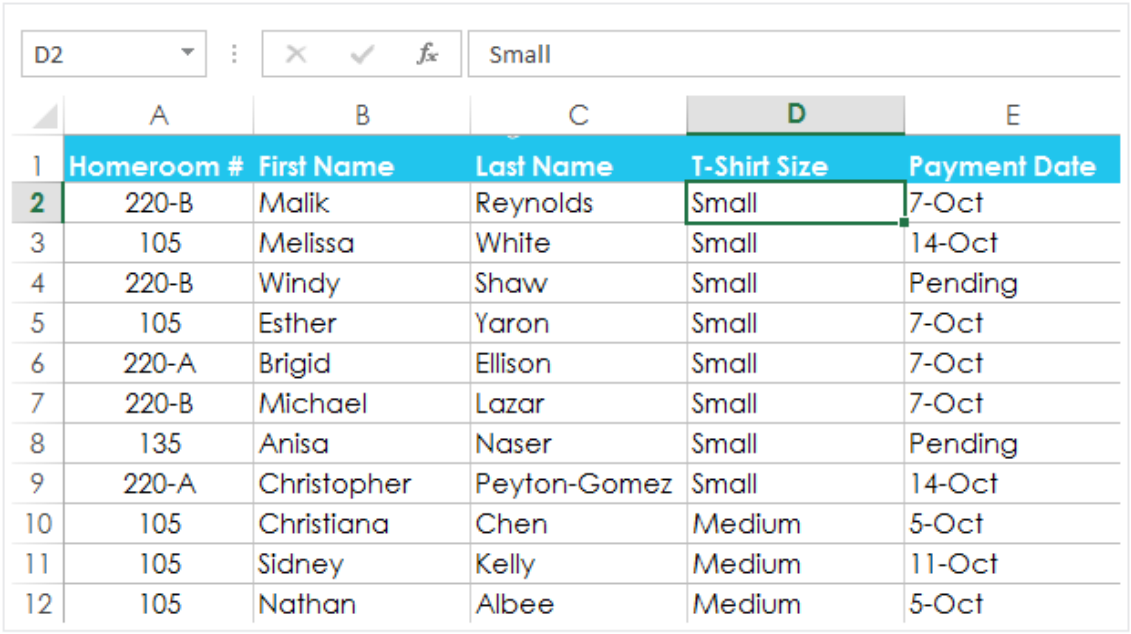
The Subtotal command allows you to automatically create groups and use common functions like SUM, COUNT, and AVERAGE to help summarize your data. For example, the Subtotal command could help to calculate the cost of office supplies by type from a large inventory order. It will create a hierarchy of groups, known as an outline, to help organize your worksheet.

Your data must be correctly sorted before using the Subtotal command, so you may want to review our lesson on Sorting Data to learn more.

To create a subtotal:

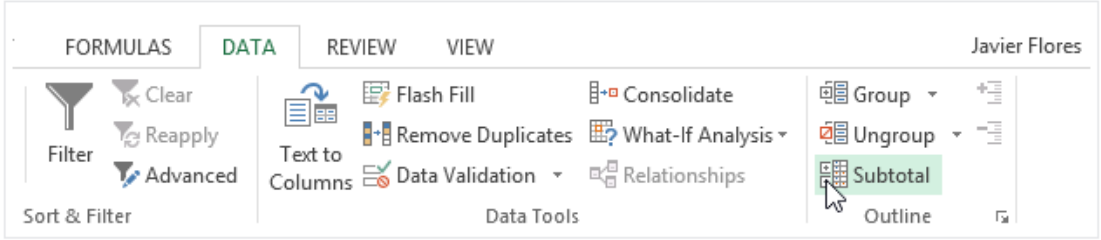
In our example, we will use the Subtotal command with a T-shirt order form to determine how many T-shirts were ordered in each size (Small, Medium, Large, and X-Large). This will create an outline for our worksheet with a group for each T-shirt size and then count the total number of shirts in each group.

1. First, **sort** your worksheet by the data you want to subtotal. In this example, we will create a subtotal for each T-shirt size, so our worksheet has been sorted by T-shirt size from smallest to largest.



	A	B	C	D	E
1	Homeroom #	First Name	Last Name	T-Shirt Size	Payment Date
2	220-B	Malik	Reynolds	Small	7-Oct
3	105	Melissa	White	Small	14-Oct
4	220-B	Windy	Shaw	Small	Pending
5	105	Esther	Yaron	Small	7-Oct
6	220-A	Brigid	Ellison	Small	7-Oct
7	220-B	Michael	Lazar	Small	7-Oct
8	135	Anisa	Naser	Small	Pending
9	220-A	Christopher	Peyton-Gomez	Small	14-Oct
10	105	Christiana	Chen	Medium	5-Oct
11	105	Sidney	Kelly	Medium	11-Oct
12	105	Nathan	Albee	Medium	5-Oct

2. Select the Data tab, then click the **Subtotal** command.

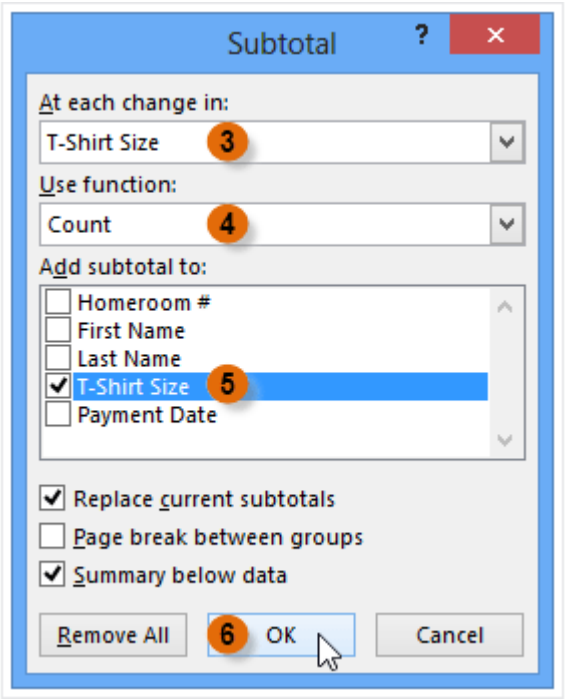


3. The **Subtotal dialog box** will appear. Click the drop-down arrow for the **At each change in:** field to select the **column** you want to subtotal. In our example, we'll select **T-Shirt Size**.

4. Click the drop-down arrow for the **Use function:** field to select the **function** you want to use. In our example, we'll select **COUNT** to count the number of shirts ordered in each size.

5. In the **Add subtotal to:** field, select the **column** where you want the **calculated subtotal** to appear. In our example, we'll select **T-Shirt Size**.

6. When you're satisfied with your selections, click **OK**.



7. The worksheet will be **outlined** into **groups**, and the subtotal will be listed below each group. In our example, the data is now grouped by T-shirt size, and the number of shirts ordered in that size appears below each group.

	A	B	C	D	E
1	Homeroom #	First Name	Last Name	T-Shirt Size	Payment Date
2	220-B	Malik	Reynolds	Small	7-Oct
3	105	Melissa	White	Small	14-Oct
4	220-B	Windy	Shaw	Small	Pending
5	105	Esther	Yaron	Small	7-Oct
6	220-A	Brigid	Ellison	Small	7-Oct
7	220-B	Michael	Lazar	Small	7-Oct
8	135	Anisa	Naser	Small	Pending
9	220-A	Christopher	Peyton-Gomez	Small	14-Oct
10			**Small Count**	8	
11	105	Christiana	Chen	Medium	5-Oct
12	105	Sidney	Kelly	Medium	11-Oct
13	105	Nathan	Albee	Medium	5-Oct
14	110			Medium	11-Oct
15	220-B			Medium	13-Oct
16	135			Medium	11-Oct
17	135	Chantal	Weller	Medium	11-Oct
18	220-A	Chevonne	Means	Medium	13-Oct
19	110	Matt	Benson	Medium	15-Oct
20	220-B	Samantha	Bell	Medium	15-Oct
21			**Medium Count**	10	

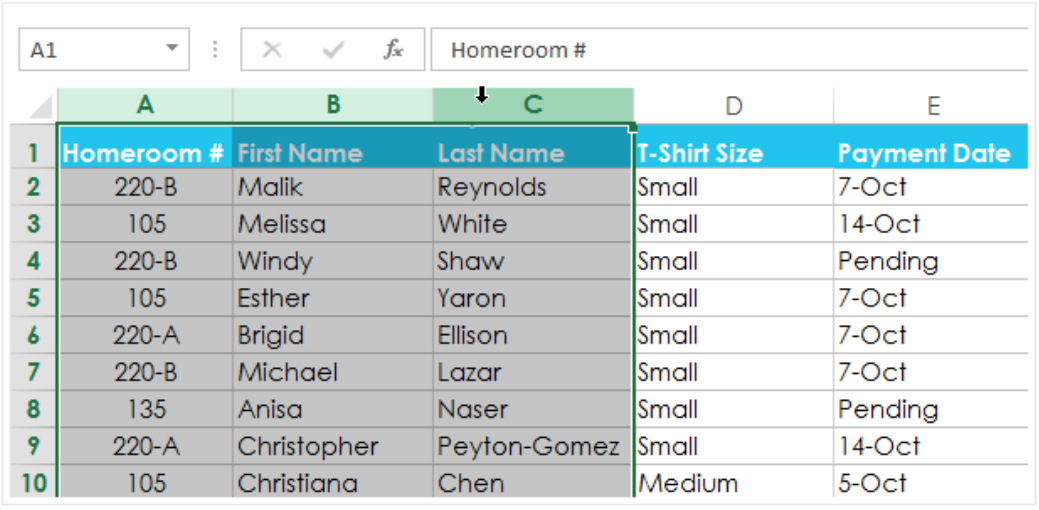
The subtotals are inserted as new rows below each group

Data Grouping

With a lot of content can sometimes feel overwhelming and even become difficult to read. Fortunately, Excel can organize data in groups, allowing you to easily show and hide different sections of your worksheet.

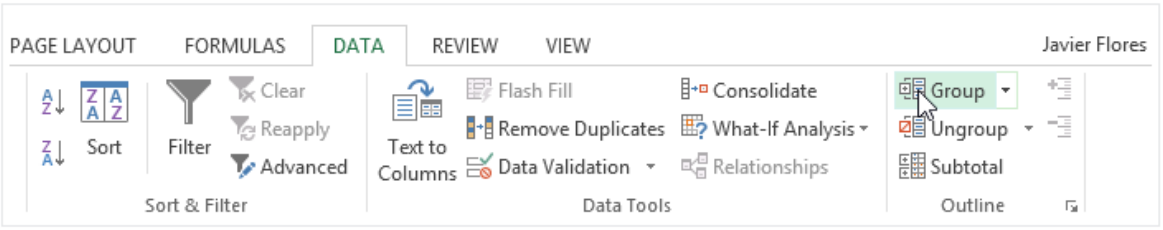
To group rows or columns:

1. Select the **rows** or **columns** you want to group. In this example, we'll select columns **A**, **B**, and **C**.

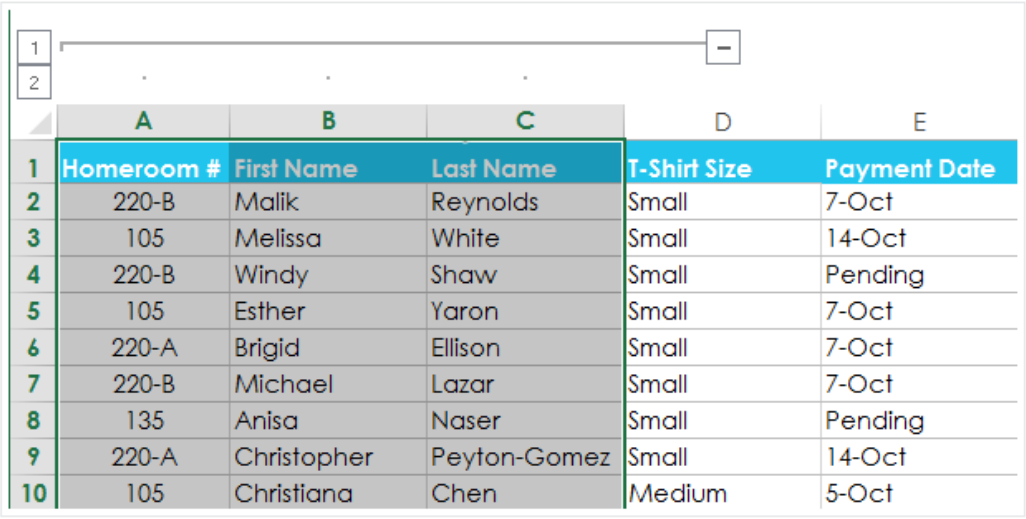


	A	B	C	D	E
1	Homeroom #	First Name	Last Name	T-Shirt Size	Payment Date
2	220-B	Malik	Reynolds	Small	7-Oct
3	105	Melissa	White	Small	14-Oct
4	220-B	Windy	Shaw	Small	Pending
5	105	Esther	Yaron	Small	7-Oct
6	220-A	Brigid	Ellison	Small	7-Oct
7	220-B	Michael	Lazar	Small	7-Oct
8	135	Anisa	Naser	Small	Pending
9	220-A	Christopher	Peyton-Gomez	Small	14-Oct
10	105	Christiana	Chen	Medium	5-Oct

2. Select the **Data** tab on the Ribbon, then click the **Group** command.

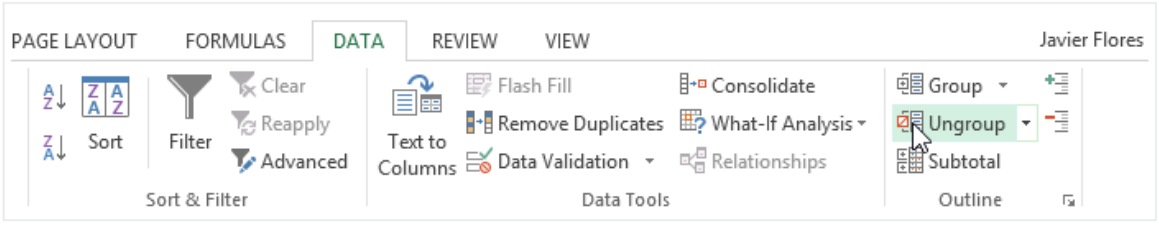


3. The selected rows or columns will be grouped. In our example, columns A, B, and C are grouped together.



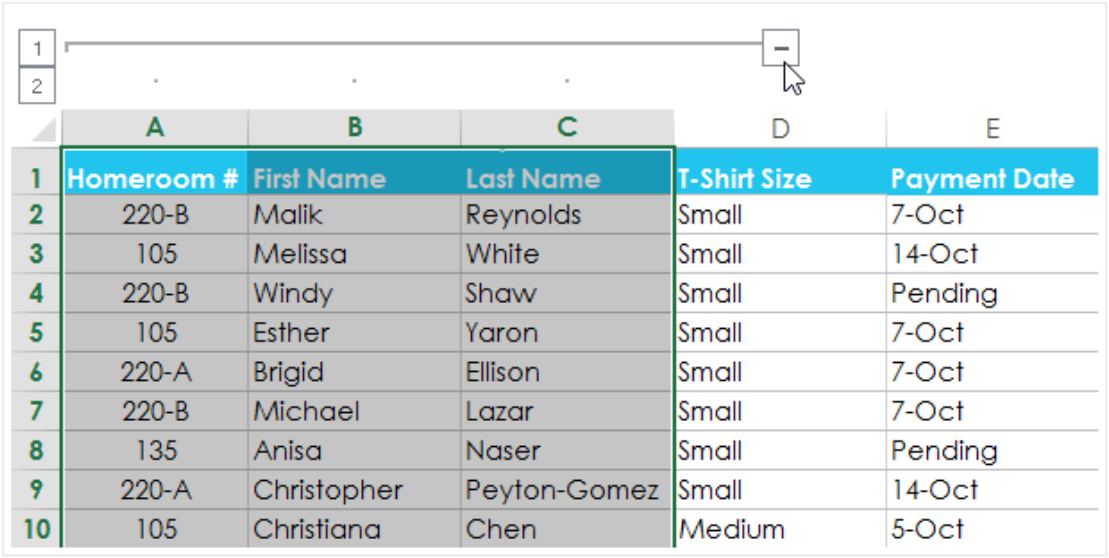
	A	B	C	D	E
1	Homeroom #	First Name	Last Name	T-Shirt Size	Payment Date
2	220-B	Malik	Reynolds	Small	7-Oct
3	105	Melissa	White	Small	14-Oct
4	220-B	Windy	Shaw	Small	Pending
5	105	Esther	Yaron	Small	7-Oct
6	220-A	Brigid	Ellison	Small	7-Oct
7	220-B	Michael	Lazar	Small	7-Oct
8	135	Anisa	Naser	Small	Pending
9	220-A	Christopher	Peyton-Gomez	Small	14-Oct
10	105	Christiana	Chen	Medium	5-Oct

To ungroup data, select the grouped rows or columns, then click the Ungroup command.



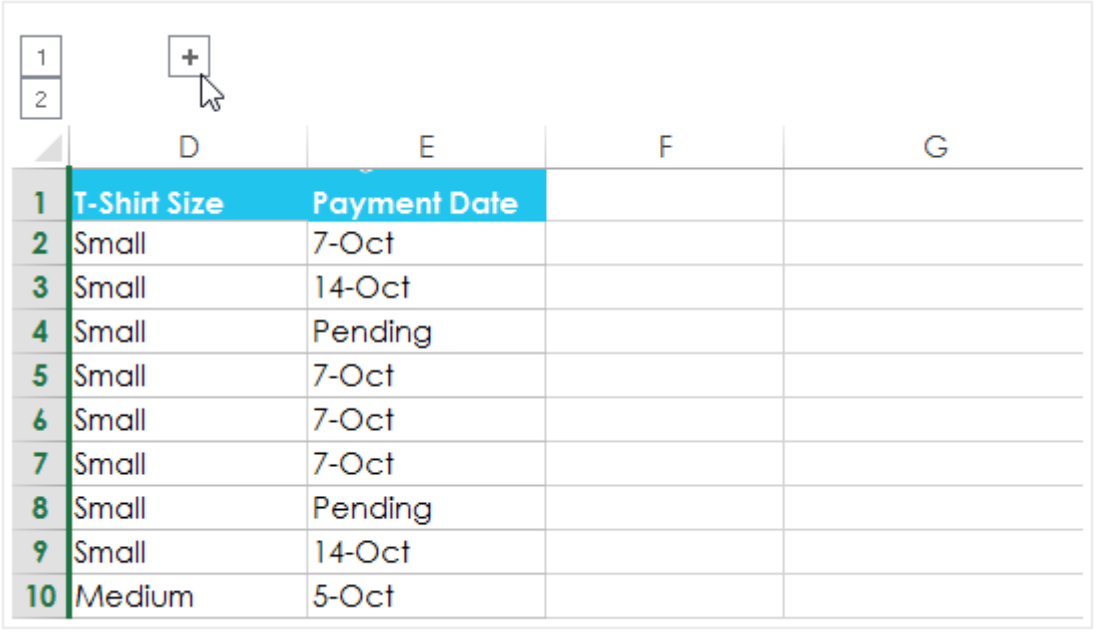
To hide and show groups:

1. To hide a group, click the **Hide Detail** button [−].



	A	B	C	D	E
1	Homeroom #	First Name	Last Name	T-Shirt Size	Payment Date
2	220-B	Malik	Reynolds	Small	7-Oct
3	105	Melissa	White	Small	14-Oct
4	220-B	Windy	Shaw	Small	Pending
5	105	Esther	Yaron	Small	7-Oct
6	220-A	Brigid	Ellison	Small	7-Oct
7	220-B	Michael	Lazar	Small	7-Oct
8	135	Anisa	Naser	Small	Pending
9	220-A	Christopher	Peyton-Gomez	Small	14-Oct
10	105	Christiana	Chen	Medium	5-Oct

2. The group will be hidden. To show a hidden group, click the Show Detail button [+].



	D	E	F	G
1	T-Shirt Size	Payment Date		
2	Small	7-Oct		
3	Small	14-Oct		
4	Small	Pending		
5	Small	7-Oct		
6	Small	7-Oct		
7	Small	7-Oct		
8	Small	Pending		
9	Small	14-Oct		
10	Medium	5-Oct		

Module 8 – *Data Consolidation*

By combining data from different places can produce important information as well.

Consolidate According to the Position in an Excel Worksheet
Identify Categories to Consolidate Excel Data
Use Formulas to Consolidate Excel Data s

Microsoft Office Excel comes with several features for customizing tables and charts full of important data. The program also offers efficient ways to combine and summarize data from multiple worksheets. Common methods to consolidate in Excel include consolidating by position, by formula and by using Excel's Pivot Table feature.

Consolidate According to the Position in an Excel Worksheet

- **Verify that data in each worksheet appear in list format.** Make sure you have removed any blank columns and rows, and that each column is labeled with similar information.
    - Add and layout each column range to a separate worksheet. However, do not add the ranges to the master worksheet that you plan to consolidate.
    - Highlight each range, and name them by picking the Formulas tab, followed by the arrow located near Name a Range. Enter a name for the range in the Name box.

- **Prepare to consolidate Excel data**. Click on the upper-left cell where you want to place your consolidated data from your master worksheet.
    - Go to the Data tab from the master worksheet, and then select the Data Tools group. Choose Consolidate.
    - Access the summary function feature from the Function box to create the settings for consolidating data.

- **Enter the names of your ranges in the Summary Function feature.** Click Add to begin the consolidation process.

- **Update the consolidation.** Choose the Create Links to Source Data box if you want to update source data automatically. Leave the box unchecked if you prefer to update consolidation data manually.

EX8.1: *Consolidate Data According to the Position in Worksheet*

In this exercise, you will learn how to consolidate data according to the Position in Worksheet.

1. Create a new worksheet with name **Q1** and prepare the contents as below:

	A	B	C	D	E	F	G
1	**Region**	**Profit**	**Expensus**	**Budget**	**Total**		
2	North	$20,000.00	$15,000.00	$22,000.00	$ 27,000.00	=D2+B2-C2	
3	Center	$18,000.00	$19,000.00	$10,000.00	$ 9,000.00	=D3+B3-C3	
4	South	$23,000.00	$21,000.00	$15,000.00	$ 17,000.00	=D4+B4-C4	
5							

2. Once worksheet **Q1** is completed, Copy to 3 more new worksheets and rename as **Q2**, **Q3** and **Q4** respectively. Change the contents for each of the newly clone worksheets with the following contents:

Q2:

	A	B	C	D	E
1	**Region**	**Profit**	**Expensus**	**Budget**	**Total**
2	North	$18,000.00	$16,000.00	$21,000.00	$ 23,000.00
3	Center	$19,000.00	$19,000.00	$10,000.00	$ 10,000.00
4	South	$22,000.00	$21,000.00	$15,000.00	$ 16,000.00

Q3:

	A	B	C	D	E
1	**Region**	**Profit**	**Expensus**	**Budget**	**Total**
2	North	$17,000.00	$15,000.00	$22,000.00	$ 24,000.00
3	Center	$18,000.00	$16,000.00	$19,000.00	$ 21,000.00
4	South	$21,000.00	$20,000.00	$15,000.00	$ 16,000.00

Q4:

	A	B	C	D	E
1	**Region**	**Profit**	**Expensus**	**Budget**	**Total**
2	North	$19,000.00	$17,000.00	$22,000.00	$ 24,000.00
3	Center	$19,000.00	$18,000.00	$10,000.00	$ 11,000.00
4	South	$24,000.00	$21,000.00	$15,000.00	$ 18,000.00

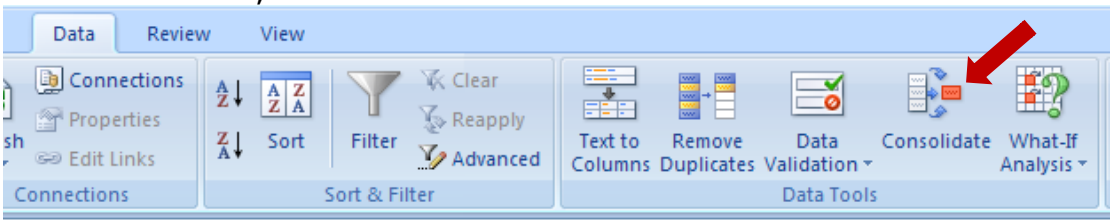
3. Create another new worksheet with name **Yearly**.

	A	B	C	D	E
1		**Profit**	**Expensus**	**Budget**	**Total**
2	North				
3	Center				
4	South				

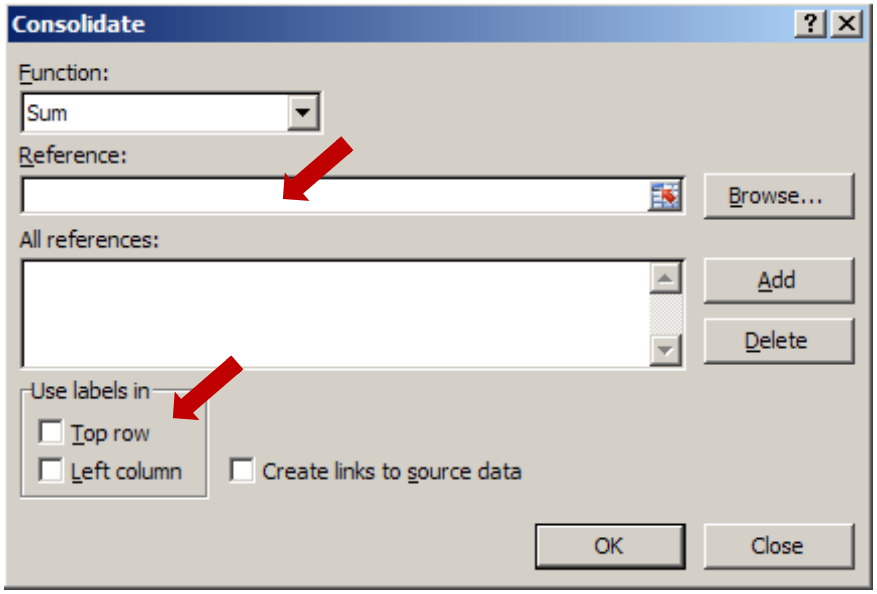
4. Switch to worksheet **Yearly**, select range **B2:E4**.

	A	B	C	D	E
1		**Profit**	**Expensus**	**Budget**	**Total**
2	North				
3	Center				
4	South				

5. Select **Data** tab, and click the **Consolidate** button.

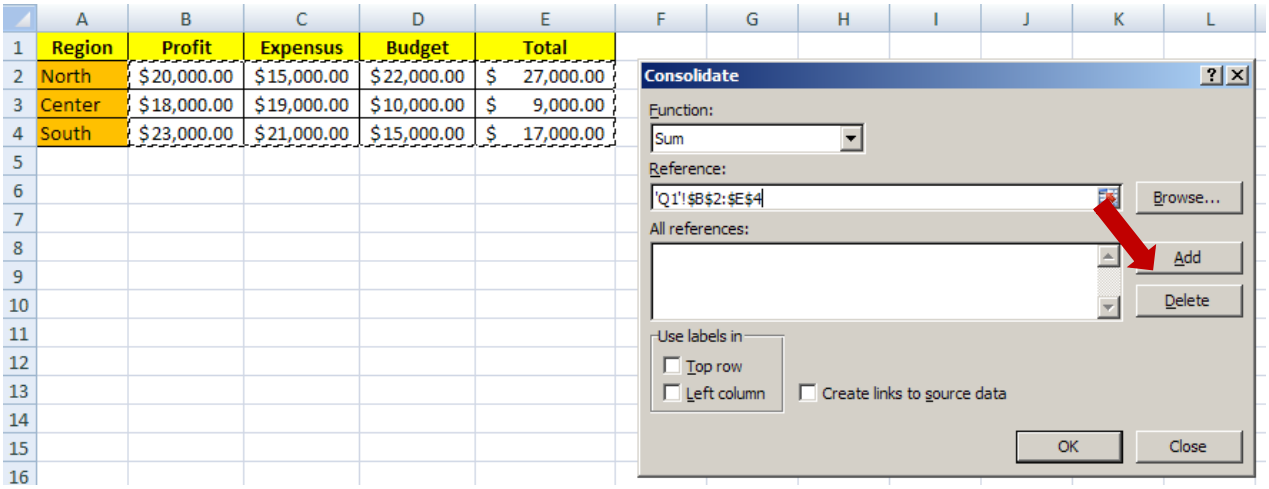


6. In the **Consolidate** dialog box, make sure that
   a. **Top row** is cleared
   b. **Left column** is cleared
   c. Editing focus is in the **Reference** field



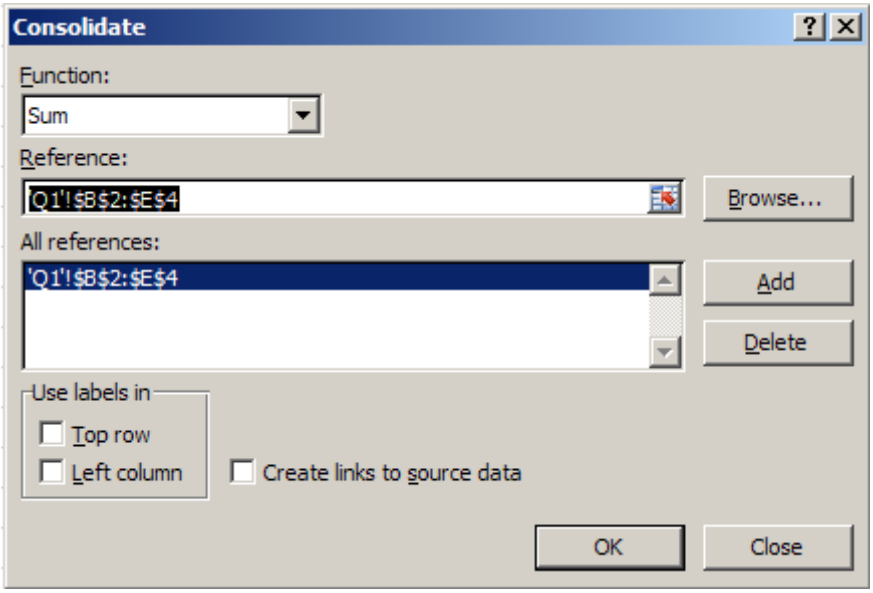
7. While the dialog box still on, switch to worksheet **Q1**.

8. Select range B2:E4 under worksheet **Q1**. Pay attention to the **Reference** field. Press **Add** button.



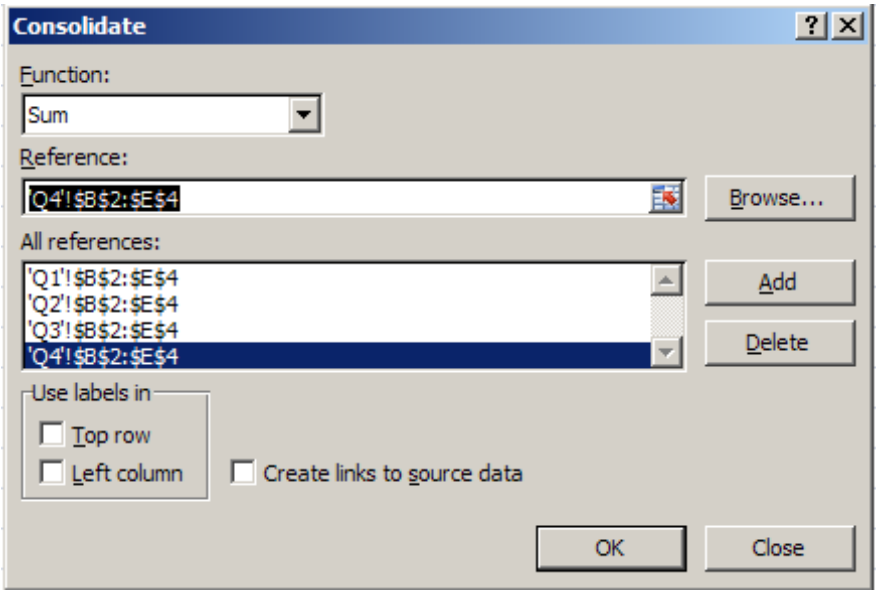
9. Now the dialog box shows the reference to **Q1**'s range is added in to

All references list box.



10. Next, while the dialog box still on, just select worksheet **Q2** name tab, then press **Add** button.

11. Repeat step 10 for **Q3** and **Q4**. Now the **Consolidate** dialog box will looks like below:



12. Press **OK** to close the **Consolidate** dialog box. Now the consolidated result done:

	A	B	C	D	E
1		Profit	Expensus	Budget	Total
2	North	$74,000.00	$63,000.00	$87,000.00	$98,000.00
3	Center	$74,000.00	$72,000.00	$49,000.00	$51,000.00
4	South	$90,000.00	$83,000.00	$60,000.00	$67,000.00

Consolidate Data by Linking

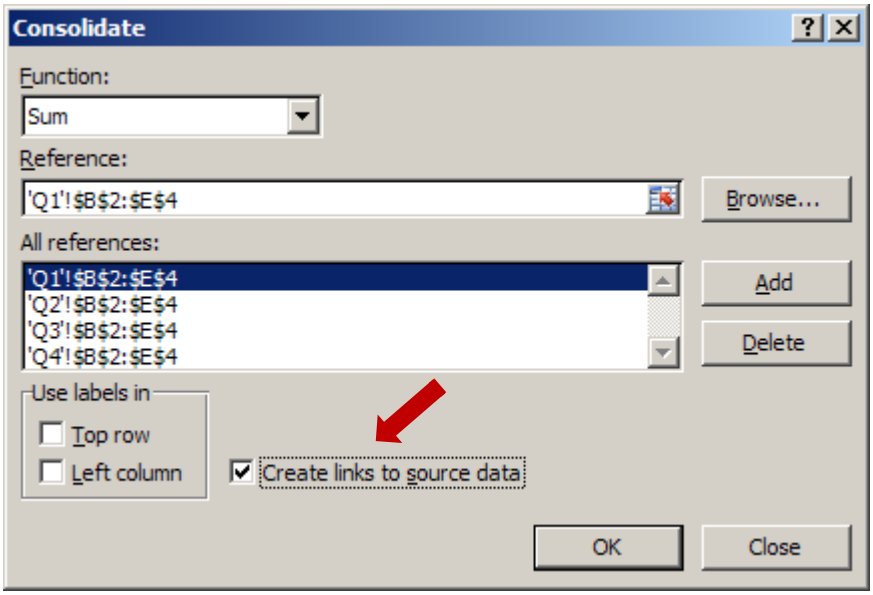
Previous method will not update the consolidate data when the source data changed. In order to update automatically, try the following exercise

EX8.2: *Consolidate Data by Linking*

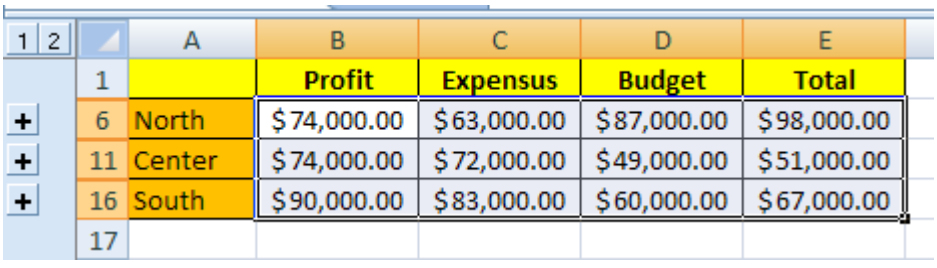
In this exercise, you will learn how to consolidate data according to the Position in Worksheet.

1. Switch to **Yearly** tab. Select range **B2:E4** Click the **Consolidate** button under **Data** tab again.

2. Check the **Create links to source data**



3. Press **OK** button confirm the consolidation.



		A	B	C	D	E
	1		Profit	Expensus	Budget	Total
+	6	North	$74,000.00	$63,000.00	$87,000.00	$98,000.00
+	11	Center	$74,000.00	$72,000.00	$49,000.00	$51,000.00
+	16	South	$90,000.00	$83,000.00	$60,000.00	$67,000.00
	17					

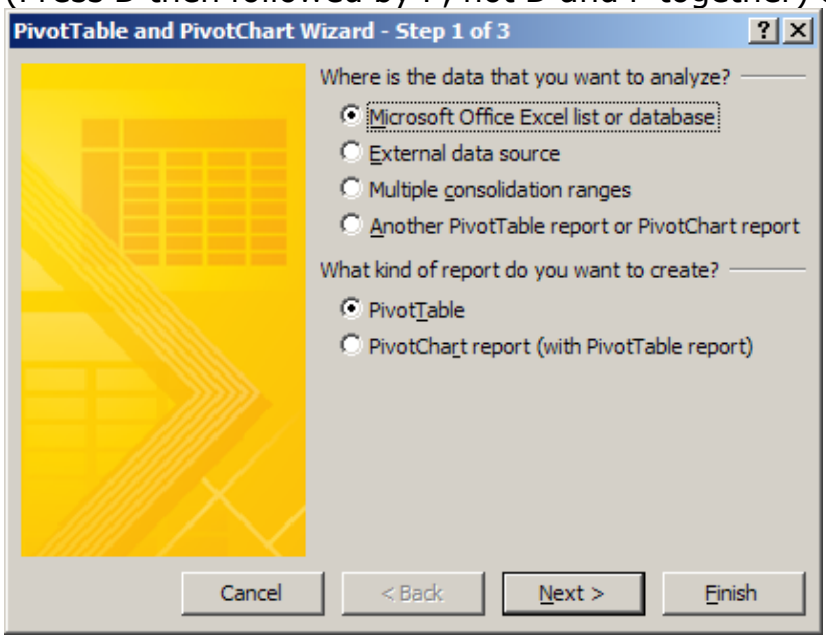
Consolidation with PivotTable Report

Data consolidation also can be done with PivotTable. This feature allows you to consolidate Excel data from multiple ranges with the capability of reorganizing categories when necessary

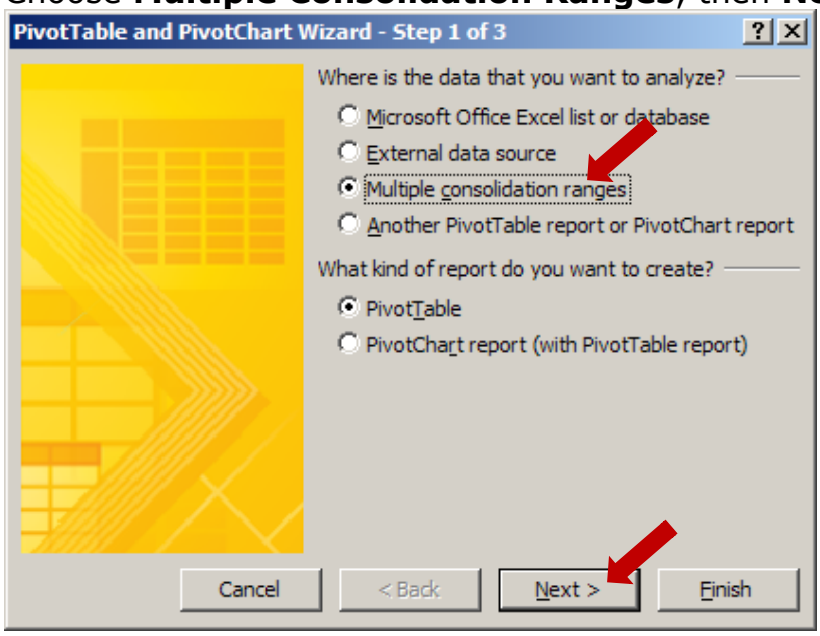
EX8.3: *Create a PivotTable report*

In this exercise, you will learn how to produce PivotTable report to consolidate data.

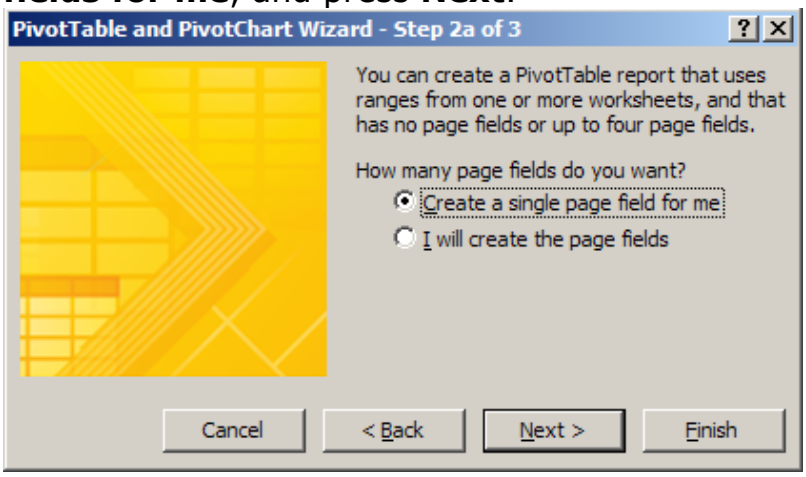
1. Start the PivotTable and PivotChart wizard by pressing **Alt**+**D**+**P** (Press D then followed by P, not D and P together) on your keyboard.



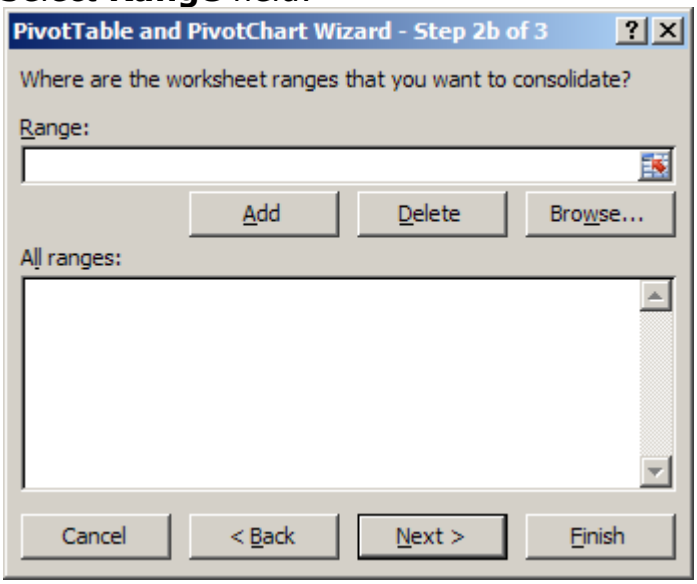
2. Choose **Multiple Consolidation Ranges**, then **Next**.



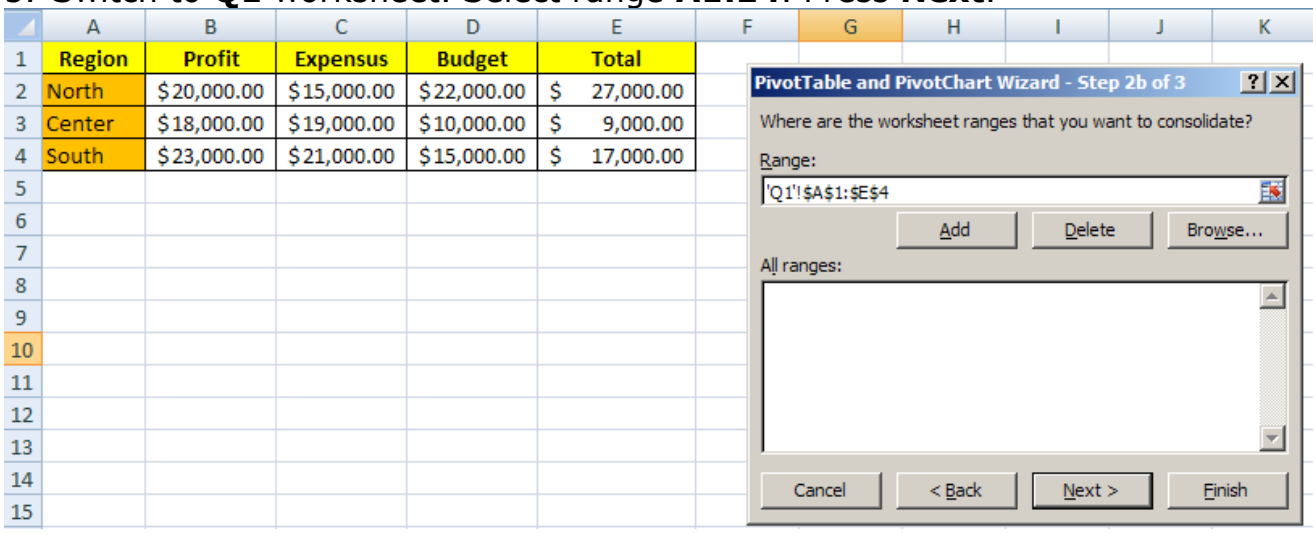
3. In the **PivotTable and PivotChart Wizard** select **Create a page fields for me**, and press **Next**.



4. Select **Range** field.

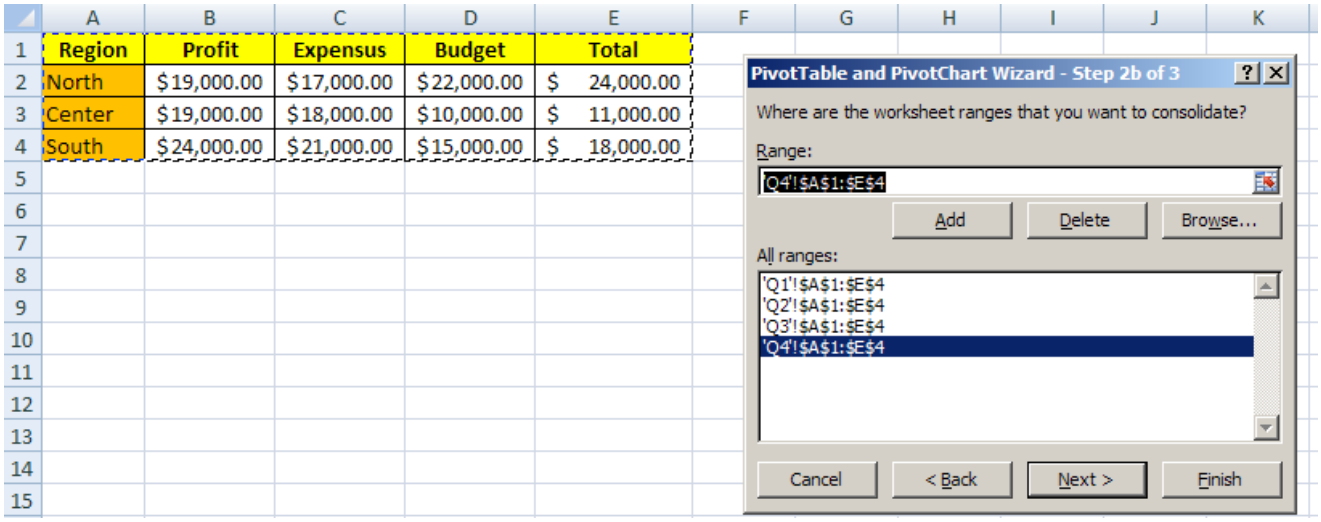


5. Switch to **Q1** worksheet. Select range **A1:E4**. Press **Next**.



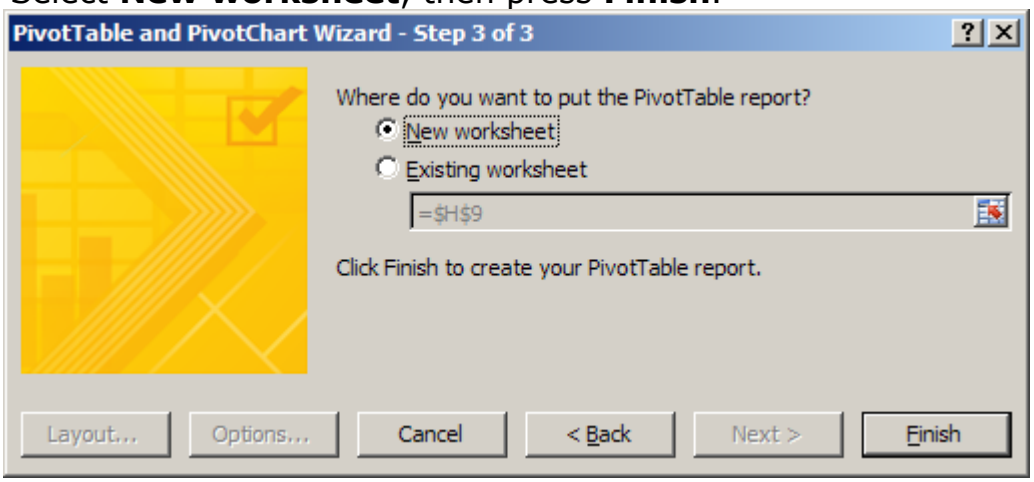
	A	B	C	D	E
1	Region	Profit	Expensus	Budget	Total
2	North	$20,000.00	$15,000.00	$22,000.00	$ 27,000.00
3	Center	$18,000.00	$19,000.00	$10,000.00	$ 9,000.00
4	South	$23,000.00	$21,000.00	$15,000.00	$ 17,000.00

6. Repeat adding same range from worksheets **Q2**, **Q3** and **Q4**. Press **Next**.

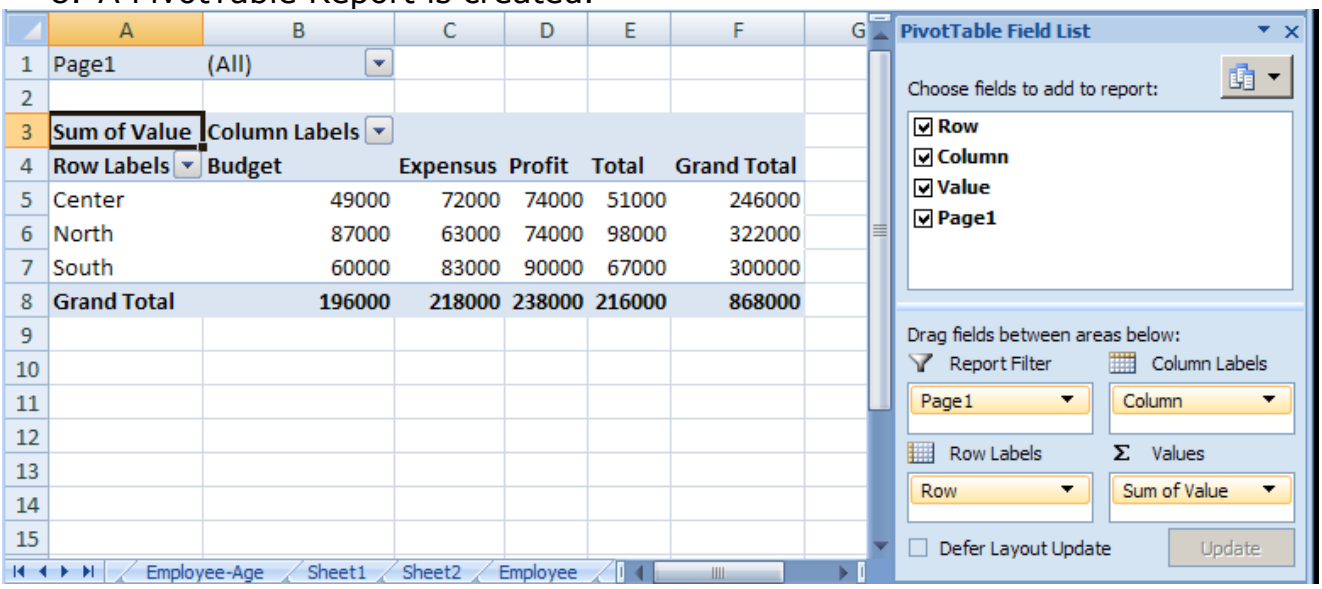


Region	Profit	Expensus	Budget	Total
North	$19,000.00	$17,000.00	$22,000.00	$ 24,000.00
Center	$19,000.00	$18,000.00	$10,000.00	$ 11,000.00
South	$24,000.00	$21,000.00	$15,000.00	$ 18,000.00

7. Select **New worksheet**, then press **Finish**.



8. A PivotTable Report is created.



Page1	(All)				
Sum of Value	Column Labels				
Row Labels	Budget	Expensus	Profit	Total	Grand Total
Center	49000	72000	74000	51000	246000
North	87000	63000	74000	98000	322000
South	60000	83000	90000	67000	300000
Grand Total	196000	218000	238000	216000	868000

Module 9 – *Using PivotTable*

PivotTable is one of the unique powerful feature provided by Excel. It is one of the main reason so many users decided to use Excel instead of other tools in data analysis.

To retrieve valuable information from Excel data you can use,

1. Auto subtotal
2. Filter
3. Sorting
4. Table features
5. Functions

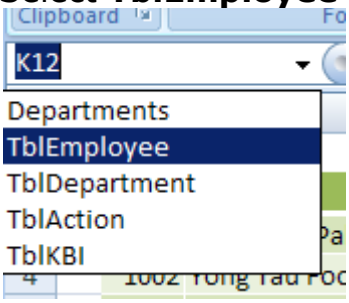
Besides all these, sometimes we prefer to find the information from different orientation of data. In order to do this, we can use **Pivot Table**.

Pivot tables are one of Excel's most powerful features. A pivot table allows you to extract the significance from a large, detailed data set.

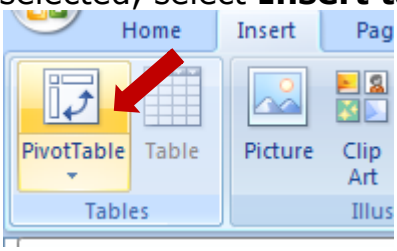
EX9.1: *Create PivotTable*

In this exercise, you will learn how to create PivotTable to analysis data from **Employee** table.

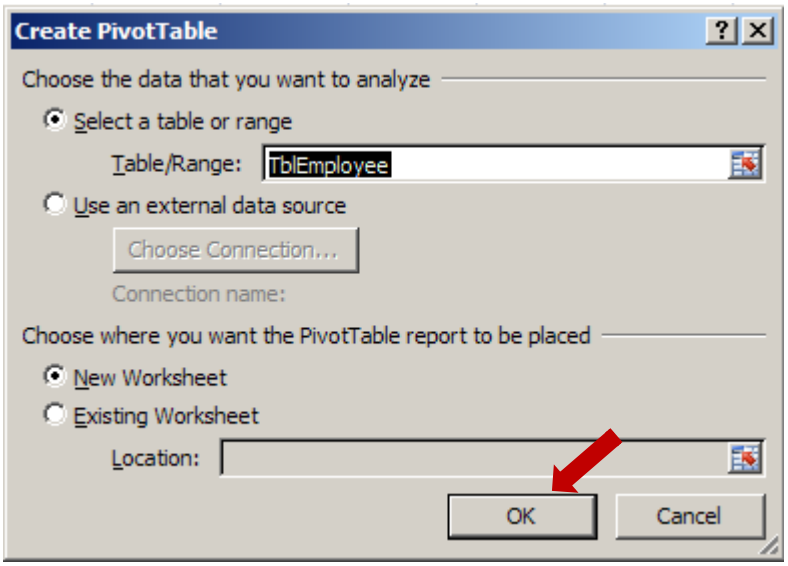
1. Select **TblEmployee** from Excel **Name Box**.



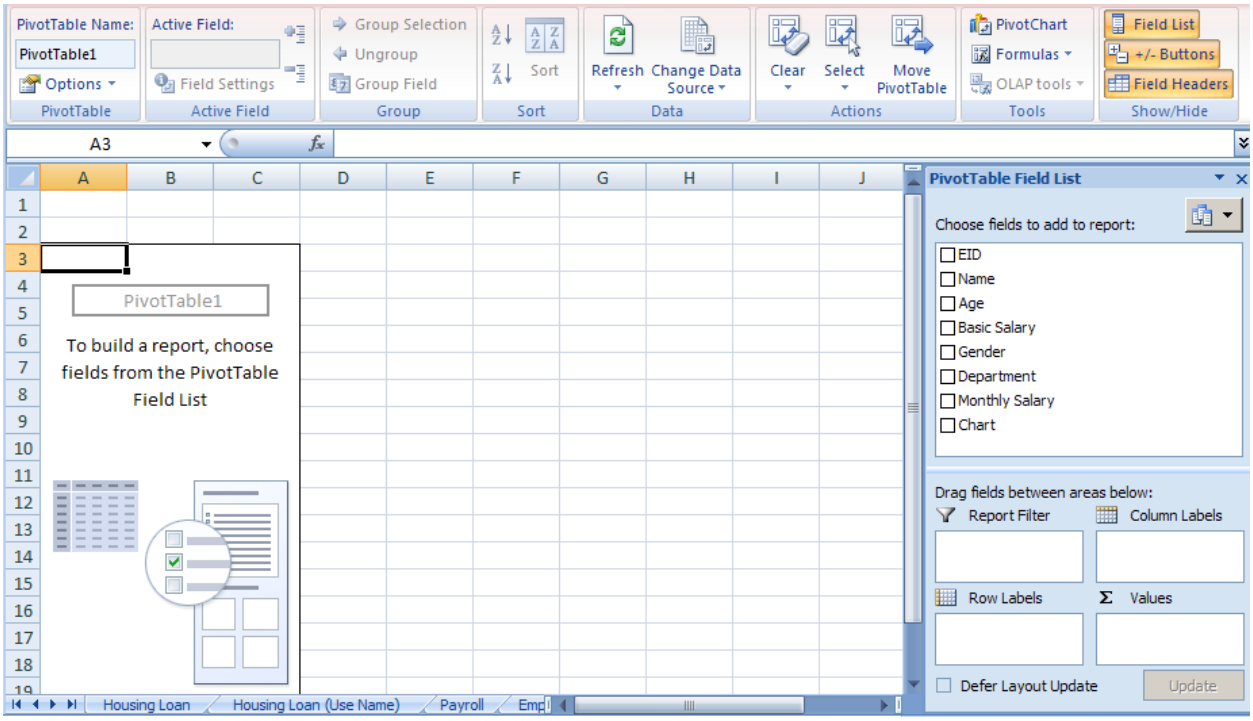
2. This will bring you to the **TblEmployee** table. While the table is selected, select **Insert tab**. Select **PivotTable** button.



3. In the **Create PivotTable** dialog box, just press **OK** button.



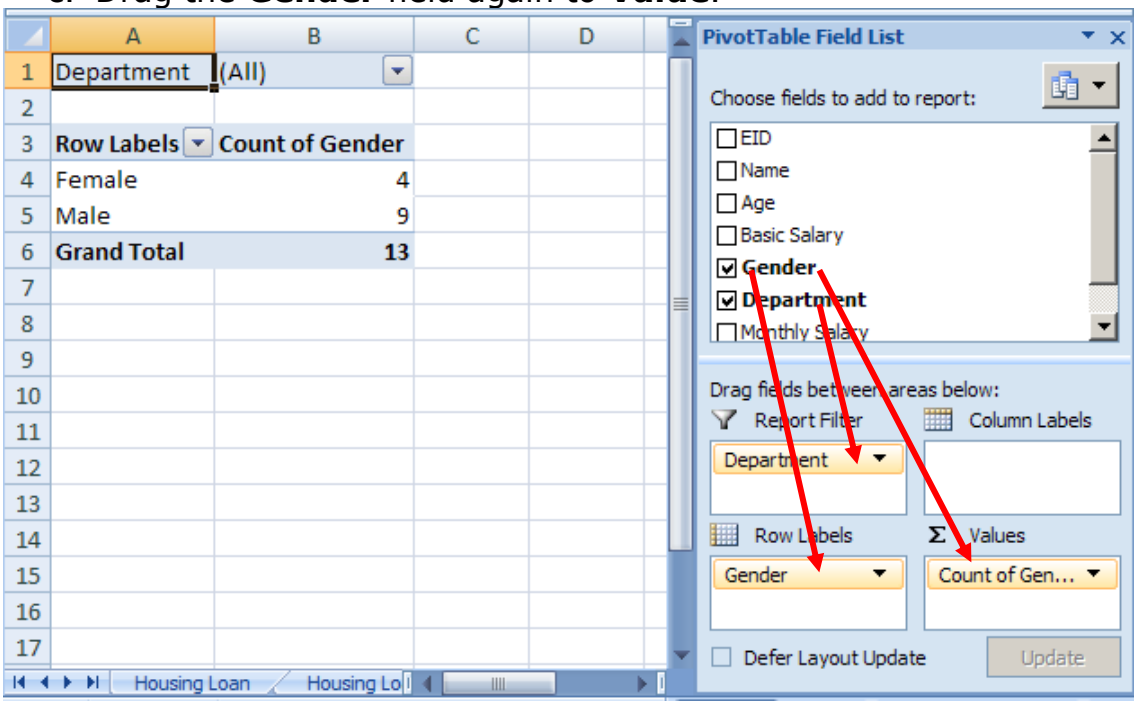
4. A new PivotTable is created in new worksheet.



EX9.2: *View fields and data*

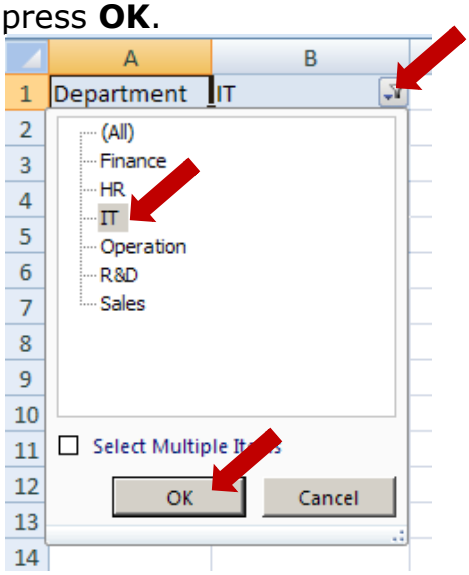
In this exercise, you will learn how to view field and data from a PivotTable.

1. From the previously created PivotTable
   a. Drag the **Department** field to **Report Filter**.
   b. Drag the **Gender** field to **Row Labels**.
   c. Drag the **Gender** field again to **Value**.



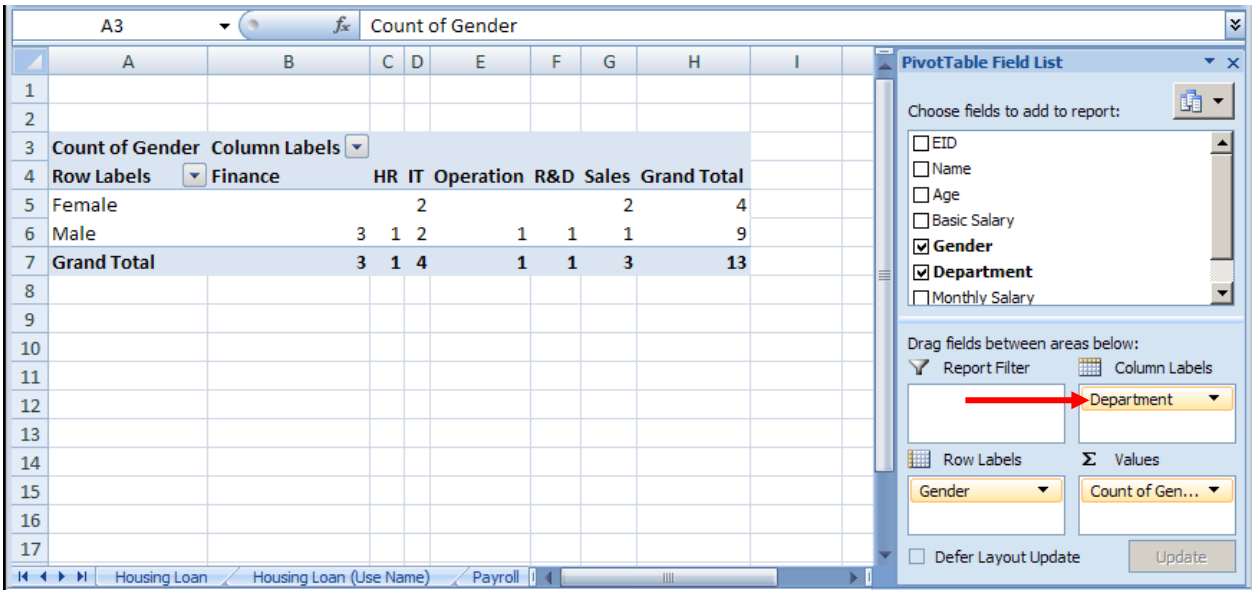
What kind of information the PivotTable showing now?

2. Try to select **Filter** button under **Report Filter**. Just select **IT** then press **OK**.



What kind of information the PivotTable showing now?

3. Now Drag the **Department** field from **Report Filter** to **Column Labels**. Observe the result produced.



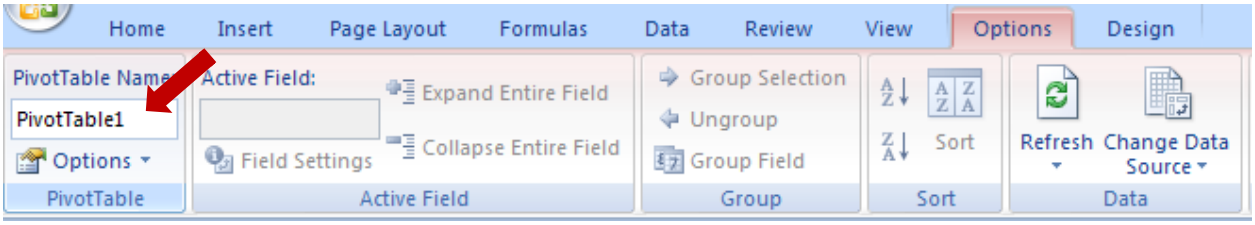
4. Try to play around with the PivotTable to find out the following information:
    a. Number of employees for each department
    b. Average employee Monthly Salary for each department
    c. Average Salary for different gender

Give your PivotTable a name

When PivotTable is created, Excel will assign a default name to it. If you want to rename it, there are many possible ways. One of the simplest ways is

1. Select **Options** tab

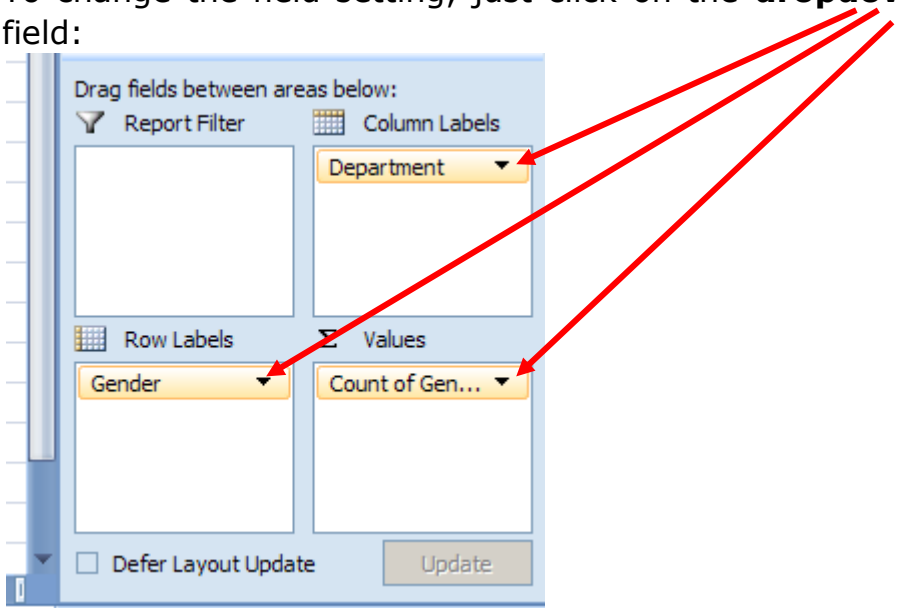
2. Change the name from the **PivotTable Name** field



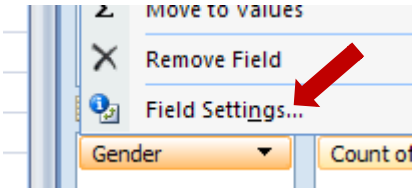
Change field settings

When fields are dragged to the areas, Excel will provide default setting for the fields. Sometime the customization of the field is needed.

To change the field setting, just click on the **dropdown arrow** for each field:



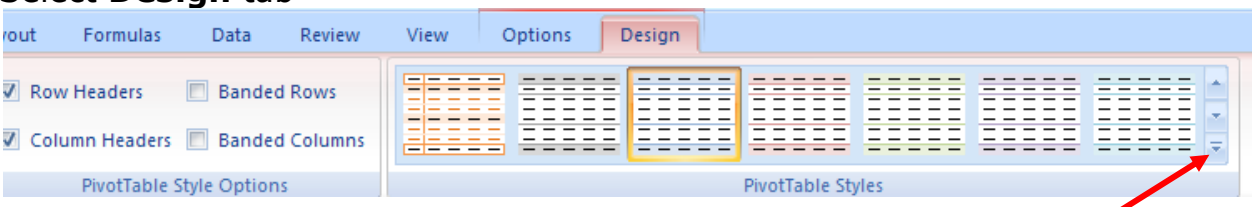
You should be able to find the **Field Settings...**



Styles

To change the PivotTable style,

1. Select **Design** tab

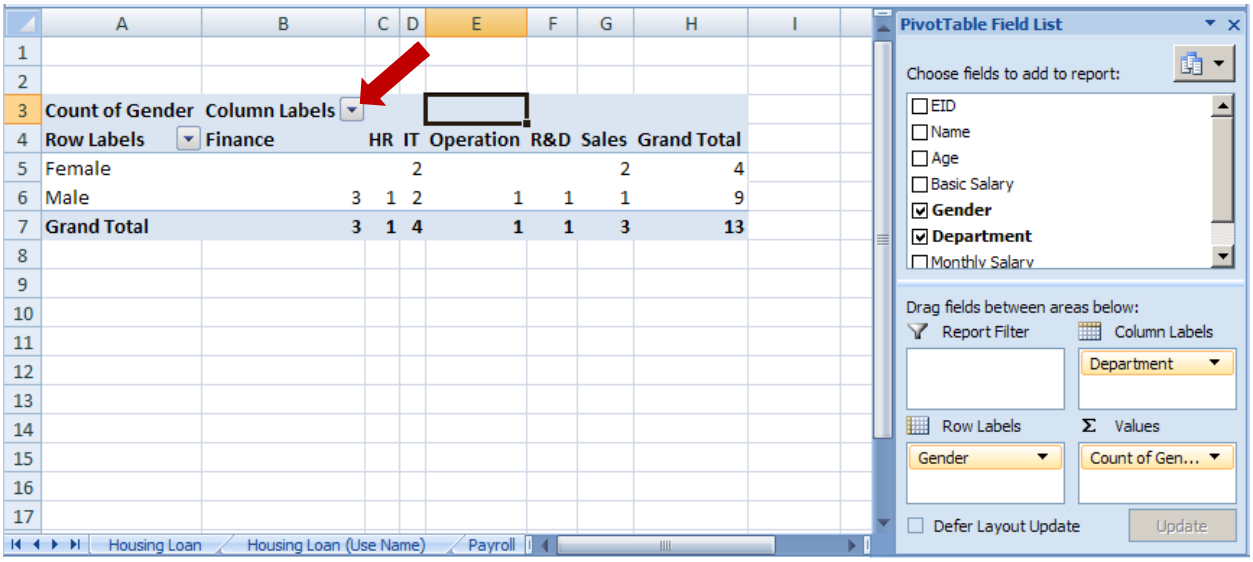


2. You can select any desire style
3. More style will be listed if you select the dropdown button.

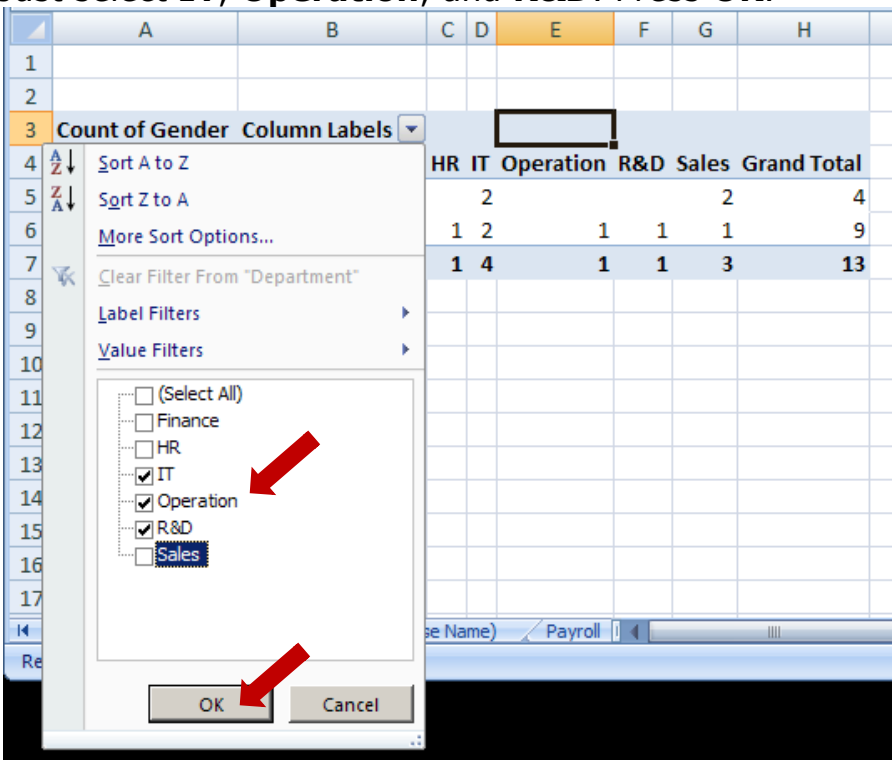
EX9.3: *Filter a field*

In this exercise, you will learn how to filter a field to hide unwanted candidates.

1. From the previous PivotTable, select **Column Labels** dropdown button.



2. Just select **IT**, **Operation**, and **R&D**. Press **OK**.



3. Observe the result.

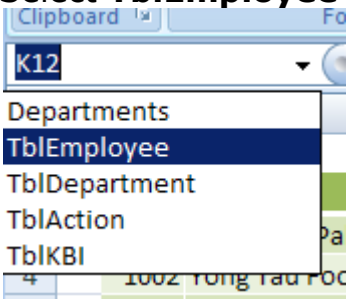
Creating PivotChart Reports

A pivot chart is the visual representation of a pivot table in Excel. Pivot charts and pivot tables are connected with each other.

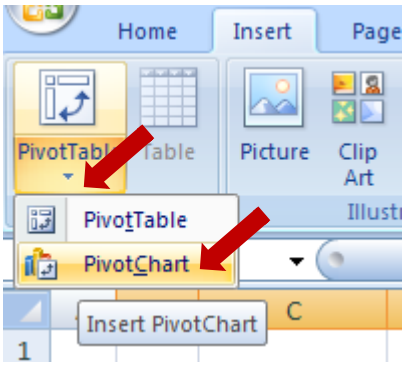
EX9.4: *Create PivotChart*

In this exercise, you will learn how to create PivotChart.

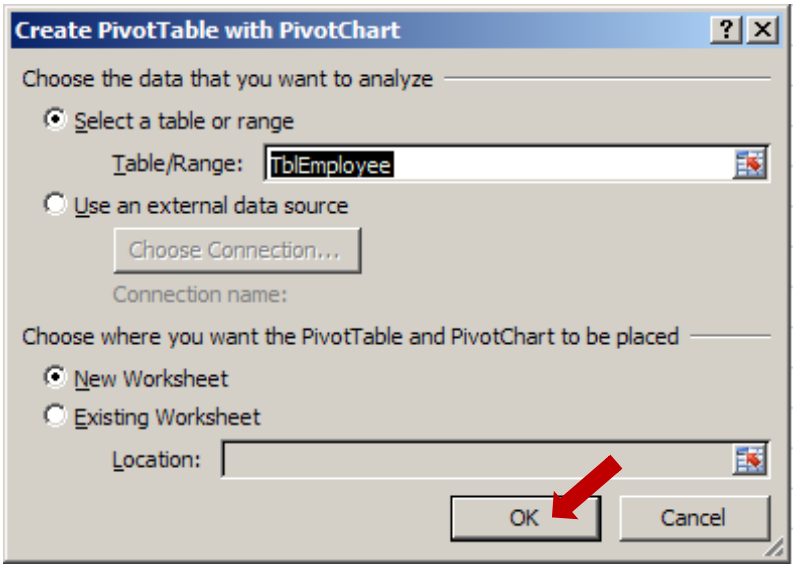
1. Select **TblEmployee** from Excel **Name Box**.



2. This will bring you to the **TblEmployee** table. While the table is selected, select **Insert tab**. Select **PivotTable** dropdown button, then select **PivotChart**.

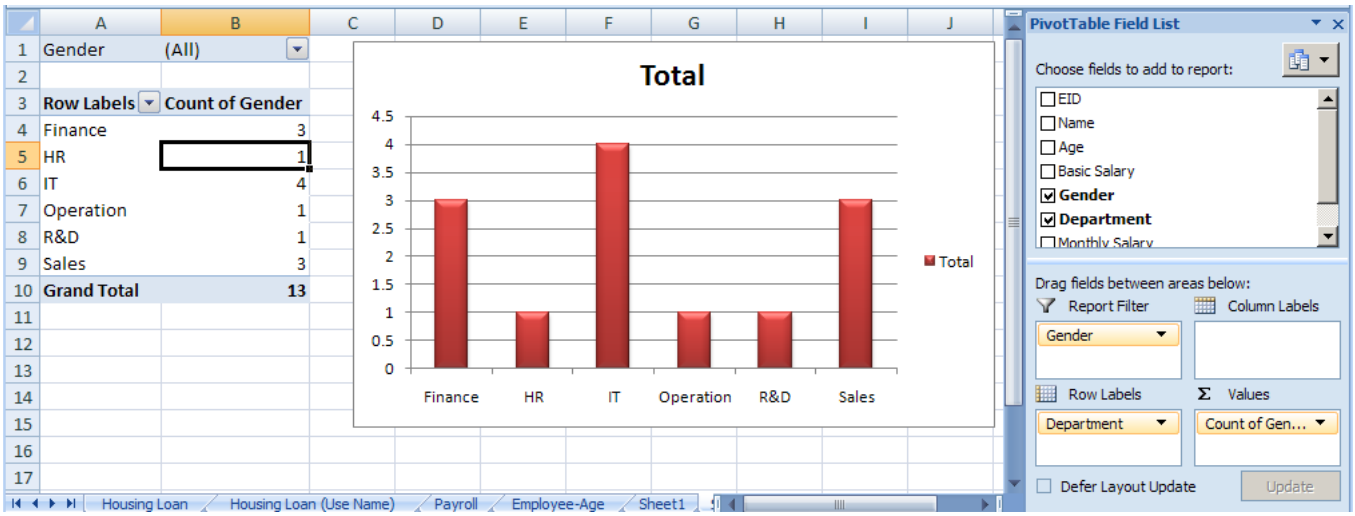


3. In the **Create PivotTable with PivotChart** dialog box, just press **OK**.



4. Try to drag around with the PivotTable to find out the following information:
    a. Drag the **Department** field to **Row Labels**.
    b. Drag the **Gender** field to **Report Filter**.
    c. Drag the **Gender** field again to **Value**.

5. Try to change other setting to make the final result looks like the following:



Module 10 – *What-If Analysis*

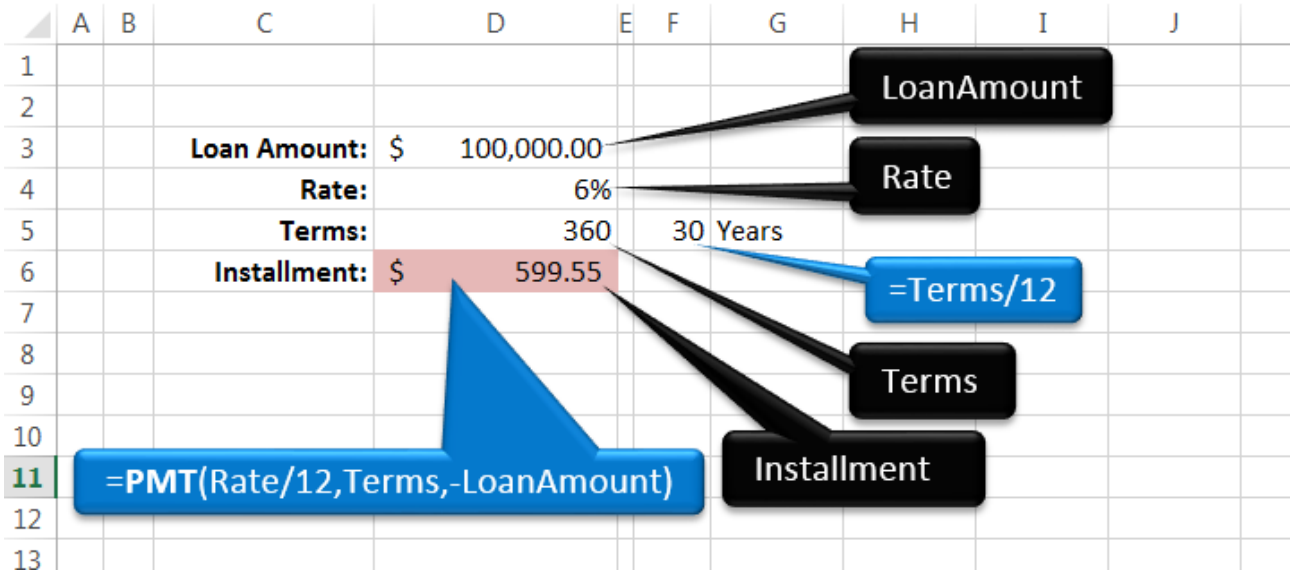
What is What-If Analysis?

What-if analysis is the process of changing the values in cells to see how those changes will affect the outcome of formulas on the worksheet. Three kinds of what-if analysis tools come with Excel: scenarios, data tables, and Goal Seek. Scenarios and data tables take sets of input values and determine possible results.

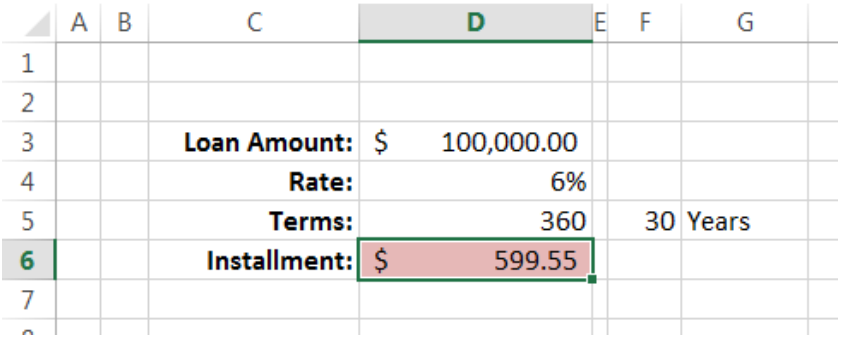
Solving single Variable Problem using Goal Seek

The goal seek function, part of Excel's what-if analysis tool set, allows the user to use the desired result of a formula to find the possible input value necessary to achieve that result.

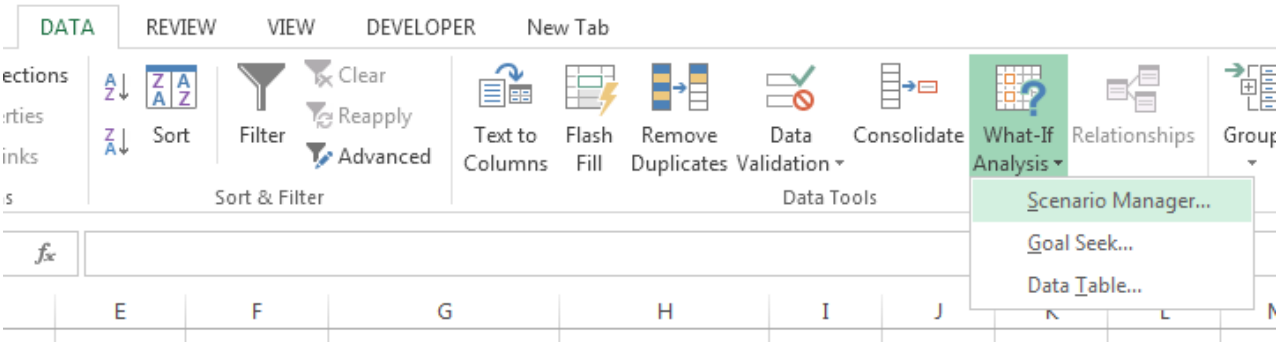
Exercise 10.1: Loan

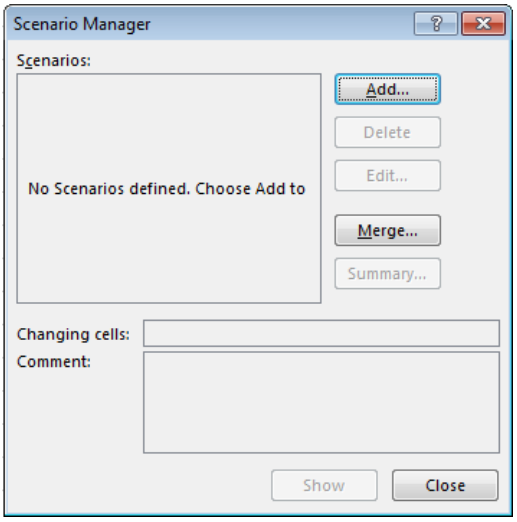


Place selection at cell D6.

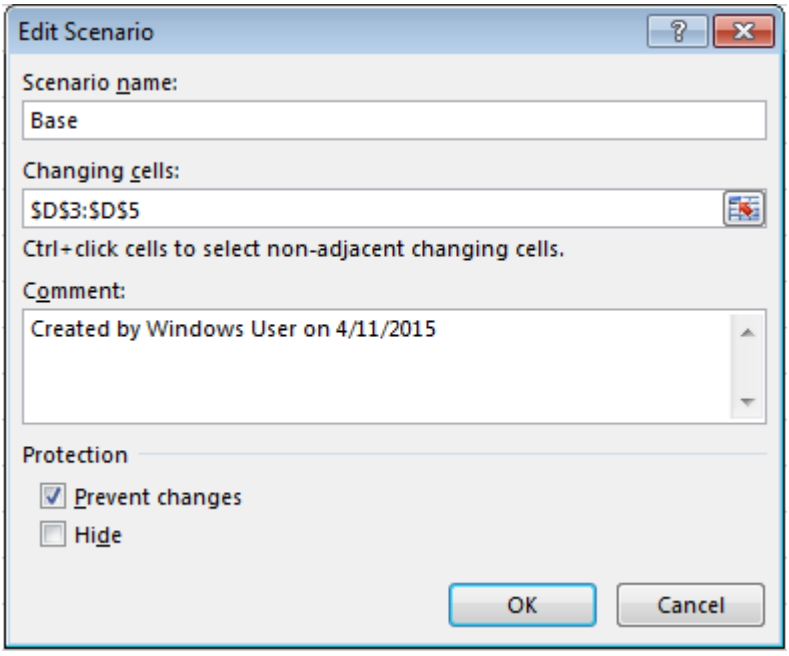


Select Scenario Manager from **Data** Ribbon Tab





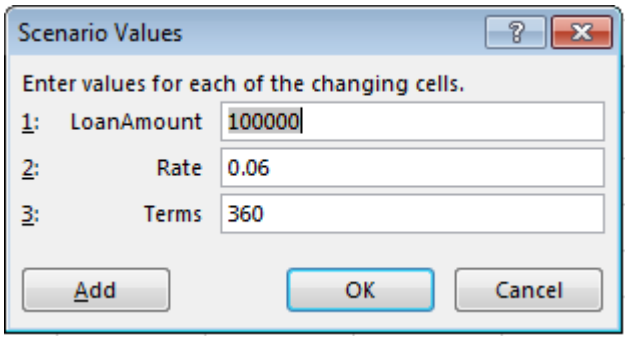
Press **Add**



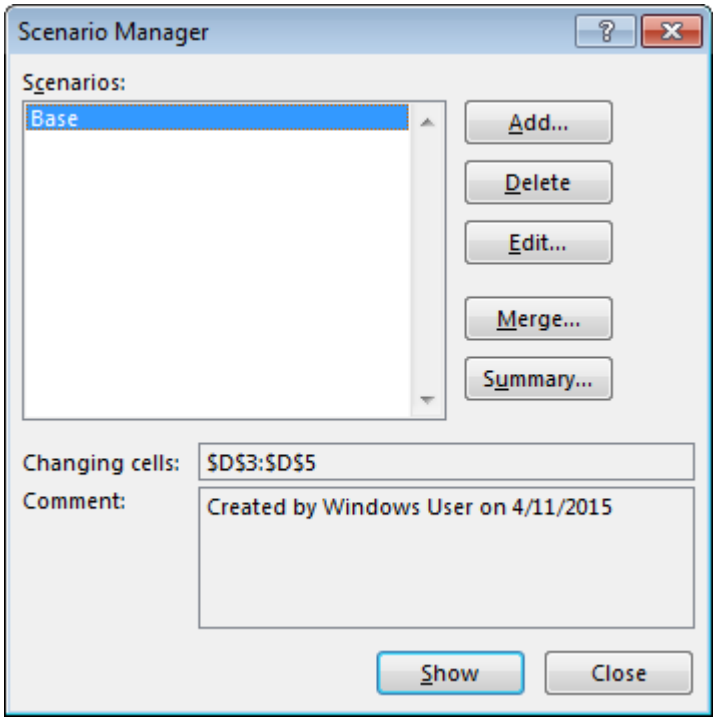
Name the Scenario as "Base".

Select **Changing cells**.

Press **OK**.



Press **OK**.

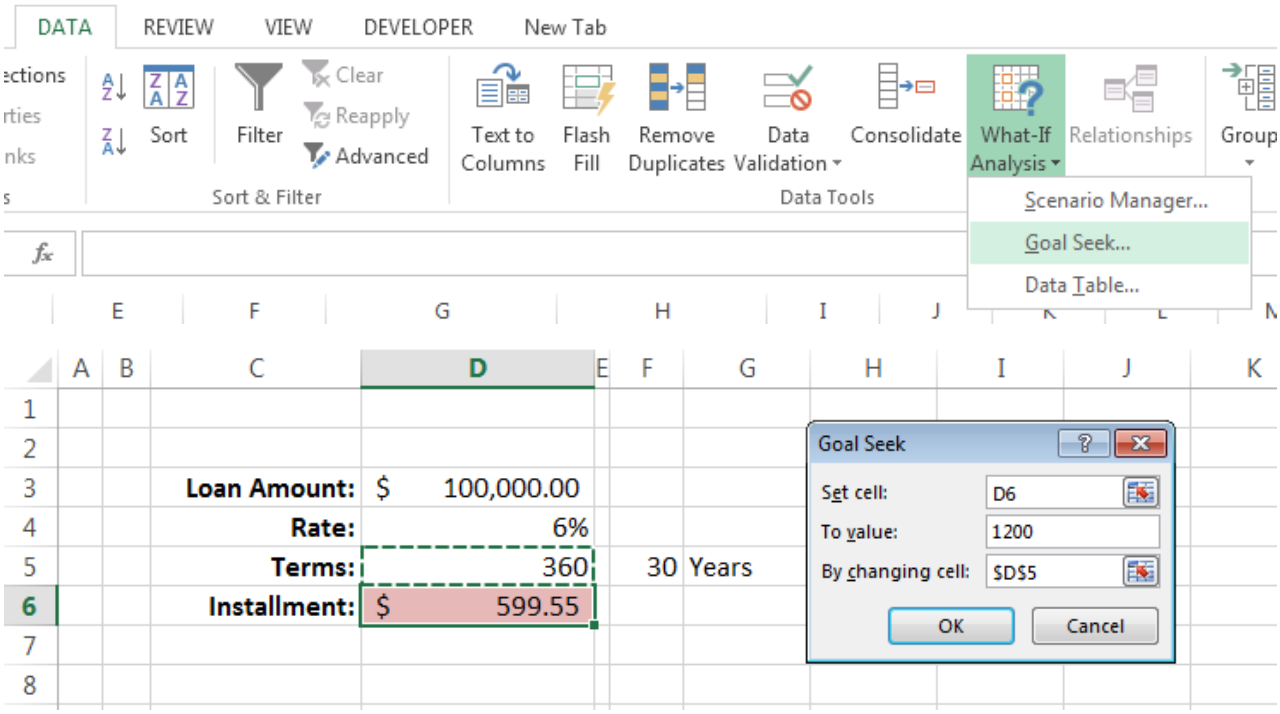


Press **Close**.

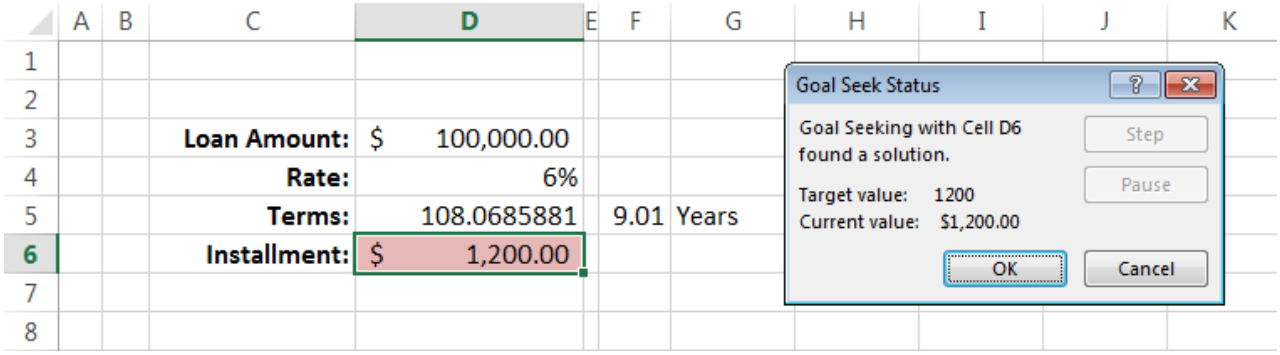
Place selection at cell D6 again.

	A	B	C	D	E	F	G
1							
2							
3			**Loan Amount:**	$ 100,000.00			
4			**Rate:**	6%			
5			**Terms:**	360		30	Years
6			**Installment:**	$ 599.55			
7							

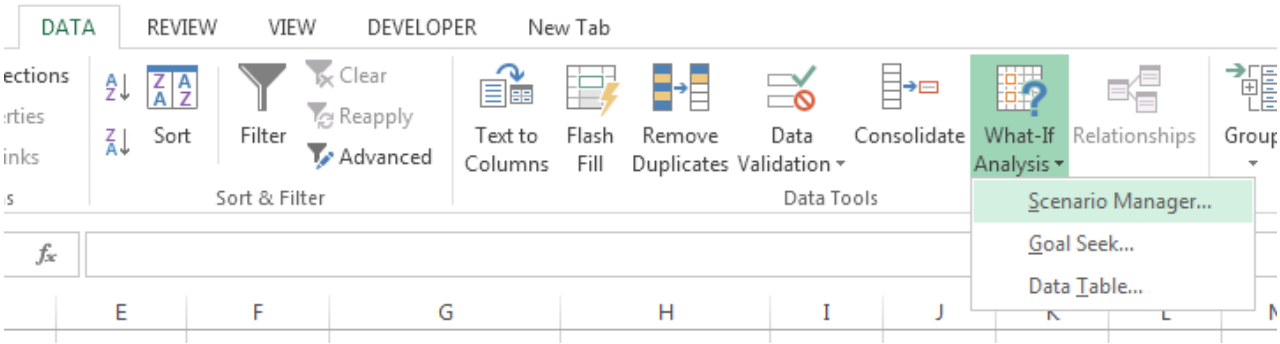
Select **Goal Seek** from Data Ribbon Tab



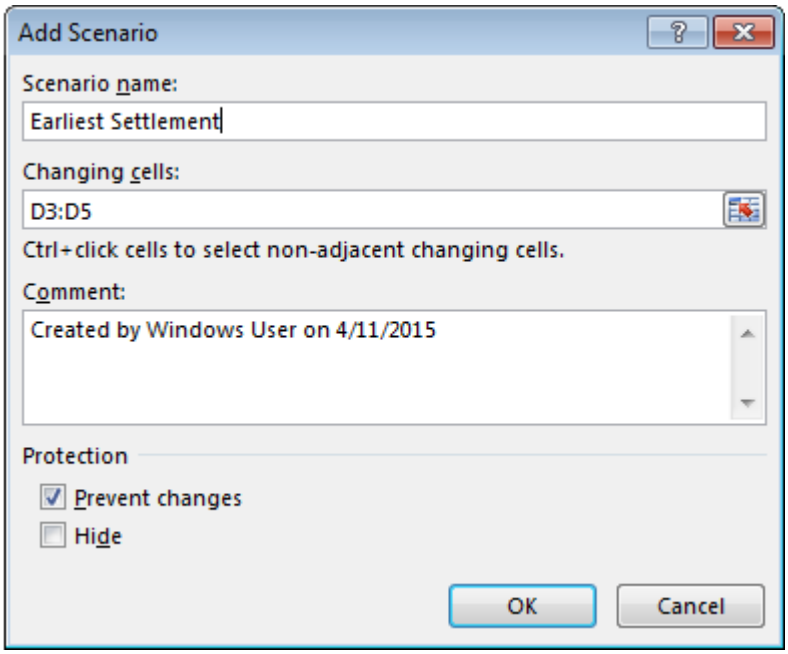
Press **OK**.



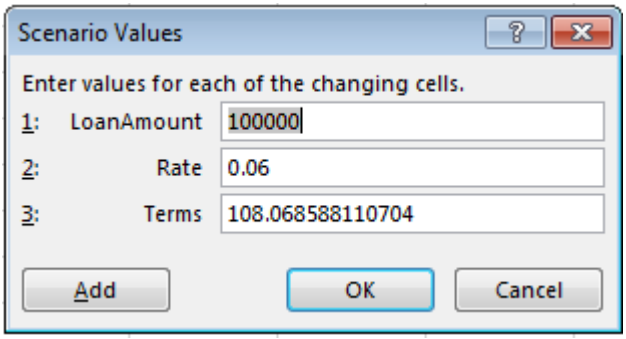
Press **OK**. Then select **Scenario Manager** from Data Ribbon Tab



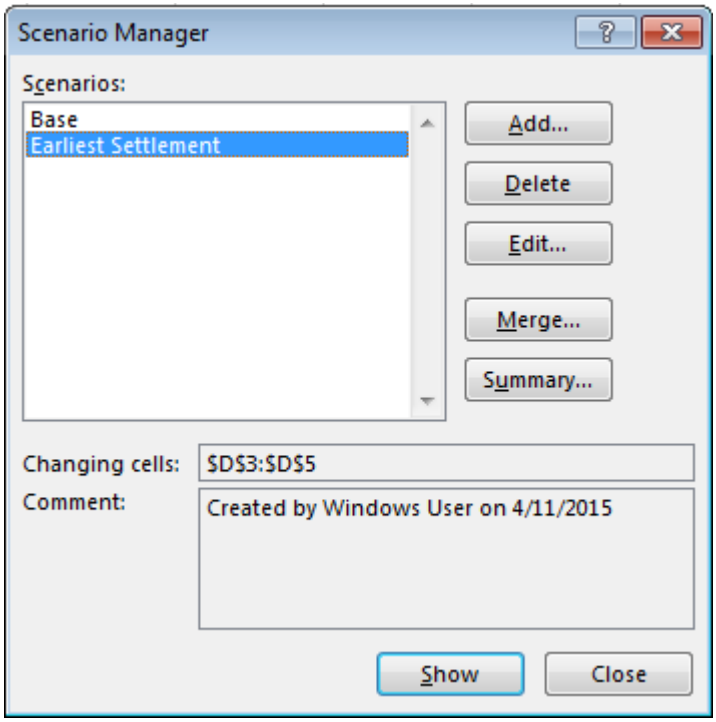
Press **Add**.



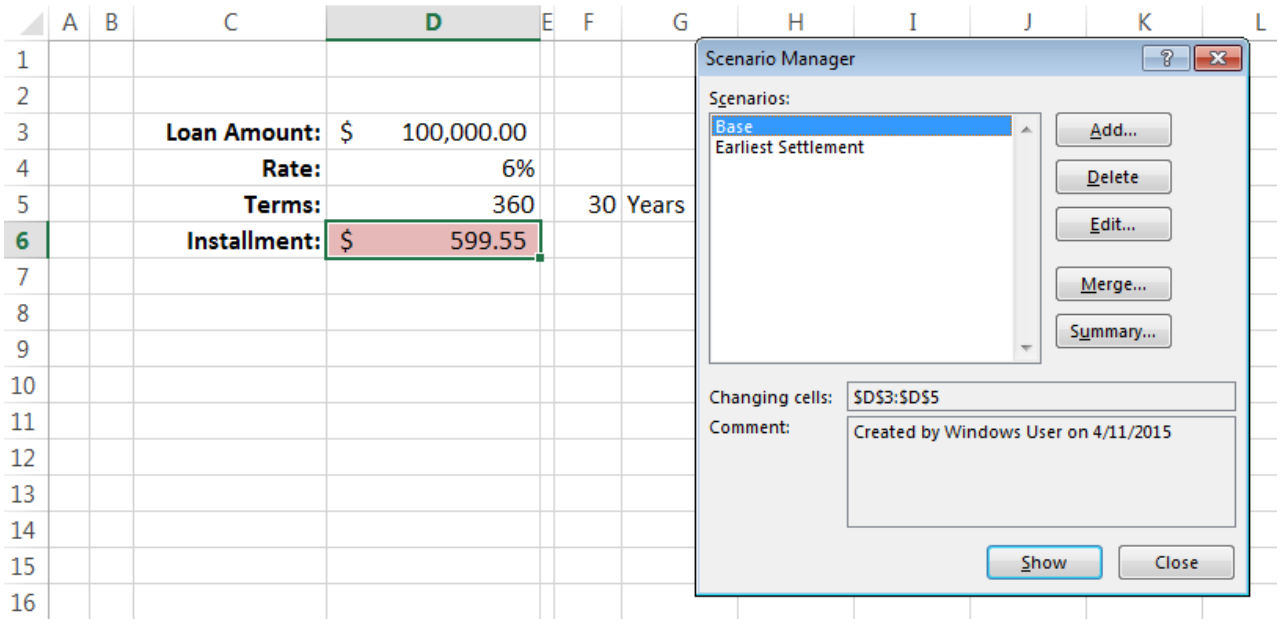
Name the Scenario as "Earliest Settlement", then press **OK**.



In the Scenario Values Dialog Box, press **OK**.



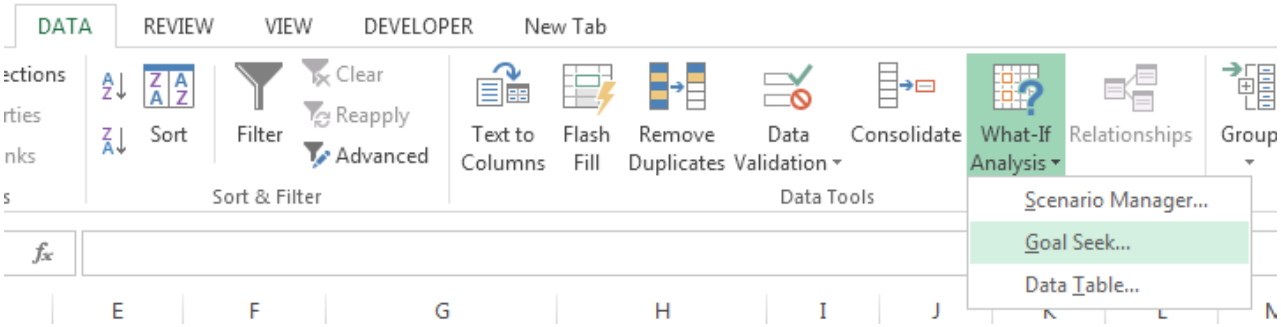
Select Scenario "Base", then press **Show**.



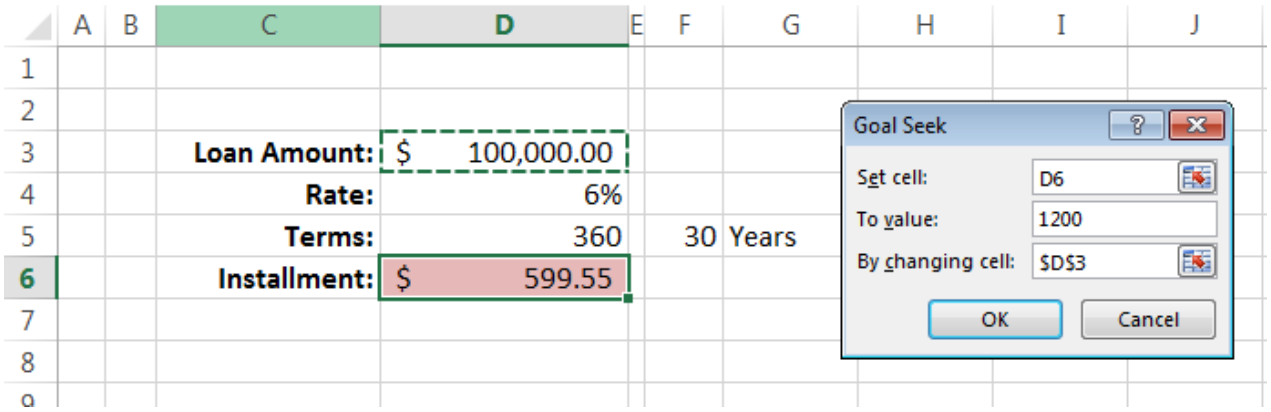
Beware that the model reset back to Base scenario.

Press **Close**.

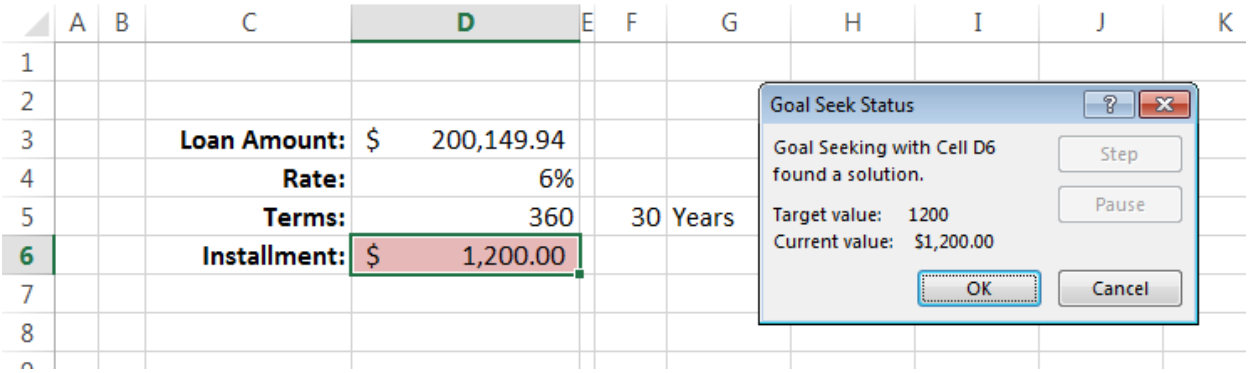
While the selection still with cell D6, select **Goal Seek** from Data Ribbon Tab



Prepare the value as below:

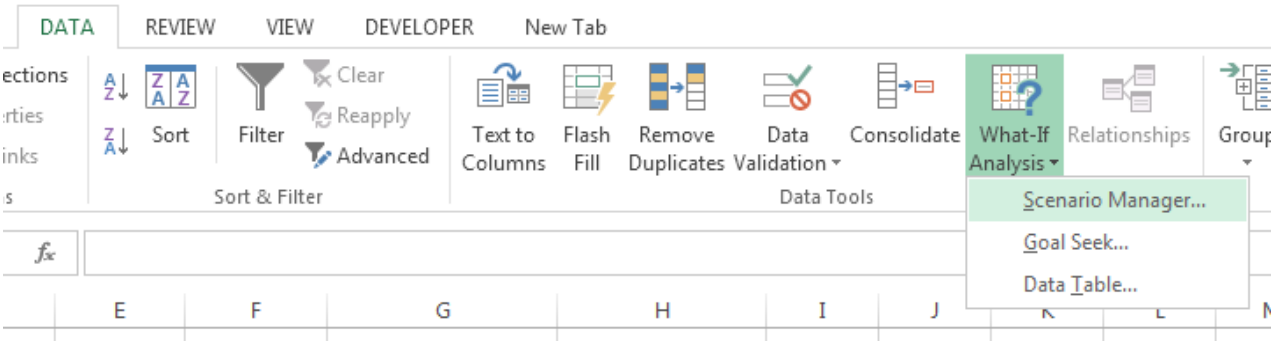


Press **OK**.

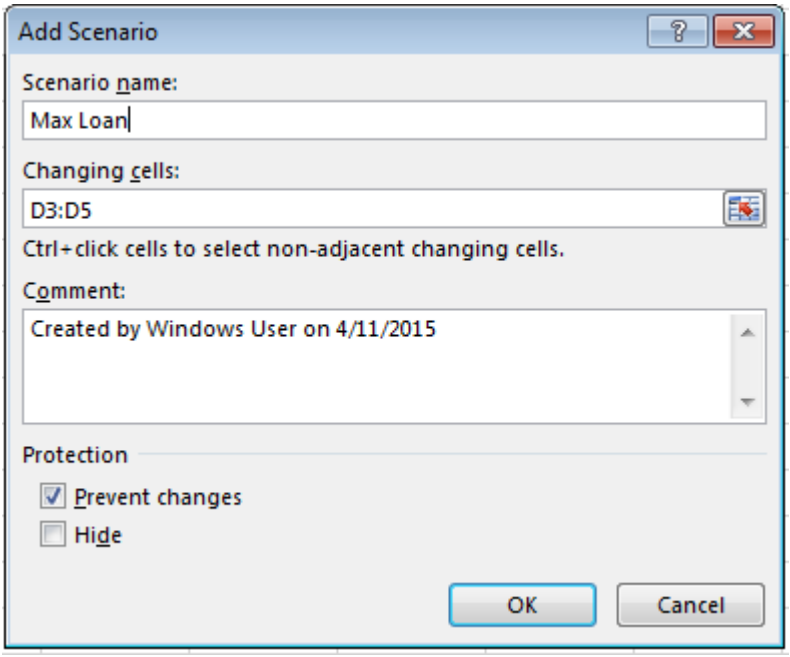


Press **OK** to close the Goal Seek Status Dialog Box.

Press **OK**. Then select **Scenario Manager** from Data Ribbon Tab

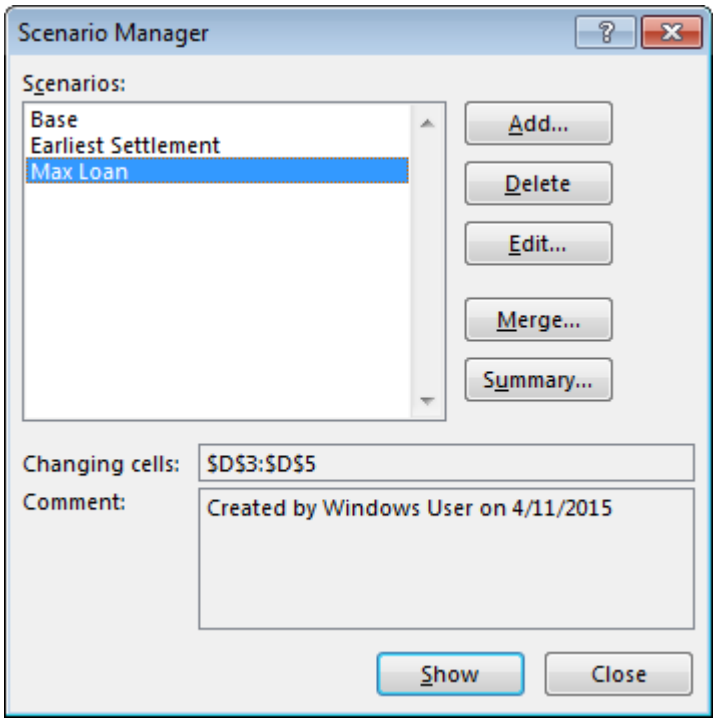


Press **Add** to add new Scenario.

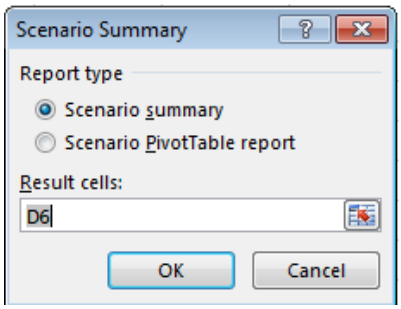


Name the new Scenario as "Max Loan". Press **OK**

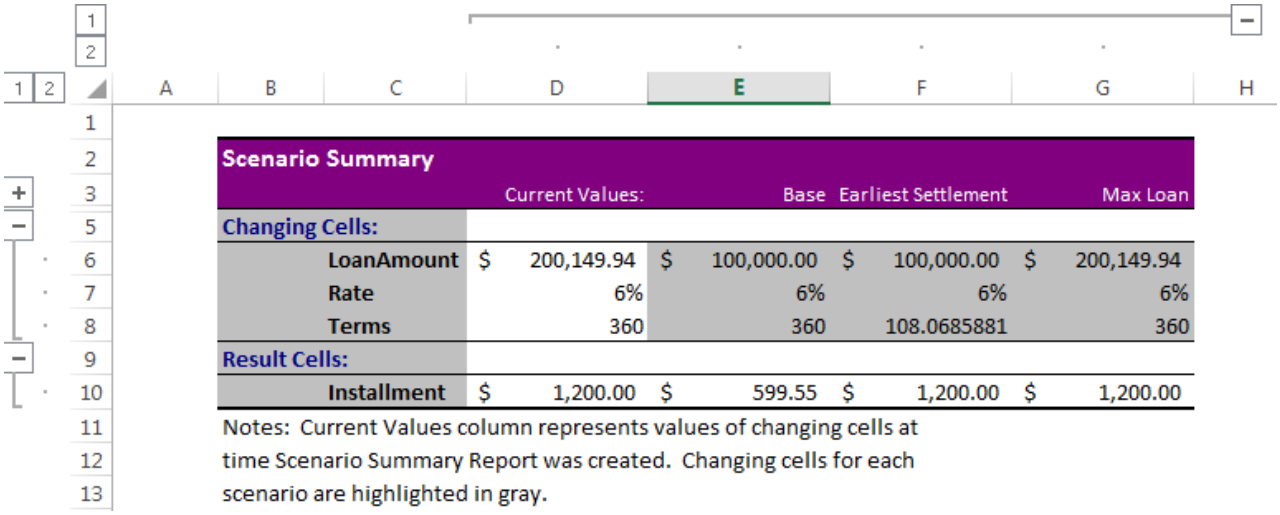
In the **Scenario Values** Dialog Box, press **OK**.



Now, Press **Summary** button.



Press **OK** under Scenario Summary Dialog Box.



Scenario Summary	Current Values:	Base	Earliest Settlement	Max Loan
Changing Cells:				
LoanAmount	$ 200,149.94	$ 100,000.00	$ 100,000.00	$ 200,149.94
Rate	6%	6%	6%	6%
Terms	360	360	108.0685881	360
Result Cells:				
Installment	$ 1,200.00	$ 599.55	$ 1,200.00	$ 1,200.00

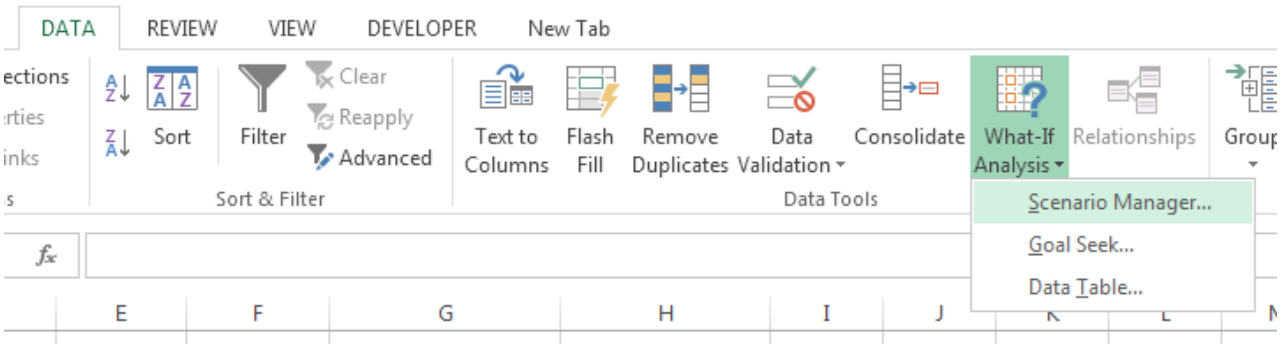
Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.

A Scenario Summary Sheet is generated.

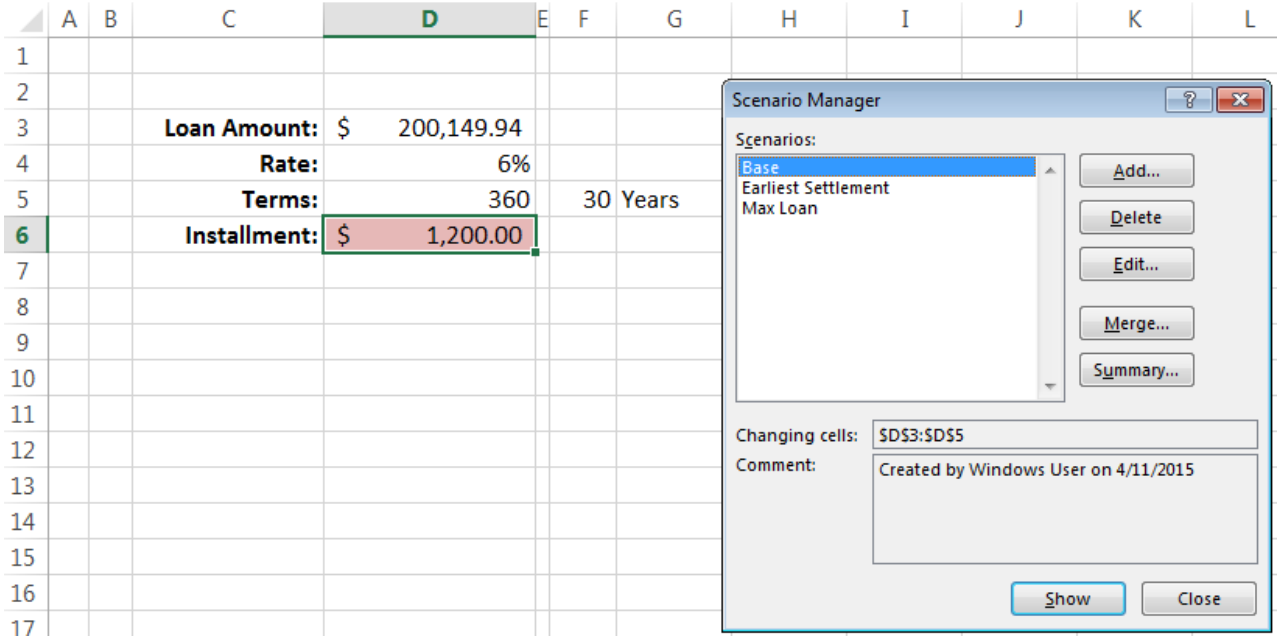
Back to Goal Seek worksheet.

Select cell D6 again.

Press **OK**. Then select **Scenario Manager** again from Data Ribbon Tab



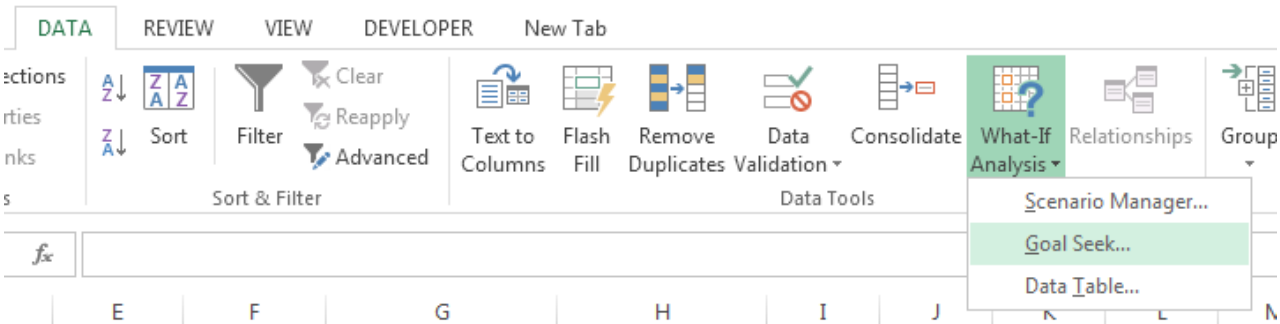
Select Scenario Base, then press **Show**.



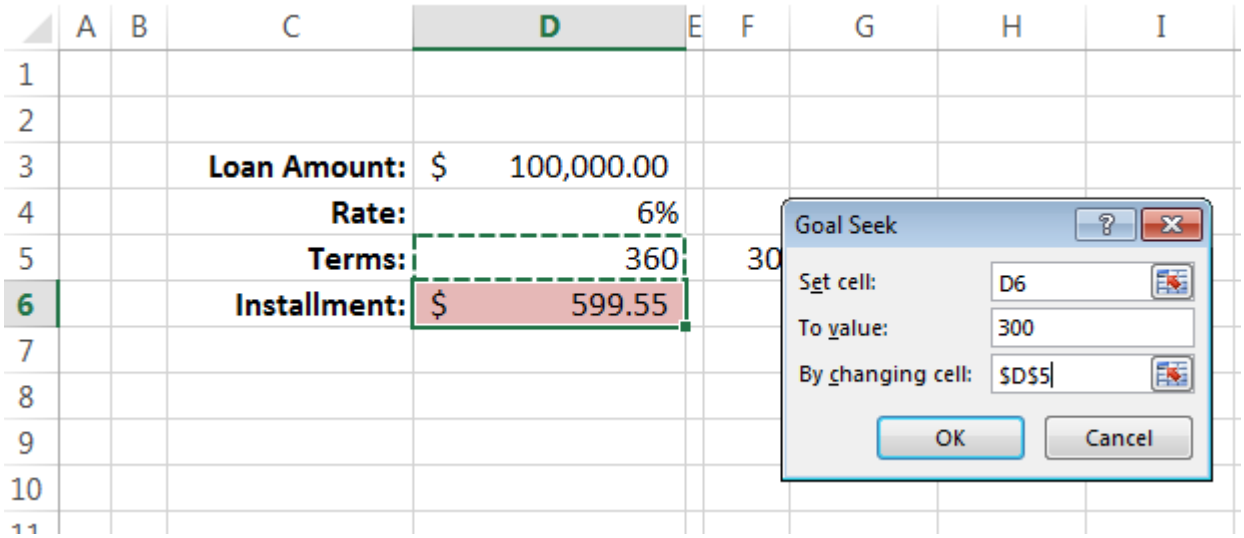
Beware that the model reset back to Base scenario.

Press **Close**.

While the selection still with cell D6, select **Goal Seek** from Data Ribbon Tab



Prepare the value as below:



Press **OK**.

Explain what you get.

Press **OK** to end the exercise.

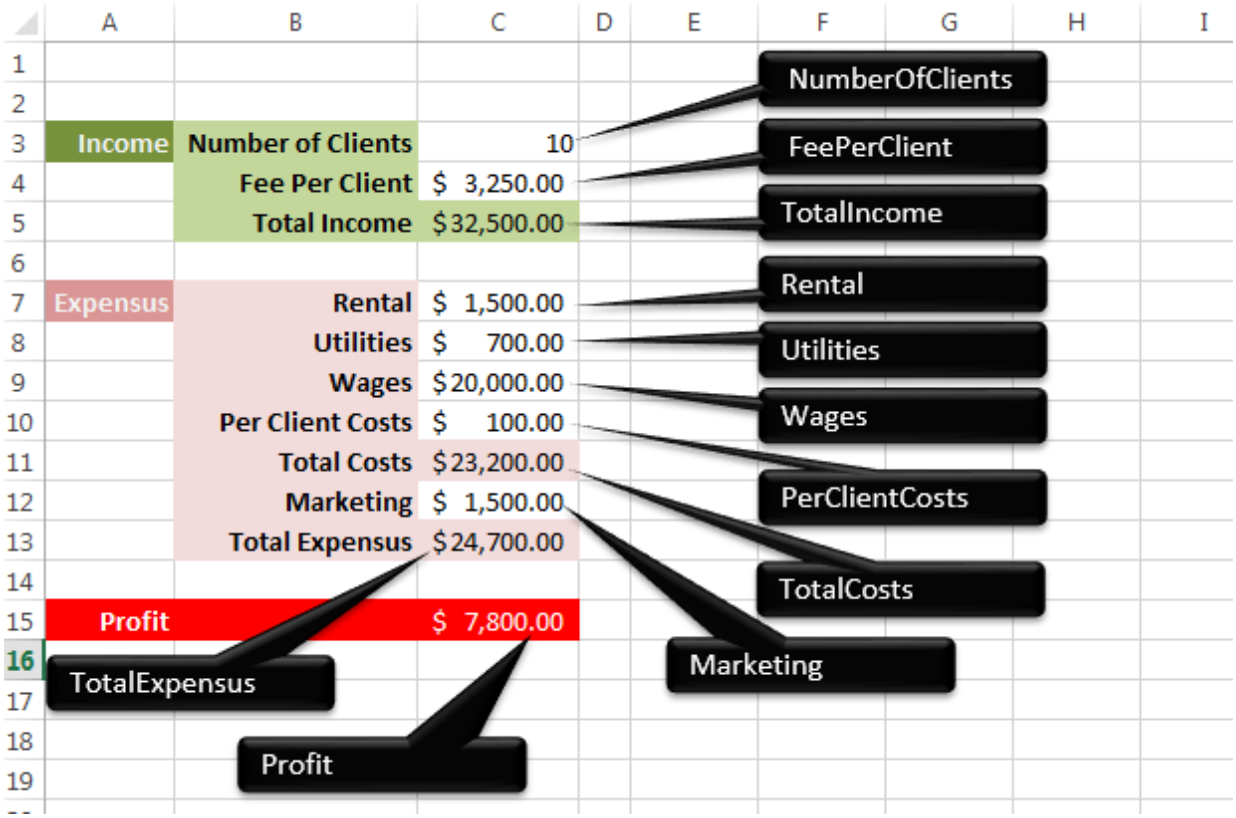
What is Data Table?

A data table is a range of cells that shows how changing one or two variables in your formulas affects the results of those formulas.

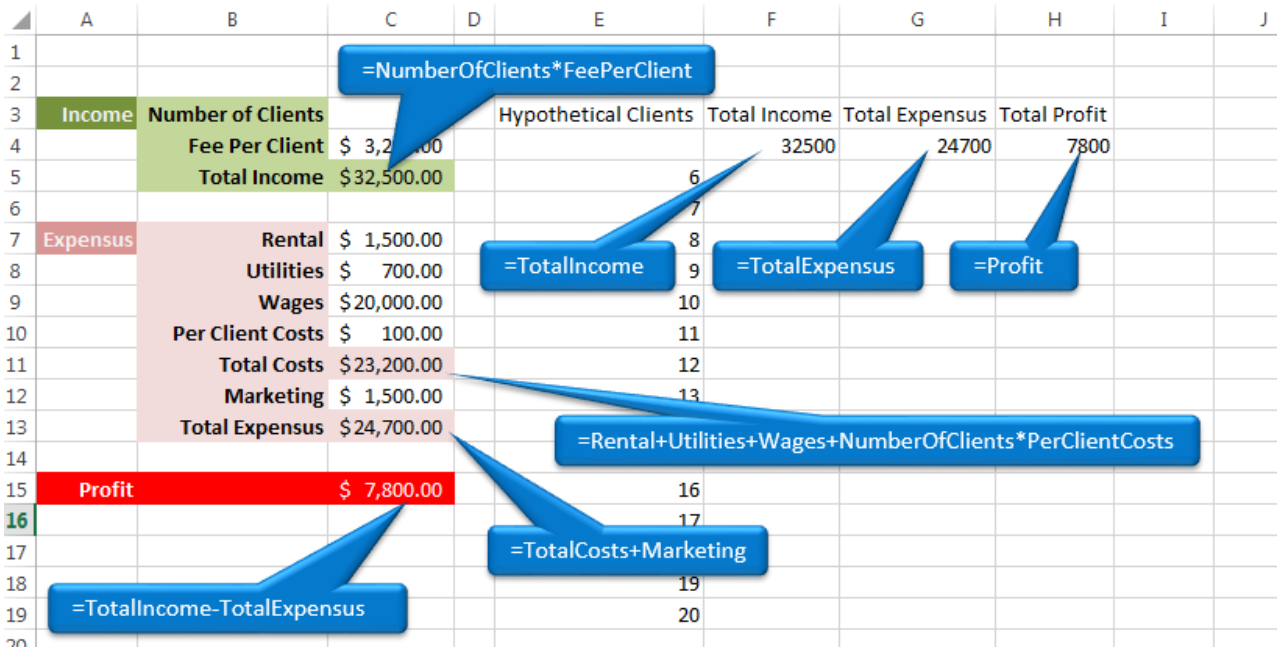
Exercise 10.2: Solving Single Variable Problem

Prepare new worksheet with name "Data Table (1 Var)"

Name the cells as below:



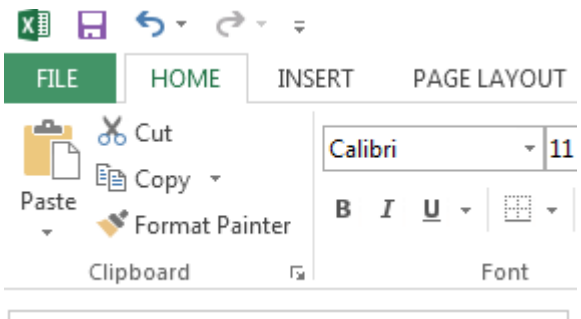
Prepare the following formula as below:



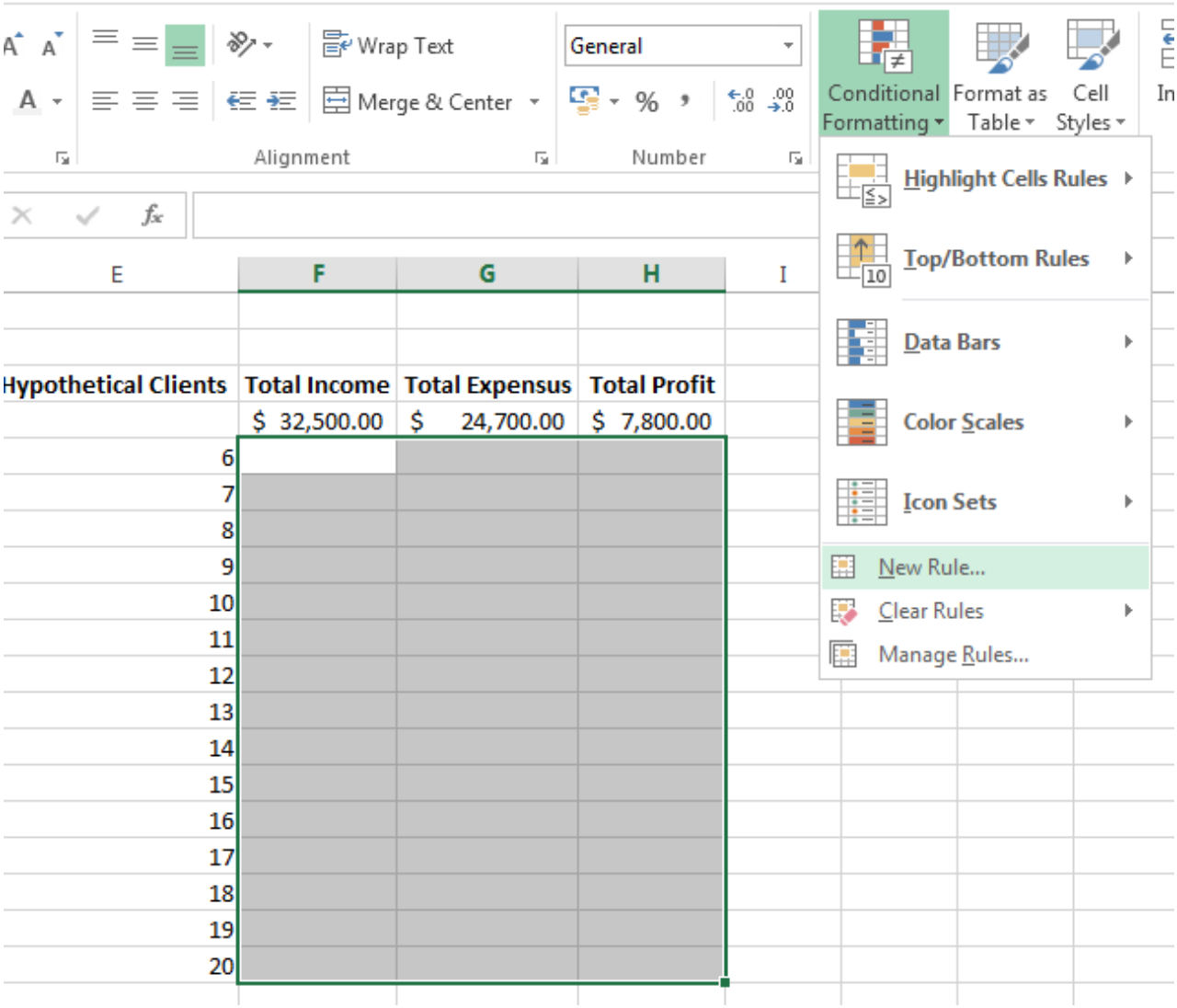
Complete the worksheet as below:

Income	Number of Clients	10		Hypothetical Clients	Total Income	Total Expensus	Total Profit
	Fee Per Client	$ 3,250.00			$ 32,500.00	$ 24,700.00	$ 7,800.00
	Total Income	$32,500.00		6			
				7			
Expensus	Rental	$ 1,500.00		8			
	Utilities	$ 700.00		9			
	Wages	$20,000.00		10			
	Per Client Costs	$ 100.00		11			
	Total Costs	$23,200.00		12			
	Marketing	$ 1,500.00		13			
	Total Expensus	$24,700.00		14			
				15			
Profit		$ 7,800.00		16			
				17			
				18			
				19			
				20			

Select **Home** ribbon Tab

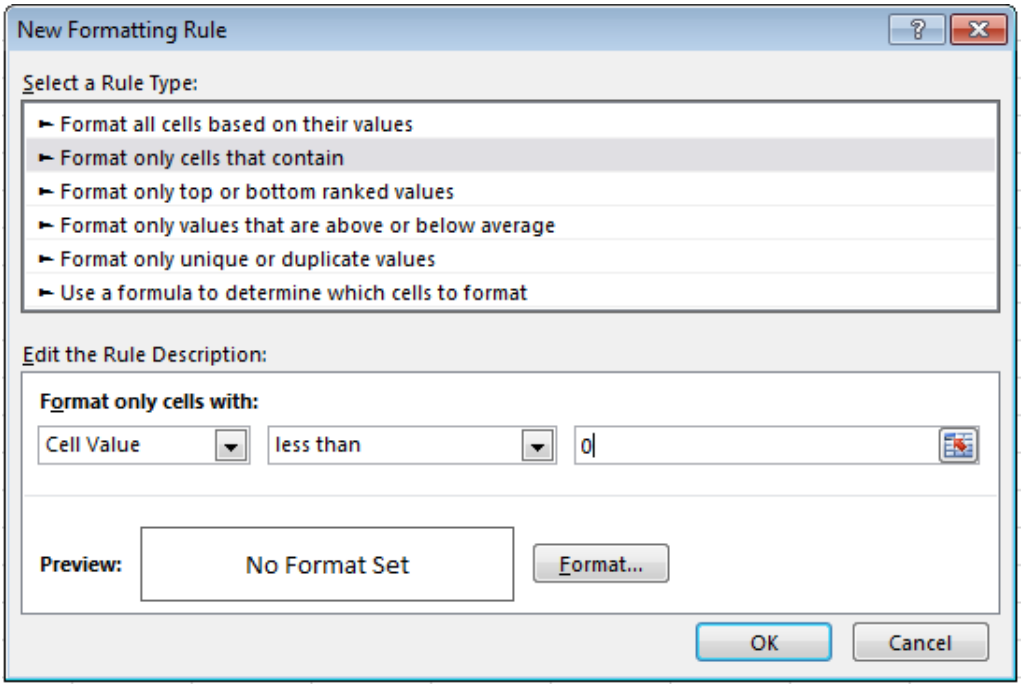


Highlight range F5:H19 and select **New Rule** under Conditional Formatting.

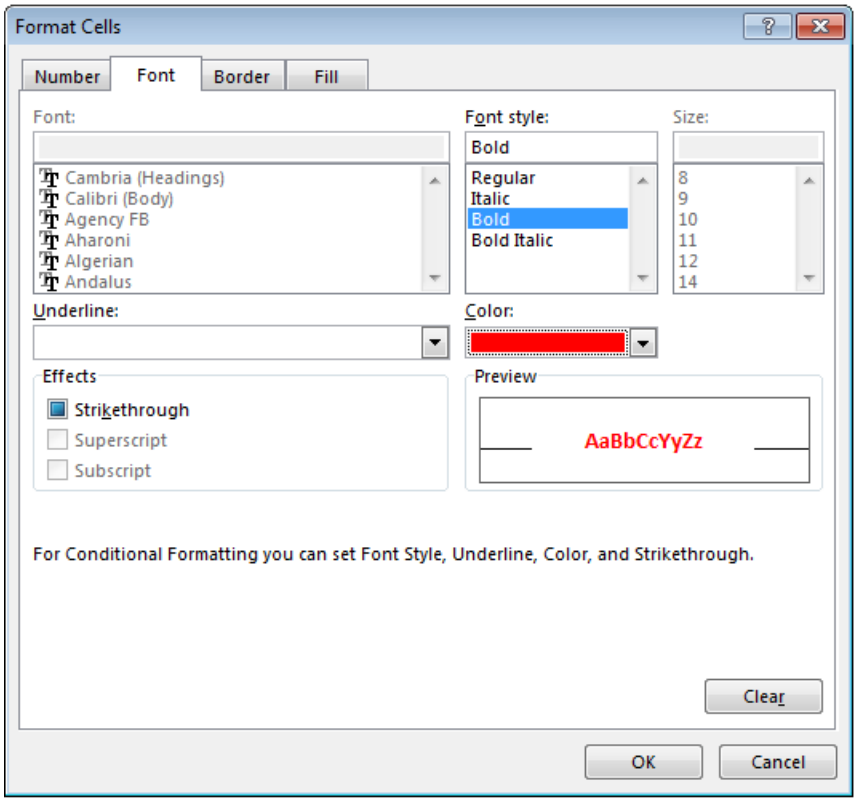


Select Rule Type as **Format only cells that contain**

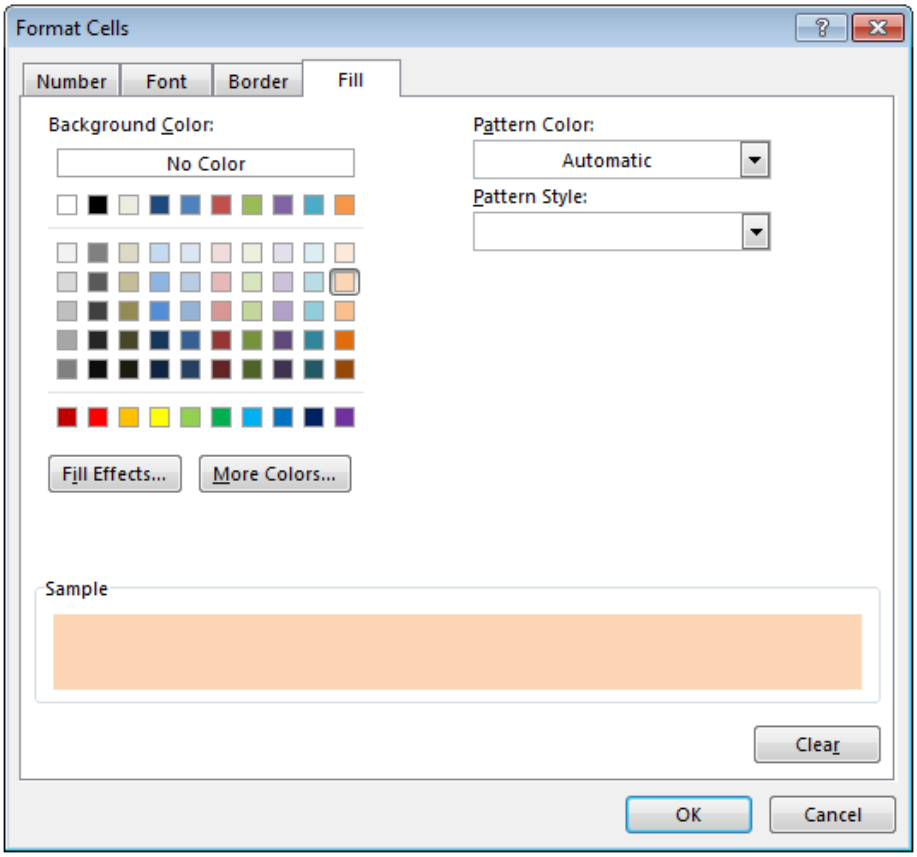
Prepare the **Edit the Rule Description** as below:



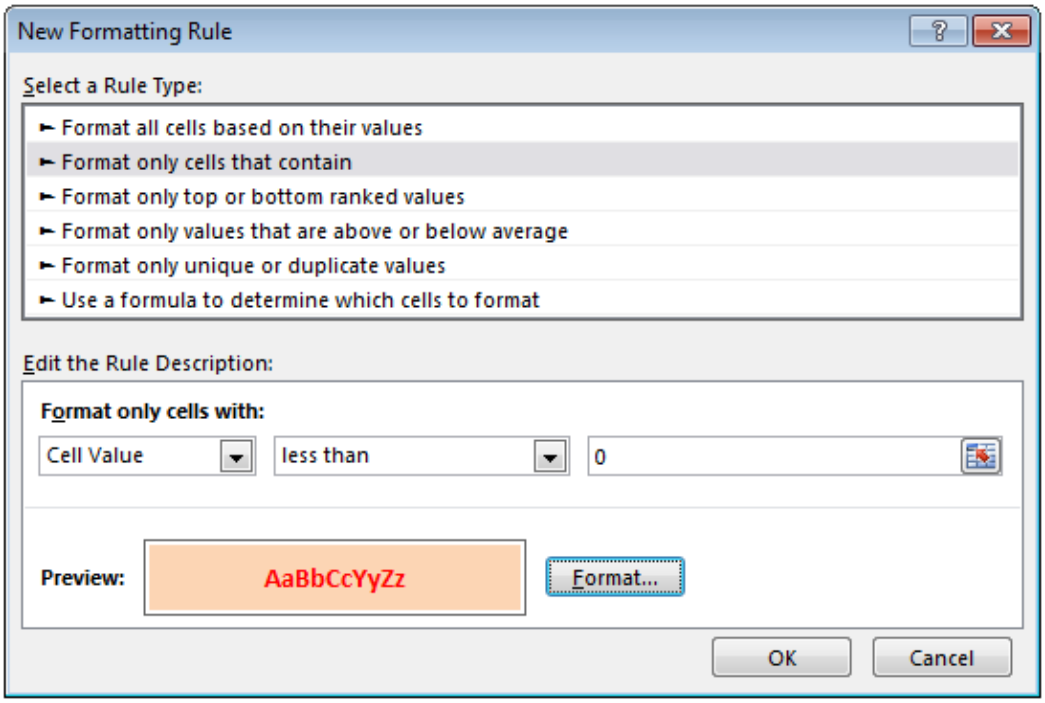
Click **Format**.



Set the font to **Bold** and **Red**.



Set the fill color to **Pink**. Press **OK**.

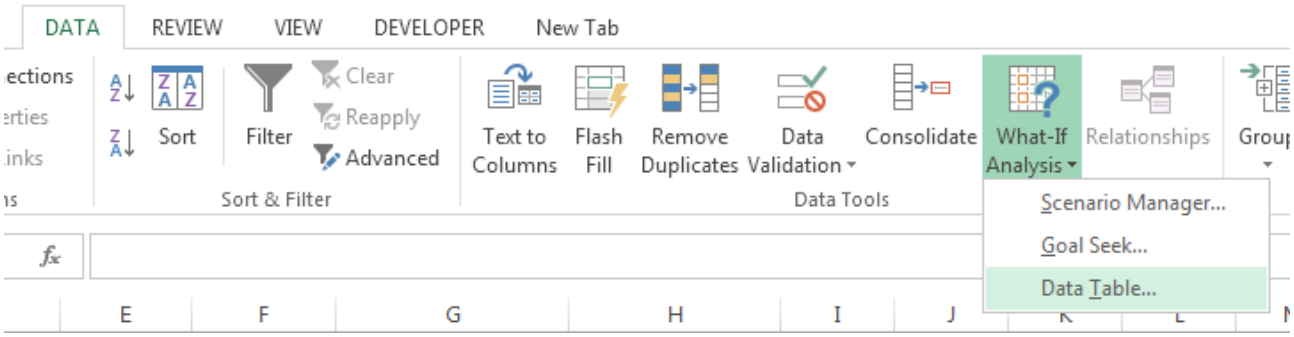


Press **OK**.

Select Range E4:H19

	A	B	C	D	E	F	G	H
1								
2								
3	Income	Number of Clients	10		Hypothetical Clients	Total Income	Total Expensus	Total Profit
4		Fee Per Client	$ 3,250.00			$ 32,500.00	$ 24,700.00	$ 7,800.00
5		Total Income	$32,500.00		6			
6					7			
7	Expensus	Rental	$ 1,500.00		8			
8		Utilities	$ 700.00		9			
9		Wages	$20,000.00		10			
10		Per Client Costs	$ 100.00		11			
11		Total Costs	$23,200.00		12			
12		Marketing	$ 1,500.00		13			
13		Total Expensus	$24,700.00		14			
14					15			
15	Profit		$ 7,800.00		16			
16					17			
17					18			
18					19			
19					20			

Go to **Data** Ribbon Tab.

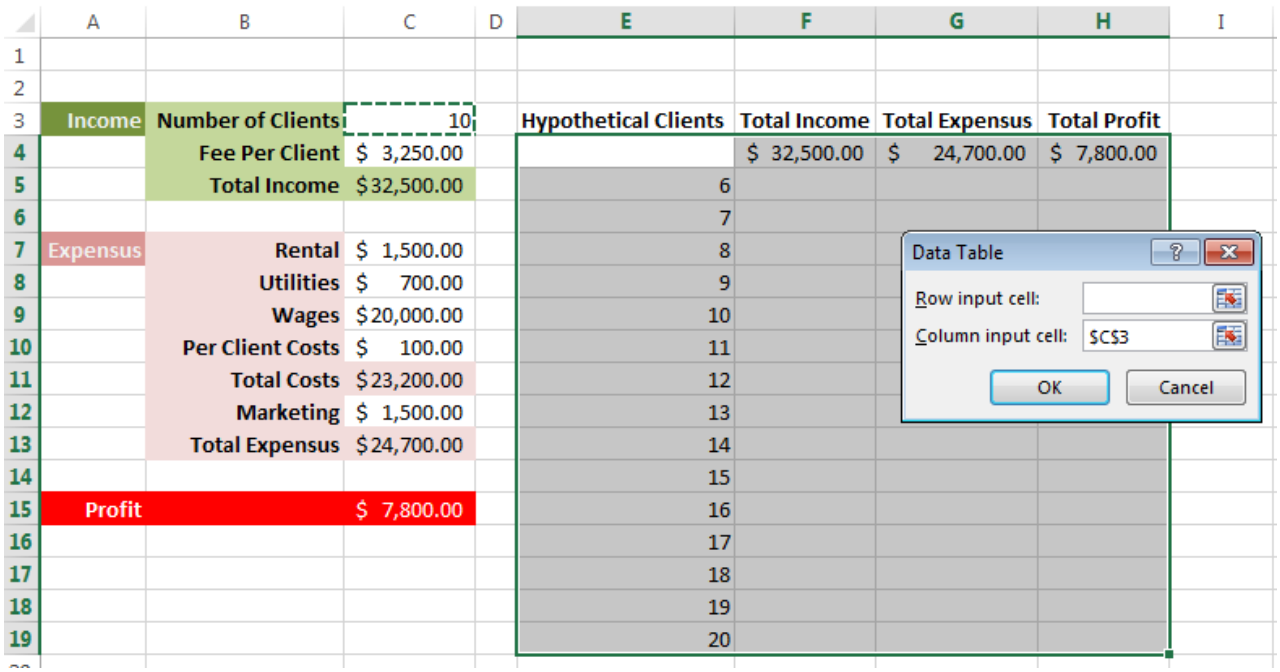


Under What-If Analysis, select **Data Table**.

In the **Data Table** Dialog Box, place the editing cursor to **Column Input Cell** field.

Click on cell **C3**.

Now, you should get the following:



Press **OK**.

	A	B	C	D	E	F	G	H
1								
2								
3	Income	Number of Clients	10		Hypothetical Clients	Total Income	Total Expensus	Total Profit
4		Fee Per Client	$ 3,250.00			$ 32,500.00	$ 24,700.00	$ 7,800.00
5		Total Income	$32,500.00		6	19500	24300	-4800
6					7	22750	24400	-1650
7	Expensus	Rental	$ 1,500.00		8	26000	24500	1500
8		Utilities	$ 700.00		9	29250	24600	4650
9		Wages	$20,000.00		10	32500	24700	7800
10		Per Client Costs	$ 100.00		11	35750	24800	10950
11		Total Costs	$23,200.00		12	39000	24900	14100
12		Marketing	$ 1,500.00		13	42250	25000	17250
13		Total Expensus	$24,700.00		14	45500	25100	20400
14					15	48750	25200	23550
15	Profit		$ 7,800.00		16	52000	25300	26700
16					17	55250	25400	29850
17					18	58500	25500	33000
18					19	61750	25600	36150
19					20	65000	25700	39300
20								

Explain the meaning of the outcome.

Exercise 10.3: Solving Two Variables Problem

Copy worksheet "Data Table (1 Var)".

Rename the copy as "Data Table (2 Vars)"

Data Table (2 Vars)

Switch to the new copy.

Delete entire columns D:H

Prepare the following:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2															
3	Income	Number of Clients	10		No of Clients			Client Fees							
4		Fee Per Client	$ 3,250.00		$ 7,800.00	$1,600.00	$1,700.00	$1,800.00	$1,900.00	$2,000.00	$2,100.00	$2,200.00	$2,300.00	$2,400.00	$2,500.00
5		Total Income	$32,500.00		6										
6					7										
7	Expensus	Rental	$ 1,500.00		8										
8		Utilities	$ 700.00		9										
9		Wages	$20,000.00		10										
10		Per Client Costs	$ 100.00		11										
11		Total Costs	$23,200.00		12										
12		Marketing	$ 1,500.00		13										
13		Total Expensus	$24,700.00		14										
14					15										
15	Profit		$ 7,800.00		16										
16					17										
17					18										
18					19										
19					20										
20					21										
21					22										
22					23										
23					24										
24					25										

=Profit

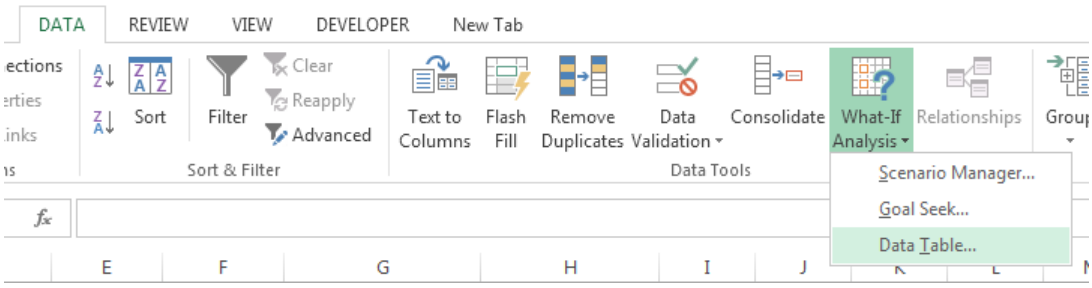
Select the similar conditional formatting for negative value as before in worksheet "Data Table (1 Var)" for Range F5:O24.

Select range E4:O24

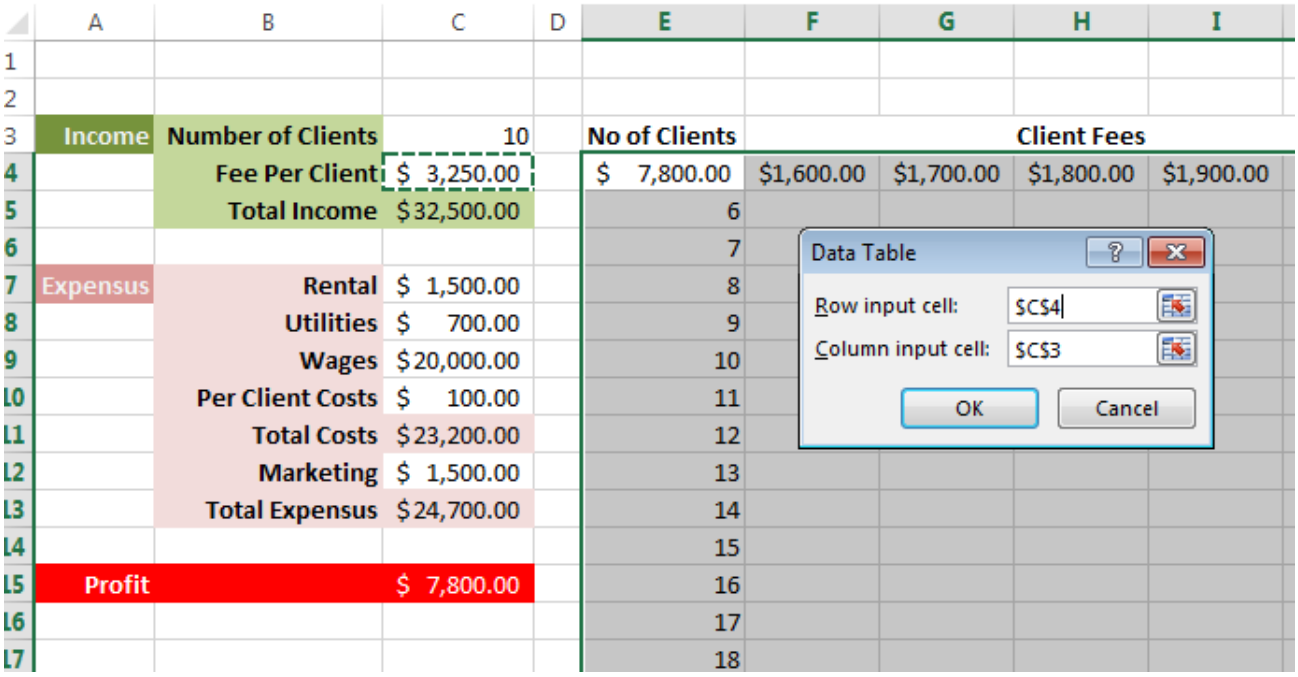
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2															
3	Income	Number of Clients	10		No of Clients			Client Fees							
4		Fee Per Client	$ 3,250.00		$ 7,800.00	$1,600.00	$1,700.00	$1,800.00	$1,900.00	$2,000.00	$2,100.00	$2,200.00	$2,300.00	$2,400.00	$2,500.00
5		Total Income	$32,500.00		6										
6					7										
7	Expensus	Rental	$ 1,500.00		8										
8		Utilities	$ 700.00		9										
9		Wages	$20,000.00		10										
10		Per Client Costs	$ 100.00		11										
11		Total Costs	$23,200.00		12										
12		Marketing	$ 1,500.00		13										
13		Total Expensus	$24,700.00		14										
14					15										
15	Profit		$ 7,800.00		16										
16					17										
17					18										
18					19										
19					20										
20					21										
21					22										
22					23										
23					24										
24					25										

Go to **Data** Ribbon Tab.

Under What-If Analysis, select **Data Table**.



Prepare the following Data Table Dialog Box:



Press **OK**.

Income	Number of Clients	10		No of Clients	Client Fees										
	Fee Per Client	$ 3,250.00		$ 7,800.00	$1,600.00	$1,700.00	$1,800.00	$1,900.00	$2,000.00	$2,100.00	$2,200.00	$2,300.00	$2,400.00	$2,500.00
	Total Income	$32,500.00		6	-14700	-14100	-13500	-12900	-12300	-11700	-11100	-10500	-9900	-9300
				7	-13200	-12500	-11800	-11100	-10400	-9700	-9000	-8300	-7600	-6900
Expensus	Rental	$ 1,500.00		8	-11700	-10900	-10100	-9300	-8500	-7700	-6900	-6100	-5300	-4500
	Utilities	$ 700.00		9	-10200	-9300	-8400	-7500	-6600	-5700	-4800	-3900	-3000	-2100
	Wages	$20,000.00		10	-8700	-7700	-6700	-5700	-4700	-3700	-2700	-1700	-700	300
	Per Client Costs	$ 100.00		11	-7200	-6100	-5000	-3900	-2800	-1700	-600	500	1600	2700
	Total Costs	$23,200.00		12	-5700	-4500	-3300	-2100	-900	300	1500	2700	3900	5100
	Marketing	$ 1,500.00		13	-4200	-2900	-1600	-300	1000	2300	3600	4900	6200	7500
	Total Expensus	$24,700.00		14	-2700	-1300	100	1500	2900	4300	5700	7100	8500	9900
				15	-1200	300	1800	3300	4800	6300	7800	9300	10800	12300
Profit		$ 7,800.00		16	300	1900	3500	5100	6700	8300	9900	11500	13100	14700
				17	1800	3500	5200	6900	8600	10300	12000	13700	15400	17100
				18	3300	5100	6900	8700	10500	12300	14100	15900	17700	19500
				19	4800	6700	8600	10500	12400	14300	16200	18100	20000	21900
				20	6300	8300	10300	12300	14300	16300	18300	20300	22300	24300
				21	7800	9900	12000	14100	16200	18300	20400	22500	24600	26700
				22	9300	11500	13700	15900	18100	20300	22500	24700	26900	29100
				23	10800	13100	15400	17700	20000	22300	24600	26900	29200	31500
				24	12300	14700	17100	19500	21900	24300	26700	29100	31500	33900
				25	13800	16300	18800	21300	23800	26300	28800	31300	33800	36300

Explain the result.

What is Solver?

In Excel, Solver is part of a suite of commands sometimes called what-if analysis tools. With Solver, you can find an optimal (maximum or minimum) value for a formula in one cell — called the objective cell — subject to constraints, or limits, on the values of other formula cells on a worksheet.

Enable Solver

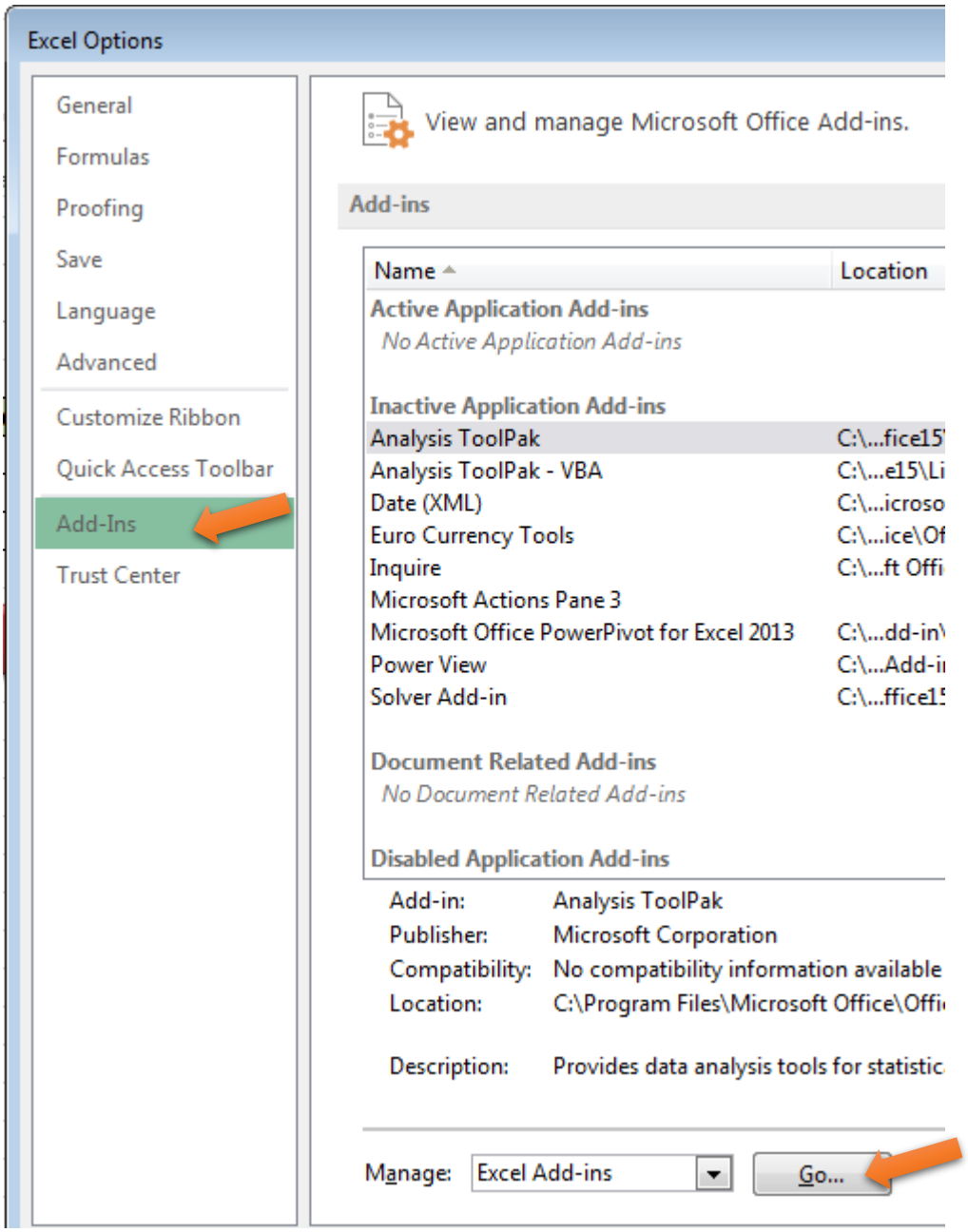
Solver by default is not enabled. Before we can use it, we need to enable it.

Go to backstage of Excel by click on the **File** at the top left of Ribbon.

Select **Option**.

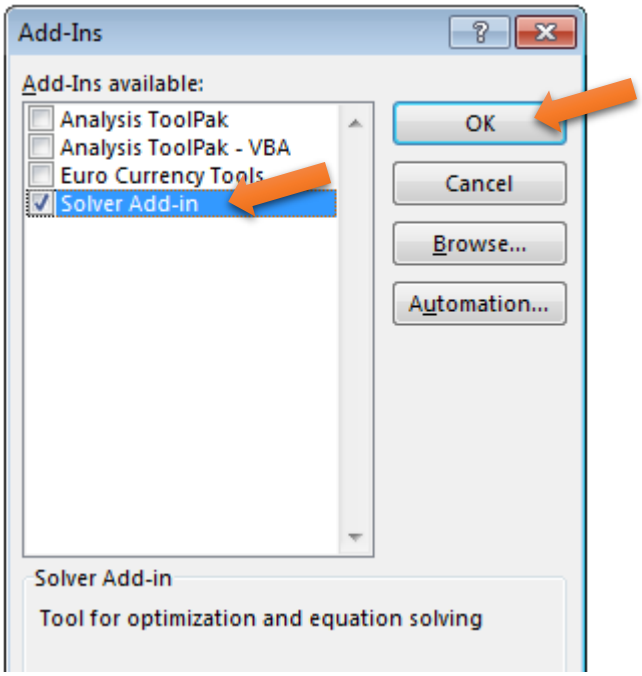
Under **Excel Options** Dialog Box, Select **Add-Ins**.

Then Click **Go...**

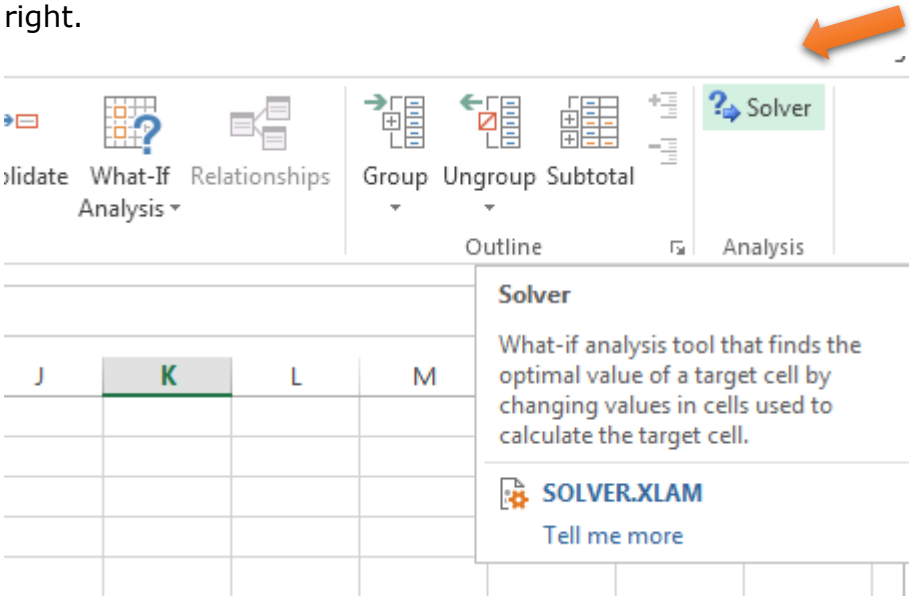


Under **Add-Ins** Dialog Box, Check the **Solver Add-In**.

Press **OK**.



Select **Data** Ribbon Tab, you should be able to see the **Solver** button at the far right.



Solver is enabled now.

Set up Model

Assuming that you are running a furniture factory. Your factory mainly produce tables. Currently you hired 3 skillful senior workers that work 10 hours per day and 10 less skillful workers that work 8 hours per day.

Currently your factory has two types of table:

1. Maple Table

2. Mahogany Table

Your factory has unlimited supply of maple, but limited supply of mahogany.

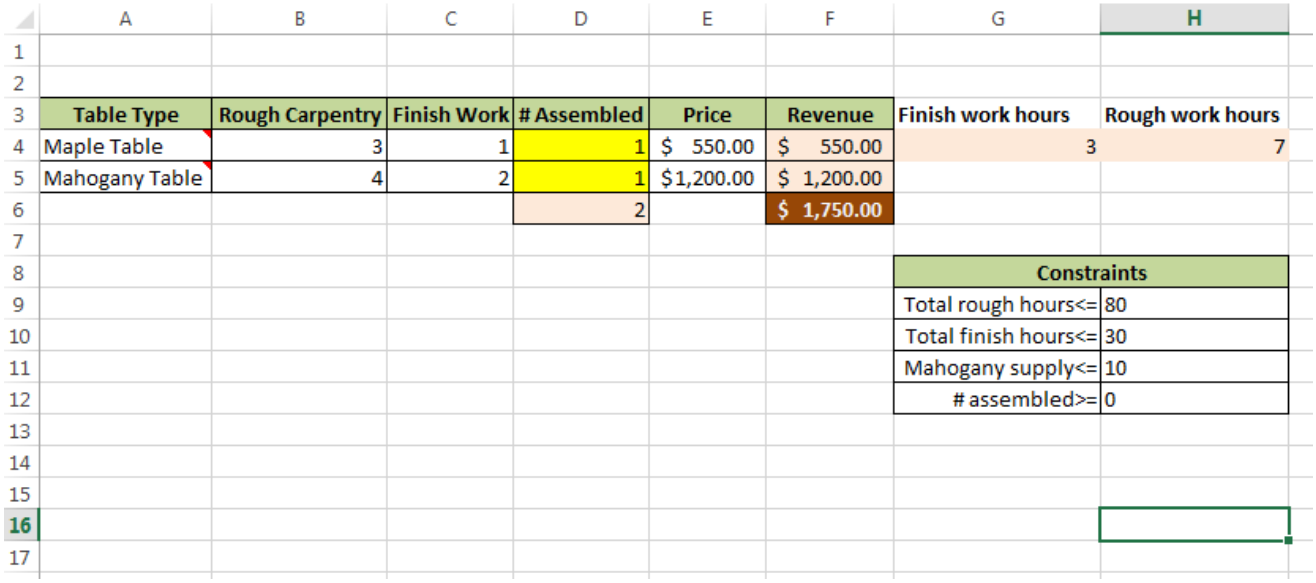
Before we start the exercises. Let's prepare our basic model.

Create a new worksheet.

Name it as "Solver"

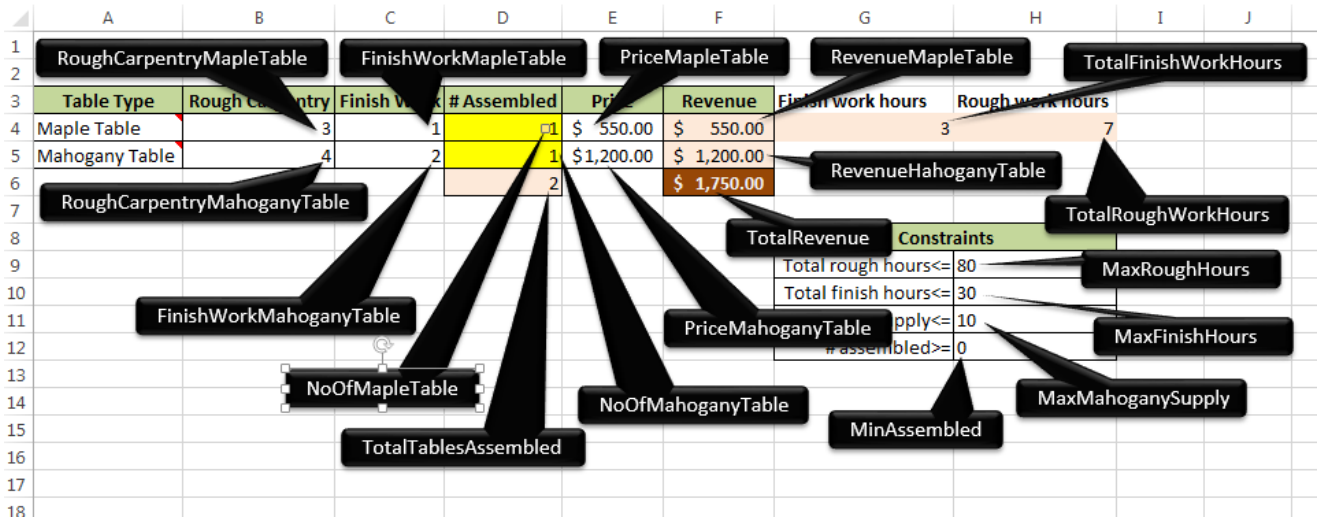
Solver

Prepare the content as below:

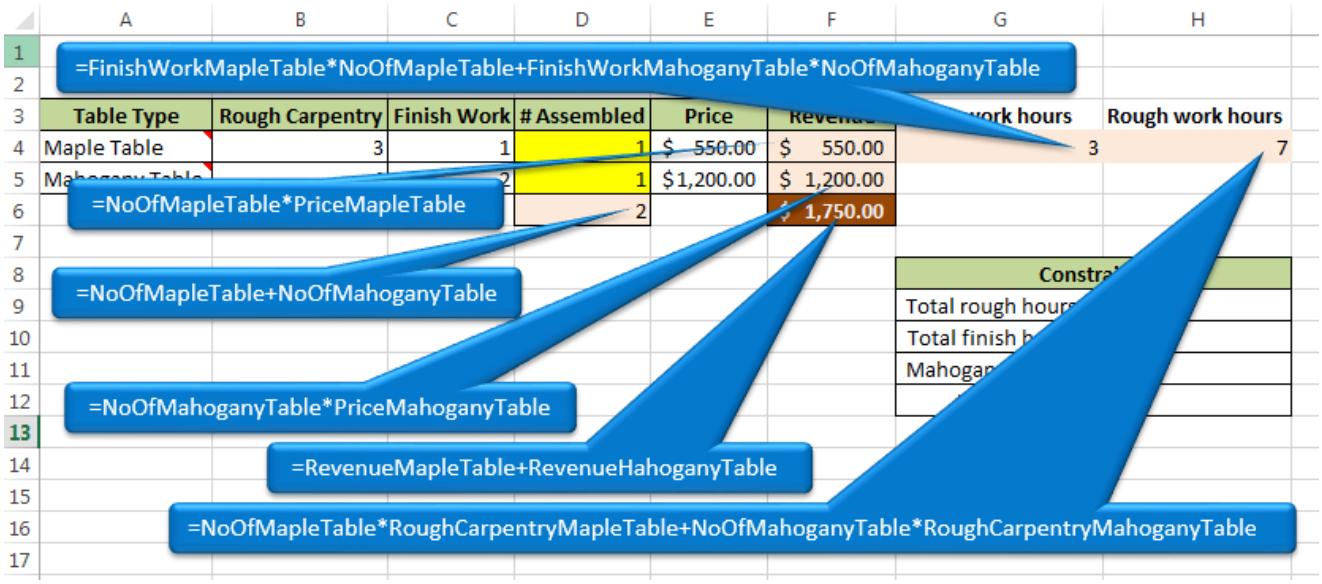


	A	B	C	D	E	F	G	H
3	Table Type	Rough Carpentry	Finish Work	# Assembled	Price	Revenue	Finish work hours	Rough work hours
4	Maple Table	3	1	1	$ 550.00	$ 550.00	3	7
5	Mahogany Table	4	2	1	$1,200.00	$ 1,200.00		
6				2		$ 1,750.00		
8							Constraints	
9							Total rough hours<=	80
10							Total finish hours<=	30
11							Mahogany supply<=	10
12							# assembled>=	0

Name the cells as below:



Assign Formulas:



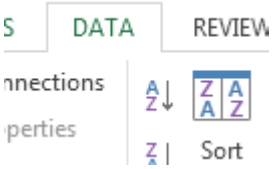
So, the basic model is done.

Exercise 10.4

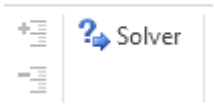
Copy worksheet "Solver", and rename the copy as "**Solver(Ex1)**"

Switch to worksheet Solver(Ex1) now.

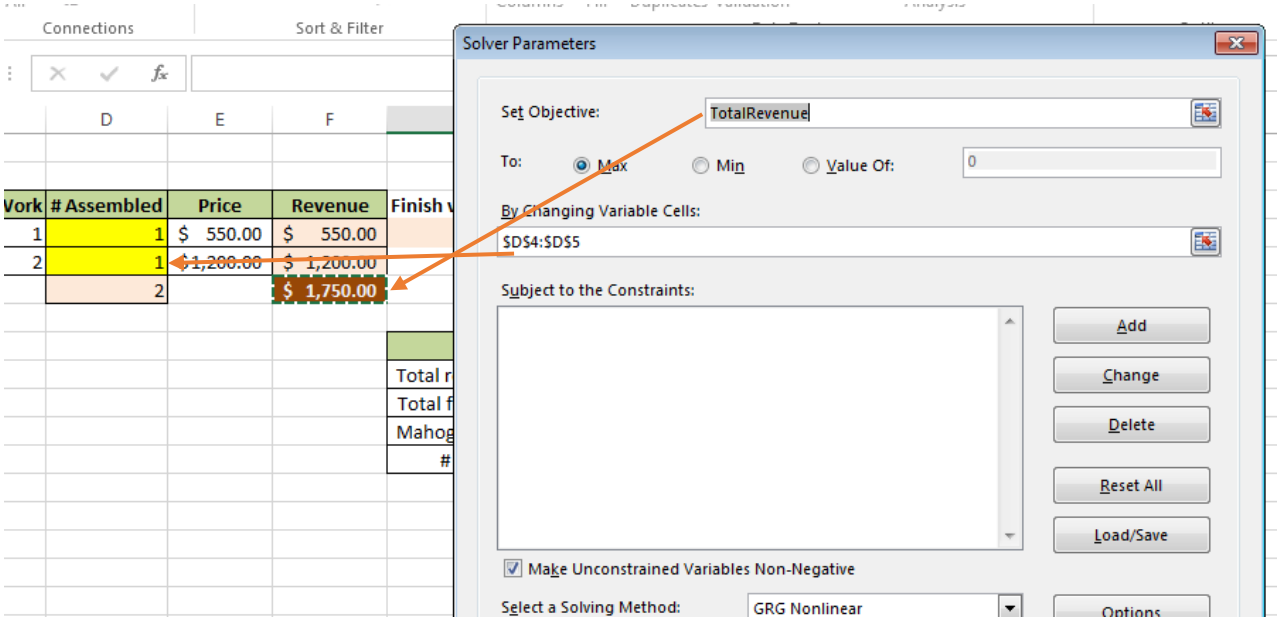
Select **Data** Ribbon Tab.



At the far right, select **Solver**.

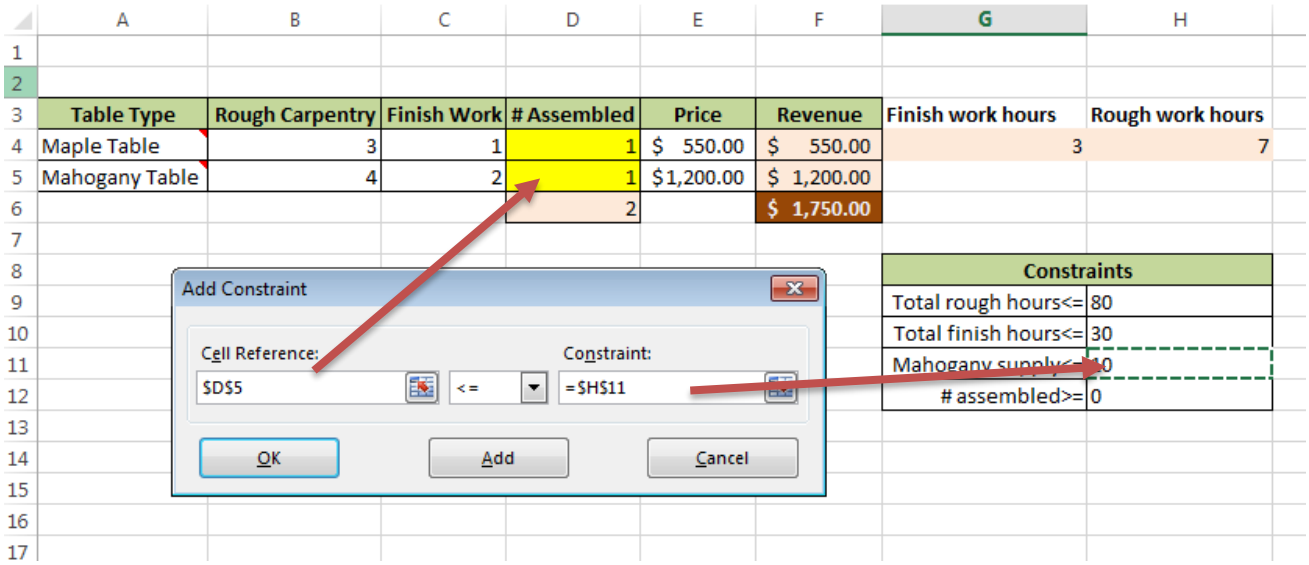


In the **Solver Variables** Dialog Box, select cell **TotalRevenue** under **Set Objective** field, and select range D4:D5 under **By Changing Variables Cells** field as below:



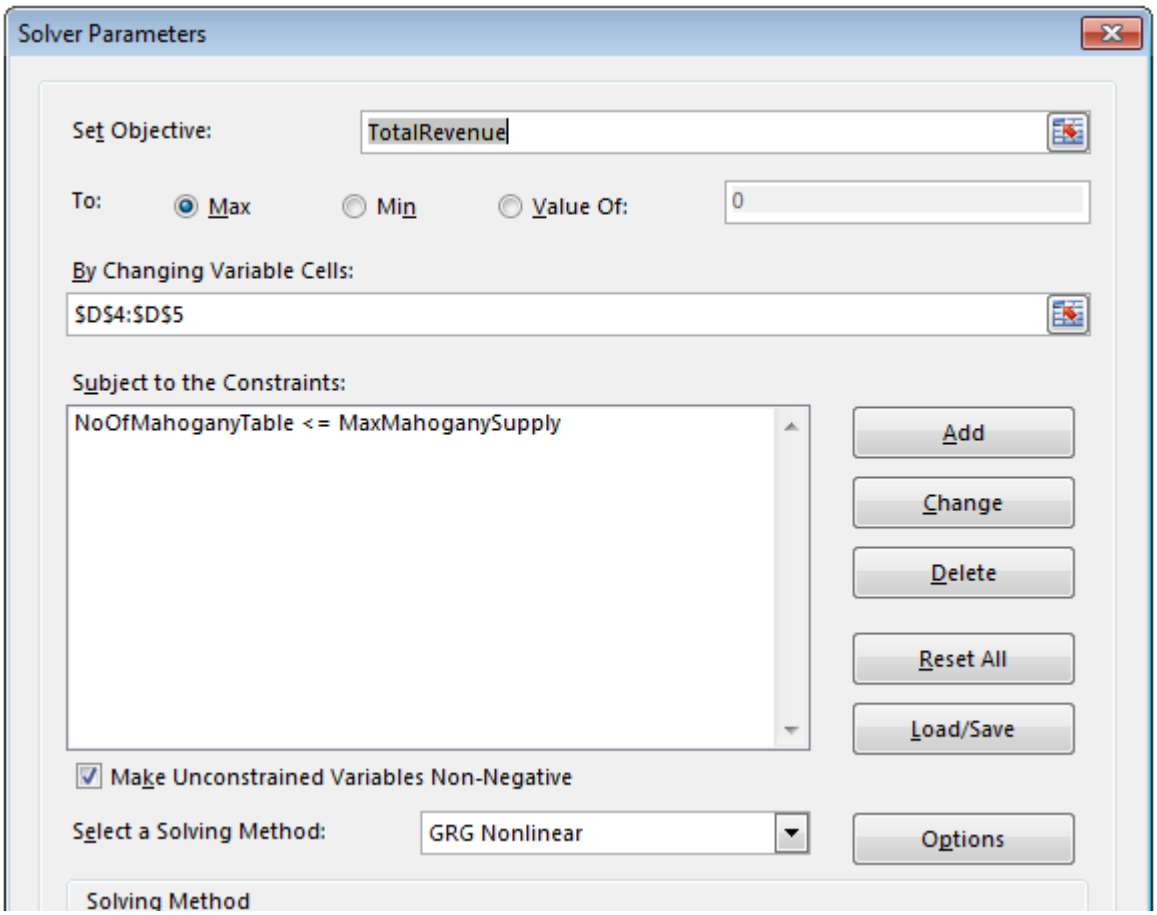
Click **Add** button.

In the **Add Constraint** Dialog Box, prepare the following:



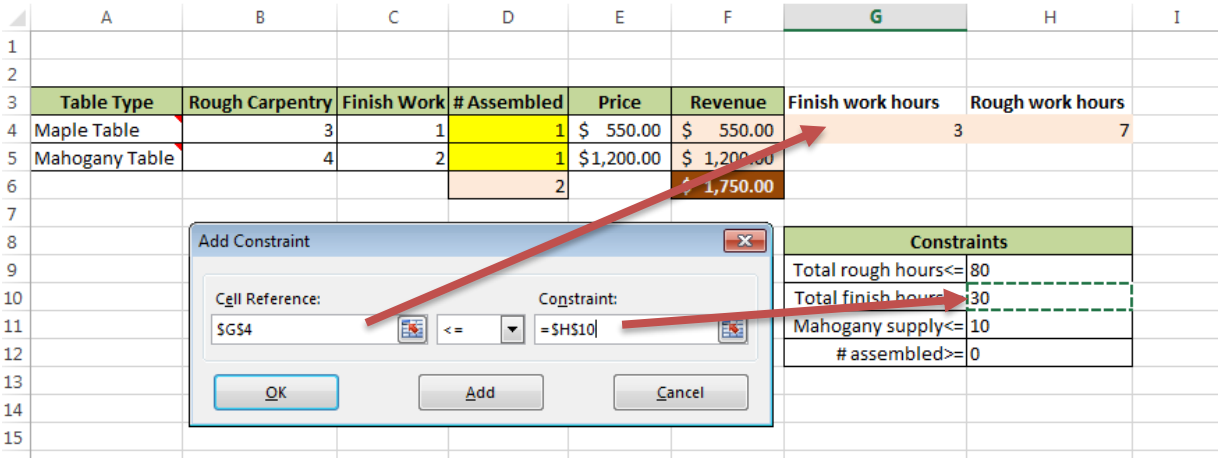
Press **OK**.

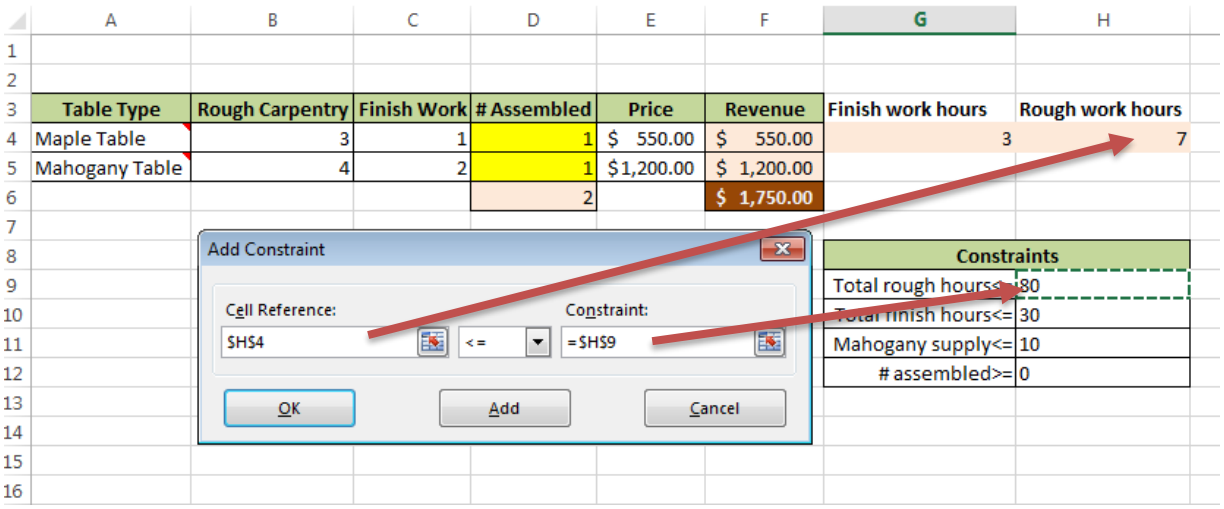
You should get the following:

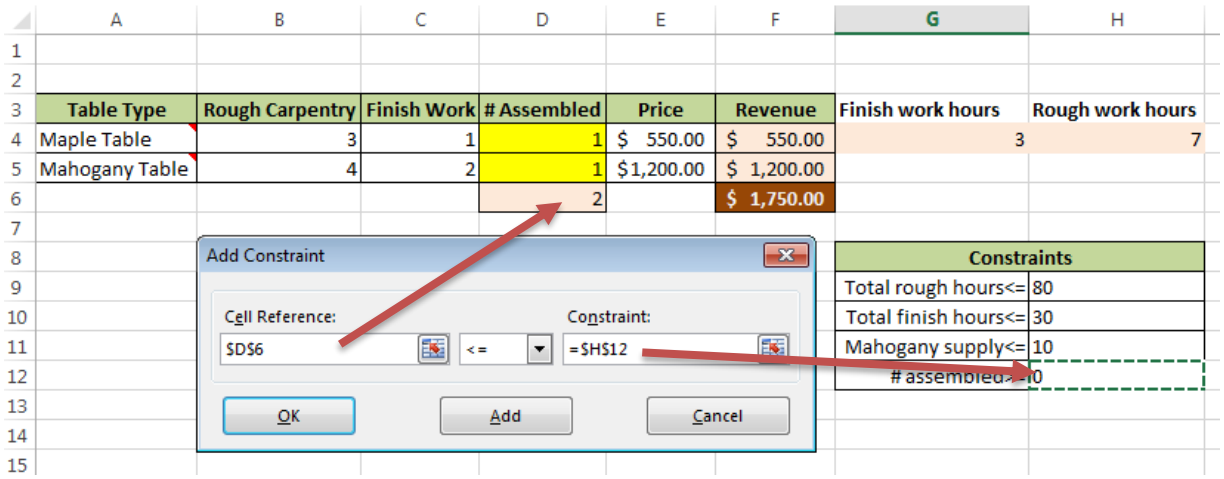


Beware that the constraint is applying names. In fact this is one of the very useful aspect of using name instead of address.

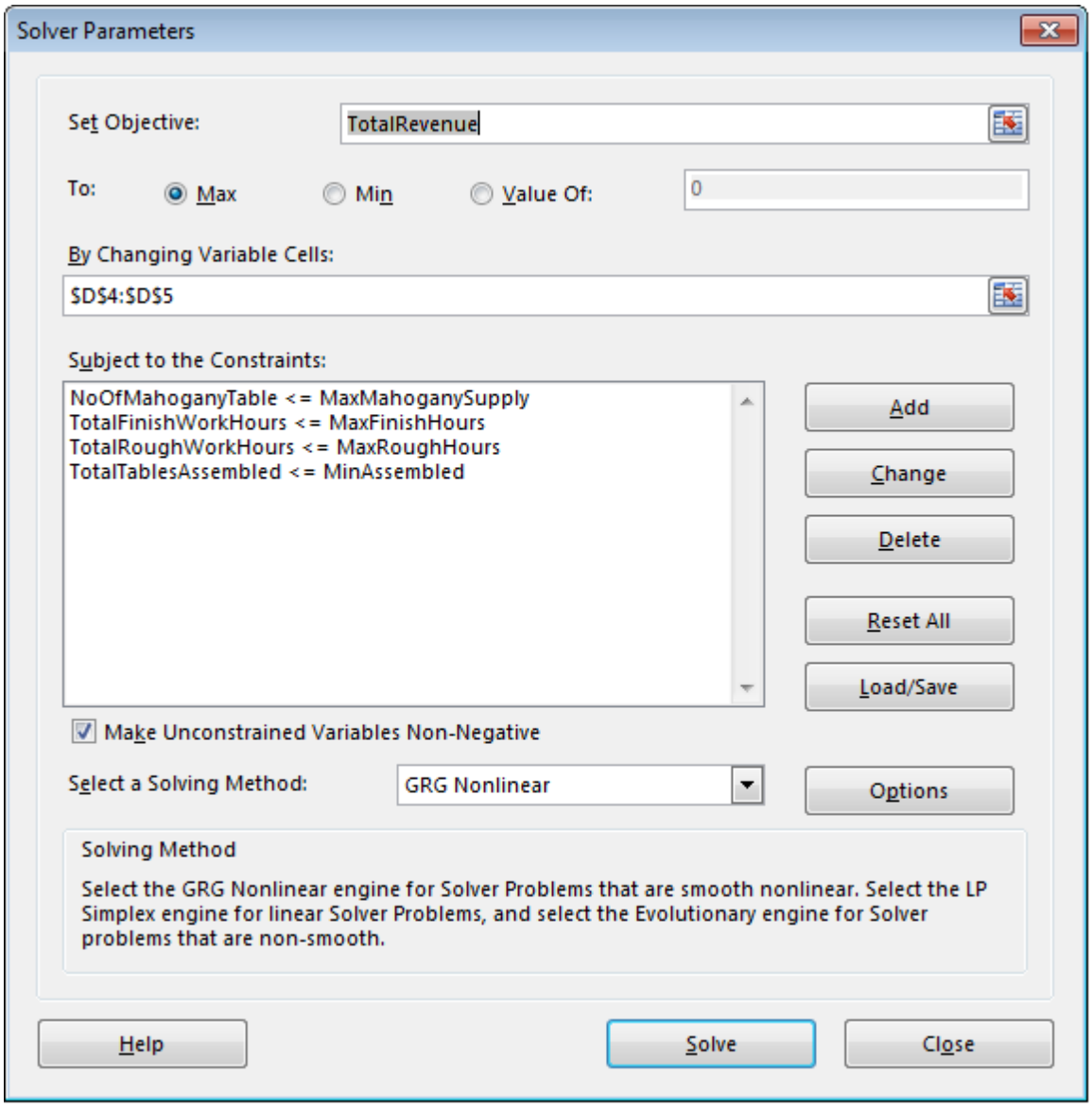
Continue adding the rest of the constraints but pressing **Add**.

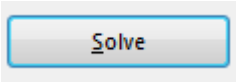


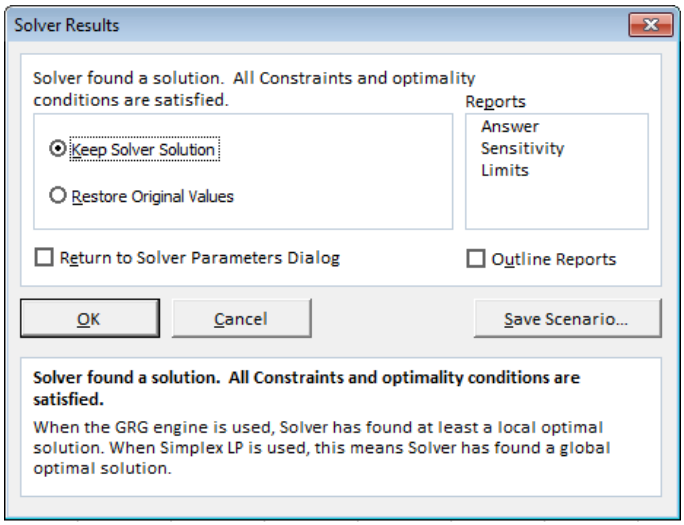




Eventually the constraint set should be as below:



Press  to let the solver start finding solution.

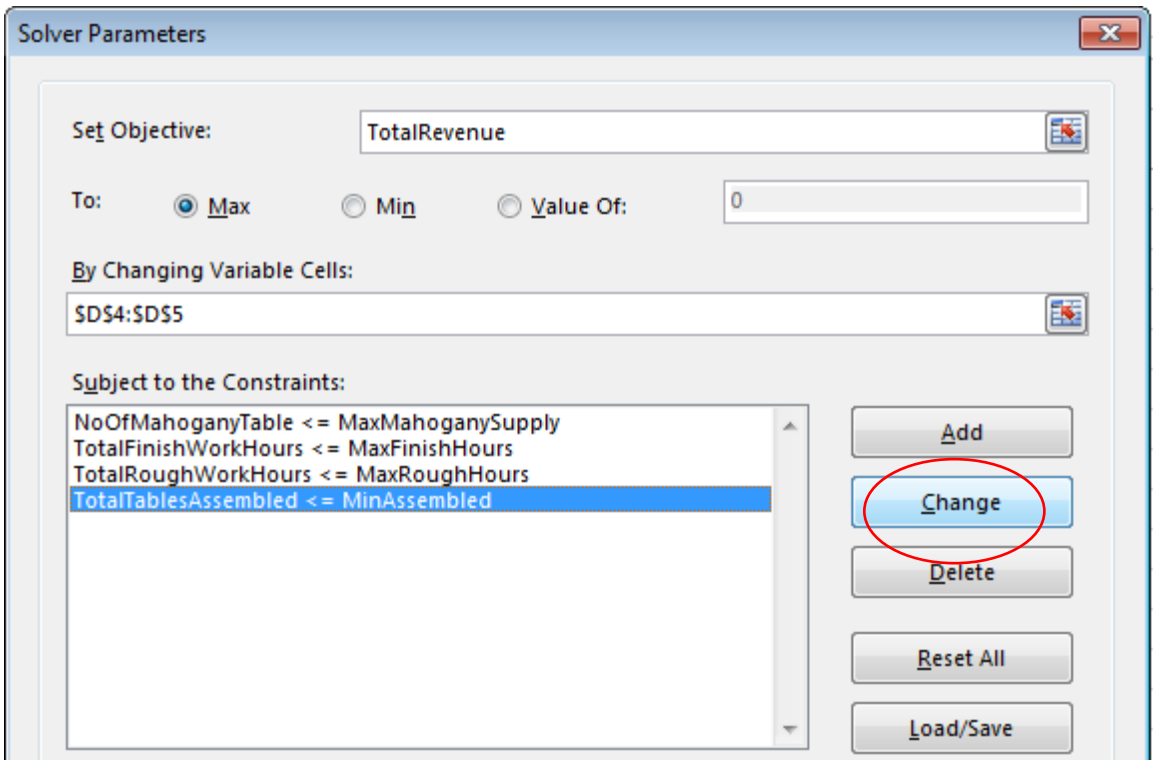


Press **OK** to complete the solution. You should get the following result. But…

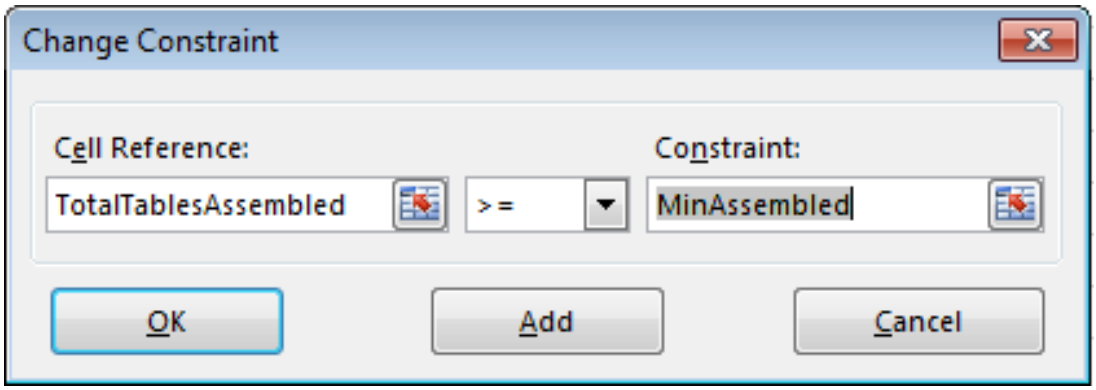
	A	B	C	D	E	F	G	H
1								
2								
3	**Table Type**	**Rough Carpentry**	**Finish Work**	**# Assembled**	**Price**	**Revenue**	**Finish work hours**	**Rough work hours**
4	Maple Table	3	1	0	$ 550.00	$ -	0	0
5	Mahogany Table	4	2	0	$1,200.00	$ -		
6				0		$ -		
7								
8							**Constraints**	
9							Total rough hours<=	80
10							Total finish hours<=	30
11							Mahogany supply<=	10
12							# assembled>=	0
13								

What's wrong??

Run Solver Again.

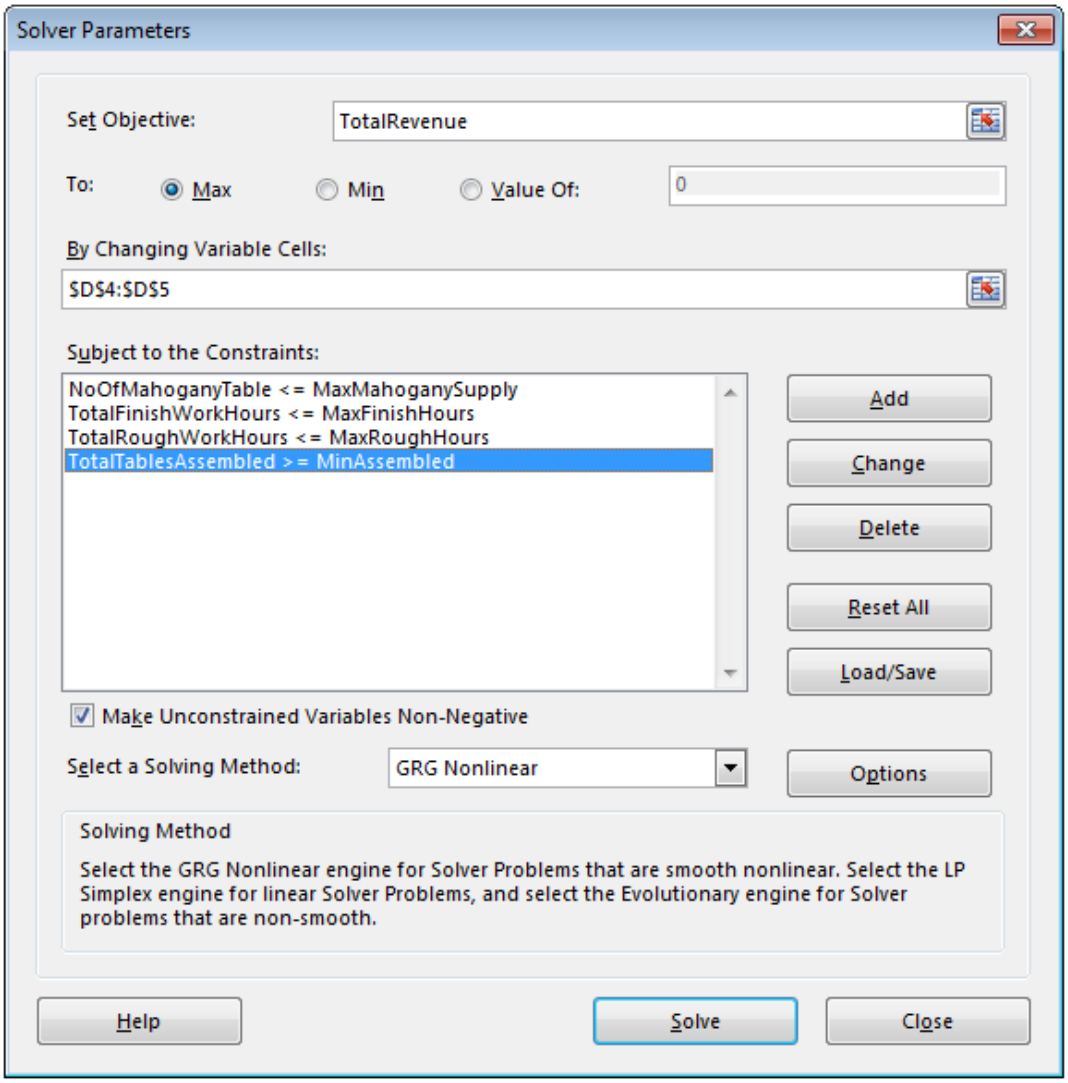


Select the above highlighted constraint. Press **Change**.

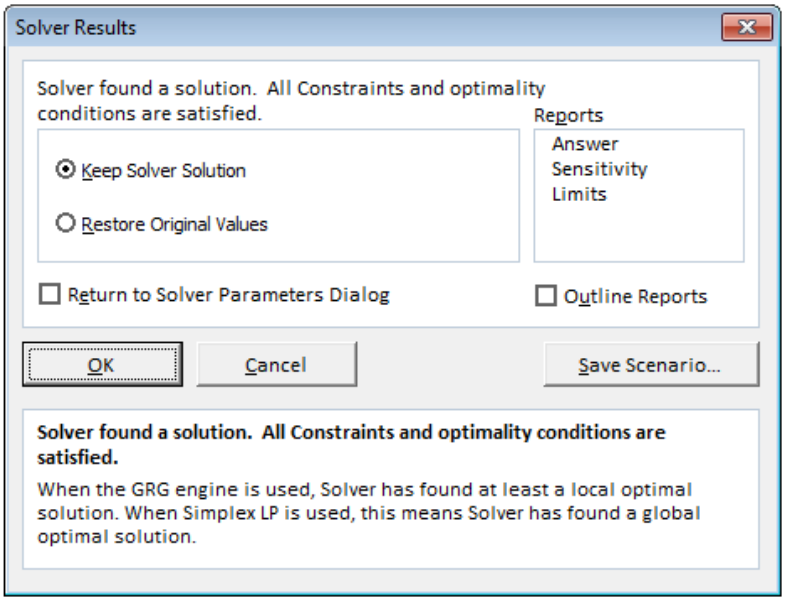


Change the operator.

Press **OK**.



Press **Solve**.



Press **OK** under Solver Result dialog Box.

	A	B	C	D	E	F	G	H
1								
2								
3	**Table Type**	**Rough Carpentry**	**Finish Work**	**# Assembled**	**Price**	**Revenue**	**Finish work hours**	**Rough work hours**
4	Maple Table	3	1	10	$ 550.00	$ 5,500.00	30	70
5	Mahogany Table	4	2	10	$1,200.00	$12,000.00		
6				20		$17,500.00		
7								
8							**Constraints**	
9							Total rough hours<=	80
10							Total finish hours<=	30
11							Mahogany supply<=	10
12							# assembled>=	0
13								

Discuss the new result with your classmate.

What is the man-power utilization in this case?

Exercise 10.5

In order to maximize the man-power utilization, your factory plan to produce another type of table called Plywood table which does not require very skillful workmanship.

Let's change the model a bit to find out the optimum result.

Copy Worksheet "Solver" and rename the new copy as "**Solver(Ex2)**".

	A	B	C	D	E	F	G	H
1								
2		Added new product						
3	Table Type	Rough [illegible]entry	Finish Work	# Assembled	Price	Revenue	Finish work hours	Rough work hours
4	Maple Table	3	1	1	$ 550.00	$ 550.00	3	9
5	Mahogany Table	4	2	1	$1,200.00	$ 1,200.00		
6	Plywood Table	2	0	1	$ 200.00	$ 200.00		
7				3		$ 1,950.00		
8								
9							Constraints	
10							Total rough hours<=	80
11							Total finish hours<=	30
12							Mahogany supply<=	10
13							# assembled>=	0
14								
15								
16								

Name the new cells:

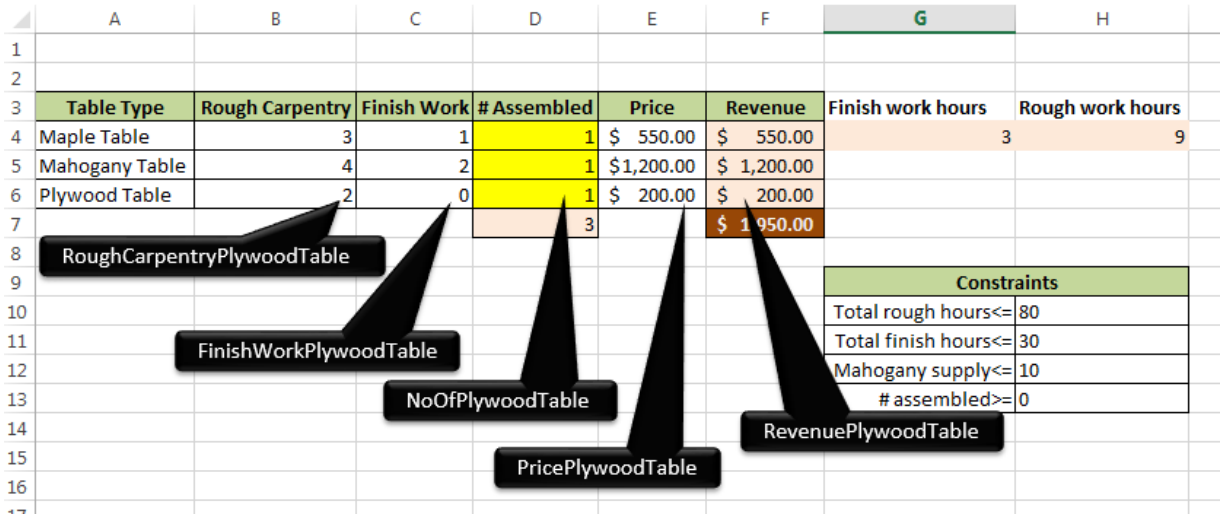


Table Type	Rough Carpentry	Finish Work	# Assembled	Price	Revenue
Maple Table	3	1	1	$ 550.00	$ 550.00
Mahogany Table	4	2	1	$1,200.00	$ 1,200.00
Plywood Table	2	0	1	$ 200.00	$ 200.00
			3		$ 1,950.00

Finish work hours	Rough work hours
3	9

Constraints	
Total rough hours<=	80
Total finish hours<=	30
Mahogany supply<=	10
# assembled>=	0

Assign new formula and change some formulas:

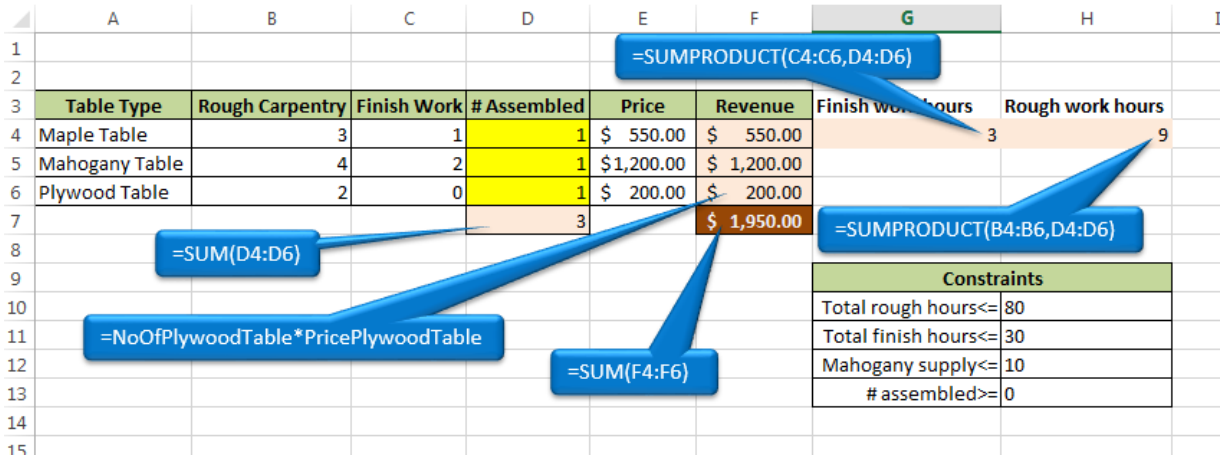


Table Type	Rough Carpentry	Finish Work	# Assembled	Price	Revenue
Maple Table	3	1	1	$ 550.00	$ 550.00
Mahogany Table	4	2	1	$1,200.00	$ 1,200.00
Plywood Table	2	0	1	$ 200.00	$ 200.00
			3		$ 1,950.00

Finish work hours	Rough work hours
3	9

Constraints	
Total rough hours<=	80
Total finish hours<=	30
Mahogany supply<=	10
# assembled>=	0

Try to find out optimum solution.

Exercise 10.6

After introduce too many types of tables, you just realized that your factory warehouse already reached its capacity constraint. You have to take into account this new constraint in your solution.

Let's do it.

Copy Worksheet "Solver(Ex2)" and rename the new copy as "**Solver(Ex3)**".

Add new constraint to the model.

	A	B	C	D	E	F	G	H
1								
2								
3	**Table Type**	**Rough Carpentry**	**Finish Work**	**# Assembled**	**Price**	**Revenue**	**Finish work hours**	**Rough work hours**
4	Maple Table	3	1	1	$ 550.00	$ 550.00	3	9
5	Mahogany Table	4	2	1	$1,200.00	$ 1,200.00		
6	Plywood Table	2	0	1	$ 200.00	$ 200.00		
7				3		$ 1,950.00		
8								
9							**Constraints**	
10							Total rough hours<=	80
11							Total finish hours<=	30
12							Mahogany supply<=	10
13							# assembled>=	0
14							Total No of Tables<=	22
15								
16								
17								
18								

Added warehouse capacity constraint

WarehouseCapacity

Try to use solver to find the optimum result.

Discuss your finding with your classmates.

Exercise 10.7

After running the factory for few years, the senior skillful workers request to work only maximum 8 hours per day due to aging problem.

You need to remodel your solution again.

Copy Worksheet "Solver(Ex3)" and rename the new copy as "**Solver(Ex4)**".

Solver (Ex4)

Change the constraint values

	A	B	C	D	E	F	G	H
1								
2								
3	**Table Type**	**Rough Carpentry**	**Finish Work**	**# Assembled**	**Price**	**Revenue**	**Finish work hours**	**Rough work hours**
4	Maple Table	3	1	1	$ 550.00	$ 550.00	3	9
5	Mahogany Table	4	2	1	$1,200.00	$ 1,200.00		
6	Plywood Table	2	0	1	$ 200.00	$ 200.00		
7				3		$ 1,950.00		
8								
9							**Constraints**	
10							Total rough hours<=	80
11							Total finish hours<=	24
12							Mahogany supply<=	10
13							# assembled>=	0
14							Total No of Tables<=	30
15								
16								
17								
18								

Senior workers want to work only 8 hours/Day

Warehouse capacity upgraded to keep 30 tables

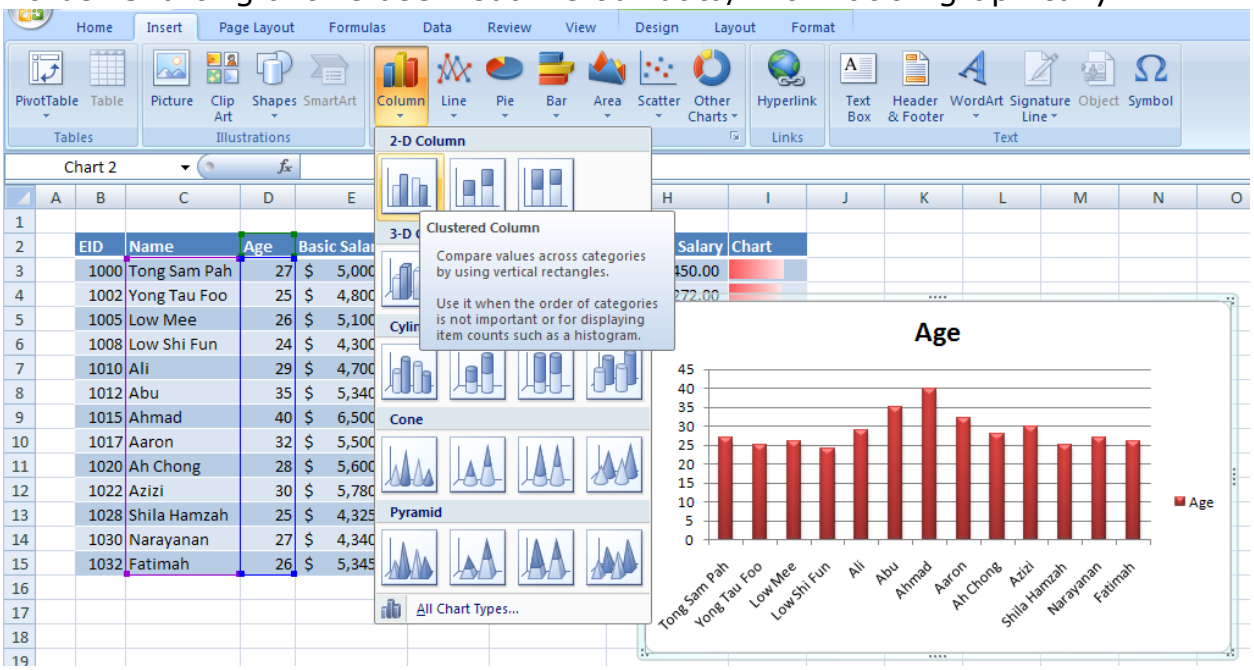
Try to use solver to find the optimum result.

Discuss your finding with your classmates.

Module 11 – *Data Visualization*

Creating Charts

When presenting information, picture normally is better than thousands words. Charting allows use visualize our data/information graphically.



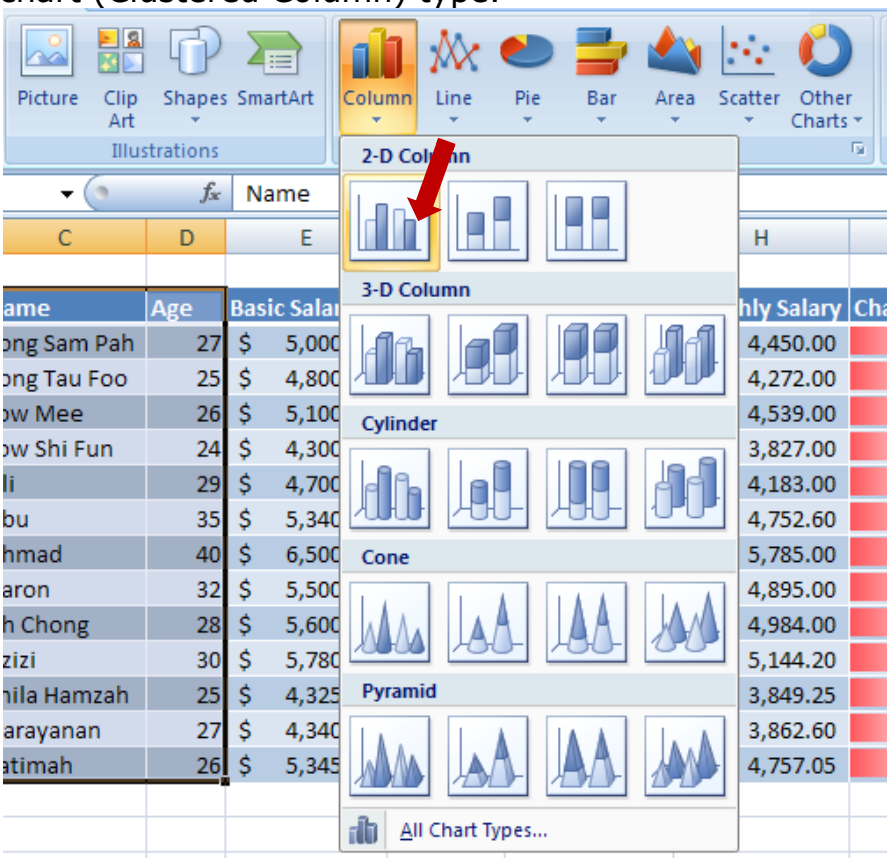
11.1: *Add Chart*

In this exercise, you will learn how to add column chart in to worksheet.

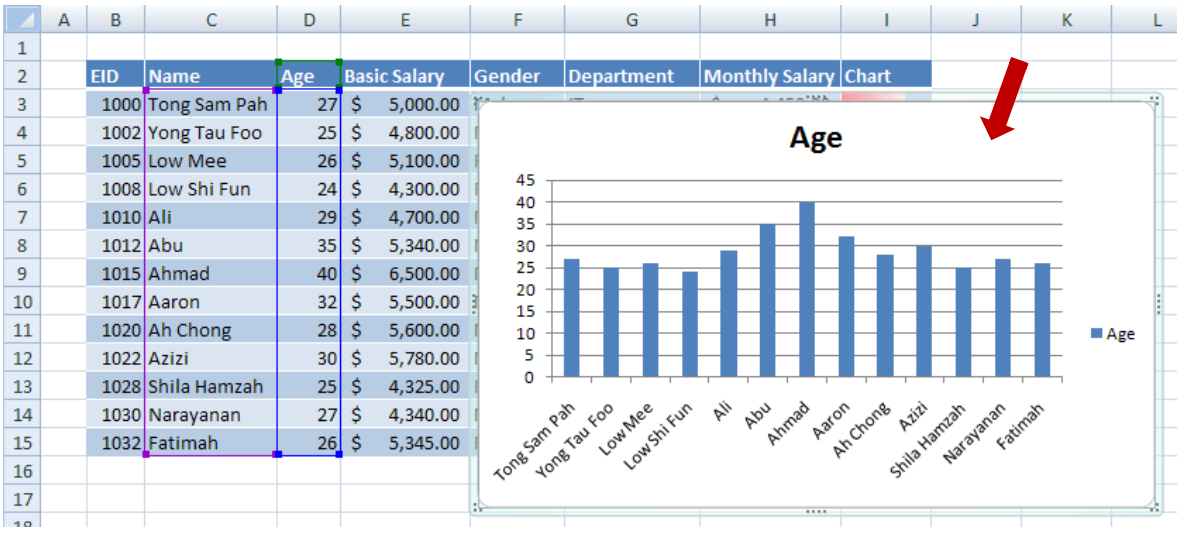
1. Switch to **Employee** worksheet. Select columns **Name** and **Age** from table **TblEmployee**.

EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary	Chart
1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	$ 4,450.00	
1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance	$ 4,272.00	
1005	Low Mee	26	$ 5,100.00	Female	IT	$ 4,539.00	
1008	Low Shi Fun	24	$ 4,300.00	Female	IT	$ 3,827.00	
1010	Ali	29	$ 4,700.00	Male	HR	$ 4,183.00	
1012	Abu	35	$ 5,340.00	Male	Finance	$ 4,752.60	
1015	Ahmad	40	$ 6,500.00	Male	IT	$ 5,785.00	
1017	Aaron	32	$ 5,500.00	Male	Operation	$ 4,895.00	
1020	Ah Chong	28	$ 5,600.00	Male	Sales	$ 4,984.00	
1022	Azizi	30	$ 5,780.00	Male	R&D	$ 5,144.20	
1028	Shila Hamzah	25	$ 4,325.00	Female	Sales	$ 3,849.25	
1030	Narayanan	27	$ 4,340.00	Male	Finance	$ 3,862.60	
1032	Fatimah	26	$ 5,345.00	Female	Sales	$ 4,757.05	

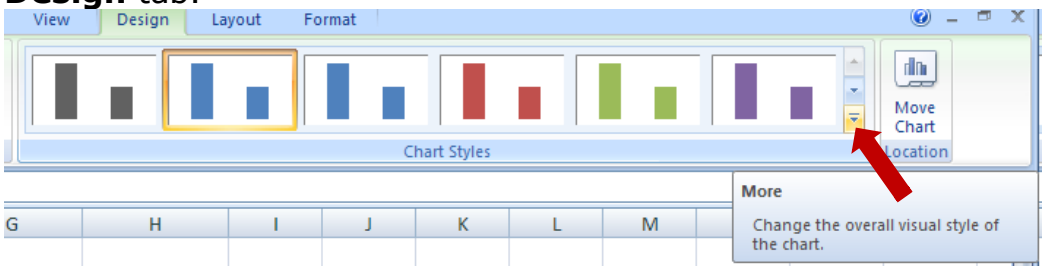
2. Select **Insert** tab. **Column** button. Under **2-D Column,** select first chart (Clustered Column) type.



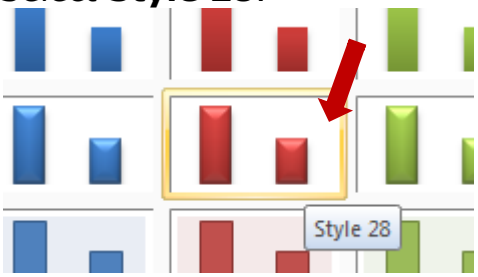
3. New clustered column chart is created as below:



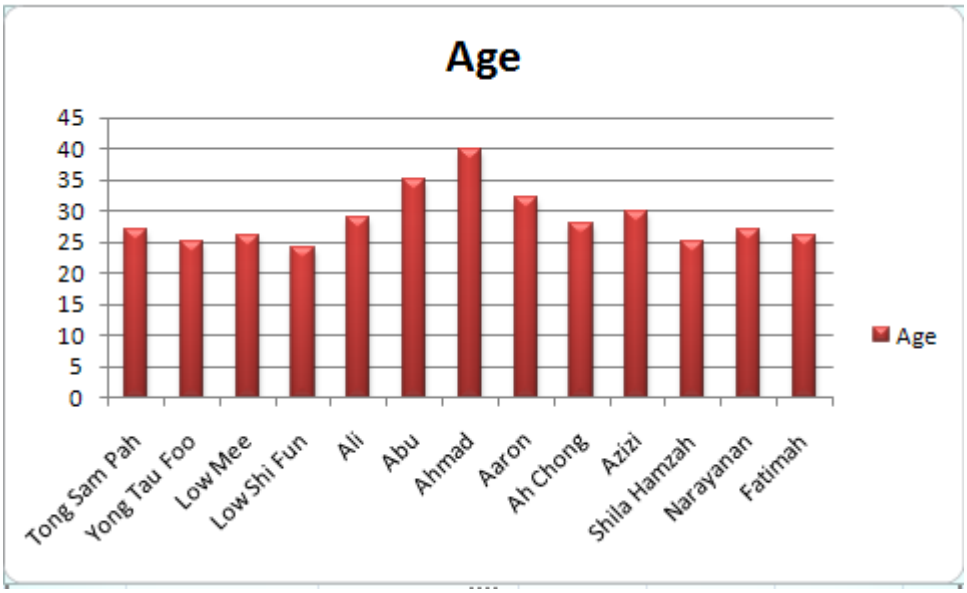
4. While the chart is selected, select the **More** dropdown button under **Design** tab.



5. Select **Style 28**.



6. Now the chart will look like below:



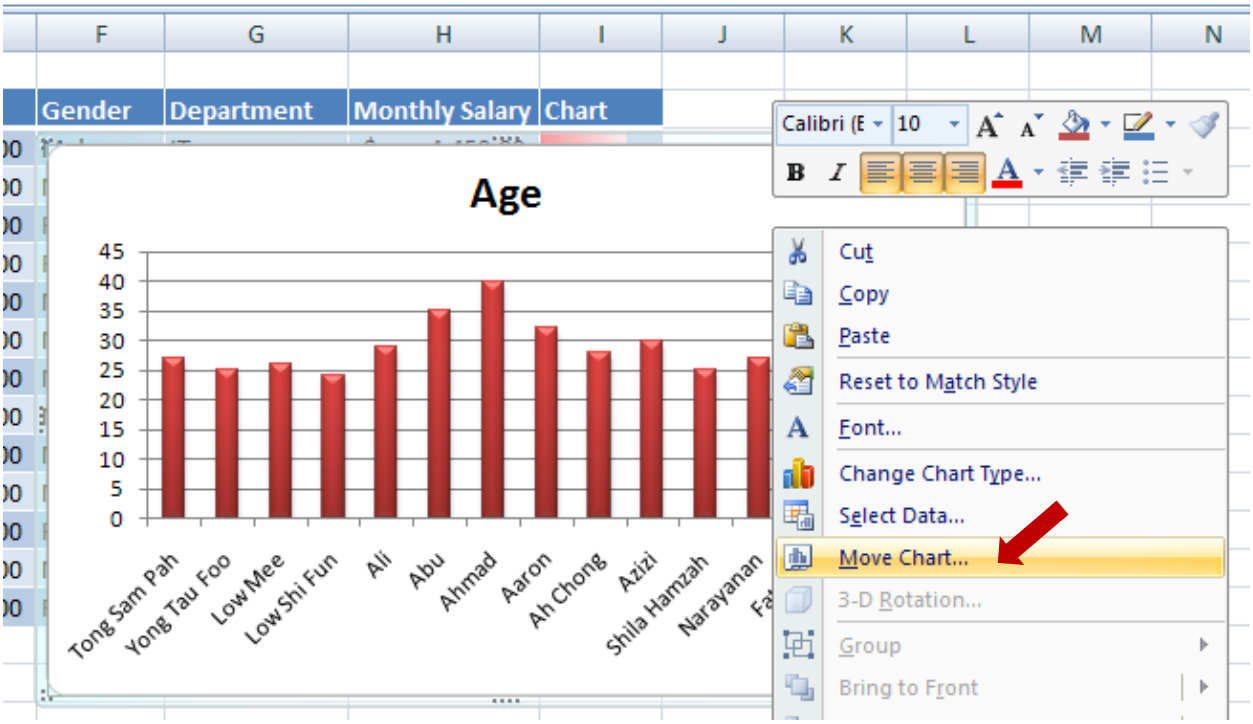
Changing the Chart Location and Size

You can easily move and resize chart simply by using mouse.
Chart also can be moved to other sheet.

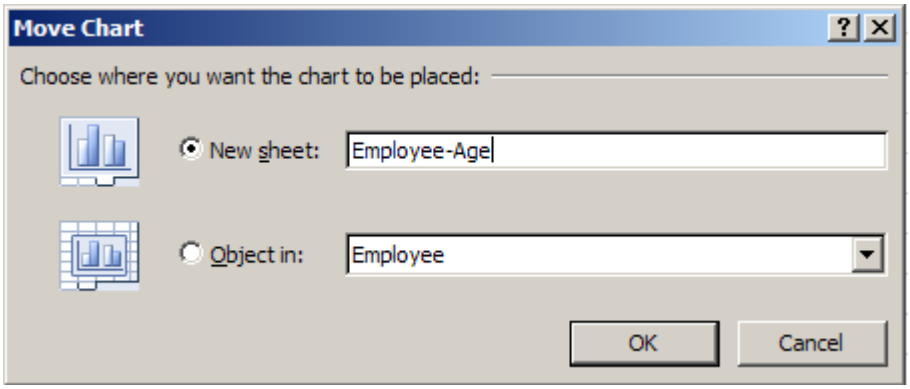
11.2: *Move Chart*

In this exercise, you will learn how to move chart to new chart sheet.

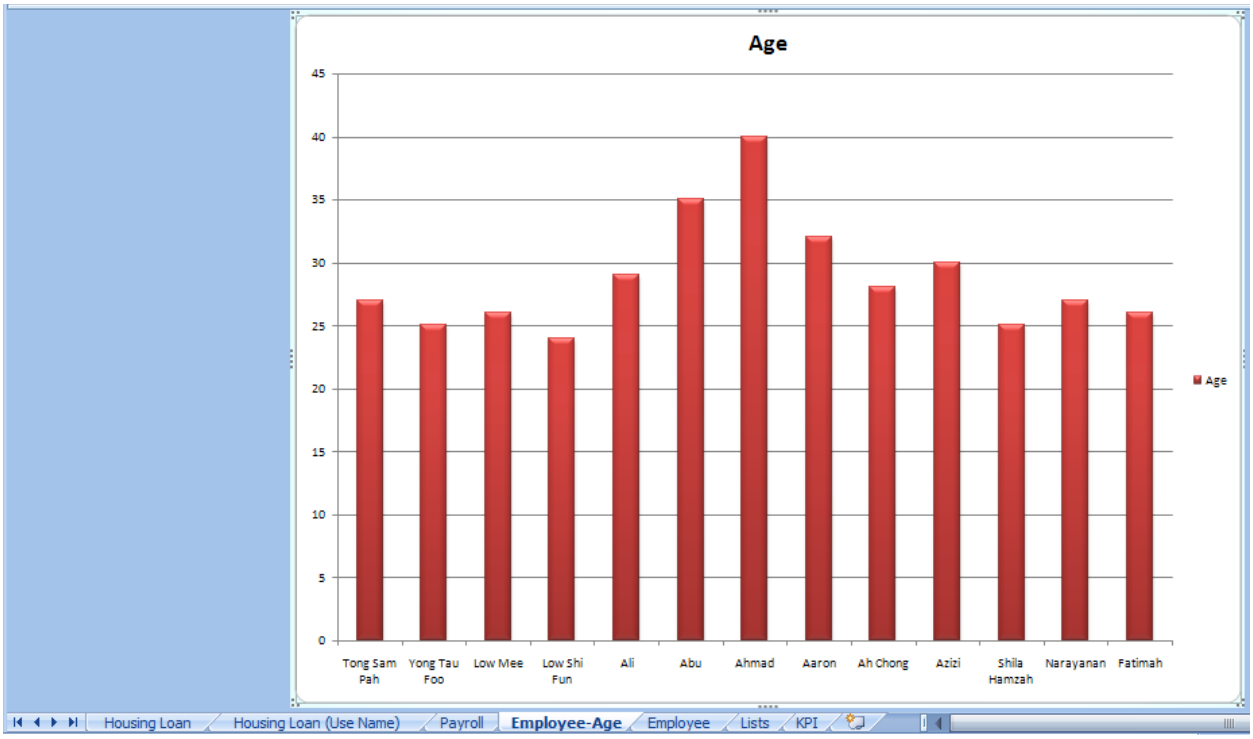
1. Right click the previously created chart, select **Move Chart...**



2. In the **Move Chart** dialog box,type **Employee-Age** under **New sheet** field. Click **OK**.

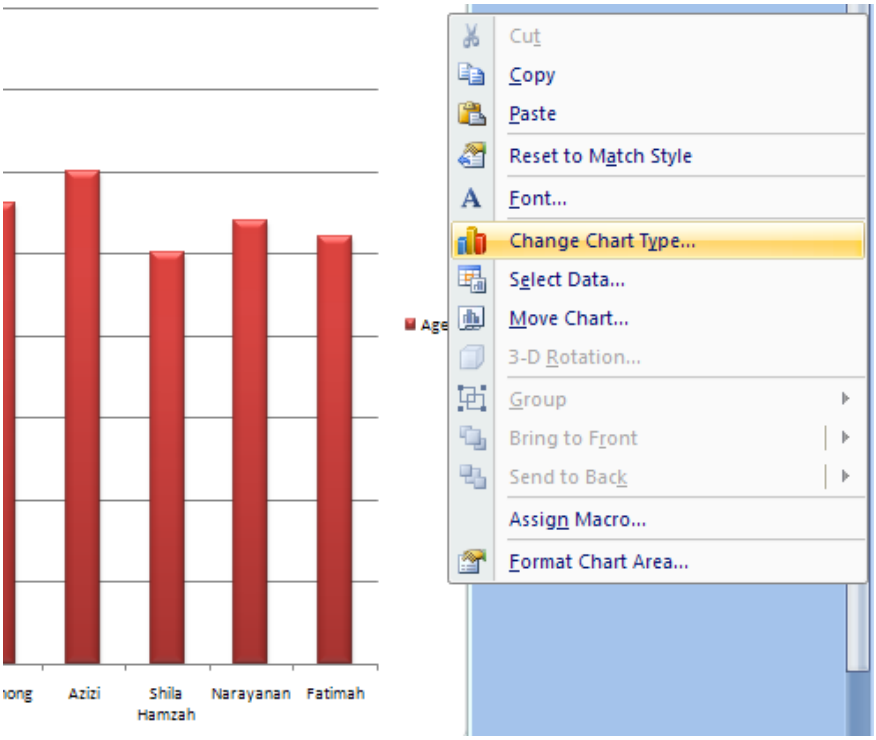


3. Now the chart is moved to new chart sheet as below:



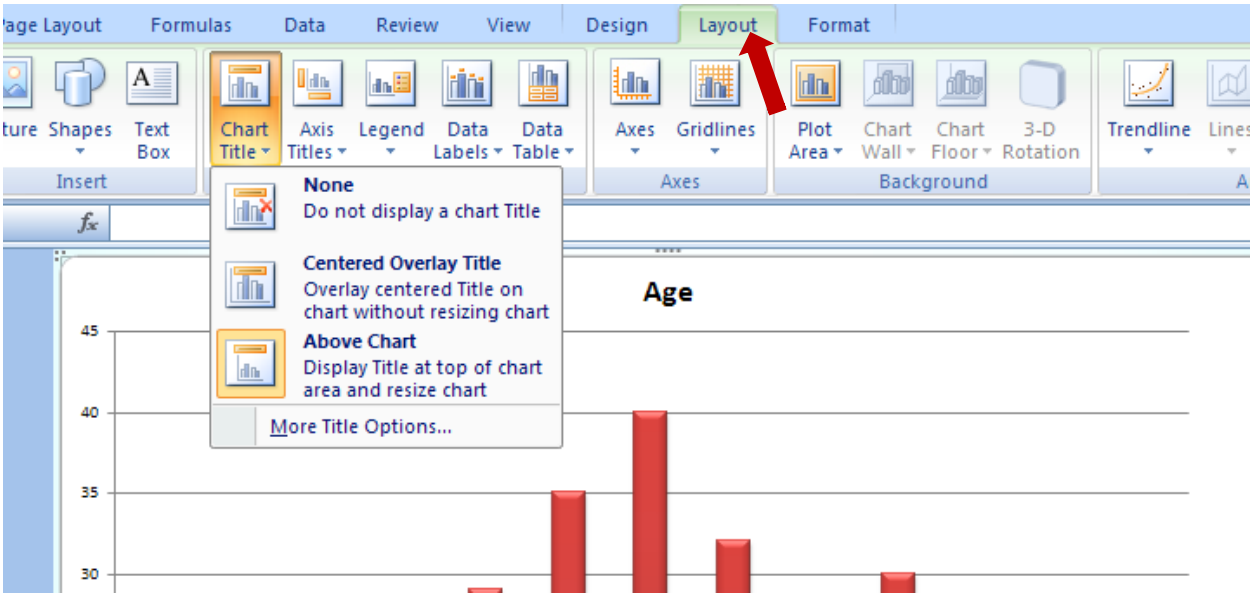
Changing the Chart Type

To change chart type, just right click on the chart then select **Change Chart Type...**



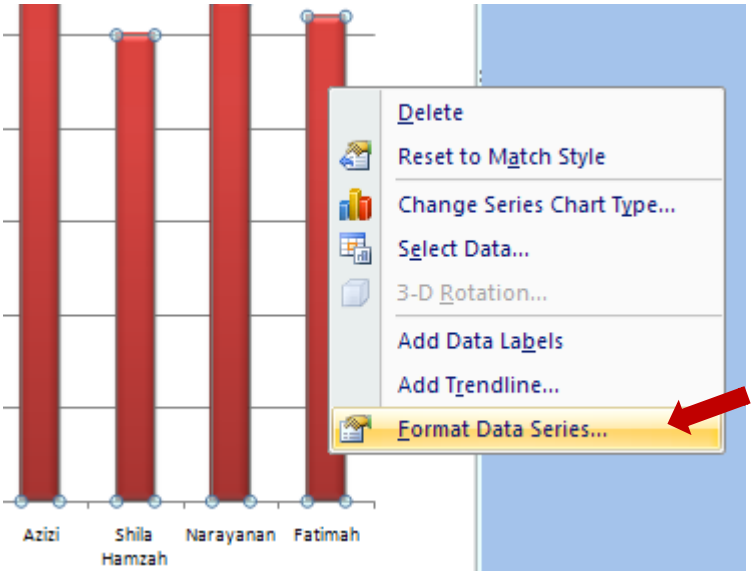
Modifying Chart Elements

You can decide what type of elements can appear in the chart by using buttons under **Layout** tab.



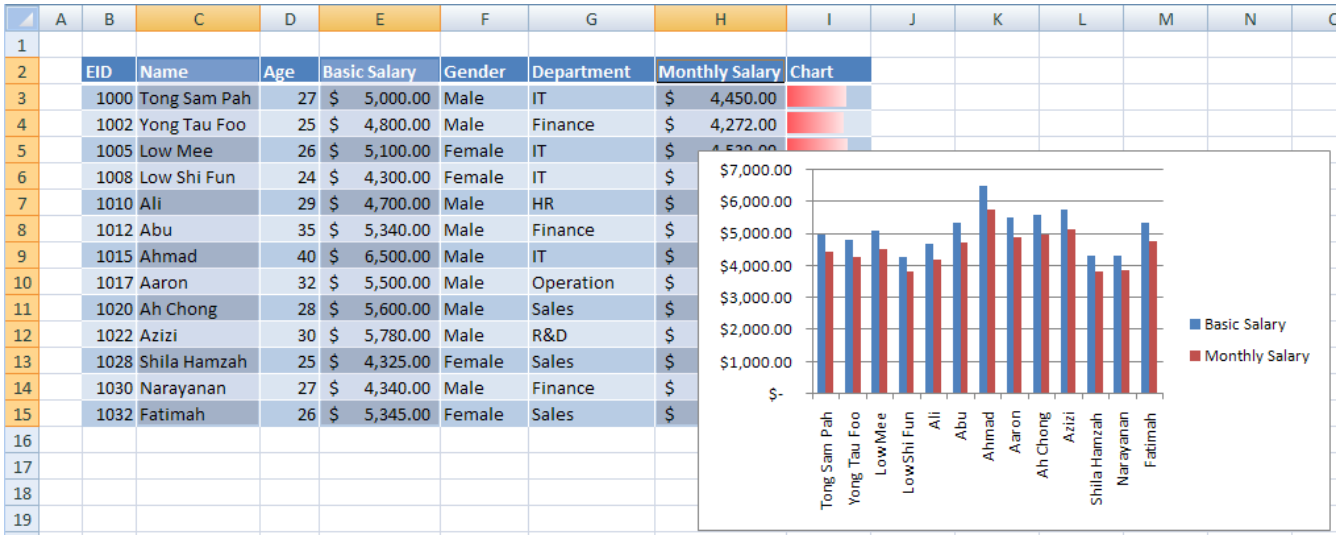
Formatting Chart Elements

The appearance of the chart element can be change independently by select and right click, then change from the floating menu.



Adding and Removing Data Series

Charts may have multiple data series.



EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary	Chart
1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	$ 4,450.00	
1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance	$ 4,272.00	
1005	Low Mee	26	$ 5,100.00	Female	IT	$	
1008	Low Shi Fun	24	$ 4,300.00	Female	IT	$	
1010	Ali	29	$ 4,700.00	Male	HR	$	
1012	Abu	35	$ 5,340.00	Male	Finance	$	
1015	Ahmad	40	$ 6,500.00	Male	IT	$	
1017	Aaron	32	$ 5,500.00	Male	Operation	$	
1020	Ah Chong	28	$ 5,600.00	Male	Sales	$	
1022	Azizi	30	$ 5,780.00	Male	R&D	$	
1028	Shila Hamzah	25	$ 4,325.00	Female	Sales	$	
1030	Narayanan	27	$ 4,340.00	Male	Finance	$	
1032	Fatimah	26	$ 5,345.00	Female	Sales	$	

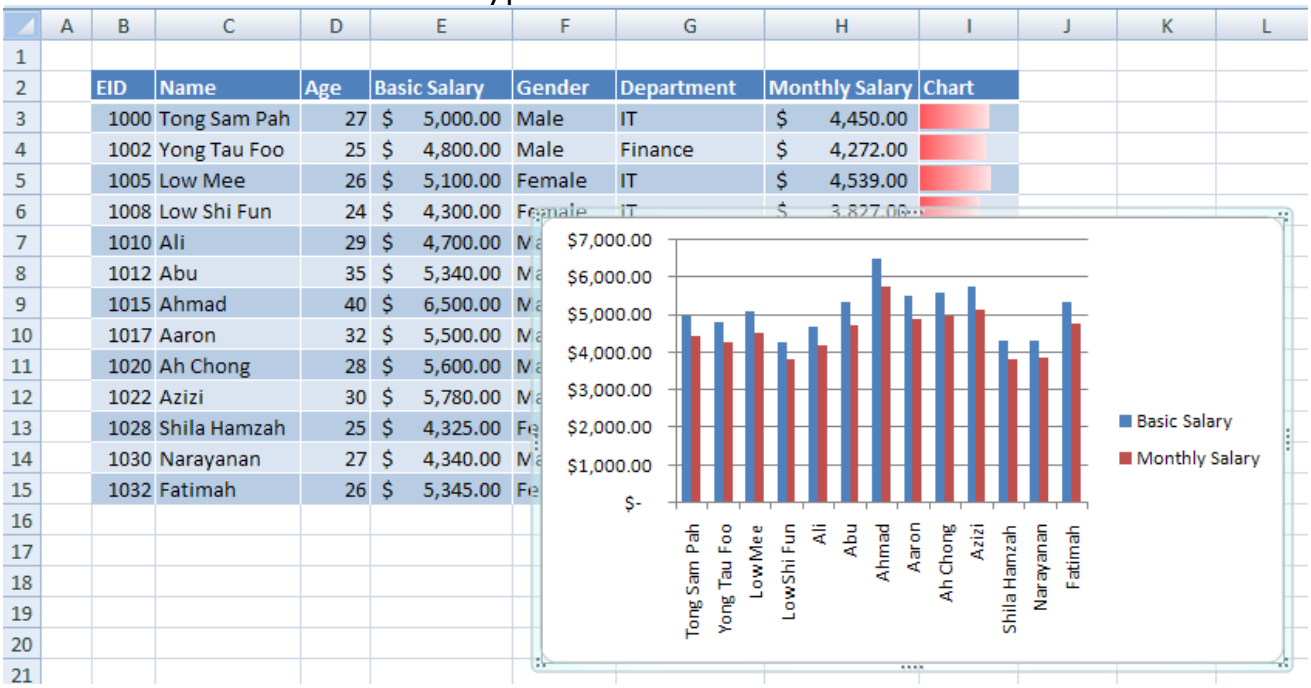
EX11.3: *Create multiple Data Series chart*

In this exercise, you will learn how to create multiple data series chart.

1. Switch to **Employee** worksheet. Select Columns (Inclusive headers) **Name, Basic Salary** and **Monthly Salary**.
   Hint: use control-drag to select disjointed range.

EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary	Chart
1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	$ 4,450.00	
1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance	$ 4,272.00	
1005	Low Mee	26	$ 5,100.00	Female	IT	$ 4,539.00	
1008	Low Shi Fun	24	$ 4,300.00	Female	IT	$ 3,827.00	
1010	Ali	29	$ 4,700.00	Male	HR	$ 4,183.00	
1012	Abu	35	$ 5,340.00	Male	Finance	$ 4,752.60	
1015	Ahmad	40	$ 6,500.00	Male	IT	$ 5,785.00	
1017	Aaron	32	$ 5,500.00	Male	Operation	$ 4,895.00	
1020	Ah Chong	28	$ 5,600.00	Male	Sales	$ 4,984.00	
1022	Azizi	30	$ 5,780.00	Male	R&D	$ 5,144.20	
1028	Shila Hamzah	25	$ 4,325.00	Female	Sales	$ 3,849.25	
1030	Narayanan	27	$ 4,340.00	Male	Finance	$ 3,862.60	
1032	Fatimah	26	$ 5,345.00	Female	Sales	$ 4,757.05	

2. Select **Insert** tab, **Column** button under **Charts** group, click **Clustered Column** chart type.



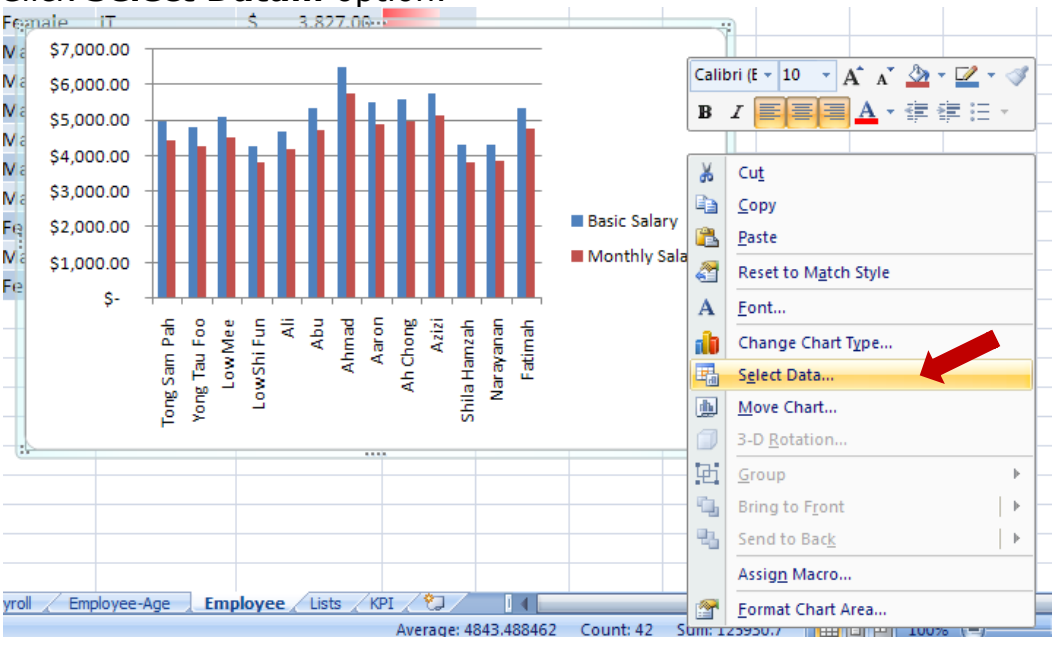
EID	Name	Age	Basic Salary	Gender	Department	Monthly Salary	Chart
1000	Tong Sam Pah	27	$ 5,000.00	Male	IT	$ 4,450.00	
1002	Yong Tau Foo	25	$ 4,800.00	Male	Finance	$ 4,272.00	
1005	Low Mee	26	$ 5,100.00	Female	IT	$ 4,539.00	
1008	Low Shi Fun	24	$ 4,300.00	Female	IT	$ 3,827.06	
1010	Ali	29	$ 4,700.00	Male			
1012	Abu	35	$ 5,340.00	Male			
1015	Ahmad	40	$ 6,500.00	Male			
1017	Aaron	32	$ 5,500.00	Male			
1020	Ah Chong	28	$ 5,600.00	Male			
1022	Azizi	30	$ 5,780.00	Male			
1028	Shila Hamzah	25	$ 4,325.00	Female			
1030	Narayanan	27	$ 4,340.00	Male			
1032	Fatimah	26	$ 5,345.00	Female			

3. New multiple data series chart is created.

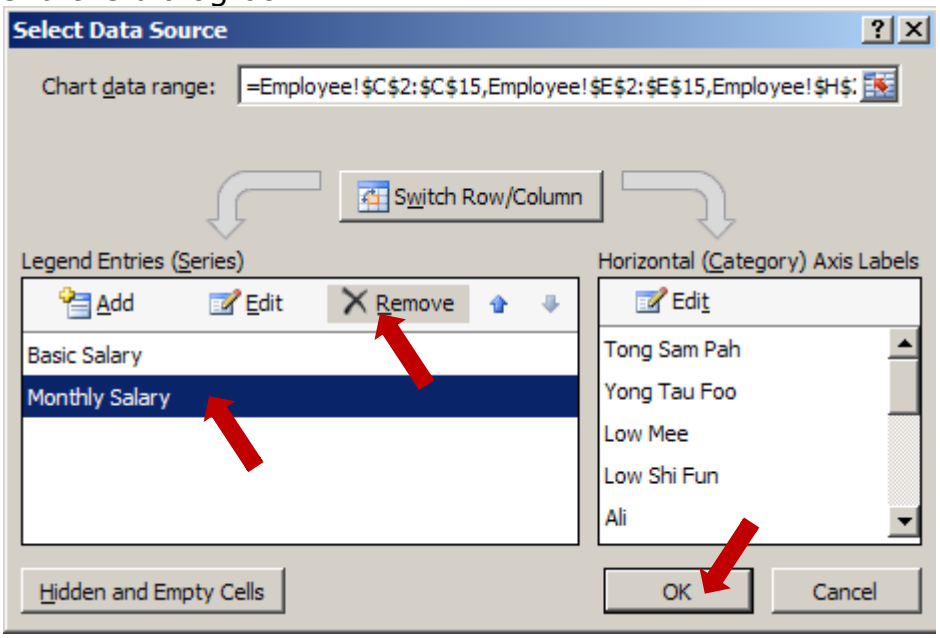
EX11.4: *Remove Data Series*

In this exercise, you will learn how to remove data series from chart.

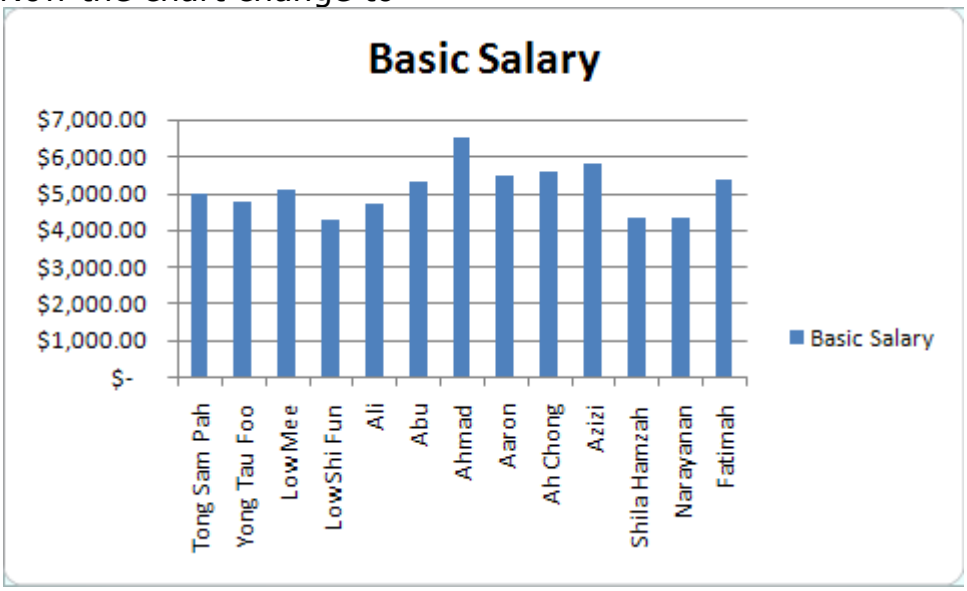
1. Right click on the previously created multiple data series column chart. Click **Select Data...** option.



2. In **Select Data Source** dialog box, select **Monthly Salary** under **Legend Entries (Series)** then click **Remove** button. Click **OK** to end the dialog box



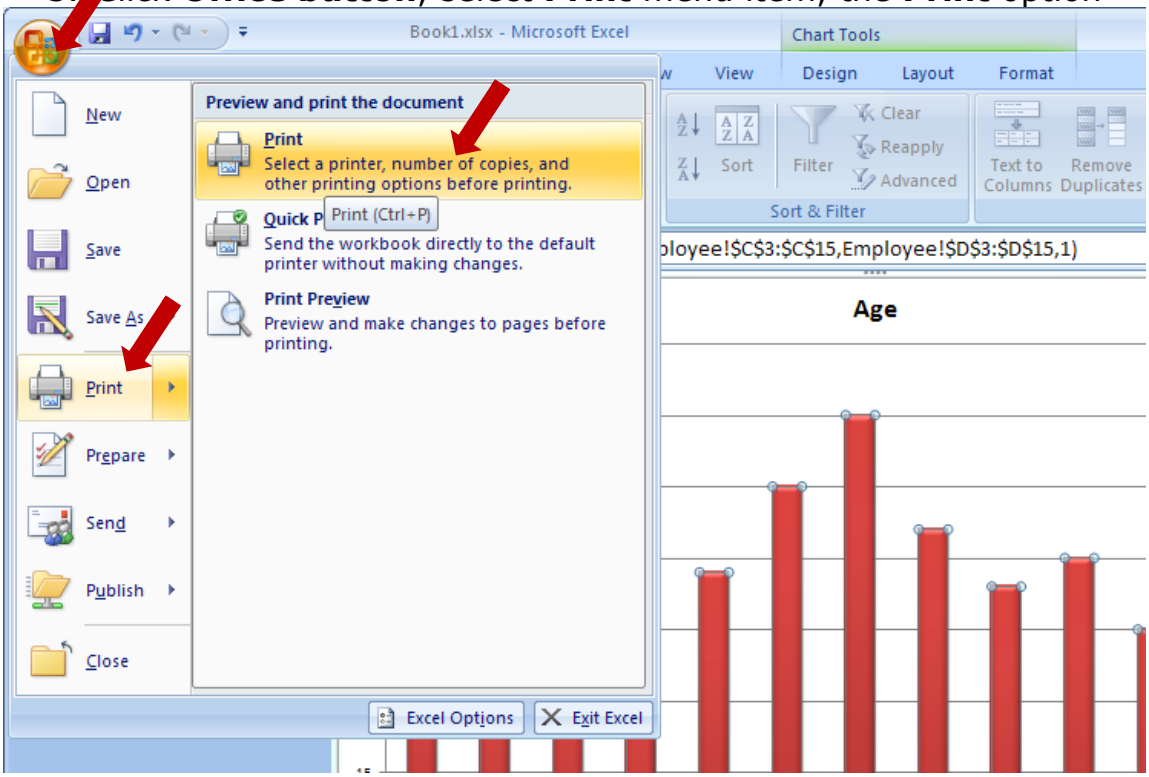
3. Now the chart change to



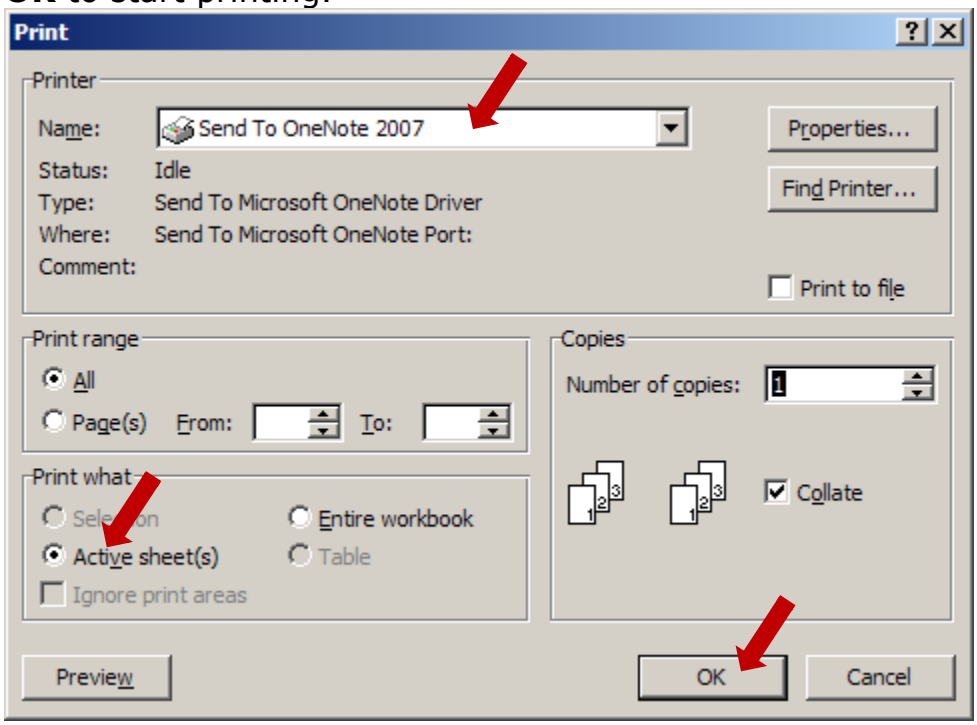
Printing Charts

To print chart, common practice is

1. First of all, move the chart to separate chart sheet.
2. Make sure that the chart sheet is active sheet
3. Click **Office button**, select **Print** menu item, the **Print** option



4. In the **Print** dialog box, select the printer in used and configure printer properties. Ensure that **Active sheet(s)** is selected then click **OK** to start printing.



Creating and Using a Chart Template

After you created a chart with the format or style that you like, you can then save it as chart template.

In the future you can apply the chart template to other chart with the same type. With this you are not only save time, consistency of look and feel for the charts with the same type are preserved.