Lesson no. 1: Function Reference-Lookups

FUNCTION REFERENCE

LOOKUP Functions

This article describes the formula syntax and usage of the **LOOKUP** function in Microsoft Excel.

Description

The **LOOKUP** function returns a value either from a one-row or one-column range or from an array. The **LOOKUP** function has two syntax forms: the vector form and the array form.

Syntax

LOOKUP(lookup_value, lookup_vector, [result_vector])

VLOOKUP Functions

This article describes the formula syntax and usage of the **VLOOKUP** function in Microsoft Excel.

Description

You can use the **VLOOKUP** function to search the first column of a range of cells, and then return a value from any cell on the same row of the range. For example, suppose that you have a list of employees contained in the range A2:C10. The employees' ID numbers are stored in the first column of the range, as shown in the following illustration.

	A	B	C
1	Employee ID	Department	Full Name
2	35	Sales	Yossi Banai
3	36	Production	Nicole Bousseau
4	37	Sales	Alk Chen
5	38	Operations	Axel Delgado
6	39	Sales	Suroor Fatima
7	40	Production	Gerhard Goeschl
8	41	Sales	Andreas Hauser
9	42	Operations	Nattorn Jayanama
10	43	Production	Jim Kim

If you know the employee's ID number, you can use the **VLOOKUP** function to return either the department or the name of that employee. To obtain the name of employee number 38, you can use the formula **=VLOOKUP(38, A2:C10, 3, FALSE)**. This formula searches for the value 38 in the first column of the range A2:C10, and then returns the value that is contained in the third column of the range and on the same row as the lookup value ("Axel Delgado").

The V in **VLOOKUP** stands for vertical. Use **VLOOKUP** instead of **HLOOKUP** when your comparison values are located in a column to the left of the data that you want to find.

Syntax

VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])

	A	B	C	D
1	**Employee ID**	**Department**	**Full Name**	**Full Name**
2	35	Sales	Yossi Banai	Tom Cruise
3	36	Production	Nicole Bousseau	Nicole Bousseau
4	37	Sales	Alk Chen	Chris Evans
5	38	Operations	Axel Delgado	Axel Delgado
6	39	Sales	Suroor Fatima	Chris Hemsworth
7	40	Production	Gerhard Goeschl	Gerhard Goeschl
8	41	Sales	Andreas Hauser	Tony Stark
9	42	Operations	Nattorn Jayanama	Nattorn Jayanama
10	43	Production	Jim Kim	Harry Potter

The VLOOKUP function syntax has the following arguments:

- **lookup_value**   Required. The value to search in the first column of the table or range. The *lookup_value* argument can be a value or a reference. If the value you supply for the l*ookup_value* argument is smaller than the smallest value in the first column of the *table_array* argument, **VLOOKUP** returns the #N/A error value.

- **table_array**   Required. The range of cells that contains the data. You can use a reference to a range (for example, **A2:D8**), 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 is equivalent.

- **col_index_num**   Required. The column number in the *table_array* argument from which the matching value must be returned. A *col_index_num* argument 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 the *col_index_num* argument 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**   Optional. A logical value that specifies whether you want **VLOOKUP** to find an exact match or an approximate match:

  If *range_lookup* is either TRUE or is 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.

  Important   If *range_lookup* is either TRUE or is omitted, the values in the first column of *table_array* must be placed in ascending sort order; otherwise, **VLOOKUP** might not return the correct value.

  For more information, see Sort data in a range or table.

  If *range_lookup* is FALSE, the values in the first column of *table_array* do not need to be sorted.

  If the *range_lookup* argument is FALSE, **VLOOKUP** will find only an exact match. 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.

HLOOKUP Function

This article describes the formula syntax and usage of the **HLOOKUP** function in Microsoft Excel.

Description

Searches for a value in the top row of a table or an array of values, and then returns a value in the same column from a row you specify in the table or array. Use HLOOKUP when your comparison values are located in a row across the top of a table of data, and you want to look down a specified number of rows. Use VLOOKUP when your comparison values are located in a column to the left of the data you want to find.

The H in HLOOKUP stands for "Horizontal."

Syntax

HLOOKUP(lookup_value, table_array, row_index_num, [range_lookup])

The HLOOKUP function syntax has the following arguments:

- **Lookup_value**   Required. The value to be found in the first row of the table. Lookup_value can be a value, a reference, or a text string.

- **Table_array**   Required. A table of information in which data is looked up. Use a reference to a range or a range name.

   The values in the first row of table_array can be text, numbers, or logical values.
   If range_lookup is TRUE, the values in the first row of table_array must be placed in ascending order: ...-2, -1, 0, 1, 2,... , A-Z, FALSE, TRUE; otherwise, HLOOKUP may not give the correct value. If range_lookup is FALSE, table_array does not need to be sorted.
   Uppercase and lowercase text are equivalent.
   Sort the values in ascending order, left to right. For more information, see Sort data in a range or table.

- **Row_index_num**   Required. The row number in table_array from which the matching value will be returned. A row_index_num of 1 returns the first row value in table_array, a row_index_num of 2 returns the second row value in table_array, and so on. If row_index_num is less than 1, HLOOKUP returns the #VALUE! error value; if row_index_num is greater than the number of rows on table_array, HLOOKUP returns the #REF! error value.

- **Range_lookup**   Optional. A logical value that specifies whether you want HLOOKUP to find an exact match or an approximate match. If TRUE or omitted, an approximate match is returned. In other words, if an exact match is not found, the next largest value that is less than lookup_value is returned. If FALSE, HLOOKUP will find an exact match. If one is not found, the error value #N/A is returned.

Lesson no. 2: Data Filtering & Shorting

Filtering & Sorting
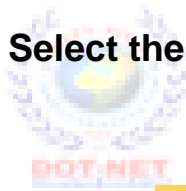
Filter data by using an AutoFilter

By filtering information in a worksheet, you can find values quickly. You can filter on one or more columns of data. With filtering, you can control not only what you want to see, but what you want to exclude. You can filter based on choices you make from a list, or you can create specific filters to focus on exactly the data that you want to see.

You can search for text and numbers when you filter by using the **Search** box in the filter interface.

When you filter data, entire rows are hidden if values in one or more columns don't meet the filtering criteria. You can filter on numeric or text values, or filter by color for cells that have color formatting applied to their background or text.
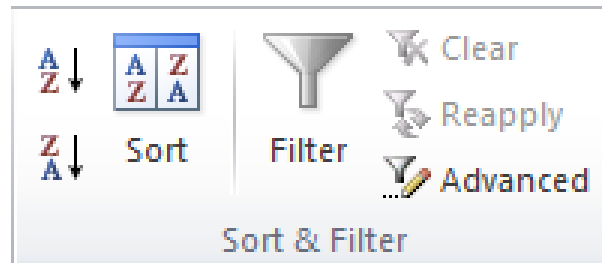
How

Select the data that you want to filter

B	C	D	E	F	G	H	I	J	K	L	M
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
40	38	44	46	51	56	67	72	70	59	45	41
34	33	38	41	45	48	51	55	54	45	41	38
61	69	79	83	95	97	100	101	94	87	72	66
0	2	9	24	28	32	36	39	35	21	12	4

1. On the **Data** tab, in the **Sort & Filter** group, click **Filter**.

2. Click the arrow ⏷ in the column header to display a list in which you can make filter choices.

Note: Depending on the type of data in the column, Microsoft Excel displays either **Number Filters** or **Text Filters** in the list.

Filter by selecting values or searching

Selecting values from a list and searching are the quickest ways to filter. When you click the arrow in a column that has filtering enabled, all values in that column appear in a list.
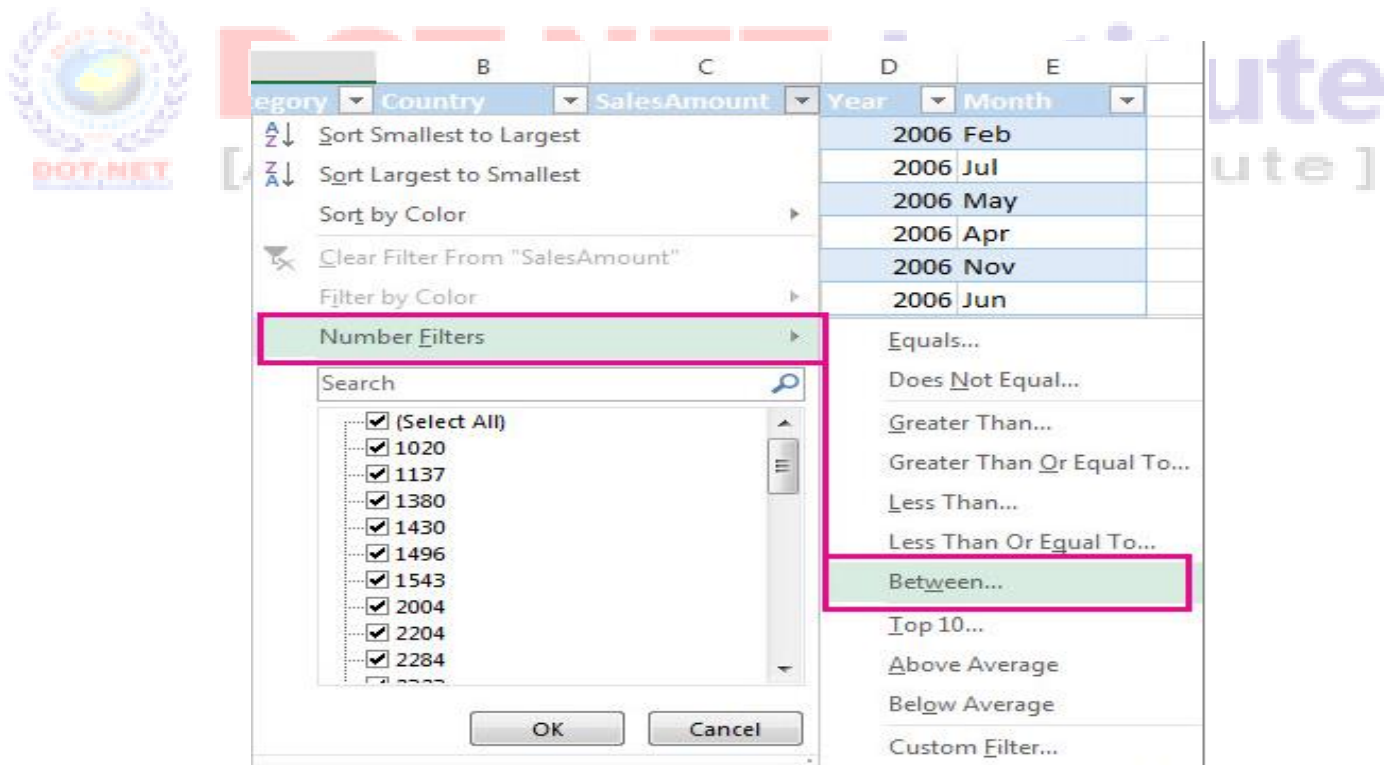
1. Use the **Search** box to enter text or numbers on which to search.

2. Select and clear the check boxes to show values that are found in the column of data.

3. Use advanced criteria to find values that meet specific conditions.

➢ To select by values, in the list, clear the **(Select All)** check box. This removes the check marks from all the check boxes. Then, select only the values you want to see, and click **OK** to see the results.

➢ To search on text in the column, enter text or numbers in the **Search** box. Optionally, you can use wildcard characters, such as the asterisk (*****) or the question mark (**?**). Press ENTER to see the results.

Filter data by specifying conditions

By specifying conditions, you can create custom filters that narrow down the data in the exact way that you want. You do this by building a filter. If you've ever queried data in a database, this will look familiar to you.

1. Point to either **Number Filters** or **Text Filters** in the list. A menu appears that allows you to filter on various conditions.

2. Choose a condition and then select or enter criteria. Click the **And** button to combine criteria (that is, two or more criteria that must both be met), and the **Or** button to require only one of multiple conditions to be met.

3. Click **OK** to apply the filter and get the results you expect.

Conditionally Formatting Data

By applying conditional formatting to your data, you can quickly identify variances in a range of values with a quick glance.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	Avg High	40	38	44	46	51	56	67	72	70	59	45	41
3	Avg Low	34	33	38	41	45	48	51	55	54	45	41	38
4	Record High	61	69	79	83	95	97	100	101	94	87	72	66
5	Record Low	0	2	9	24	28	32	36	39	35	21	12	4

This graphic shows temperature data with conditional formatting that uses a color scale to differentiate high, medium, and low values. The following procedure uses that data.
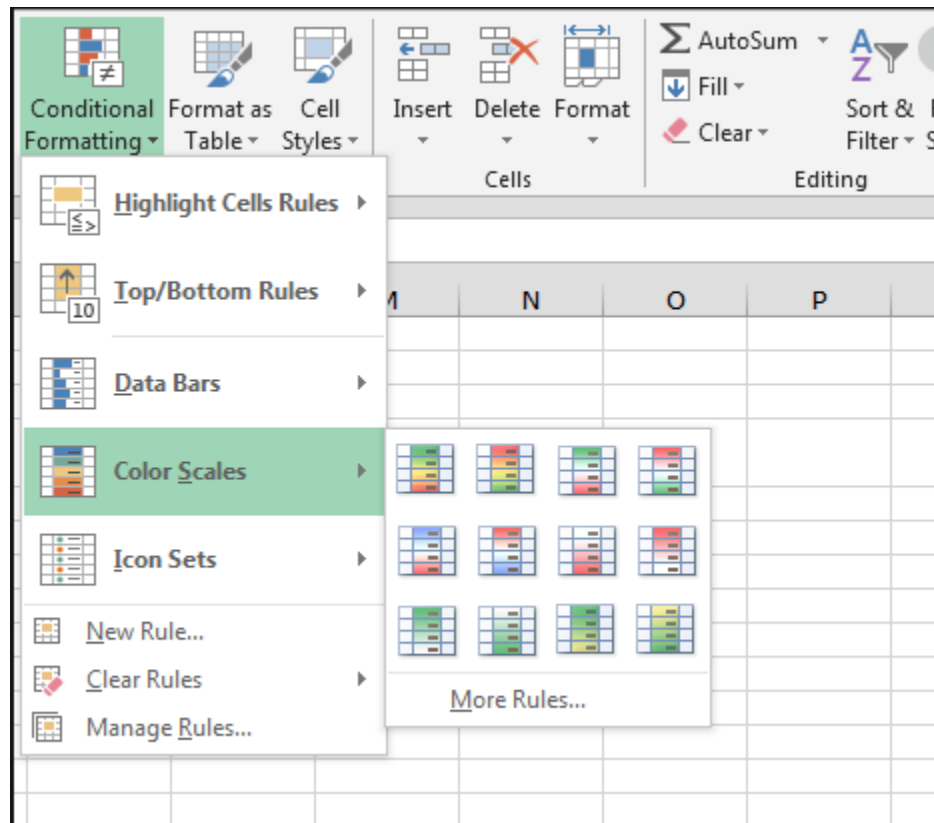
- **Select the data that you want to conditionally format**

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	Avg High	40	38	44	46	51	56	67	72	70	59	45	41
3	Avg Low	34	33	38	41	45	48	51	55	54	45	41	38
4	Record High	61	69	79	83	95	97	100	101	94	87	72	66
5	Record Low	0	2	9	24	28	32	36	39	35	21	12	4

 Apply the conditional formatting

On the **Home** tab, in the **Styles** group, click the arrow next to **Conditional Formatting**, and then click **Color Scales**

However over the color scale icons to see a preview of the data with conditional formatting applied.
In a three-color scale, the top color represents higher values, the middle color represents medium values, and the bottom color represents lower values. This example uses the Red-Yellow-Green color scale.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	Avg High	40	38	44	46	51	56	67	72	70	59	45	41
3	Avg Low	34	33	38	41	45	48	51	55	54	45	41	38
4	Record High	61	69	79	83	95	97	100	101	94	87	72	66
5	Record Low	0	2	9	24	28	32	36	39	35	21	12	4

✎ *Do Practical Assignment No. - 1*

Lesson no. 4: Data Validation in Excel

Data Validation

Use data validation in Excel to make sure that users enter certain values into a cell.
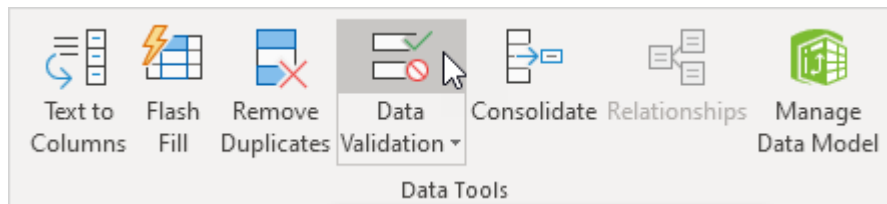Data Validation Example

In this example, we restrict users to enter a whole number between 0 and 10.
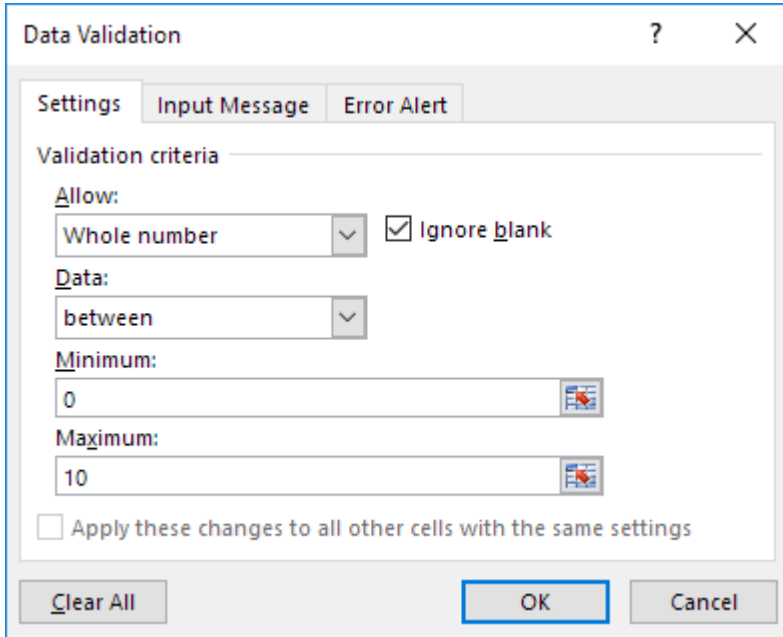

Create Data Validation Rule

To create the data validation rule, execute the following steps.

1. Select cell C2.

2. On the Data tab, in the Data Tools group, click Data Validation.

On the Settings tab:

3. In the Allow list, click Whole number.

4. In the Data list, click between.
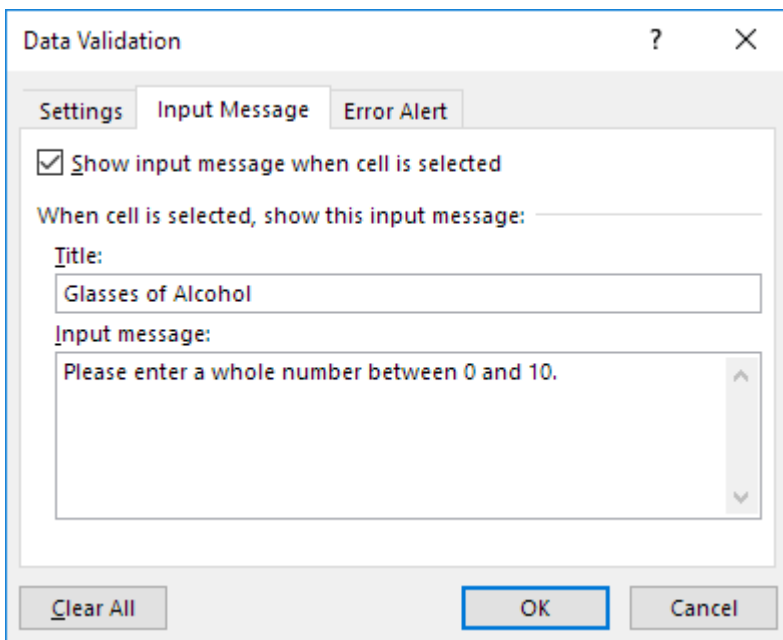
5. Enter the Minimum and Maximum values.

Input Message

Input messages appear when the user selects the cell and tell the user what to enter.

On the Input Message tab:

1. Check 'Show input message when cell is selected'.

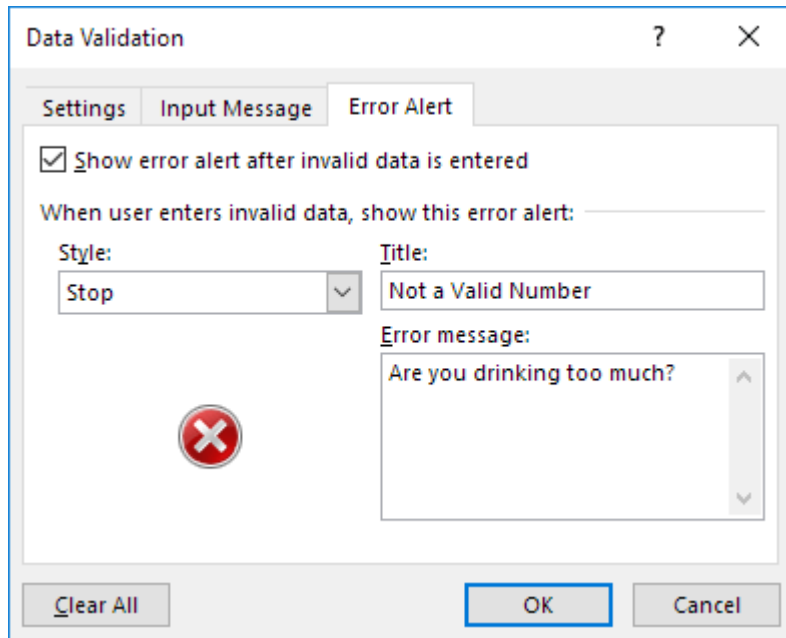2. Enter a title.

3. Enter an input message.

Error Alert

If users ignore the input message and enter a number that is not valid, you can show them an error alert.

On the Error Alert tab:

1. Check 'Show error alert after invalid data is entered'.

2. Enter a title.

3. Enter an error message.
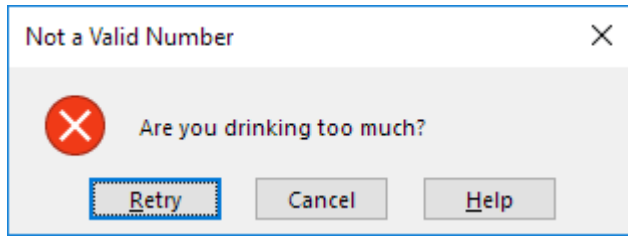

4. Click OK.

Data Validation Result

1. Select cell C2.

2. Try to enter a number higher than 10.

Result:

Not a Valid Number ✕

❌ Are you drinking too much?

Retry   Cancel   Help

Note: to remove data validation from a cell, select the cell, on the Data tab, in the Data Tools group, click Data Validation, and then click Clear All. You can use Excel's Go To Special feature to quickly select all cells with data validation.

Reject Invalid Dates

This example teaches you how to use data validation to reject invalid dates.
1. Select the range A2:A4.

	A	B
1	Dates	
2		
3		
4	✛	
5		

2. On the Data tab, in the Data Tools group, click Data Validation.

Text to Columns | Flash Fill | Remove Duplicates | Data Validation | Consolidate | Relationships | Manage Data Model

Data Tools
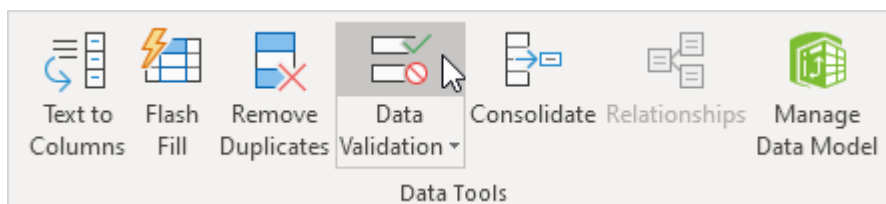
Outside a Date Range

3. In the Allow list, click Date.

4. In the Data list, click between.

5. Enter the Start date and End date shown below and click OK.
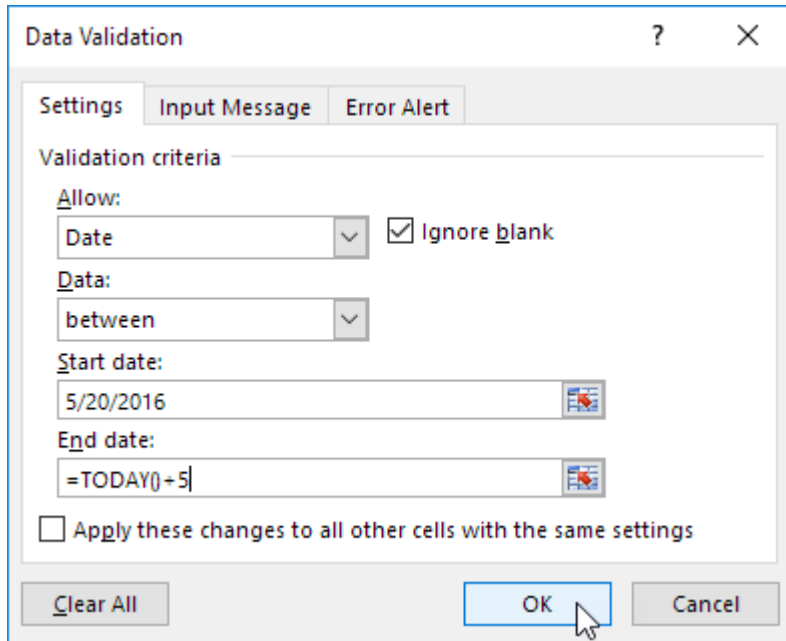
Explanation: all dates between 5/20/2016 and today's date + 5 days are allowed. All dates outside this date range are rejected.

6. Enter the date 5/19/2016 into cell A2.

Result. Excel shows an error alert.
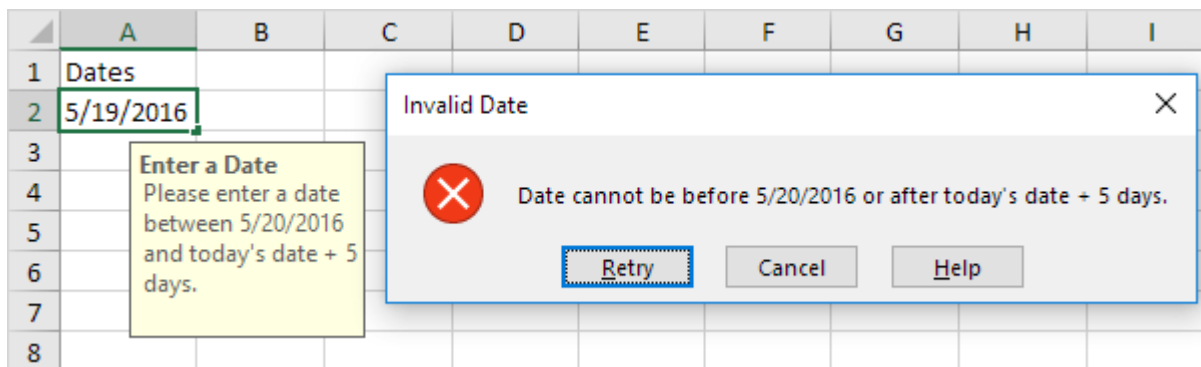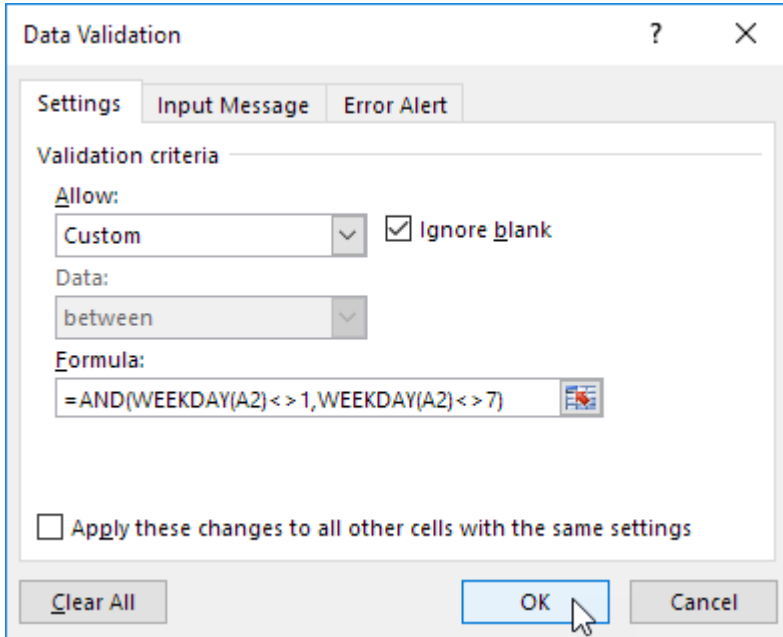
Note: to enter an input message and error alert message, go to the Input Message and Error Alert tab.

Sundays and Saturdays

3. In the Allow list, click Custom.
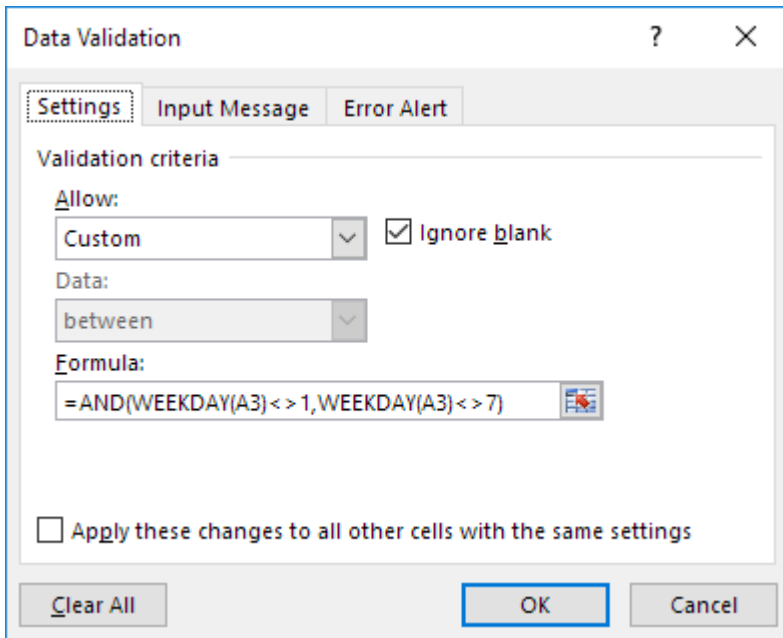
4. In the Formula box, enter the formula shown below and click OK.

Explanation: the WEEKDAY function returns a number from 1 (Sunday) to 7 (Saturday) representing the day of the week of a date. If a date's weekday is not equal to 1 (Sunday) AND not equal to 7 (Saturday), the date is allowed (<> means not equal to). In other words, Mondays, Tuesdays, Wednesdays, Thursdays and Fridays are allowed. Sundays and Saturdays are rejected. Because we selected the range A2:A4 before we clicked on Data Validation, Excel automatically copies the formula to the other cells.

5. To check this, select cell A3 and click Data Validation.

As you can see, this cell also contains the correct formula.

6. Enter the date 8/27/2016 (Saturday) into cell A2.

Result. Excel shows an error alert.
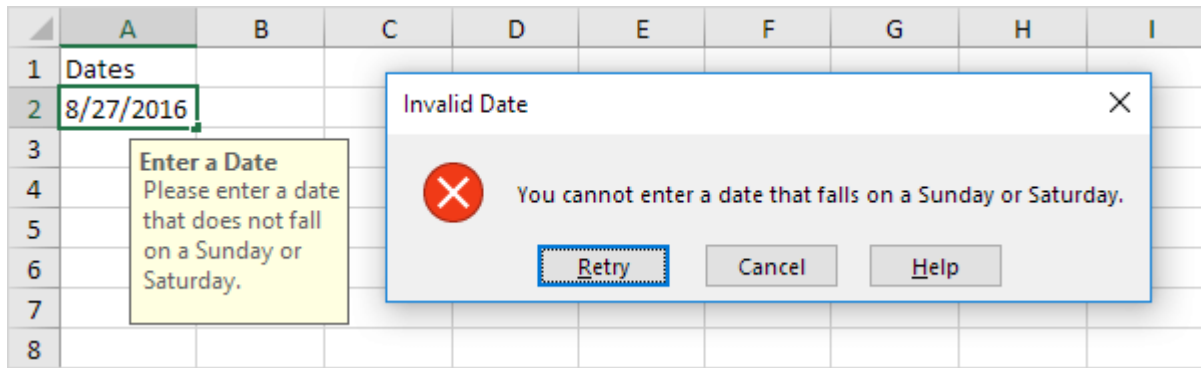
Note: to enter an input message and error alert message, go to the Input Message and Error Alert tab.

Budget Limit

This example teaches you how to use data validation to prevent users from exceeding a budget limit.

1. Select the range B2:B8.

Note: cell B10 contains a SUM function that calculates the sum of the range B2:B8.

2. On the Data tab, in the Data Tools group, click Data Validation.
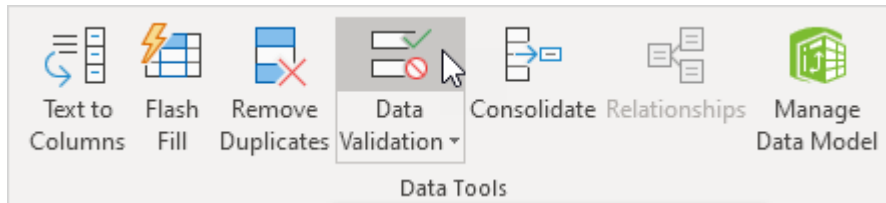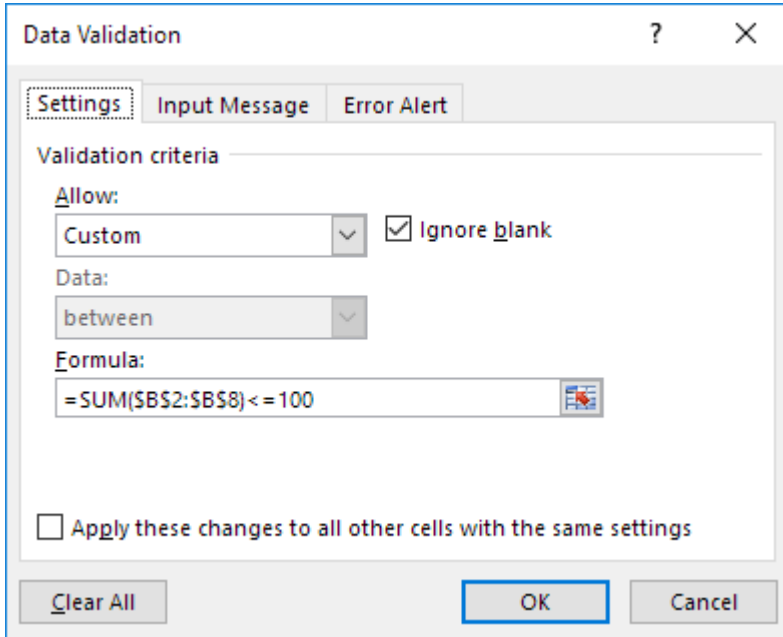
3. In the Allow list, click Custom.

4. In the Formula box, enter the formula shown below and click OK.
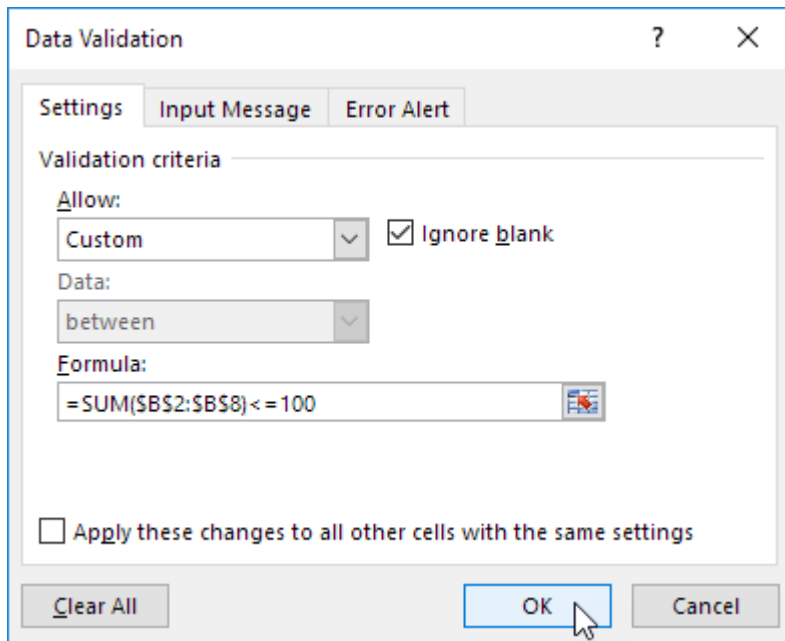
Explanation: the sum of the range B2:B8 may not exceed the budget limit of $100. Therefore, we apply data validation to the range B2:B8 (not cell B10!) because this is where the values are entered. Because we selected the range B2:B8 before we clicked on Data Validation, Excel automatically copies the formula to the other cells. Notice how we created an absolute reference ($B$2:$B$8) to fix this reference.

5. To check this, select cell B3 and click Data Validation.
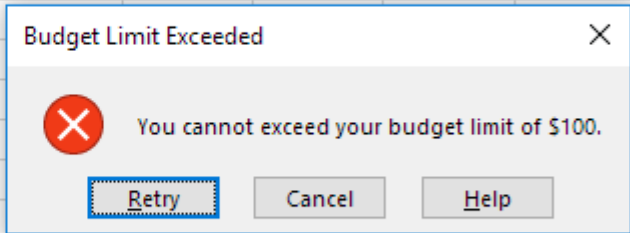
As you can see, this cell also contains the correct formula.

6. Enter the value 30 into cell B7.

Result. Excel shows an error alert. You cannot exceed your budget limit of $100.

Note: to enter an error alert message, go to the Error Alert tab.

Lesson no. 5: Data Consolidation in Excel

Data Consolidation
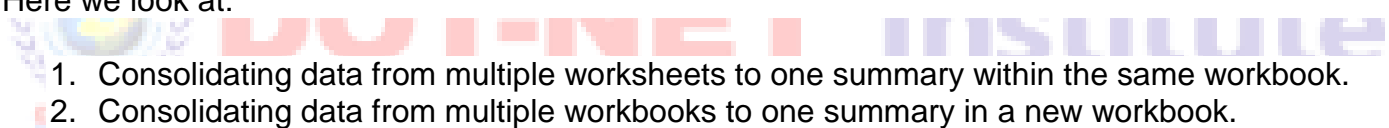
Do you need to view and compare lots of data in a single spreadsheet? There is a quick and easy way to do this – using the Data Consolidation tool. In this blog, Edmund, one of our Excel experts, shares his top tips.

Data Consolidation allows you to gather together your data from separate worksheets into a master worksheet. In other words, the Data Consolidation function takes data from a series of worksheets or workbooks and summaries it into a single worksheet that you can update easily.

The trouble is, working with Data Consolidation can be tricky! Don't be put off. Data Consolidation is an incredibly useful tool that help you understand and present your data quickly and easily. The screen may look daunting but like all great things, good planning is the key.

This example contains some tips from Edmund, one of our Excel experts, and will help you decide how to organise your data before you start summarising it to get easily understandable results.

Here we look at:

1. Consolidating data from multiple worksheets to one summary within the same workbook.
2. Consolidating data from multiple workbooks to one summary in a new workbook.

NOTE: The following processes will work in Excel versions: 2007, 2010, 2013 and 2016. If you are using an older version (Excel 2003 or older), this tip may not work for you.

Consolidate data in multiple worksheets within the same workbook

In our example, we have data for 3 years expenditure on tea, coffee and milk. The data is broken down into quarters and stored in one year per worksheet in one workbook. We can create a 'Consolidated Summary' sheet which will show expenditure by year and quarter. It does not matter if the data has the same arrangement of columns and rows or not. Excel will sort that out for you. Amazing!

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1	A	B	C	D / E
Coffee	£ 2,128	£ 3,526	£ 5,372	£ 9,378
Tea	£ 1,633		£ 5,392	£ 1,730
Milk	£ 4,837		£ 3,082	£ 5,272

Year 1 | Year 2 | Year 3 | Consolidated Summary ⊕

Year 2 worksheet

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
8				
Coffee	£ 2,944	£ 3,528	£ 7,822	£ 8,464
Milk	£ 8,227		£ 9,462	£ 2,748
11				

Year 1 | Year 2 | Year 3 | Consolidated Summary ⊕

Year 3 worksheet

	Quarter 4	Quarter 3	Quarter 1
7			
Coffee	£ 9,664	£ 7,123	£ 2,643
Tea	£ 7,356	£ 2,865	£ 6,092
Milk	£ 6,787	£ 1,595	£ 8,356
11			

Year 1 | Year 2 | Year 3 | Consolidated Summary ⊕

As you can see, Years 1, 2 and 3 each have different arrangements of columns and rows. There is no tea in Year 2; in Year 3 the first quarter appears at the end of the table, there is no Quarter 2 and the Quarters are not in order. The ranges you consolidate do not have to be of the same size in each worksheet, the number of rows or columns might be different from sheet to sheet. And yet, you can still consolidate the data into a summary sheet. How incredible is that!

Consolidation steps:

To start using the Data Consolidation tool, you need to select an empty sheet in the workbook as your master worksheet or add a new one if necessary. The worksheet is renamed 'Consolidated Summary'.

Select the upper-left cell of the area where you want the consolidated data to appear.

On the Ribbon, Choose Data > Consolidate to view the Consolidate dialog:
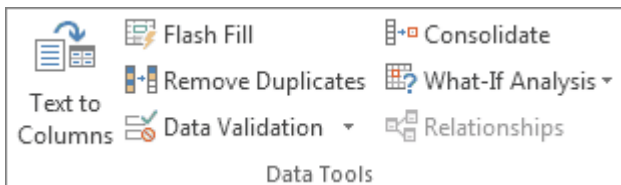
In the Function box, click the summary function that you want Excel to use to consolidate the data. As you will see from the drop-down, there are 11 functions to choose from. For our data we want to add up the values so we'll set the Function to Sum.
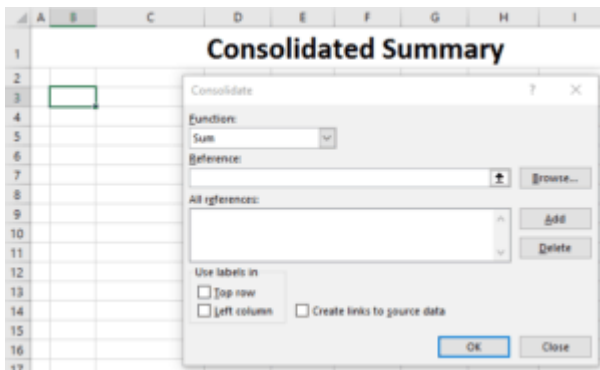
Click in the Reference area and select the first data range to consolidate – to do this you will need to click the Sheet tab i.e. "Year 1" and then drag over the data (including row and column headings) and then click the Add button to add this first set of data to the consolidation dialog.

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Coffee	£ 2,128	£ 3,526	£ 5,372	£ 9,378
Tea	£ 1,633		£ 5,392	£ 1,730
Milk	£ 4,837		£ 3,082	£ 5,272
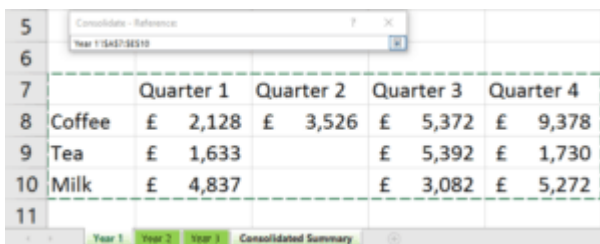
Continue in the same way by clicking on the next sheet, highlighting the data, and clicking on the Add button until all your data and worksheets appear in the References section of the dialog e.g. "Year 2" and "Year 3".
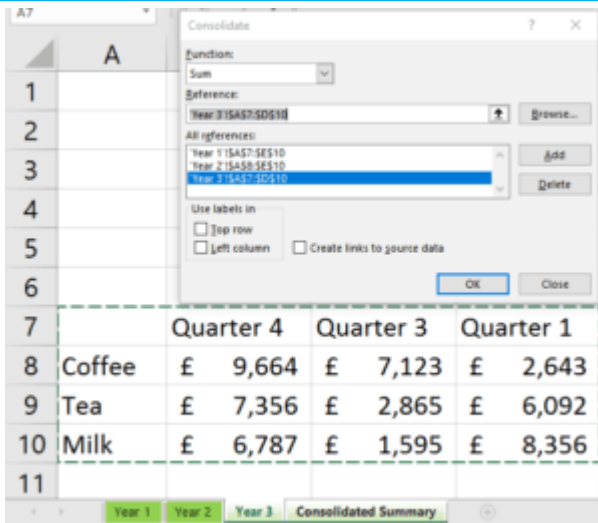
Top Tip: You can name your ranges before you start the Consolidation process. If you name each range then, when you create the consolidation, place your cursor in the Reference field, press F3 and then choose the range from the list in the Paste Name dialog.
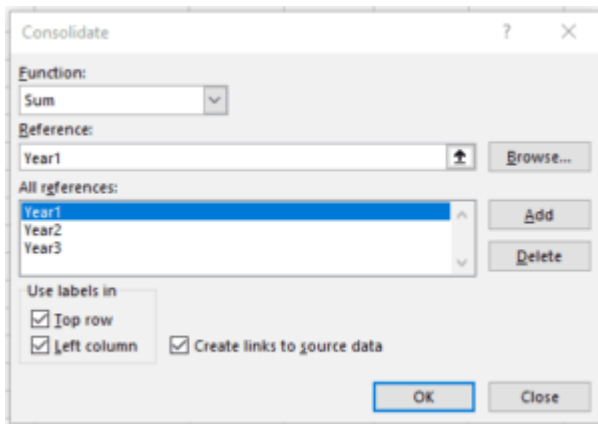
To indicate where the labels are located in the source ranges, select the check boxes under Use labels in: either the Top row, the Left column, or both. In this example, Top row is the name of the quarters, i.e. Quarter 1, Quarter 2, etc. and the Left Column are the list of items, i.e. Coffee, Tea and Milk.

Automatic vs. Manual updates: If you want Excel to update your consolidation table automatically when the source data changes, select the Create links to source data check box. If unchecked, you can still update the consolidation manually.
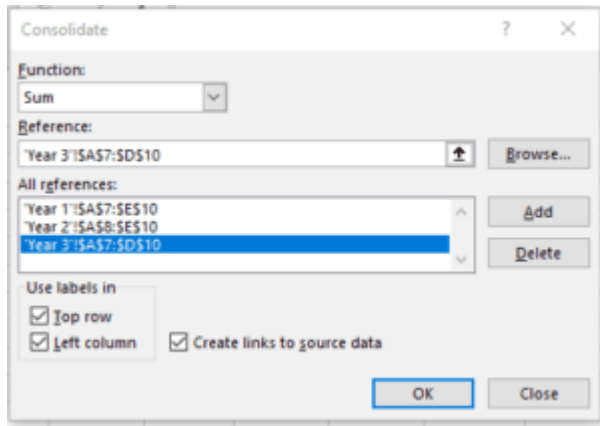
When you click OK, Excel summarises all the data into your new sheet as your master worksheet (Consolidated Summary).

You'll immediately notice a change to the Excel worksheet that you may never have seen before. You will see grouping tools down the left of the screen which you can use to display and hide the data. Next to rows 7, 10 and 14, there are plus signs. This signifies that cells are part of a group that is currently collapsed. Clicking on the plus sign will expand the group and there is a line connecting these rows to the left:

You'll find that the second column (Column C) of data shows the name of the workbook (Core Excel Level 2) that contains the data. You can hide this column if you want to, by right clicking it and choosing Hide. This simply hides the column so the data is there should you need to refer to it later on.

Copying your worksheets to a new workbook

Here's another time when pre-planning will be your friend.

When you look at your Consolidated Summary, you will see that there are some entries which are not helpful. For instance, range C4:C6 shows only the name of the workbook, so we cannot immediately see where the figures in the range D4:G6 come from.

If you wish to show the location of the source data on the summary sheet, I strongly advise you to separate all worksheets to individual workbooks before you apply the data consolidation. Let's look at how to do this.

We're going to copy the selected worksheet into a new workbook, so select (new book) from the To book drop-down list. Select the Create a copy check box. Because we're creating a new workbook, there are no worksheets in the Before sheet list before which we can insert the copied worksheet. It will be the only worksheet in the new workbook.
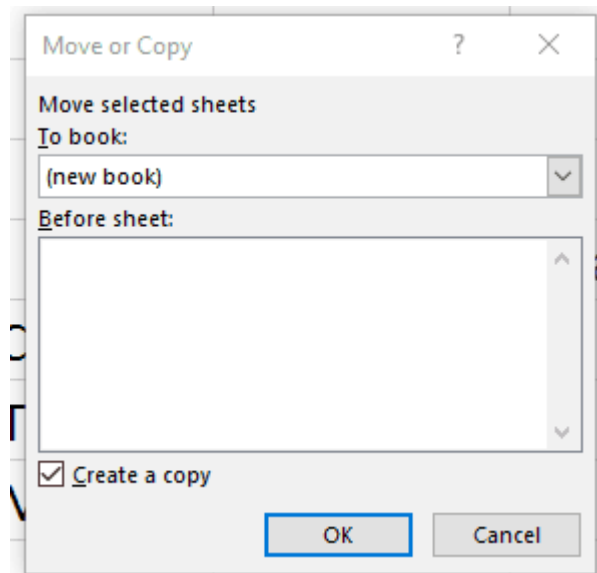
Click OK. A new workbook is created and the worksheet is copied into it. If you chose to move the worksheet, it will no longer be in the original workbook. Save the current workbook by the name of the worksheet that you copied to i.e. "Year 1.xls".

Continue creating new workbooks for each year e.g. "Year 2" and "Year 3" to "Year 2.xls" and "Year 3.xls" respectively. Yes, this is tedious, especially if you have a lot of worksheets, but you'll thank me in the end!

Consolidate data from multiple workbooks to one new workbook

Make sure all the individual workbooks you wish to consolidate are currently open.

Open a new, blank workbook as your master worksheet or add a new one if necessary. The worksheet is renamed as "Consolidate Summary" and save this workbook with a name e.g. Summary.xls.

Select the upper-left cell of the area where you want the consolidated data to appear.

On the Ribbon, Choose Data > Consolidate to view the Consolidate dialog

We now simply proceed as we did in the first example, the only difference being we are selecting data ranges from different workbooks instead of different worksheets.

When you click OK, Excel summarises all the data into your new master worksheet (Consolidated Summary).

			Quarter 1	Quarter 2	Quarter 3	Quarter 4
1		**Consolidated Summary**				
2						
3			Quarter 1	Quarter 2	Quarter 3	Quarter 4
4		Year 1	£ 2,128	£ 3,526	£ 5,372	£ 9,378
5		Year 2	£ 2,944	£ 3,528	£ 7,822	£ 8,464
6		Year 3	£ 2,643		£ 7,123	£ 9,664
7	Coffee		£ 7,715	£ 7,054	£20,317	£27,506
8		Year 1	£ 1,633		£ 5,392	£ 1,730
9		Year 3	£ 6,092		£ 2,865	£ 7,356
10	Tea		£ 7,725		£ 8,257	£ 9,086
11		Year 1	£ 4,837		£ 3,082	£ 5,272
12		Year 2	£ 8,227		£ 9,462	£ 2,748
13		Year 3	£ 8,356		£ 1,595	£ 6,787
14	Milk		£21,420		£14,139	£14,807

Here you will see the same data as in the first example, except displayed in a much more helpful way – Column C now shows the name of the workbook that contains the data.

Lesson no. 6: Text Function in Excel

How to use Text Functions in Excel
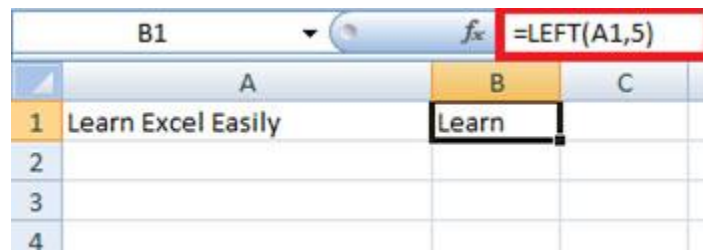
Excel is mostly about the numerical data, but at times you can come across the data which has too much text and that is the time when Text Functions in Excel will help you to simplify the things easily.

Here are few text functions you should know

1.Left()
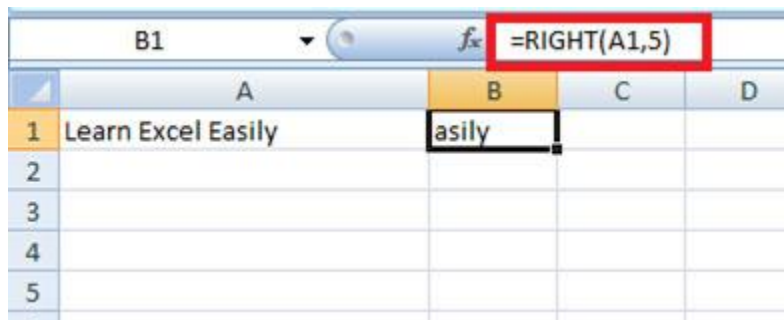
You can use the Left function when you want to extract the leftmost characters from a string.
Syntax **=left(text, num_char)**

Similarly, you can also use the Right function to extract the rightmost characters from a string.
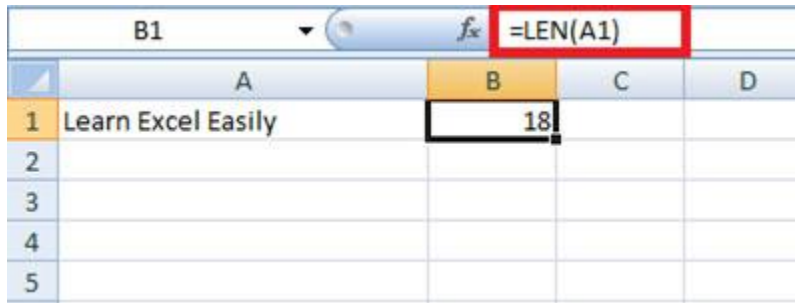
2. Len ()

Len function in Excel helps you to know the length of a string that is number of characters in a string. Syntax **= LEN(text)**
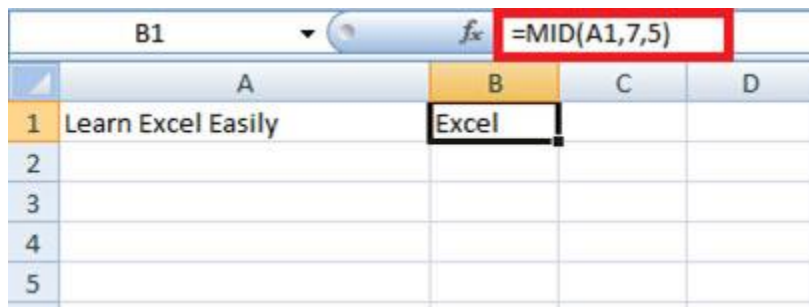
Note – Spaces are included while calculating length.

B1		fx	=LEN(A1)	
	A	B	C	D
1	Learn Excel Easily	18		
2				
3				
4				
5				

3. Mid ()
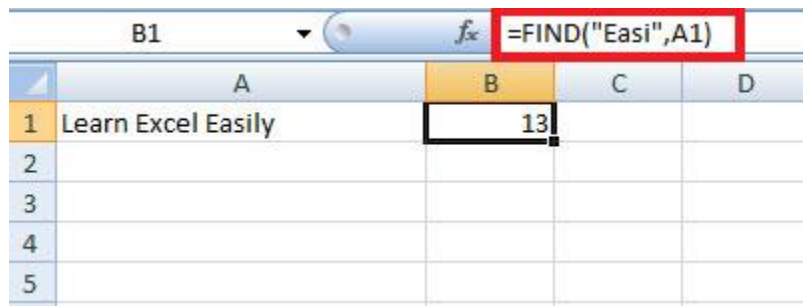
Mid function in Excel is used to extract the characters from the middle of a string. Syntax **= MID(text, start_char, num_chars)**

B1		fx	=MID(A1,7,5)	
	A	B	C	D
1	Learn Excel Easily	Excel		
2				
3				
4				
5				

4. Find ()

Find function in Excel is used when you want to know the position of certain characters in a particular string. Syntax **=FIND(find_text, within_text,[start_num])**

B1		fx	=FIND("Easi",A1)	
	A	B	C	D
1	Learn Excel Easily	13		
2				
3				
4				
5				

5. Proper ()

Proper function in Excel capitalizes each word in the string that is, it converts the case into proper case. Syntax **=PROPER(Text)**

6. Rept ()

Rept function in Excel is used when you want a certain text to be repeated certain number of times. Syntax **=REPT(Text, number_times)**

7. Trim()

Trim function in Excel removes the unnecessary spaces from a particular string.
Syntax **=TRIM(Text)**

8. Upper()

Upper function in Excel converts the text into Upper case from lower case. Syntax **=UPPER(Text)**

9. Substitute ()

Substitute function in Excel helps to replace existing text with a new text in a particular string.
Syntax **=SUBSTITUTE(text, old_text, new_text, instance number)**

10. Concatenate ()

Concatenate function in Excel helps to join the text of two or more cells.
Syntax **=CONCATENATE(text1, text2….)**

If you have any doubts or suggestions for us, then do let us know in the comments section below and we shall get back to you at the earliest.
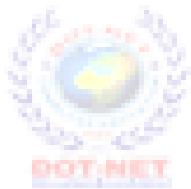
Lesson no. 7: Date Function

Date & Time Functions

To enter a date in Excel, use the "/" or "-" characters. To enter a time, use the ":" (colon). You can also enter a date and a time in one cell.

A1		fx	6/23/2016	
	A	B	C	D	E
1	6/23/2016	6:00	6/23/2016 6:00		
2					

Note: Dates are in US Format. Months first, Days second. This type of format depends on your windows regional settings. Learn more about Date and Time formats.

Year, Month, Day

To get the year of a date, use the YEAR function.

B1		fx	=YEAR(A1)	
	A	B	C	D	E
1	6/23/2016	2016			
2					

Note: use the MONTH and DAY function to get the month and day of a date.

Date Function

1. To add a number of days to a date, use the following simple formula.

B1		fx	=A1+5	
	A	B	C	D	E
1	6/23/2016	6/28/2016			
2					

2. To add a number of years, months and/or days, use the DATE function.

B1	▼	⋮	×	✓	*fx*	=DATE(YEAR(A1)+4,MONTH(A1)+2,DAY(A1)+9)			

	A	B	C	D	E	F	G	H	I
1	6/23/2016	9/1/2020							
2									

Note: the DATE function accepts three arguments: year, month and day. Excel knows that 6 + 2 = 8 = August has 31 days and rolls over to the next month (23 August + 9 days = 1 September).

Current Date & Time

To get the current date and time, use the NOW function.

A1	▼	⋮	×	✓	*fx*	=NOW()

	A	B	C	D	E
1	2/23/2017 10:43				
2					

Note: use the TODAY function to enter today's date in Excel.
Hour, Minute, Second

To return the hour, use the HOUR function.

B1	▼	⋮	×	✓	*fx*	=HOUR(A1)

	A	B	C	D	E
1	6:45:17	6			
2					

Note: use the MINUTE and SECOND function to return the minute and second.

Time Function

To add a number of hours, minutes and/or seconds, use the TIME function.

B1	▼	⋮	×	✓	*fx*	=TIME(HOUR(A1)+2,MINUTE(A1)+10,SECOND(A1)+70)			

	A	B	C	D	E	F	G	H	I
1	6:45:17	8:56:27							
2									

Note: Excel adds 2 hours, 10 + 1 = 11 minutes and 70 - 60 = 10 seconds.

DateDif

To get the number of days, weeks or years between two dates in Excel, use the DATEDIF function. The DATEDIF function has three arguments.

1. Fill in "d" for the third argument to get the number of days between two dates.

A4					ƒx	=DATEDIF(A1,A2,"d")	
	A	**B**	**C**	**D**	**E**	**F**	
1	4/18/2009						
2	6/23/2016						
3							
4	2623						
5							

Note: =A2-A1 produces the exact same result!

2. Fill in "m" for the third argument to get the number of months between two dates.

A4					ƒx	=DATEDIF(A1,A2,"m")	
	A	**B**	**C**	**D**	**E**	**F**	
1	4/18/2009						
2	6/23/2016						
3							
4	86						
5							

3. Fill in "y" for the third argument to get the number of years between two dates.

A4					ƒx	=DATEDIF(A1,A2,"y")	
	A	**B**	**C**	**D**	**E**	**F**	
1	4/18/2009						
2	6/23/2016						
3							
4	7						
5							

4. Fill in "yd" for the third argument to ignore years and get the number of days between two dates.

A4		⋮	✕	✓	*fx*	=DATEDIF(A1,A2,"yd")	

◢	A	B	C	D	E	F
1	4/18/2009					
2	6/23/2016					
3						
4	66					
5						

5. Fill in "md" for the third argument to ignore months and get the number of days between two dates.

A4		⋮	✕	✓	*fx*	=DATEDIF(A1,A2,"md")	

◢	A	B	C	D	E	F
1	4/18/2009					
2	6/23/2016					
3						
4	5					
5						

6. Fill in "ym" for the third argument to ignore years and get the number of months between two dates.

A4		⋮	✕	✓	*fx*	=DATEDIF(A1,A2,"ym")	

◢	A	B	C	D	E	F
1	4/18/2009					
2	6/23/2016					
3						
4	2					
5						

Important note: the DATEDIF function returns the number of <u>complete</u> days, months or years. This may give unexpected results when the day/month number of the second date is lower than the day/month number of the first date. See the example below.

A4		⋮	✕	✓	*fx*	=DATEDIF(A1,A2,"y")	

◢	A	B	C	D	E	F
1	4/18/2009					
2	4/17/2016					
3						
4	6					
5						

The difference is 6 years. Almost 7 years! Use the following formula to return 7 years.

A4	▼	:	×	✓	*fx*	=YEAR(A2)-YEAR(A1)		
	A	B	C	D	E	F		
1	4/18/2009							
2	4/17/2016							
3								
4	7							
5								

Today's Date

To enter today's date in Excel, use the TODAY function. To enter the current date and time, use the NOW function. To enter the current date and time as a static value, use keyboard shortcuts. Today and Now

1. To enter today's date in Excel, use the TODAY function.

A1	▼	:	×	✓	*fx*	=TODAY()			
	A	B	C	D	E	F	G	H
1	11/16/2018							
2								

Note: the TODAY function takes no arguments. This date will update automatically when you open the workbook on another date.

2. To enter the current date and time, use the NOW function.

A1	▼	:	×	✓	*fx*	=NOW()			
	A	B	C	D	E	F	G	H
1	11/16/2018 14:25							
2								

Note: the NOW function takes no arguments. This time will update automatically whenever the sheet is recalculated. This happens when you make a change to any cell or when you open the workbook. Press F9 to manually recalculate the workbook.

3. To enter the current time only, use NOW()-TODAY() and apply a time format.

A1	▼	:	✕	✓	*fx*	=NOW()-TODAY()		
	A	B	C	D	E	F	G	H
1	14:26							
2								

Note: dates are stored as numbers in Excel and count the number of days since January 0, 1900. Times are handled internally as numbers between 0 and 1. Visit our page about date and time formats for more information.

Static Date and Time

1. To enter the current date as a static value, press CTRL + ; (semicolon).

A1	▼	:	✕	✓	*fx*	11/16/2018		
	A	B	C	D	E	F	G	H
1	11/16/2018							
2								

Note: this date will not change when you open the workbook on another date.

2. To enter the current time as a static value, press CTRL + SHIFT + ; (semicolon).

A1	▼	:	✕	✓	*fx*	2:27:00 PM		
	A	B	C	D	E	F	G	H
1	2:27 PM							
2								

Note: this time will not change when you make a change to a cell or when you open the workbook.

3. To enter the current date and time as a static value, simply press CTRL + ; (semicolon), enter a space and press CTRL + SHIFT + ; (semicolon).

A1	▼	:	✕	✓	*fx*	11/16/2018 2:28:00 PM		
	A	B	C	D	E	F	G	H
1	11/16/2018 14:28							
2								

Calculate Age

To calculate the age of a person in Excel, use the DATEDIF function and the TODAY function. The DATEDIF function has three arguments.

1. Enter the date of birth into cell A2.

A2	▼	⋮	✕	✓	ƒx	4/21/1980

◢	A	B	C	D	E	F	G	H	I
1	Date of Birth								
2	4/21/1980								
3									

2. Enter the TODAY function into cell B2 to return today's date.

B2	▼	⋮	✕	✓	ƒx	=TODAY()

◢	A	B	C	D	E	F	G	H	I
1	Date of Birth	Today							
2	4/21/1980	10/18/2018							
3									

3. The DATEDIF function below calculates the age of a person.

C2	▼	⋮	✕	✓	ƒx	=DATEDIF(A2,B2,"y")

◢	A	B	C	D	E	F	G	H	I
1	Date of Birth	Today	Age						
2	4/21/1980	10/18/2018	38						
3									

Note: fill in "y" for the third argument to get the number of complete years between the date of birth and today's date.

4. Calculate the age of a person without displaying today's date.

B2	▼	⋮	✕	✓	ƒx	=DATEDIF(A2,TODAY(),"y")

◢	A	B	C	D	E	F	G	H	I
1	Date of Birth	Age							
2	4/21/1980	38							
3									

5. Calculate the age of a person on a specific date.

B2		:	×	✓	*fx*	=DATEDIF(A2,DATE(2018,1,1),"y")			

▲	A	B	C	D	E	F	G	H	I
1	Date of Birth	Age							
2	4/21/1980	37							
3									

Note: the DATE function accepts three arguments: year, month and day.

6. Calculate the age of a person in years, months and days.

=DATEDIF(A2,B2,"y") & "y " & DATEDIF(A2,B2,"ym") & "m " & DATEDIF(A2,B2,"md") & "d"							

▲	A	B	C	D	E	F	G	H
1	Date of Birth	Today	Age					
2	4/21/1980	10/18/2018	38y 5m 27d					
3								

Note: fill in "ym" for the third argument to ignore years and get the number of months between two dates. Fill in "md" for the third argument to ignore months and get the number of days between two dates. Use the & operator to join strings.

Time Difference

Calculating the difference between two times in Excel can be tricky. Times are handled internally as numbers between 0 and 1.
Simple Formula

Let's start with a simple formula that calculates the difference between two times in the same day.

1. Simply subtract the start time from the end time.

C2		:	×	✓	*fx*	=B2-A2			

▲	A	B	C	D	E	F	G	H	I
1	Start time	End time	Hours						
2	6:00 AM	3:00 PM	9:00						
3									

Note: AM is used for times in the night and morning. PM is used for times in the afternoon and evening. Change the Time format to display a time with or without AM/PM.
2. Change the number format of the values in cell A2, B2 and C2 to General.

C2		▼	:	✕	✓	*fx*	=B2-A2		
	A	B	C	D	E	F	G	H	I
1	Start time	End time	Hours						
2	0.25	0.625	0.375						
3									

Note: times are handled internally as numbers between 0 and 1. For example, 6:00 AM is represented as 0.25 (quarter through the day).

Time Difference Formula

The simple formula shown above doesn't work if the start time is before midnight and the end time is after midnight.

1. Times that are negative show as ######.

C2		▼	:	✕	✓	*fx*	=B2-A2		
	A	B	C	D	E	F	G	H	I
1	Start time	End time	Hours						
2	10:00 PM	2:30 AM	########						
3									

2. To clearly see this, change the number format of the values in cell A2, B2 and C2 to General.

C2		▼	:	✕	✓	*fx*	=B2-A2		
	A	B	C	D	E	F	G	H	I
1	Start time	End time	Hours						
2	0.9166667	0.1041667	-0.8125						
3									

3. The time difference formula below always works.

C2		▼	:	✕	✓	*fx*	=IF(B2>=A2,B2-A2,B2+1-A2)		
	A	B	C	D	E	F	G	H	I
1	Start time	End time	Hours						
2	10:00 PM	2:30 AM	4:30						
3									

Explanation: if the end time is greater than or equal to the start time, simply subtract the start time from the end time. If not, add 1 (full day) to the end time to represent a time on the next day and subtract the start time.

Time Difference in Hours as Decimal Value

To calculate the difference between two times in hours as a decimal value, multiply the previous formula by 24 and change the number format to General.

1. The formula below does the trick.

C2			✕	✓	fx	=IF(B2>=A2,B2-A2,B2+1-A2)*24				
	A	B	C	D	E	F	G	H	I
1	Start time	End time	Hours						
2	10:00 PM	2:30 AM	4.5						
3									

Weekdays

Learn how to get the day of the week of a date in Excel and how to get the number of weekdays or workdays days between two dates.
Weekday function

1. The WEEKDAY function in Excel returns a number from 1 (Sunday) to 7 (Saturday) representing the day of the week of a date. Apparently, 12/18/2017 falls on a Monday.

B1			✕	✓	fx	=WEEKDAY(A1)				
	A	B	C	D	E	F	G	H	I
1	12/18/2017	2							
2									

2. You can also use the TEXT function to display the day of the week.

B1			✕	✓	fx	=TEXT(A1,"dddd")				
	A	B	C	D	E	F	G	H	I
1	12/18/2017	Monday							
2									

3. Or create a custom date format (**dddd**) to display the day of the week.

A1			✕	✓	fx	12/18/2017				
	A	B	C	D	E	F	G	H	I
1	Monday								
2									

Networkdays function

1. The NETWORKDAYS function returns the number of weekdays (weekends excluded) between two dates.

2. If you supply a list of holidays, the NETWORKDAYS function returns the number of workdays (weekends and holidays excluded) between two dates.

The calendar below helps you understand the NETWORKDAYS function.

3. Dates are stored as numbers in Excel and count the number of days since January 0, 1900. Instead of supplying a list, supply an array constant of the numbers that represent these dates. To achieve this, select E1:E2 in the formula and press F9.

Workday function

The WORKDAY function is (almost) the opposite of the NETWORKDAYS function. It returns the date before or after a specified number of weekdays (weekends excluded).

Note: the WORKDAY function returns the serial number of the date. Apply a Date format to display the date.

The calendar below helps you understand the WORKDAY function.

Again, if you supply a list of holidays, the WORKDAY function returns the date before or after a specified number of workdays (weekends and holidays excluded).

Lesson no. 8: Financial Function in Excel

Financial Functions

To illustrate Excel's most popular financial functions, we consider a loan with monthly payments, an annual interest rate of 6%, a 20-year duration, a present value of $150,000 (amount borrowed) and a future value of 0 (that's what you hope to achieve when you pay off a loan).

We make monthly payments, so we use 6%/12 = 0.5% for Rate and 20*12 = 240 for Nper (total number of periods). If we make annual payments on the same loan, we use 6% for Rate and 20 for Nper.

PMT

Select cell A2 and insert the PMT function.

COUNTIF	▼	⋮	✕	✓	fx	=PMT(

	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	=PMT(	0.50%	240	$150,000	0	
3	PMT(**rate**, nper, pv, [fv], [type])					
4						

Note: the last two arguments are optional. For loans, Fv can be omitted (the future value of a loan equals 0, however, it's included here for clarification). If Type is omitted, it is assumed that payments are due at the end of the period.

Result. The monthly payment equals $1,074.65.

A2	▼	⋮	✕	✓	fx	=PMT(B2,C2,D2,E2)

	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

Tip: when working with financial functions in Excel, always ask yourself the question, am I making a payment (negative) or am I receiving money (positive)? We pay off a loan of $150,000 (positive, we received that amount) and we make monthly payments of $1,074.65 (negative, we pay). Visit our page about the **PMT function** for many more examples.

RATE

If Rate is the only unknown variable, we can use the RATE function to calculate the interest rate.

B2					f_x	=RATE(C2,A2,D2,E2)		
	A		B	C		D	E	F
1	Pmt		RATE	Nper			Fv	
2		($1,074.65)	0.50%	240		$150,000	0	
3								

NPER

Or the NPER function. If we make monthly payments of $1,074.65 on a 20-year loan, with an annual interest rate of 6%, it takes 240 months to pay off this loan.

C2					f_x	=NPER(B2,A2,D2,E2)		
	A		B	C		D	E	F
1	Pmt		Rate	NPER		Pv	Fv	
2		($1,074.65)	0.50%	240		$150,000	0	
3								

We already knew this, but we can change the monthly payment now to see how this affects the total number of periods.

C2					f_x	=NPER(B2,A2,D2,E2)		
	A		B	C		D	E	F
1	Pmt		Rate	NPER		Pv	Fv	
2		($2,074.65)	0.50%	89.95316057		$150,000	0	
3								

Conclusion: if we make monthly payments of $2,074.65, it takes less than 90 months to pay off this loan.

PV

Or the PV (Present Value) function. If we make monthly payments of $1,074.65 on a 20-year loan, with an annual interest rate of 6%, how much can we borrow? You already know the answer.

D2					fx	=PV(B2,C2,A2,E2)	

	A	B	C	D	E	F
1	Pmt	Rate	Nper	PV	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

FV

And we finish this chapter with the FV (Future Value) function. If we make monthly payments of $1,074.65 on a 20-year loan, with an annual interest rate of 6%, do we pay off this loan? Yes.

E2					fx	=FV(B2,C2,A2,D2)	

	A	B	C	D	E	F
1	Pmt	Rate	Nper	Pv	FV	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

But, if we make monthly payments of only $1,000.00, we still have debt after 20 years.

E2					fx	=FV(B2,C2,A2,D2)	

	A	B	C	D	E	F
1	Pmt	Rate	Nper	Pv	FV	
2	($1,000.00)	0.50%	240	$150,000	($34,489.78)	
3						

The PMT function in Excel calculates the payment for a loan based on constant payments and a constant interest rate. This page contains many easy to follow PMT examples.

PMT examples

Consider a loan with an annual interest rate of 6%, a 20-year duration, a present value of $150,000 (amount borrowed) and a future value of 0 (that's what you hope to achieve when you pay off a loan).

1. The PMT function below calculates the annual payment.

A2				f_x	=PMT(B2,C2,D2,E2)			
	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($13,077.68)	6.00%	20	$150,000	0	
3						

Note: if the fifth argument is omitted, it is assumed that payments are due at the end of the period. We pay off a loan of $150,000 (positive, we received that amount) and we make annual payments of $13,077.68 (negative, we pay).

2. The PMT function below calculates the quarterly payment.

A2				f_x	=PMT(B2,C2,D2,E2)			
	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($3,232.25)	1.50%	80	$150,000	0	
3						

Note: we make quarterly payments, so we use 6%/4 = 1.5% for Rate and 20*4 = 80 for Nper (total number of periods).

3. The PMT function below calculates the monthly payment.

A2				f_x	=PMT(B2,C2,D2,E2)			
	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($1,074.65)	0.50%	240	$150,000	0	
3						

Note: we make monthly payments, so we use 6%/12 = 0.5% for Rate and 20*12 = 240 for Nper (total number of periods).

Consider an investment with an annual interest rate of 8% and a present value of 0. How much money should you deposit at the end of each year to have $1,448.66 in the account in 10 years?

4. The PMT function below calculates the annual deposit.

A2	▼	⋮	✕	✓	*fx*	=PMT(B2,C2,D2,E2)		

◢	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	($100.00)	8.00%	10	0	$1,448.66	
3						

Explanation: in 10 years time, you pay 10 * $100 (negative) = $1000, and you'll receive $1,448.66 (positive) after 10 years. The higher the interest, the faster your money grows.

Consider an annuity with an annual interest rate of 6% and a present value of $83,748.46 (purchase value). How much money can you withdraw at the end of each month for the next 20 years?

5. The PMT function below calculates the monthly withdrawal.

A2	▼	⋮	✕	✓	*fx*	=PMT(B2,C2,D2,E2)		

◢	A	B	C	D	E	F
1	PMT	Rate	Nper	Pv	Fv	
2	$600.00	0.50%	240	($83,748.46)	0	
3						

Explanation: you need a one-time payment of $83,748.46 (negative) to pay this annuity. You'll receive 240 * $600 (positive) = $144,000 in the future. This is another example that money grows over time.

PPMT and IPMT

Consider a loan with an annual interest rate of 5%, a 2-year duration and a present value (amount borrowed) of $20,000.

1. The PMT function below calculates the monthly payment.

A2	▼	⋮	✕	✓	*fx*	=PMT(B2,C2,D2,E2)		

	A	B	C	D	E	F
1	Payment	Rate	Nper	Pv	Fv	
2	($877.43)	0.42%	24	$20,000	0	
3						

Note: we make monthly payments, so we use 5%/12 for Rate and 2*12 for Nper (total number of periods).

2. The PPMT function in Excel calculates the principal part of the payment. The second argument specifies the payment number.

A2	▼	⋮	✕	✓	*fx*	=PPMT(B2,5,C2,D2,E2)		

	A	B	C	D	E	F
1	Principal	Rate	Nper	Pv	Fv	
2	($807.41)	0.42%	24	$20,000	0	
3						

Explanation: the PPMT function above calculates the principal part of the 5th payment.

3. The IPMT function in Excel calculates the interest part of the payment. The second argument specifies the payment number.

A2	▼	⋮	✕	✓	*fx*	=IPMT(B2,5,C2,D2,E2)		

|	A	B	C	D	E	F
1	Interest	Rate	Nper	Pv	Fv	
2	($70.02)	0.42%	24	$20,000	0	
3						

Explanation: the IPMT function above calculates the interest part of the 5th payment.

4. It takes 24 months to pay off this loan. Create a loan amortization schedule (see picture below) to clearly see how the principal part increases and the interest part decreases with each payment.

	A	B	C	D	E	F
1	Annual Interest Rate	5.00%				
2	Years	2				
3	Payments Per Year	12				
4	Amount	$20,000				
5						
6	Payment Number	Payment	Principal	Interest	Balance	
7	1	($877.43)	($794.09)	($83.33)	$19,205.91	
8	2	($877.43)	($797.40)	($80.02)	$18,408.50	
9	3	($877.43)	($800.73)	($76.70)	$17,607.78	
10	4	($877.43)	($804.06)	($73.37)	$16,803.71	
11	5	($877.43)	($807.41)	($70.02)	$15,996.30	
12	6	($877.43)	($810.78)	($66.65)	$15,185.53	
13	7	($877.43)	($814.15)	($63.27)	$14,371.37	
14	8	($877.43)	($817.55)	($59.88)	$13,553.82	
15	9	($877.43)	($820.95)	($56.47)	$12,732.87	
16	10	($877.43)	($824.37)	($53.05)	$11,908.50	
17	11	($877.43)	($827.81)	($49.62)	$11,080.69	
18	12	($877.43)	($831.26)	($46.17)	$10,249.43	
19	13	($877.43)	($834.72)	($42.71)	$9,414.71	
20	14	($877.43)	($838.20)	($39.23)	$8,576.51	
21	15	($877.43)	($841.69)	($35.74)	$7,734.81	
22	16	($877.43)	($845.20)	($32.23)	$6,889.62	
23	17	($877.43)	($848.72)	($28.71)	$6,040.89	
24	18	($877.43)	($852.26)	($25.17)	$5,188.64	
25	19	($877.43)	($855.81)	($21.62)	$4,332.83	
26	20	($877.43)	($859.37)	($18.05)	$3,473.45	
27	21	($877.43)	($862.96)	($14.47)	$2,610.50	
28	22	($877.43)	($866.55)	($10.88)	$1,743.95	
29	23	($877.43)	($870.16)	($7.27)	$873.79	
30	24	($877.43)	($873.79)	($3.64)	($0.00)	
31						
32						

Note: the principal part and the interest part always add up to the payment amount.
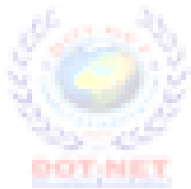
Lesson no. 9: Logical Function in Excel
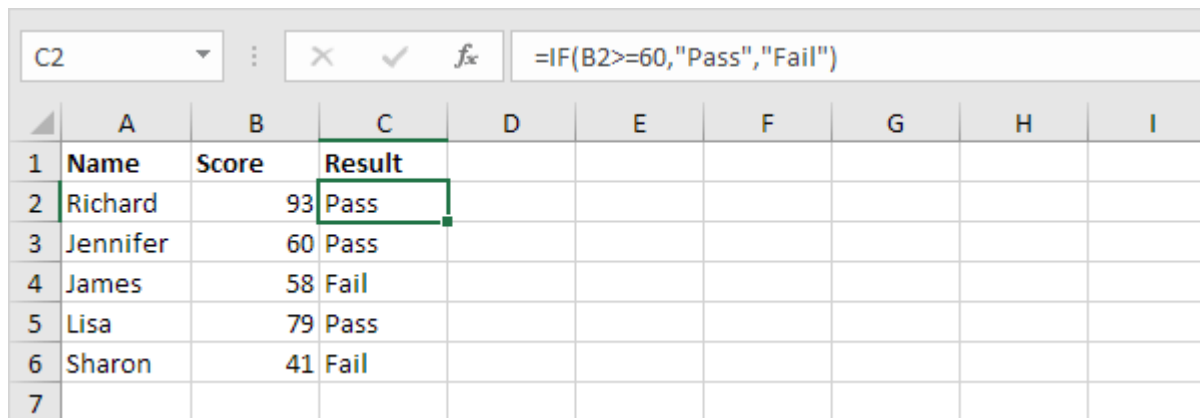
Logical Functions

Learn how to use Excel's logical functions, such as IF, AND, OR and NOT.

If

The IF function checks whether a condition is met, and returns one value if true and another value if false.

1. For example, take a look at the IF function in cell C2 below.

C2			×	✓	f_x	=IF(B2>=60,"Pass","Fail")			
◢	A	B	C	D	E	F	G	H	I
1	Name	Score	Result						
2	Richard	93	Pass						
3	Jennifer	60	Pass						
4	James	58	Fail						
5	Lisa	79	Pass						
6	Sharon	41	Fail						
7									

Explanation: if the score is greater than or equal to 60, the IF function returns Pass, else it returns Fail. Visit our page about the IF function for many more examples.

And

The AND Function returns TRUE if all conditions are true and returns FALSE if any of the conditions are false.

1. For example, take a look at the AND function in cell D2 below.

D2 =AND(B2>=60,C2>=90)

	A	B	C	D	E	F	G	H	I
1	Name	Score 1	Score 2	Result					
2	Richard	93	80	FALSE					
3	Jennifer	60	91	TRUE					
4	James	58	75	FALSE					
5	Lisa	79	94	TRUE					
6	Sharon	41	33	FALSE					
7									

Explanation: the AND function returns TRUE if the first score is greater than or equal to 60 and the second score is greater than or equal to 90, else it returns FALSE.

Or

The OR function returns TRUE if any of the conditions are TRUE and returns FALSE if all conditions are false.

1. For example, take a look at the OR function in cell D2 below.

D2 =OR(B2>=60,C2>=60)

	A	B	C	D	E	F	G	H	I
1	Name	Score 1	Score 2	Result					
2	Richard	93	80	TRUE					
3	Jennifer	60	91	TRUE					
4	James	58	75	TRUE					
5	Lisa	79	94	TRUE					
6	Sharon	41	33	FALSE					
7									

Explanation: the OR function returns TRUE if at least one score is greater than or equal to 60, else it returns FALSE. Visit our page about the OR function for many more examples.

Not

The NOT function changes TRUE to FALSE, and FALSE to TRUE.

1. For example, take a look at the NOT function in cell D2 below.

| D2 | ▼ | : | ✕ | ✓ | *fx* | =NOT(OR(B2>=60,C2>=60)) |

◢	A	B	C	D	E	F	G	H	I
1	Name	Score 1	Score 2	Result					
2	Richard	93	80	FALSE					
3	Jennifer	60	91	FALSE					
4	James	58	75	FALSE					
5	Lisa	79	94	FALSE					
6	Sharon	41	33	TRUE					
7									

Explanation: in this example, the NOT function reverses the result of the OR function (see previous example).
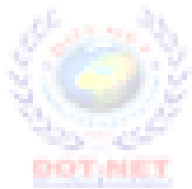
Lesson no. 10: Math and Trig Function in Excel

PRODUCT function

This article describes the formula syntax and usage of the **PRODUCT** function in Microsoft Excel.

Description

The **PRODUCT** function multiplies all the numbers given as arguments and returns the product. For example, if cells A1 and A2 contain numbers, you can use the formula **=PRODUCT(A1, A2)** to multiply those two numbers together. You can also perform the same operation by using the multiply (*) mathematical operator; for example, **=A1 * A2**.

The **PRODUCT** function is useful when you need to multiply many cells together. For example, the formula **=PRODUCT(A1:A3, C1:C3)** is equivalent to **=A1 * A2 * A3 * C1 * C2 * C3**.

Syntax

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

The PRODUCT function syntax has the following arguments:

- **number1** Required. The first number or range that you want to multiply.

- **number2, ...** Optional. Additional numbers or ranges that you want to multiply, up to a maximum of 255 arguments.

NOTE   If an argument is an array or reference, only numbers in the array or reference are multiplied. Empty cells, logical values, and text in the array or reference are ignored.
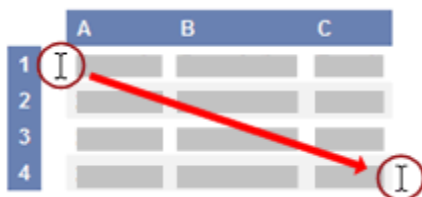
Example

The example may be easier to understand if you copy it to a blank worksheet.

⊞ How do I copy an example?

1. Select the example in this article.

   IMPORTANT   Do not select the row or column headers.

Selecting an example from Help

2. Press CTRL+C.

3. In Excel, create a blank workbook or worksheet.

4. In the worksheet, select cell A1, and press CTRL+V.

   IMPORTANT For the example to work properly, you must paste it into cell A1 of the worksheet.

5. To switch between viewing the results and viewing the formulas that return the results, press CTRL+` (grave accent), or on the **Formulas** tab, in the **Formula Auditing** group, click the **Show Formulas** button.

	A	B	C
1	**Data**		
2	5		
3	15		
4	30		
5	**Formula**	**Description**	**Result**
6	=PRODUCT(A2:A4)	Multiplies the numbers in cells A2 through A4.	2250
7	=PRODUCT(A2:A4, 2)	Multiplies the numbers in cells A2 through A4, and then multiplies that result by 2.	4500
8	=A2*A3*A4	Multiplies the numbers in cells A2 through A4 by using mathematical operators instead of the **PRODUCT** function.	2250

SUMPRODUCT function

This article describes the formula syntax and usage of the **SUMPRODUCT** function in Microsoft Excel.

Description

Multiplies corresponding components in the given arrays, and returns the sum of those products.

Syntax

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

The SUMPRODUCT function syntax has the following arguments:

- **Array1**   Required. The first array argument whose components you want to multiply and then add.

- **Array2, array3,...**   Optional. Array arguments 2 to 255 whose components you want to multiply and then add.

Remarks

- The array arguments must have the same dimensions. If they do not, SUMPRODUCT returns the #VALUE! error value.

- SUMPRODUCT treats array entries that are not numeric as if they were zeros.

Example

The example may be easier to understand if you copy it to a blank worksheet.

⊞ How do I copy an example?

1. Select the example in this article.

   IMPORTANT Do not select the row or column headers.

Selecting an example from Help

2. Press CTRL+C.

3. In Excel, create a blank workbook or worksheet.

4. In the worksheet, select cell A1, and press CTRL+V.

   IMPORTANT For the example to work properly, you must paste it into cell A1 of the worksheet.

5. To switch between viewing the results and viewing the formulas that return the results, press CTRL+` (grave accent), or on the **Formulas** tab, in the **Formula Auditing** group, click the **Show Formulas** button.

	A	B	C	D
1	**Array 1**	**Array 1**	**Array 2**	**Array 2**
2	3	4	2	7
3	8	6	6	7
4	1	9	5	3
5	**Formula**	**Description (Result)**		
6	=SUMPRODUCT(A2:B4, C2:D4)	Multiplies all the components of the two arrays and then adds the products — that is, 3*2 + 4*7 + 8*6 + 6*7 + 1*5 + 9*3. (156)		

NOTE The preceding example returns the same result as the formula SUM(A2:B4*C2:D4) entered as an array. Using arrays provides a more general solution for doing operations similar to SUMPRODUCT. For example, you can calculate the sum of the squares of the elements in A2:B4 by using the formula =SUM(A2:B4^2) and pressing CTRL+SHIFT+ENTER.

Lesson no. 11: Statistical Function in Excel

Statistical Functions

This chapter gives an overview of some very useful statistical functions in Excel.
Average

To calculate the average of a group of numbers, use the AVERAGE function.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8	
2																
3	5.6															
4																

A3 =AVERAGE(A1:O1)

Note: visit our page about the AVERAGE function for many more examples.

Averageif

To average cells based on one criteria, use the AVERAGEIF function. For example, to calculate the average excluding zeros.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8	
2																
3	6.46															
4																

A3 =AVERAGEIF(A1:O1,"<>0")

Note: visit our page about the AVERAGEIF function for many more examples.

Median

To find the median (or middle number), use the MEDIAN function.

| A3 | ▼ | ⋮ | ✕ | ✓ | *fx* | =MEDIAN(A1:O1) |

◢	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8	
2																
3	6															
4																

Check:

◢	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	0	3	4	5	5	6	6	7	7	8	8	8	8	9	

Mode

To find the most frequently occurring number, use the MODE function.

| A3 | ▼ | ⋮ | ✕ | ✓ | *fx* | =MODE(A1:O1) |

◢	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8	
2																
3	8															
4																

Standard Deviation

To calculate the standard deviation, use the STEDV function.

| A3 | ▼ | ⋮ | ✕ | ✓ | *fx* | =STDEV(A1:O1) |

◢	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8	
2																
3	2.82															
4																

Note: standard deviation is a number that tells you how far numbers are from their mean. Learn more about this topic on our page about standard deviation.

Min

To find the minimum value, use the MIN function.

A3				⃝ ✗ ✓	*fx*	=MIN(A1:O1)									

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8	
2																
3	0															
4																

Max

To find the maximum value, use the MAX function.

A3				⃝ ✗ ✓	*fx*	=MAX(A1:O1)									

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8	
2																
3	9															
4																

Large

To find the third largest number, use the following LARGE function.

A3				⃝ ✗ ✓	*fx*	=LARGE(A1:O1,3)									

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8	
2																
3	8															
4																

Check:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	0	3	4	5	5	6	6	7	7	8	8	8	8	9	

Small

To find the second smallest number, use the following SMALL function.

A3				⃝ ✗ ✓	*fx*	=SMALL(A1:O1,2)									

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	7	8	6	5	9	8	7	4	8	0	3	5	6	8	
2																
3	0															
4																

Check:

◢	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	0	0	3	4	5	5	6	6	7	7	8	8	8	8	9	

Tip: Excel can generate most of these results with the click of a button. Our Descriptive Statistics example shows you how.

Lesson no. 12: Pivot Table Report in Excel

Pivot Tables

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.

Our data set consists of 213 records and 6 fields. Order ID, Product, Category, Amount, Date and Country.

	A	B	C	D	E	F	G	H
1	Order ID	Product	Category	Amount	Date	Country		
2	1	Carrots	Vegetables	$4,270	1/6/2016	United States		
3	2	Broccoli	Vegetables	$8,239	1/7/2016	United Kingdom		
4	3	Banana	Fruit	$617	1/8/2016	United States		
5	4	Banana	Fruit	$8,384	1/10/2016	Canada		
6	5	Beans	Vegetables	$2,626	1/10/2016	Germany		
7	6	Orange	Fruit	$3,610	1/11/2016	United States		
8	7	Broccoli	Vegetables	$9,062	1/11/2016	Australia		
9	8	Banana	Fruit	$6,906	1/16/2016	New Zealand		
10	9	Apple	Fruit	$2,417	1/16/2016	France		
11	10	Apple	Fruit	$7,421	1/16/2016	Canada		

Insert a Pivot Table

To insert a pivot table, execute the following steps.

1. Click any single cell inside the data set.

2. On the Insert tab, in the Tables group, click PivotTable.

PivotTable Recommended Table
PivotTables
Tables
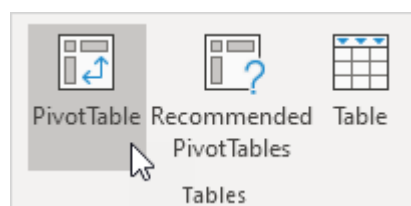
The following dialog box appears. Excel automatically selects the data for you. The default location for a new pivot table is New Worksheet.

3. Click OK.

Drag fields

The PivotTable Fields pane appears. To get the total amount exported of each product, drag the following fields to the different areas.

1. Product field to the Rows area.

2. Amount field to the Values area.

3. Country field to the Filters area.

Below you can find the pivot table. Bananas are our main export product. That's how easy pivot tables can be!

Row Labels	Sum of Amount
Apple	191257
Banana	340295
Beans	57281
Broccoli	142439
Carrots	136945
Mango	57079
Orange	104438
Grand Total	1029734

Country (All)

Sort

To get Banana at the top of the list, sort the pivot table.

1. Click any cell inside the Sum of Amount column.

2. Right click and click on Sort, Sort Largest to Smallest.

📋	Copy
🔢	Format Cells...
	Number Format...
🔄	Refresh
	Sort ▶
✕	Remove "Sum of Amount"
	Summarize Values By ▶
	Show Values As ▶
📊	Value Field Settings...
	PivotTable Options...
📋	Hide Field List

Sort submenu:
- A→Z↓ Sort Smallest to Largest
- Z→A↓ Sort Largest to Smallest
- More Sort Options...
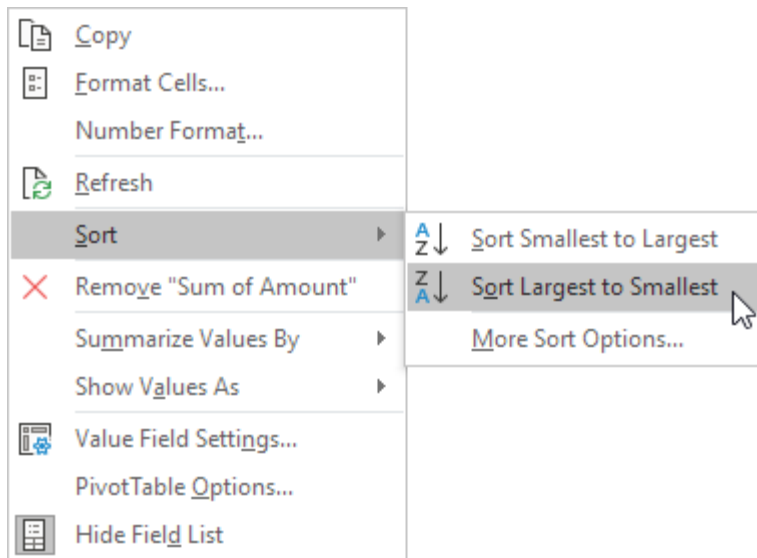
Result.

	A	B	C
1	Country	(All) ▼	
2			
3	Row Labels ↓	Sum of Amount	
4	Banana	340295	
5	Apple	191257	
6	Broccoli	142439	
7	Carrots	136945	
8	Orange	104438	
9	Beans	57281	
10	Mango	57079	
11	**Grand Total**	**1029734**	
12			

Filter

Because we added the Country field to the Filters area, we can filter this pivot table by Country. For example, which products do we export the most to France?

1. Click the filter drop-down and select France.

Result. Apples are our main export product to France.

	A	B	C
1	Country	France ⏷	
2			
3	Row Labels ↓	Sum of Amount	
4	Apple	80193	
5	Banana	36094	
6	Carrots	9104	
7	Mango	7388	
8	Broccoli	5341	
9	Orange	2256	
10	Beans	680	
11	Grand Total	141056	
12			

Note: you can use the standard filter (triangle next to Row Labels) to only show the amounts of specific products.

Change Summary Calculation

By default, Excel summarizes your data by either summing or counting the items. To change the type of calculation that you want to use, execute the following steps.

1. Click any cell inside the Sum of Amount column.

2. Right click and click on Value Field Settings.

	Copy
	Format Cells...
	Number Format...
	Refresh
	Sort ▶
✕	Remove "Sum of Amount"
	Summarize Values By ▶
	Show Values As ▶
	Value Field Settings...
	PivotTable Options...
	Hide Field List
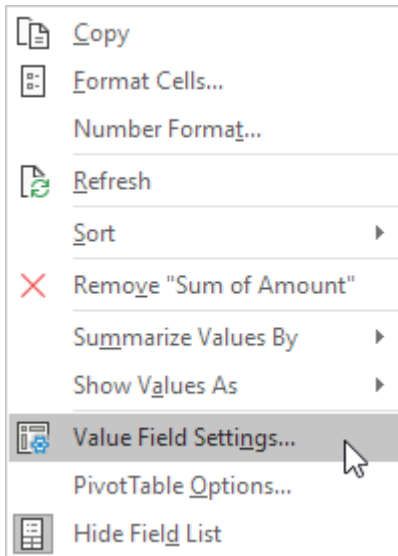
3. Choose the type of calculation you want to use. For example, click Count.

Value Field Settings

Source Name: Amount

Custom Name: Count of Amount

Summarize Values By | Show Values As

Summarize value field by

Choose the type of calculation that you want to use to summarize data from the selected field

Sum
Count
Average
Max
Min
Product

Number Format   OK   Cancel
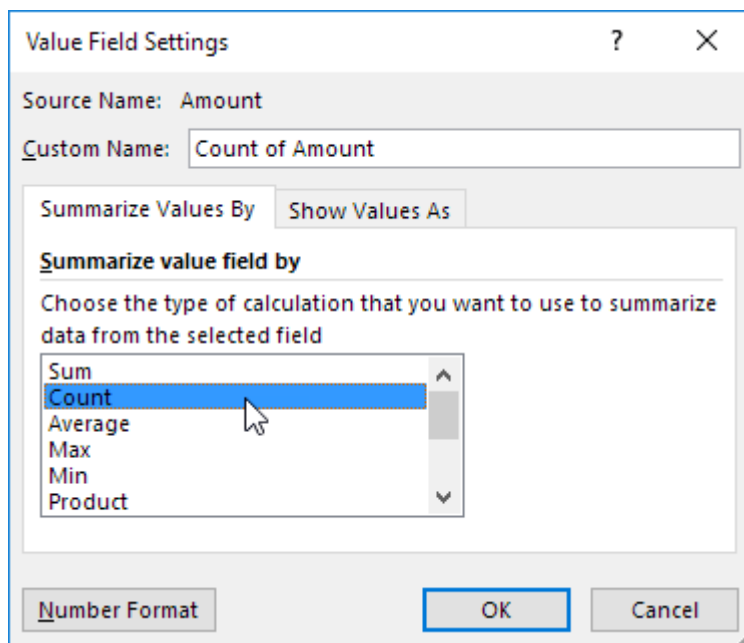
4. Click OK.

Result. 16 out of the 28 orders to France were 'Apple' orders.

◢	A	B	C
1	Country	France ⊤	
2			
3	Row Labels ↓	Count of Amount	
4	Apple	16	
5	Banana	7	
6	Carrots	1	
7	Mango	1	
8	Orange	1	
9	Beans	1	
10	Broccoli	1	
11	**Grand Total**	**28**	
12			

Two-dimensional Pivot Table

If you drag a field to the Rows area and Columns area, you can create a two-dimensional pivot table. First, insert a pivot table. Next, to get the total amount exported to each country, of each product, drag the following fields to the different areas.

1. Country field to the Rows area.

2. Product field to the Columns area.

3. Amount field to the Values area.

4. Category field to the Filters area.

PivotTable Fields ▼ ✕

Choose fields to add to report: ⚙ ▼

Search 🔍

☐ Order ID
☑ **Product**
☑ **Category**
☑ **Amount**
☐ Date
☑ **Country**

Drag fields between areas below:

▼ Filters

Category	▼

▥ Columns

Product	▼

☰ Rows

Country	▼

Σ Values

Sum of Amou...	▼

☐ Defer Layout Update   Update

Below you can find the two-dimensional pivot table.

	A	B	C	D	E	F	G	H	I	J
1	Category	(All) ▼								
2										
3	Sum of Amount	Column ▼								
4	Row Labels ▼	Apple	Banana	Beans	Broccoli	Carrots	Mango	Orange	Grand Total	
5	Australia	20634	52721	14433	17953	8106	9186	8680	131713	
6	Canada	24867	33775		12407		3767	19929	94745	
7	France	80193	36094	680	5341	9104	7388	2256	141056	
8	Germany	9082	39686	29905	37197	21636	8775	8887	155168	
9	New Zealand	10332	40050		4390			12010	66782	
10	United Kingdom	17534	42908	5100	38436	41815	5600	21744	173137	
11	United States	28615	95061	7163	26715	56284	22363	30932	267133	
12	**Grand Total**	191257	340295	57281	142439	136945	57079	104438	1029734	
13										

Pivot Chart

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

Below you can find a two-dimensional pivot table. Go back to Pivot Tables to learn how to create this pivot table.

	A	B	C	D	E	F	G	H	I	J
1	Category	(All)								
2										
3	Sum of Amount	Column								
4	Row Labels	Apple	Banana	Beans	Broccoli	Carrots	Mango	Orange	Grand Total	
5	Australia	20634	52721	14433	17953	8106	9186	8680	131713	
6	Canada	24867	33775		12407		3767	19929	94745	
7	France	80193	36094	680	5341	9104	7388	2256	141056	
8	Germany	9082	39686	29905	37197	21636	8775	8887	155168	
9	New Zealand	10332	40050		4390			12010	66782	
10	United Kingdom	17534	42908	5100	38436	41815	5600	21744	173137	
11	United States	28615	95061	7163	26715	56284	22363	30932	267133	
12	Grand Total	191257	340295	57281	142439	136945	57079	104438	1029734	
13										

Insert Pivot Chart

To insert a pivot chart, execute the following steps.

1. Click any cell inside the pivot table.

2. On the Analyze tab, in the Tools group, click PivotChart.
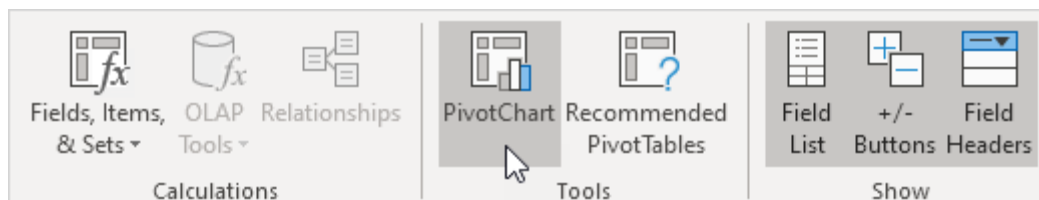
The Insert Chart dialog box appears.

3. Click OK.

Below you can find the pivot chart. This pivot chart will amaze and impress your boss.
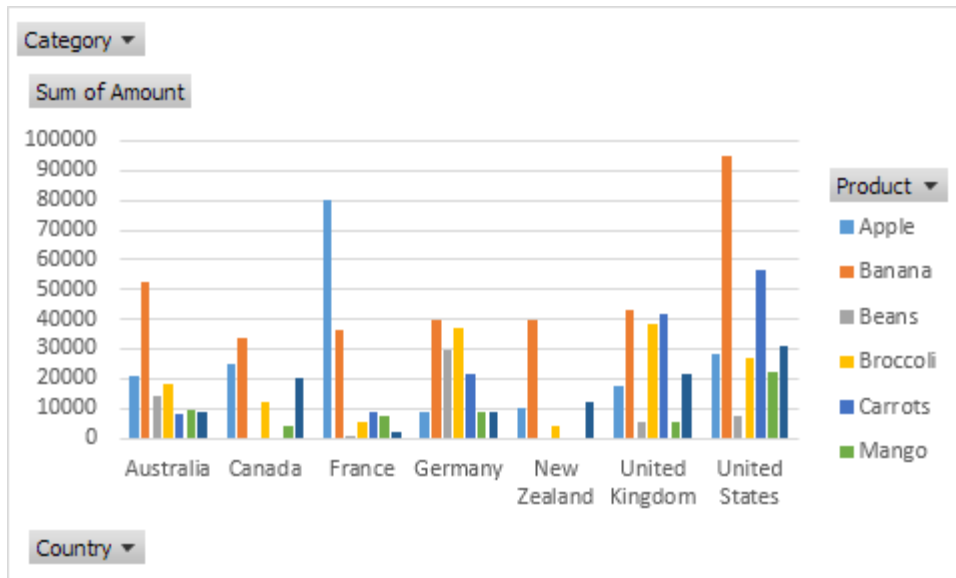
Note: any changes you make to the pivot chart are immediately reflected in the pivot table and vice versa.

Filter Pivot Chart

To filter this pivot chart, execute the following steps.

1. Use the standard filters (triangles next to Product and Country). For example, use the Country filter to only show the total amount of each product exported to the United States.
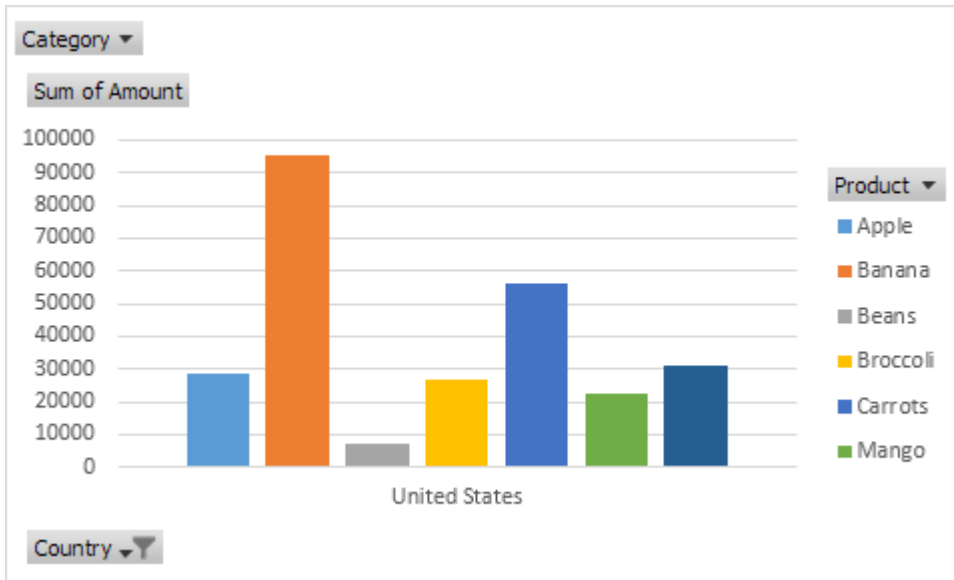
2. Remove the Country filter.

3. Because we added the Category field to the Filters area, we can filter this pivot chart (and pivot table) by Category. For example, use the Category filter to only show the vegetables exported to each country.
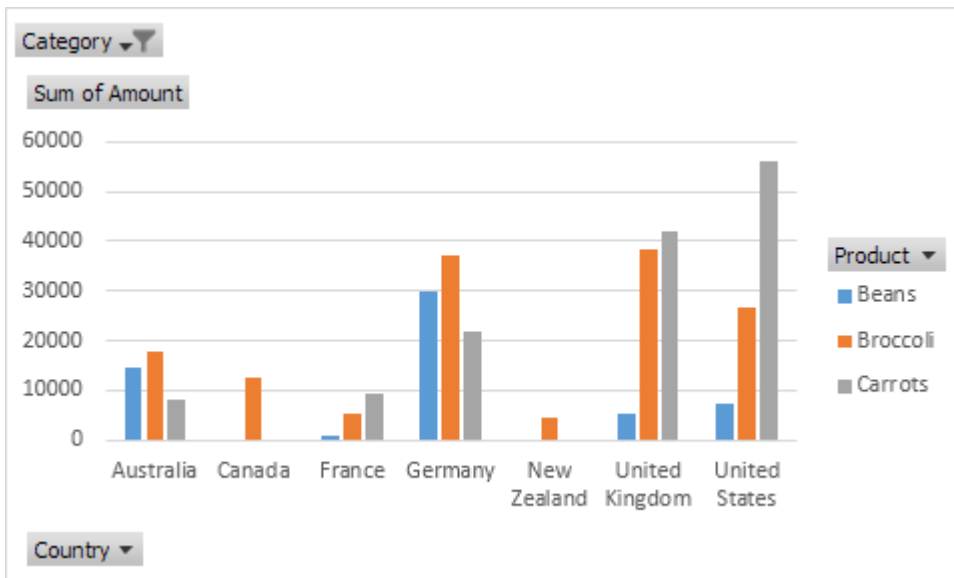
Change Pivot Chart Type

You can change to a different type of pivot chart at any time.

1. Select the chart.

2. On the Design tab, in the Type group, click Change Chart Type.
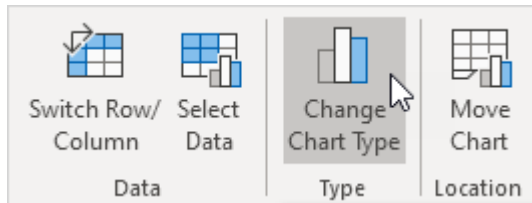
3. Choose Pie.
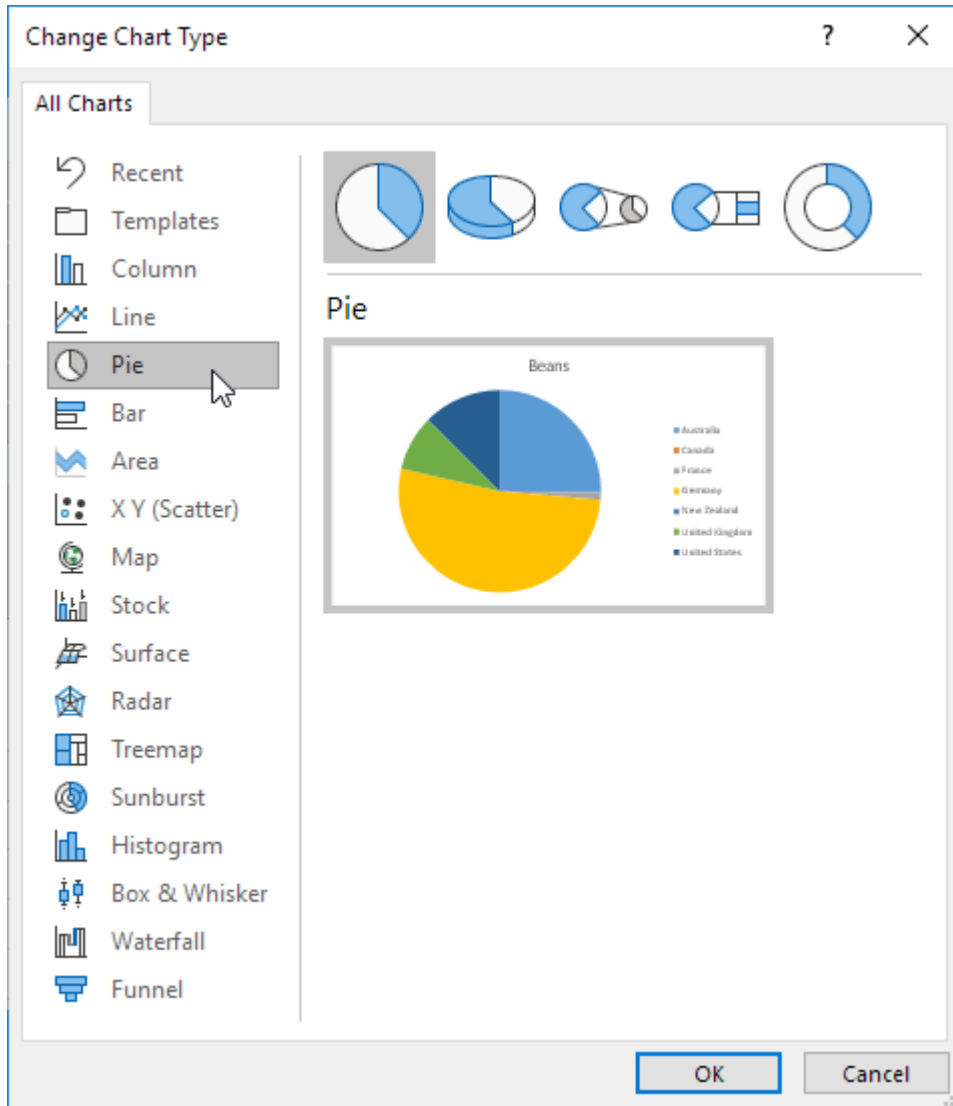
4. Click OK.

Result:
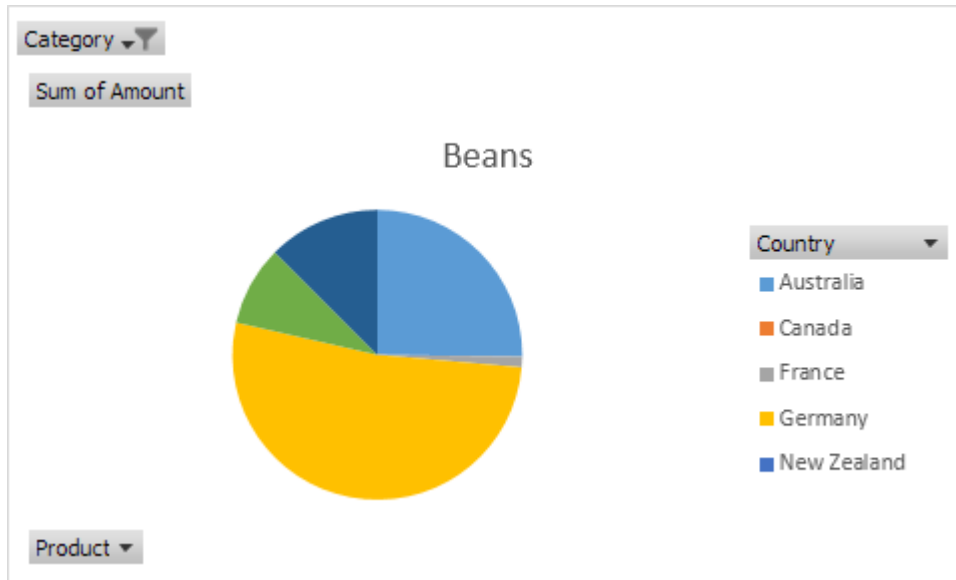
Note: pie charts always use one data series (in this case, Beans). To get a pivot chart of a country, swap the data over the axis. First, select the chart. Next, on the Design tab, in the Data group, click Switch Row/Column.

Lesson no. 14: Comparing PTR and CTR in Excel

In Microsoft Excel, you can pivot data in a PivotTable or PivotChart report by changing the field layout of the data. By using the PivotTable Field List, you can add, rearrange, or remove fields to show data in a PivotTable or PivotChart exactly the way that you want.

By default, changes you make in the PivotTable Field List are automatically updated in the report layout. To improve performance when you are accessing a large amount of external data, you can temporarily switch to manual updating.

Working with the PivotTable Field List

When you create a PivotTable, Excel displays the PivotTable Field List so that you can add fields to the PivotTable, rearrange and reposition them as needed, or remove them from the PivotTable. By default, the PivotTable Field List displays two sections:

A field section at the top for adding fields to and removing fields from the PivotTable

A layout section at the bottom for rearranging and repositioning fields

You can dock the PivotTable Field List to either side of the Excel window and horizontally resize it. You can also undock the PivotTable Field List, in which case, you can resize it both vertically and horizontally.

If you don't see the PivotTable Field List, make sure that you click anywhere in the PivotTable.

If you close the PivotTable Field List, you can display it again. Right-click the PivotTable, and then click Show Field List. You can also click Field List on the Ribbon (PivotTable Tools, Options tab, Show group for a PivotTable; PivotChart Tools, Analyze tab, Show/Hide group for a PivotChart).

If you don't see the fields that you want to use in the PivotTable Field List, refresh (refresh: To update the contents of a PivotTable or PivotChart report to reflect changes to the underlying source data. If the report is based on external data, refreshing runs the underlying query to retrieve new or changed data.) the PivotTable or PivotChart report to display any new fields, calculated fields (calculated field: A field in a PivotTable report or PivotChart report that uses a formula you create. Calculated fields can perform calculations by using the contents of other fields in the PivotTable report or PivotChart report.), measures, calculated measures, or dimensions that you have added since the last operation (PivotTable Tools, Options tab, Data group).

How the PivotTable Field List works

It's important to understand how the PivotTable field List works and the ways that you can arrange different types of fields so that you can achieve the results that you want when you create the field layout of a PivotTable or PivotChart report.
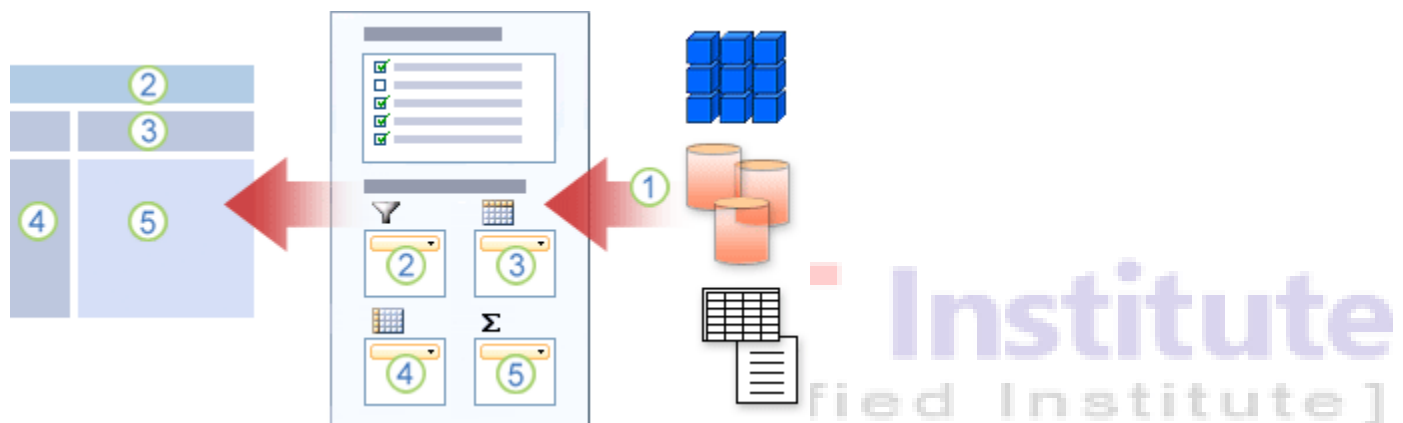
1. An external data source contains structured data organized as one or more fields (also called columns) that are displayed in the Field List.
2. Move a field to the Report Filter area in the Field List, which simultaneously moves the field to the Report Filter area in the PivotTable report.
3. Move a field to the Column Label area in the Field List, which simultaneously moves the field to the Column Label area in the PivotTable report.
4. Move a field to the Row Label area in the Field List, which simultaneously moves the field to the Row Label area in the PivotTable report.
5. Move a field to the Values area in the Field List, which simultaneously moves the field to the Values area in the PivotTable report.

Guidelines for moving fields in the PivotTable Field List

To create a field layout, use the following guidelines for moving Value, Name, and Dimension fields from the field section to the four report areas in the layout section.

Value fields If you select a check box only for a numeric field, by default, it is moved to the Values area.

Row and Column fields You can add a field only once to either the Report Filter, Row Labels, or Column Labels areas, whether the data type is numeric or non-numeric. If you try to add the same field more than once — for example, to the Row Labels and the Column Labels areas in the layout section — the field is automatically removed from the original area and put in the new area.

Measures In an Online Analytical Processing (OLAP) (OLAP: A database technology that has been optimized for querying and reporting, instead of processing transactions. OLAP data is organized hierarchically and stored in cubes instead of tables.) data source, there are often many fields (or measures) organized in a hierarchy of different dimensions, hierarchies, and levels. Click the expand ⊞and collapse ⊟buttons until you find the fields that you want.

You can move only hierarchies, attributes, and named sets to the Row Labels, Column Labels, and Report Filters areas.

You can move only measures, calculated measures, and Key Performance Indicators (KPIs) to the Values area.

Changing the PivotTable Field List view

The PivotTable Field List has five different views that are designed and optimized for different types of PivotTable tasks.

To change the view, click the Field List views button at the top of the PivotTable Field List.
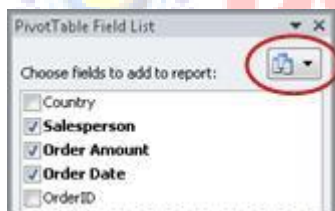
In the list, select one of the following views:

Fields Section and Areas Section Stacked	This is the default view, and it is designed for a small number of fields.
Fields Section and Areas Section Side-By-Side	This view is designed for adding and removing fields when you have more than four fields in each area.
Fields Section Only	This view is designed for just adding and removing many fields.
Areas Section Only (2 by 2)	This view is designed for just rearranging many fields.

Areas Section Only (1 by 4)	This view is designed for just rearranging many fields.

Tip In the Fields Section and Areas Section Stacked and Fields Section and Areas Section Side-By-Side views, you can adjust the width and height of each section by resting the pointer on the section divider until the pointer changes to a vertical double arrow $\updownarrow$ or horizontal double arrow $\leftrightarrow$, by dragging the double arrow up or down or left or right to where you want it, and then either clicking the double arrow or pressing ENTER.

Add fields to a PivotTable or PivotChart

After you create a PivotTable or PivotChart report, you are ready to add the fields that contain the data you want to display in the report. You typically select one field for each area in the layout section. However, to see different values for a specific field, you can also add multiple copies of a field to the Values area.

If the PivotTable report is connected to an external data source that contains a lot of data, you can filter one or more fields before you add fields to the report, which can help reduce the time it takes to update the report.

Add the fields you want to display

In the PivotTable Field List, you can add fields to the PivotTable or PivotChart by doing one or more of the following:

To place a field in a designated area of the layout section, in the Choose fields to add to report box, select the check box of the field that you want. You can then rearrange fields later if you want.

Note By default, nonnumeric fields are added to the Row Labels area, numeric fields are added to the Values area, and Online Analytical Processing (OLAP) (OLAP: A database technology that has been optimized for querying and reporting, instead of processing transactions. OLAP data is organized hierarchically and stored in cubes instead of tables.) date and time hierarchies are added to the Column Labels area.

To place a field in a specific area of the layout section, in the Choose fields to add to report box, right-click the field name, and then click Add to Report Filter, Add to Column Label, Add to Row Label, or Add to Values.

To drag a field to an area in the layout section, in the Choose fields to add to report box, click and hold a field, and then drag it from the field section to the layout section that you want.

Add multiple copies of a field in the Values area

In a PivotTable report that is based on data in an Excel worksheet or external data from a non-Online Analytical Processing (OLAP) (OLAP: A database technology that has been optimized for

querying and reporting, instead of processing transactions. OLAP data is organized hierarchically and stored in cubes instead of tables.) data source, you may want to add the same field more than once to the Values area. You can do this whether the data type is numeric or non-numeric. For example, you may want to compare calculations side-by-side, such as gross and net profit margins, minimum and maximum sales, or customer counts and percentage of total customers.

In the PivotTable Field List, in the Choose fields to add to report box, click and hold a field, and then drag it to the Values area in the layout section.

Repeat step 1 to create as many copies of that field that you want to display in the Value area.

In the PivotTable, change the summary function or custom calculation the way you want in each copy of the field.

Tip In the PivotTable, you can also change the name of the copied fields as needed.

Notes

When you add two or more fields to the Values area, whether they are copies of the same field or different fields, the Field List automatically adds a Values Column label to the Values area. You can use this field to move the field positions up and down in the Values area. You can even move the Values Column Label to the Column Labels area or Row Labels areas. However, you cannot move the Values Column label to the Report Filters area.

You can add a field only once to either the Report Filter, Row Labels, or Column Labels areas, whether the data type is numeric or non-numeric. If you try to add the same field more than once — for example, to the Row Labels and the Column Labels areas in the layout section — the field is automatically removed from the original area and put in the new area.

Another way to add the same field to the Values area is by using a formula (also called a calculated column) that uses that same field in the formula.

Filter data before you add fields

In the PivotTable Field List, in the Choose fields to add to report box, rest the pointer on a field name, and then click the filter drop-down arrow next to the field name.

On the Filter menu, select the filter options that you want.

Rearrange fields in the PivotTable or PivotChart

In the PivotTable Field List, you can rearrange existing fields or reposition those fields by using one of the four areas at the bottom of the layout section:

PivotTable report	Description		PivotChart	Description

Values	Use to display summary numeric data.	Values	Use to display summary numeric data.
Row Labels	Use to display fields as rows on the side of the report. A row lower in position is nested within another row immediately above it.	Axis Field (Categories)	Use to display fields as an axis in the chart.
Column Labels	Use to display fields as columns at the top of the report. A column lower in position is nested within another column immediately above it.	Legend Fields (Series)	Use to display fields in the legend of the chart.
Report Filter	Use to filter the entire report based on the selected item in the report filter.	Report Filter	Use to filter the entire report based on the selected item in the report filter.

To rearrange fields in a PivotTable report, click the field name in one of the areas, and then select one of the following commands:

Move Up	Moves the field up one position in the area.
Move Down	Moves the field down position in the area.
Move to Beginning	Moves the field to the beginning of the area.
Move to End	Moves the field to the end of the area.
Move to Report Filter	Moves the field to the Report Filter area.
Move to Row Labels	Moves the field to the Row Labels area.
Move to Column Labels	Moves the field to the Column Labels area.
Move to Values	Moves the field to the Values area.

Value Field Settings, Field Settings	Displays the Field Settings or Value Field Settings dialog boxes. For more information about each setting, click the Help button ❓ at the top of the dialog box.

Tip You can also click and hold a field name, and then drag the field between the field and layout sections, and between the different areas.

Remove fields from the PivotTable or PivotChart

To remove a field, in the PivotTable Field List, do one of the following:

In the Choose fields to add to report box, clear the check box of the field you want to remove.

Note Clearing a check box removes all instances of the field from the report.

In a layout area, click the field that you want to remove, and then click Remove Field.

In a layout area, click and hold the field that you want to remove, and then drag it outside the PivotTable Field List.

Switch between automatic and manual updating of the report layout

By default, changes you make in the PivotTable Field List are automatically updated in the report layout. To improve performance when you are accessing a large amount of external data, you can temporarily switch to manual updating mode. Manual updating mode allows you to quickly add, move, and remove fields in the PivotTable Field List. However, you cannot use the report until you switch back to automatic updating mode.

To enable manual updating of the PivotTable report, at the bottom of the PivotTable Field List, select the Defer layout update check box.

Caution After you set the report layout to manual updating, closing the PivotTable Field List, changing to Fields only view, or exiting Excel discards all layout changes that you have made to the PivotTable report without confirmation.

In the PivotTable Field List, make the field layout changes, and then click Update to manually update the layout in the PivotTable report.

To return to automatic updating after you finish changing the report layout in the Field List, clear the Defer layout update check box.

Lesson no. 14: MIS Report in Excel

What is MIS Report & How It Works?

MIS report provides a summarised and bulletin view of different verticals that are required to be monitored for the proper functioning of your business. The primary use of MIS reports is to take set parameters and compare it to the performance of business operations.

They provide a concise view of a company performance in terms of revenue, orders, customer queries, HR indices, employee performance and attrition.

By analysing the variance between the estimated target with the achieved results, businesses can adopt new practices that would result in higher performance. The primary contribution of MIS reports is to condense disparate figures to provide insights on the business model.

What are the Types of MIS Reports?

Sales MIS Reports: Sales MIS report is created and managed by the sales and marketing departments for transactional analysis of various products and services. The analysis is based on variance, which is the difference between the estimated sales compared to actual sales.

Budget Reports: In any business, creating budget report is necessary to manage allotted finances and to minimise expenses. Some common budget reports that can be generated include production budget, expense budget, income budget, cash budget, etc.

Production Reports: The manufacturing department is responsible for the creation of production reports which include the comparison of set production targets and the final production count. Variation between the targeted and achieved production helps in quantifying the overall process efficiency.

Cashflow Statement Report: With this MIS report, business operations department can analyse the inflow and outflow of cash, to check the overall transactions at a certain period.It also helps in tracing fund sources that have been utilised for the outflows.

Funds Statement Report: Funds Statement Report is processed by the accounting and finance team to keep a track of the fund sources. It is also created to check where the funds have been utilised.

Profit Report: Profit reports are created by the accounts department to check the difference between actual and estimated profit (or loss) at a certain time span. It also accounts the factors which led to the profit or loss.

Income Statement Report: Reports for income, taxes, ledgers and balance sheet are crucial for assessing the financial data of shareholders and investors. With the help of income statement report, accountants can analyse the concurrent financial state of a business.

Abnormal Losses Reports: Coming under the umbrella of manufacturing department, the report on abnormal losses can help business reduce expenditure. Some of the abnormal losses include manufacturing defects, spillage or breakdown of machinery, defects in raw material or natural calamities.

Costing Reports Cost reports are one of the most important aspects of MIS. Whether it is a small business or an enterprise, overall costs incurred by different departments is analysed to see if it can be reduced.

HR MIS Reports: HR MIS Reports help in analysing the performance of employees at a certain duration of time. It calculates the total amount of tasks, assignments or projects completed by different employees in that duration.

Inventory Reports: MIS provides inventory reports to which raw material is in surplus and which ones need to be replenished. It also helps keep daily, weekly, monthly and quarterly production and stock statements.

How to Prepare MIS Report?

There are two main methods of preparing MIS reports for different tasks; in Tally and in Excel. Both these processes require advanced MIS reporting skills. Let's have a look at the two methods.

MIS Report in Tally

There are preset templates of various types of MIS report in Tally. Most of these reports can be divided in five major categories.

Accounting: All the different kinds of reports mentioned above that are used by the accounts department fall in this category. Reports such as Profits, and Fund Statements can be

processed with the help of Tally ERP 9's accounting templates. These reports provide the details of the financial aspects of the business activities.

Finance: Managed by the finance department, these reports help in managing the investments and assets of shareholders and creditors. This category includes reports such as financial statement and fund statement.

Inventory: With the help of inventory MIS report in Tally, tasks related to manufacturing, stock management, and order reports can be managed. It helps in comparing goods and machinery that are procured, sold, and bought, for the manufacturing.

Management Control: This category of MIS report in Tally helps in creating reports for various tasks related to management control such as statistics, costing, budget and sales, to name a few. This category of MIS reports helps in the efficient management of logistics in the business.

Using the preset MIS templates provided in Tally, you can create specific reports for various departments such as sales, MIS reports, HR MIS reports etc. Just fill-in the particulars that you require in the report.

Next, with the help of formulas in Tally, you simply need to connect the back-end database (Excel spreadsheet or any other DBMS) where your data is stored. The formulas fetch the unsorted data from spreadsheet to Tally and you can compile your report according to the requirements.

MIS Report in Excel
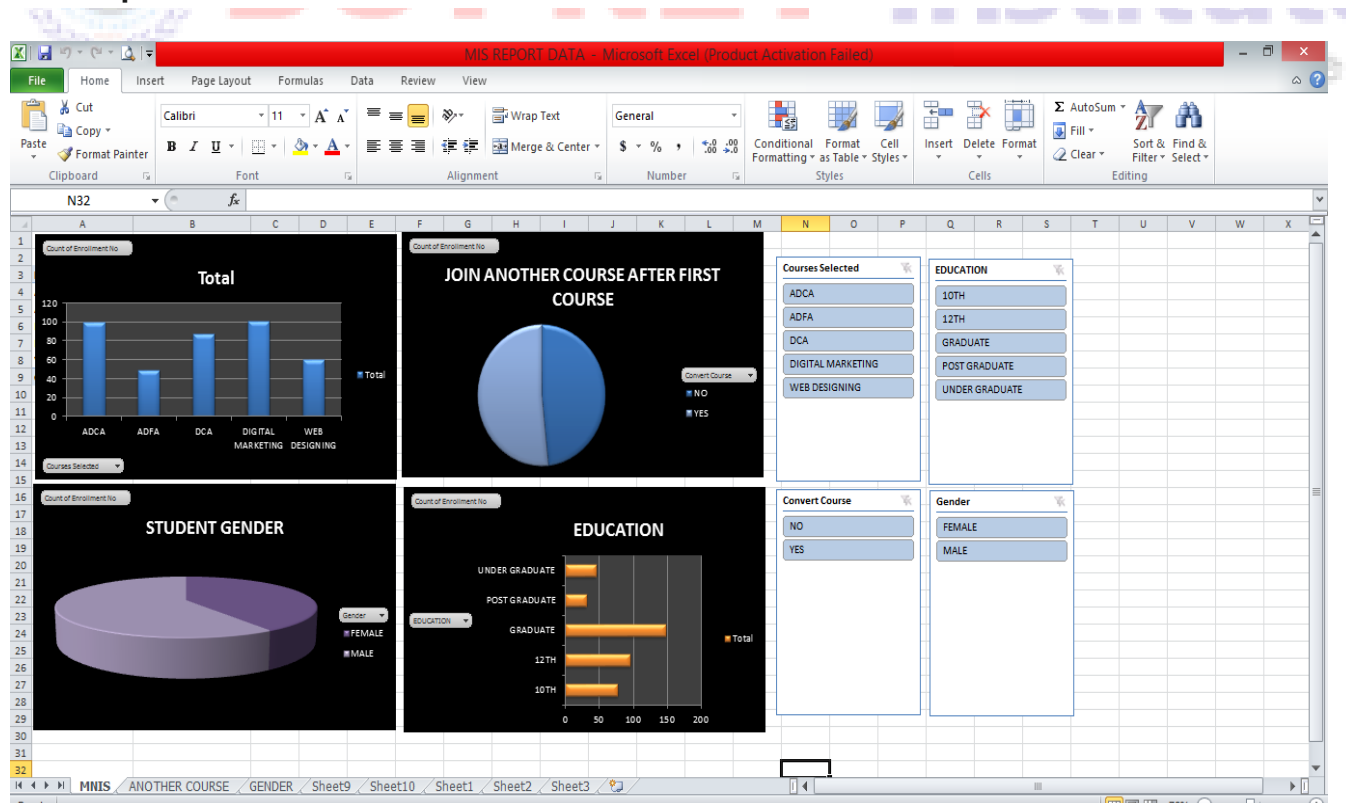
The second method is to create MIS reports in Excel format. It is necessary however, to have a good command on Excel and MIS reporting skills in order to create MIS Excel reports based on specific requirements.

Here are the specific stages required to create MIS reports in Microsoft Excel.

Before beginning the process, it is important to collect all the necessary raw data, required to create the report from different departments. Every report is specific to a department, such as sales, marketing, operations, accounts, manufacturing etc.

The next step is to mine or clean up the raw data, to filter the information that is required for the particular report.

Keep a separate sheet for data repository from where you can pick up information and include in the main report. This works as a back-end database and helps minimise the scope of errors and make the whole process systematic.

Next, with the help of Excel formulas, you can connect the back-end database to the MIS template on the spreadsheet. Excel will pull the data from the database to convert it into a well-structured report.
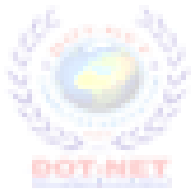
Lesson no. 15: How to Create Macros in Excel

Create a Macro

With Excel VBA you can automate tasks in Excel by writing so called macros. In this chapter, learn how to create a simple macro which will be executed after clicking on a command button. First, turn on the Developer tab.

Developer Tab

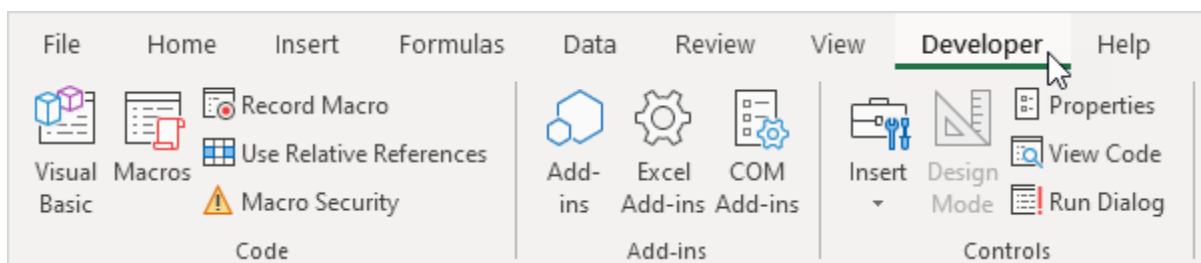To turn on the Developter tab, execute the following steps.

1. Right click anywhere on the ribbon, and then click Customize the Ribbon.
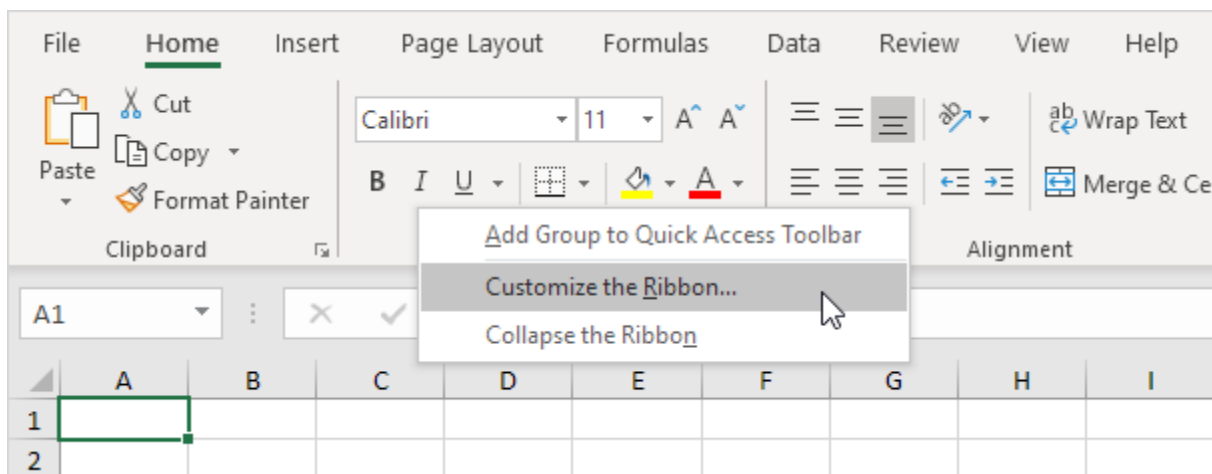
2. Under Customize the Ribbon, on the right side of the dialog box, select Main tabs (if necessary).

3. Check the Developer check box.
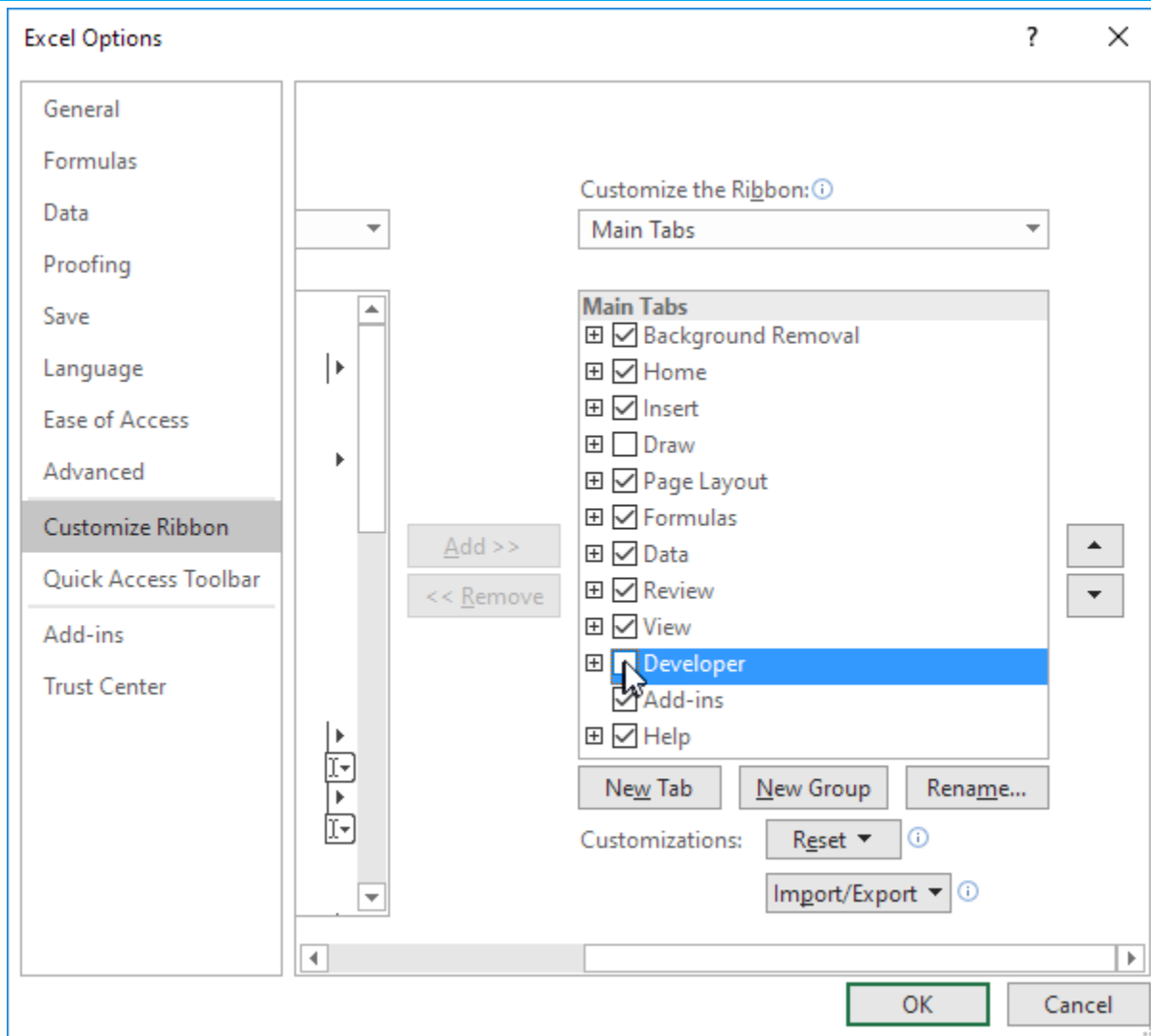
4. Click OK.

5. You can find the Developer tab next to the View tab.

Command Button

To place a command button on your worksheet, execute the following steps.

1. On the Developer tab, click Insert.
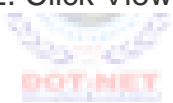2. In the ActiveX Controls group, click Command Button.
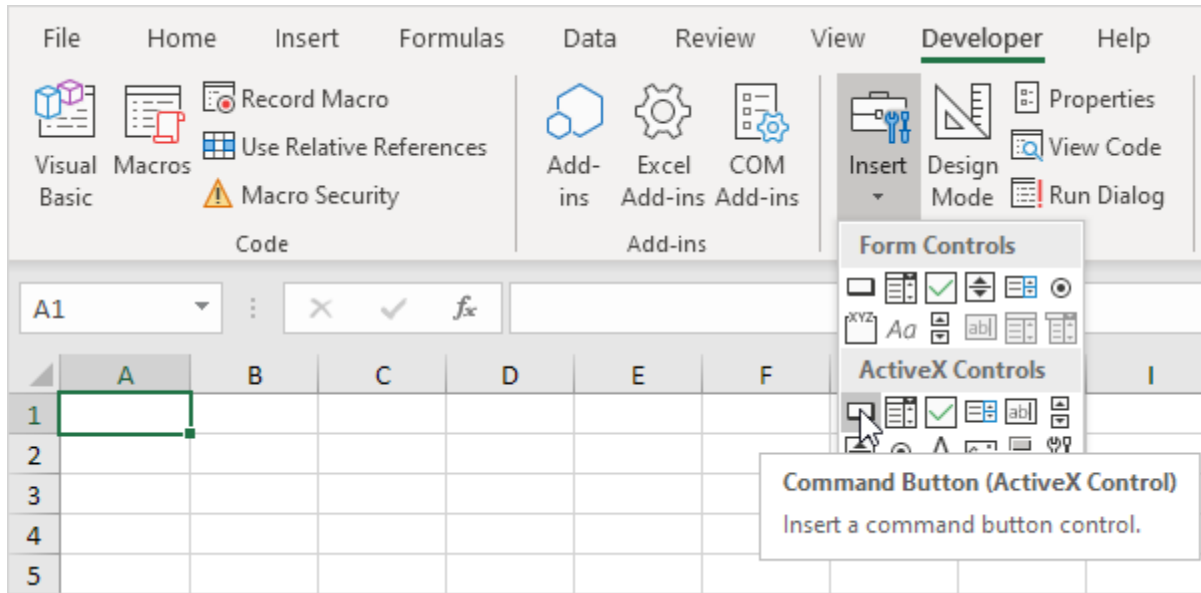
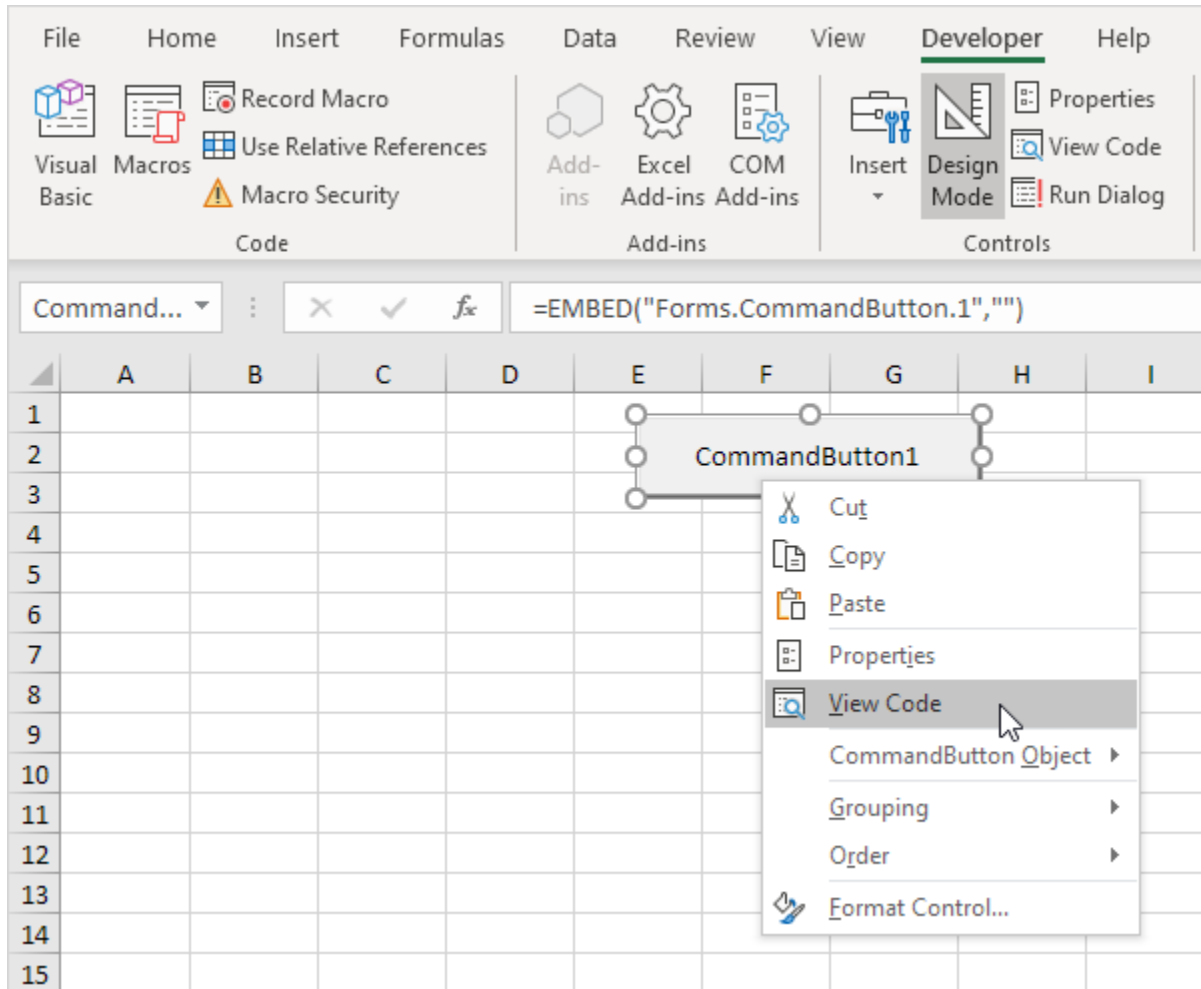3. Drag a command button on your worksheet.

Assign a Macro

To assign a macro (one or more code lines) to the command button, execute the following steps.

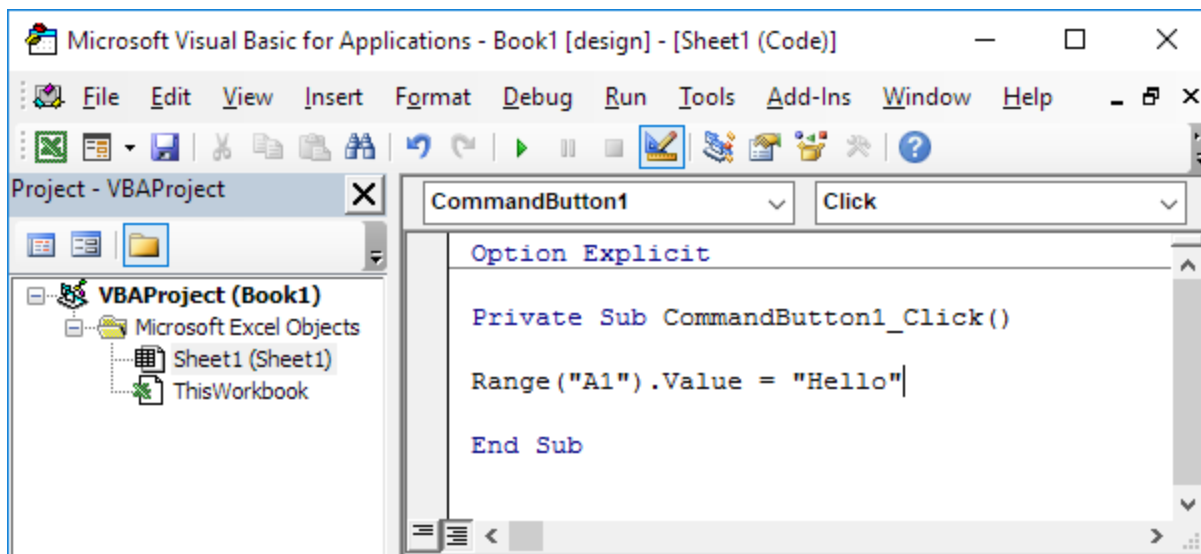1. Right click CommandButton1 (make sure Design Mode is selected).

2. Click View Code.

The Visual Basic Editor appears.

3. Place your cursor between Private Sub CommandButton1_Click() and End Sub.

4. Add the code line shown below.

Note: the window on the left with the names Sheet1 (Sheet1) and ThisWorkbook is called the Project Explorer. If the Project Explorer is not visible, click View, Project Explorer. If the Code window for Sheet1 is not visible, click Sheet1 (Sheet1). You can ignore the Option Explicit statement for now.

5. Close the Visual Basic Editor.

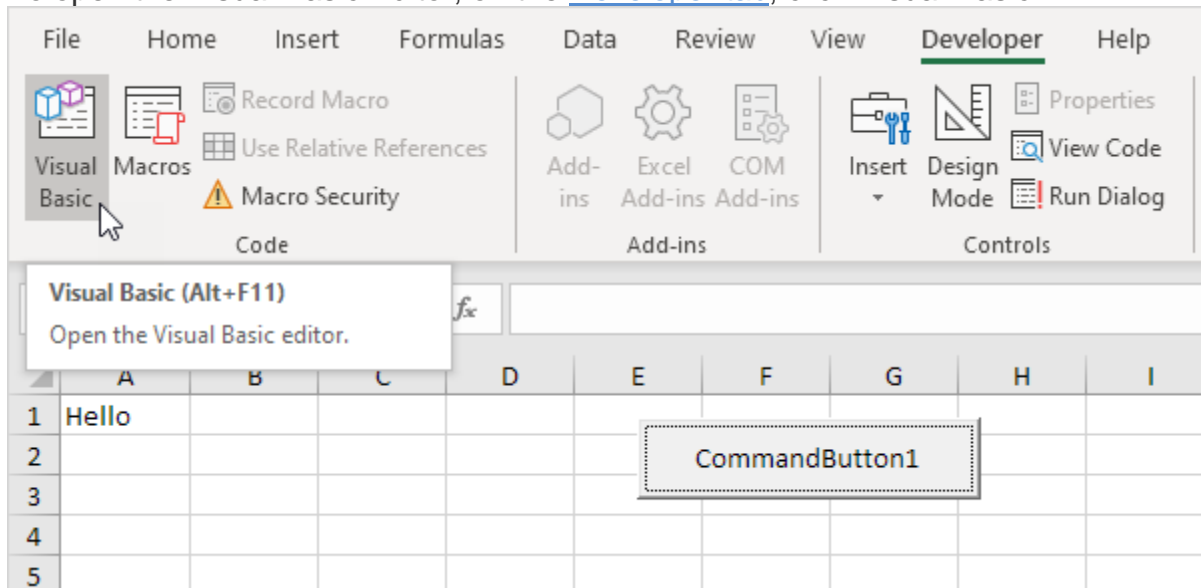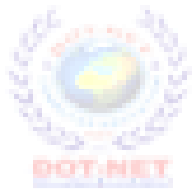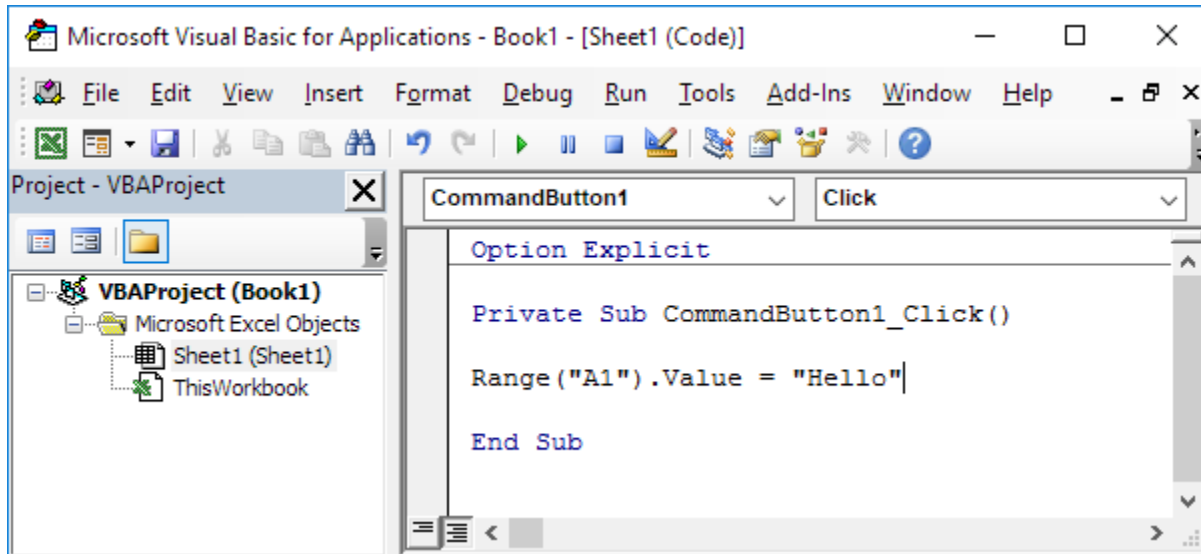6. Click the command button on the sheet (make sure Design Mode is deselected).

Result:

Congratulations. You've just created a macro in Excel!

Visual Basic Editor

To open the Visual Basic Editor, on the Developer tab, click Visual Basic.

The Visual Basic Editor appears.

Microsoft Visual Basic for Applications - Book1 - [Sheet1 (Code)]

File   Edit   View   Insert   Format   Debug   Run   Tools   Add-Ins   Window   Help

Project - VBAProject

VBAProject (Book1)
  Microsoft Excel Objects
    Sheet1 (Sheet1)
    ThisWorkbook

CommandButton1   Click

```vba
Option Explicit

Private Sub CommandButton1_Click()

Range("A1").Value = "Hello"

End Sub
```

Lesson no. 16: What If Analysis-Data Table

Data Tables

Instead of creating different scenarios, you can create a data table to quickly try out different values for formulas. You can create a one variable data table or a two variable data table.

Assume you own a book store and have 100 books in storage. You sell a certain % for the highest price of $50 and a certain % for the lower price of $20. If you sell 60% for the highest price, cell D10 below calculates a total profit of 60 * $50 + 40 * $20 = $3800.
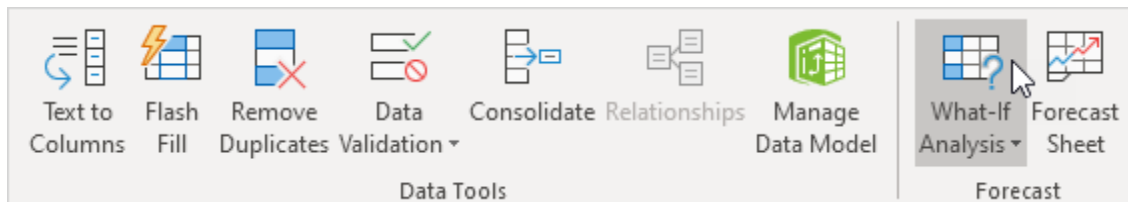
One Variable Data Table

To create a one variable data table, execute the following steps.

1. Select cell B12 and type =D10 (refer to the total profit cell).

2. Type the different percentages in column A.
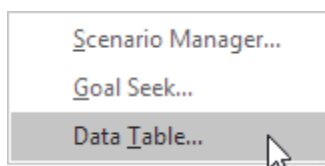
3. Select the range A12:B17.

We are going to calculate the total profit if you sell 60% for the highest price, 70% for the highest price, etc.

6R x 2C	▼	⋮	✕	✓	fx	

◢	A	B	C	D	E
1	**Book Store**				
2					
3		total number of books	% sold for the highest price		
4		100	60%		
5					
6			number of books	unit profit	
7		highest price	60	$50	
8		lower price	40	$20	
9					
10			total profit	$3,800	
11					
12		$3,800			
13	60%				
14	70%				
15	80%				
16	90%				
17	100%	✛			
18					

4. On the Data tab, in the Forecast group, click What-If Analysis.

Text to Columns	Flash Fill	Remove Duplicates	Data Validation ▾	Consolidate	Relationships	Manage Data Model	What-If Analysis ▾	Forecast Sheet
		Data Tools					Forecast	

5. Click Data Table.

S̲cenario Manager...
G̲oal Seek...
Data T̲able...

6. Click in the 'Column input cell' box (the percentages are in a column) and select cell C4.

We select cell C4 because the percentages refer to cell C4 (% sold for the highest price). Together with the formula in cell B12, Excel now knows that it should replace cell C4 with 60% to calculate the total profit, replace cell C4 with 70% to calculate the total profit, etc.

Data Table   ?   ×

Row input cell: [   ] 📑

Column input cell: [$C$4|] 📑

[OK]   [Cancel]

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

7. Click OK.

Result.

	B13	▼	⋮	×	✓	fx	{=TABLE(,C4)}		

	A	B	C	D	E
1	**Book Store**				
2					
3		total number of books	% sold for the highest price		
4		100	60%		
5					
6			number of books	unit profit	
7		highest price	60	$50	
8		lower price	40	$20	
9					
10			total profit	$3,800	
11					
12		$3,800			
13	60%	$3,800			
14	70%	$4,100			
15	80%	$4,400			
16	90%	$4,700			
17	100%	$5,000			
18					

Conclusion: if you sell 60% for the highest price, you obtain a total profit of $3800, if you sell 70% for the highest price, you obtain a total profit of $4100, etc.

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

Two Variable Data Table

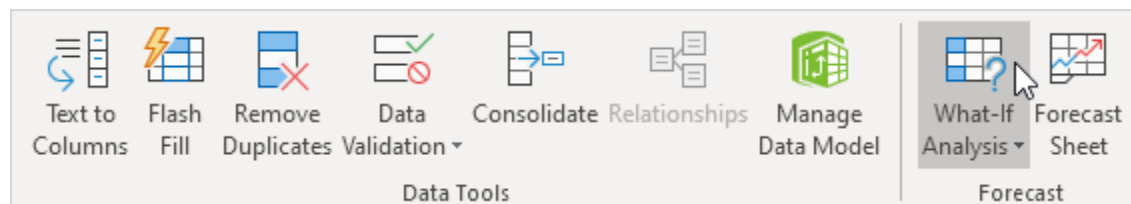To create a two variable data table, execute the following steps.

1. Select cell A12 and type =D10 (refer to the total profit cell).

2. Type the different unit profits (highest price) in row 12.

3. Type the different percentages in column A.
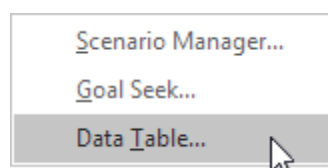
4. Select the range A12:D17.

We are going to calculate the total profit for the different combinations of 'unit profit (highest price)' and '% sold for the highest price'.

6R x 4C			f_x	=D10	

	A	B	C	D	E
1	**Book Store**				
2					
3		total number of books	% sold for the highest price		
4		100	60%		
5					
6			number of books	unit profit	
7		highest price	60	$50	
8		lower price	40	$20	
9					
10			total profit	$3,800	
11					
12	$3,800	$50	$60	$70	
13	60%				
14	70%				
15	80%				
16	90%				
17	100%				
18					

5. On the Data tab, in the Forecast group, click What-If Analysis.

Text to Columns	Flash Fill	Remove Duplicates	Data Validation ▾	Consolidate	Relationships	Manage Data Model	What-If Analysis ▾	Forecast Sheet
		Data Tools					Forecast	

6. Click Data Table.

Scenario Manager...
Goal Seek...
Data Table...

7. Click in the 'Row input cell' box (the unit profits are in a row) and select cell D7.

8. Click in the 'Column input cell' box (the percentages are in a column) and select cell C4.

We select cell D7 because the unit profits refer to cell D7. We select cell C4 because the percentages refer to cell C4. Together with the formula in cell A12, Excel now knows that it should replace cell D7 with $50 and cell C4 with 60% to calculate the total profit, replace cell D7 with $50 and cell C4 with 70% to calculate the total profit, etc.
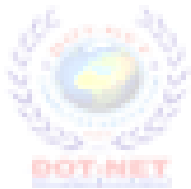
Data Table	? ✕
Row input cell:	$D$7
Column input cell:	$C$4
OK	Cancel

9. Click OK.

Result.

B13	▼ : ✕ ✓ fx	{=TABLE(D7,C4)}		
	A	B	C	D	E

	A	B	C	D	E
1	**Book Store**				
2					
3		total number of books	% sold for the highest price		
4		100	60%		
5					
6			number of books	unit profit	
7		highest price	60	$50	
8		lower price	40	$20	
9					
10			total profit	$3,800	
11					
12	$3,800	$50	$60	$70	
13	60%	$3,800	$4,400	$5,000	
14	70%	$4,100	$4,800	$5,500	
15	80%	$4,400	$5,200	$6,000	
16	90%	$4,700	$5,600	$6,500	
17	100%	$5,000	$6,000	$7,000	
18					

Conclusion: if you sell 60% for the highest price, at a unit profit of $50, you obtain a total profit of $3800, if you sell 80% for the highest price, at a unit profit of $60, you obtain a total profit of $5200, etc.

Note: the formula bar indicates that the cells contain an array formula. Therefore, you cannot delete a single result. To delete the results, select the range B13:D17 and press Delete.
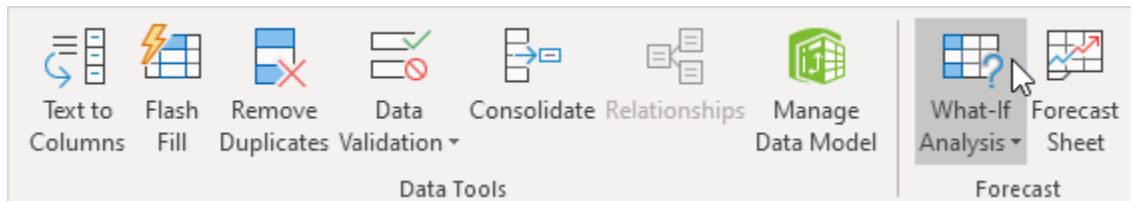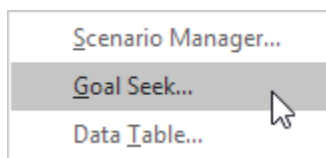
Lesson no. 16: What If Analysis-Goal Seek

Goal Seek

What if you want to know how many books you need to sell for the highest price, to obtain a total profit of exactly $4700? You can use Excel's Goal Seek feature to find the answer.

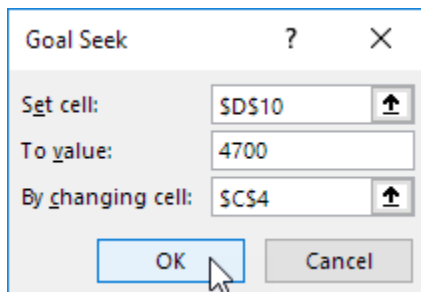1. On the Data tab, in the Forecast group, click What-If Analysis.

2. Click Goal Seek.

The Goal Seek dialog box appears.

3. Select cell D10.

4. Click in the 'To value' box and type 4700.

5. Click in the 'By changing cell' box and select cell C4.

6. Click OK.

Result. You need to sell 90% of the books for the highest price to obtain a total profit of exactly $4700.

C8		f_x	=B4*(1-C4)		
	A	B	C	D	E
1	**Book Store**				
2					
3		total number of books	% sold for the highest price		
4		100	90%		
5					
6			number of books	unit profit	
7		highest price	90	$50	
8		lower price	10	$20	
9					
10			total profit	$4,700	
11					

Note: visit our page about Goal Seek for more examples and tips.

Lesson no. 16: What If Analysis-Scenario Manager

What-If Analysis

What-If Analysis in Excel allows you to try out different values (scenarios) for formulas. The following example helps you master what-if analysis quickly and easily.

Assume you own a book store and have 100 books in storage. You sell a certain % for the highest price of $50 and a certain % for the lower price of $20.

	A	B	C	D	E
			C8	fx =B4*(1-C4)	
1	**Book Store**				
2					
3		total number of books	% sold for the highest price		
4		100	60%		
5					
6			number of books	unit profit	
7		highest price	60	$50	
8		lower price	40	$20	
9					
10			total profit	$3,800	
11					

If you sell 60% for the highest price, cell D10 calculates a total profit of 60 * $50 + 40 * $20 = $3800.
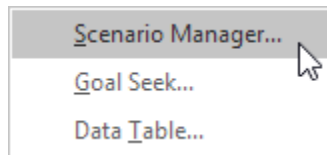
Create Different Scenarios

But what if you sell 70% for the highest price? And what if you sell 80% for the highest price? Or 90%, or even 100%? Each different percentage is a different scenario. You can use the Scenario Manager to create these scenarios.

Note: You can simply type in a different percentage into cell C4 to see the corresponding result of a scenario in cell D10. However, what-if analysis enables you to easily compare the results of different scenarios. Read on.

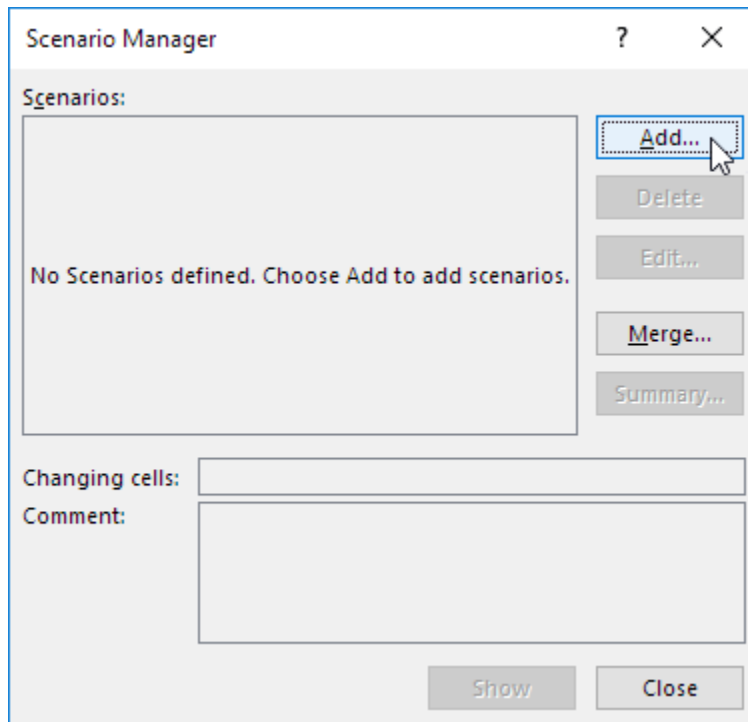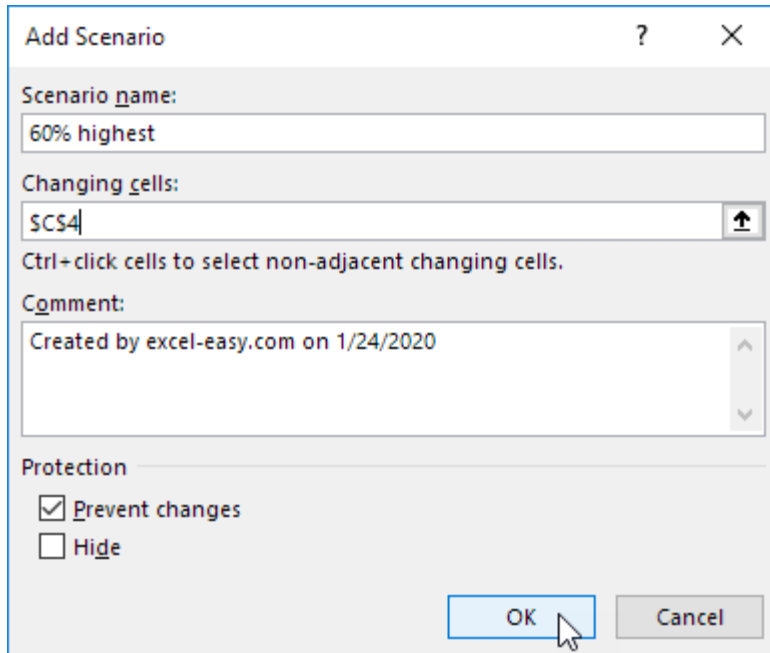1. On the Data tab, in the Forecast group, click What-If Analysis.

Text to Columns	Flash Fill	Remove Duplicates	Data Validation ▾	Consolidate	Relationships	Manage Data Model	What-If Analysis ▾	Forecast Sheet
		Data Tools					Forecast	
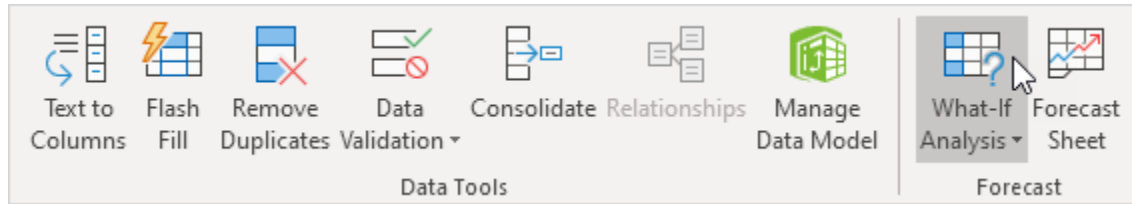
2. Click Scenario Manager.

Scenario Manager...
Goal Seek...
Data Table...

The Scenario Manager dialog box appears.

3. Add a scenario by clicking on Add.

Scenario Manager   ?   ✕

Scenarios:

No Scenarios defined. Choose Add to add scenarios.

Add...
Delete
Edit...
Merge...
Summary...

Changing cells:
Comment:

Show   Close

4. Type a name (60% highest), select cell C4 (% sold for the highest price) for the Changing cells and click on OK.

5. Enter the corresponding value 0.6 and click on OK again.

6. Next, add 4 other scenarios (70%, 80%, 90% and 100%).

Finally, your Scenario Manager should be consistent with the picture below:
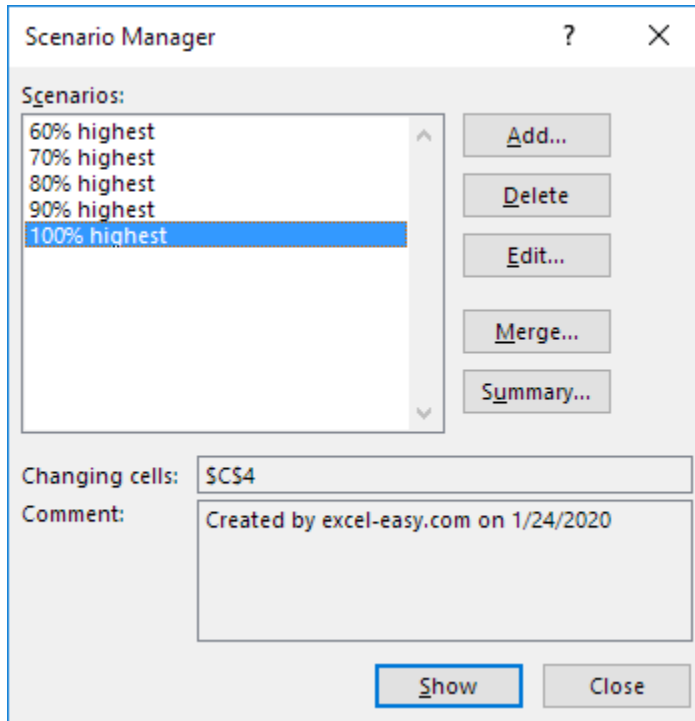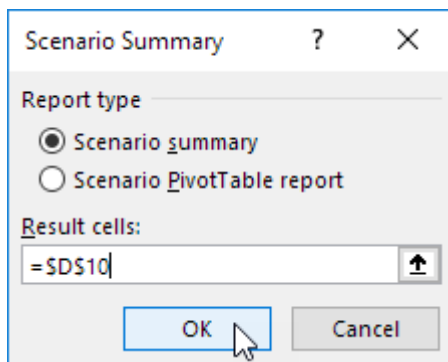
Note: to see the result of a scenario, select the scenario and click on the Show button. Excel will change the value of cell C4 accordingly for you to see the corresponding result on the sheet.

Scenario Summary

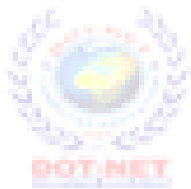To easily compare the results of these scenarios, execute the following steps.

1. Click the Summary button in the Scenario Manager.

2. Next, select cell D10 (total profit) for the result cell and click on OK.

Result:

Scenario Summary						
	Current Values:	60% highest	70% highest	80% highest	90% highest	100% highest
Changing Cells:						
$C$4	60%	60%	70%	80%	90%	100%
Result Cells:						
$D$10	$3,800	$3,800	$4,100	$4,400	$4,700	$5,000

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.

Conclusion: if you sell 70% for the highest price, you obtain a total profit of $4100, if you sell 80% for the highest price, you obtain a total profit of $4400, etc. That's how easy what-if analysis in Excel can be.