

## Chapter-5 Functions in Excel

### Text Functions

#### 1. LEN Function

**LEN function returns the count of characters in the value.** In simple words, with the LEN function, you can count how many characters are there in value. You can refer to a cell or insert the value in the function directly.

Syntax

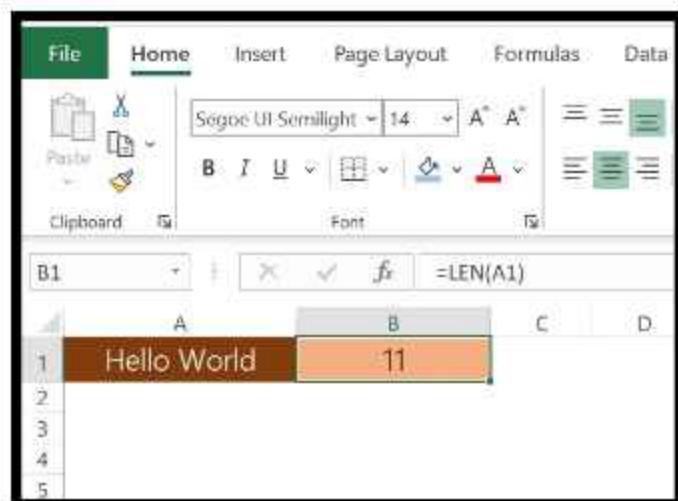
*LEN(text)*

Arguments

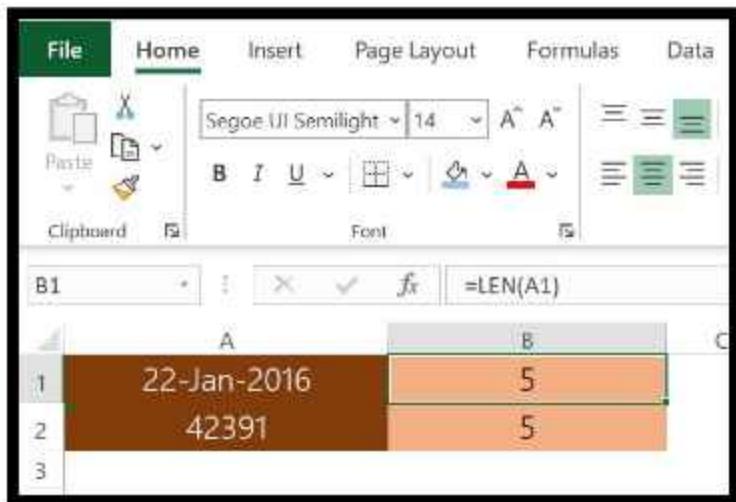
- **text:** A string for which you want to count the characters.

Example

In the below example, we have used the LEN to count letters in a cell. "Hello, World" has 10 characters with a space between and we have got 11 in the result.



In the below example, "22-Jan-2016" has 11 characters, but LEN returns 5.



The reason behind it is that the LEN function counts the characters in the value of a cell and is not concerned with formatting.

## 2. FIND Function

FIND function returns a number which is the starting position of a substring in a string. In simple words, by using the find function you can find (case sensitive) a string's starting position from another string.

### Syntax

`FIND(find_text,within_text,[start_num])`

### Arguments

- **find\_text:** The text which you want to find from another text.
- **within\_text:** The text from which you want to locate the text.
- **[start\_num]:** The number represents the starting position of the search.

### Example

In the below example, we have used the FIND to locate the ":" and then with the help of MID and LEN, we have extracted the name from the cell.

## 3. LEFT Function

**LEFT Functions return sequential characters from a string starting from the left side (starting).** In simple words, with the LEFT function, you can extract characters from a string from its left side.

### Syntax

`LEFT(text,num_chars)`

### Arguments

- **text:** A text or number from which you want to extract characters.
- **[num\_char]:** The number of characters you want to extract.

### Example

In the below example, we have extracted the first five digits from a text string using LEFT by specifying the number of characters to extract.

Text	Result	No of Characters Required	Formula Syntax
ExcelChamps	Excel	5	=LEFT(B9,D9)

In the below example, we have used LEN and FIND along with the LEFT to create a formula that [extracts the name from the cell](#).

Text	Result	Formula Syntax
Peter D'souza	Peter	=LEFT(B15,LEN(B15)-FIND(" ",B15)-1)
Roop Sharma	Roop	=LEFT(B16,LEN(B16)-FIND(" ",B16)-1)
Sam Paul	Sam	=LEFT(B17,LEN(B17)-FIND(" ",B17)-1)

### 4. RIGHT Function

The RIGHT function returns sequential characters from a string starting from the right side (ending). In simple words, with the RIGHT function, you can extract characters from a string from its left side.

#### Syntax

*RIGHT(text,num\_chars)*

#### Arguments

- text:** A text or number from which you want to extract characters.
- [num\_char]:** A number of characters you want to extract.

### Example

In the below example, we have extracted 6 characters using the right function. If you know, how many characters you need to extract from the string, you can simply extract them by using a number.

The screenshot shows an Excel spreadsheet with the following data:

Text	Result	No of Characters Required	Formula Syntax
ExcelChamps	Champs	6	=RIGHT("ExcelChamps",6)

Now, if you look at the below example, where we have to extract the last name from the cell, but we are not confirmed about the number of characters in the last name.

The screenshot shows an Excel spreadsheet with the following data:

Text	Result	Formula Syntax
Peter D'souza	D'souza	=RIGHT(A2,LEN(A2)-FIND(" ",A2))
Roop Sharma	Sharma	=RIGHT(A3,LEN(A3)-FIND(" ",A3))
Sam Paul	Paul	=RIGHT(A4,LEN(A4)-FIND(" ",A4))

So, we are using LEN and FIND to get the name. Let me show you how we have done this.

First of all, we have used the LEN to get the length of that entire text string, then we used the FIND to get the position number of space between first and last names. And in the end, we have used both the figures to get the last name.

### Arguments

- value1:** A cell reference, an array, or a number that is directly entered into the function.

- **[value2]:** A cell reference, an array, or a number that is directly entered into the function.

## 5. MID Function

MID returns a substring from a string using a specific position and number of characters. In simple words, with MID, you can extract a substring from a string by specifying the starting character and number of characters you want to extract.

### Syntax

*MID(text,start\_num,num\_chars)*

#### Arguments

- **text:** A text or a number from which you want to extract characters.
- **start\_char:** A number for the position of the character from where you want to extract characters.
- **num\_chars:** The number of characters you want to extract from the start\_char.

#### Example

In the below example, we have used different values:

- From the 6th character to the next 6 characters.
- From the 6th character to the next 10 characters.
- We have used starting a character in negative and it has returned an error.
- By using 0 for the number of characters to extract and it has returned a blank.
- With a negative number for the number of characters to extract and it has returned an error.
- The starting number is zero and it has returned an error.
- Text string directly into the function.

Text String	Result	Formula Syntax	Remarks
ExcelChamps.com	Champs	=MID(A2,5,6)	A valid syntax
ExcelChamps.com	Champs.com	=MID(A3,5,10)	A valid syntax
ExcelChamps.com	#VALUE!	=MID(A1,-1,6)	start_num is negative
ExcelChamps.com		=MID(A5,5,0)	num_chars is zero
ExcelChamps.com	#VALUE!	=MID(A6,5,-1)	num_chars is negative
ExcelChamps.com	#VALUE!	=MID(A7,0,6)	start_num is zero
ExcelChamps.com	Champs	=MID("ExcelChamps",4,6)	Text defined with in the function

## 6. LOWER Function

LOWER returns the string after converting all the letters in small. In simple words, it converts a text string where all the letters you have are in small letters, numbers will stay intact.

### Syntax

*LOWER(text)*

#### Arguments

- **text:** The text which you want to convert to the lowercase.

#### Example

In the below example, we have compared the lower case, upper case, proper case, and sentence case with each other.

1	The quick brown fox jumps over the lazy dog	Sentence Case	
2	THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG	Upper Case	
3	The Quick Brown Fox Jumps Over The Lazy Dog	Proper Case	
4	the quick brown fox jumps over the lazy dog	Lower Case	
5			
6			
7			

A lower case text has all the letters in a small case compared to others.

## 7. PROPER Function

The PROPER function returns the text string into a proper case. In simple words, with a PROPER function where the first letter of the word is in capital and rest in small (proper case).

### Syntax

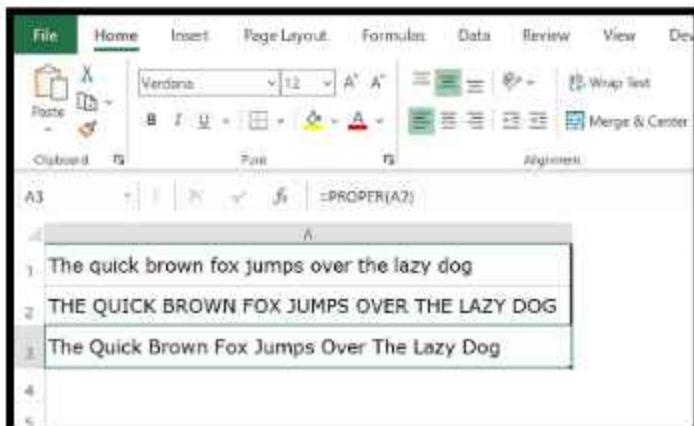
*PROPER(text)*

#### Arguments

- **text:** The text which you want to convert to the proper case.

#### Example

In the below example, we have a proper case that has the first letter in the capital case in a word and the rest of the letters are in the lower case compared to the other two cases lowercase and uppercase.



In the below example, we have used the PROPER function to streamline first name and last name into the proper case.

A	B
Text	Proper Text
STEPHANIE KAYE	Stephanie Kaye
amy janota	Amy Janota
Kimber WIGGS	Kimber Wiggs
NAT devo	Nat Devo
jim Pruitt	Jim Pruitt

## 8. UPPER Function

The UPPER function returns the string after converting all the letters in the capital. In simple words, it converts a text string where all the letters you have are in capital form and numbers will stay intact.

### Syntax

*UPPER(text)*

### Arguments

- **text:** The text which you want to convert into uppercase.

### Example

In the below example, we have used the UPPER to convert name text to capital letters from the text in which characters are in different cases.

The screenshot shows a Microsoft Excel spreadsheet. The formula bar at the top contains the formula `=UPPER([@Text])`. The main area displays a table with two columns: 'Text' and 'UPPER TEXT'. The 'Text' column contains names like 'STEPHANIE kate', 'amy janota', 'Kimber WIGGS', 'NAT devo', and 'Jim Pruitt'. The 'UPPER TEXT' column shows the same names converted to uppercase. The font is set to Verdana, size 12, and the alignment is centered.

	A	B
1	Text	UPPER TEXT
2	STEPHANIE kate	STEPHANIE KATE
3	amy janota	AMY JANOTA
4	Kimber WIGGS	KIMBER WIGGS
5	NAT devo	NAT DEVO
6	Jim Pruitt	JIM PRUITT

## 9. REPT Function

REPT function returns a text value several times. In simple words, with the REPT function, you can specify a text, and a number to repeat that text.

### Syntax

`REPT(value1, [value2], ...)`

### Example

In the below example, we have used different type of text for repetition using REPT. It can repeat any type of text or numbers and even symbols that you specify in function and the main use of the REPT function is for creating in-cell charts.

The screenshot shows a Microsoft Excel spreadsheet. The formula bar at the top contains the formula `=REPT(A4,84)`. The main area displays a table with three columns: 'Text To Repeat', 'Number of Repeats', and 'Result'. The 'Text To Repeat' column contains symbols like a double quote, a dot, an asterisk, an exclamation mark, and a double ampersand. The 'Number of Repeats' column is all 10. The 'Result' column shows the symbols repeated 10 times each. The font is set to Calibri, size 14, and the alignment is centered.

	A	B	C
1	Text To Repeat	Number of Repeats	Result
2	"	10	"
3	.	10	.....
4	*	10	*****
5	!	10	!!!!!!
6	&	10	&&&&&&&&

## 10. CONCATENATE Function

### Syntax of the CONCATENATE Function

The syntax of CONCATENATE function in Excel is defined as below:

=CONCATENATE (Text1, Text2, [Text3], ...)

### Arguments of the CONCATENATE Function

The CONCATENATE function requires the following arguments:

- **Text1 (required argument):** It is the first item/ value to join. This can be in the form of a text value, number, or number.
- **Text2 (required argument):** It is an additional text item/ value we want to join.
- **[Text3] (optional argument):** It is the third item/ value to join together. The CONCATENATE function can help us join a maximum of up to 255 items, up to 8192 characters.

**Note:** The CONCATENATE function is replaced with the CONCAT function in Excel 2016, Excel for web, and Excel Mobile. However, the function is still available for backward compatibility. But, it is better to practice using CONCAT because the CONCATENATE function may not support by upcoming Excel versions.

### How to use CONCATENATE Function in Excel?

Let us now explore the working of the CONCATENATE function with the help of some examples:

#### Example 1: Using CONCATENATE function for values in different cells

Suppose we have some people's first and last names in different cells across columns A and B. We need to combine the first and the last names to create a full name in a new column.



	A	B	C	D
1	First Name	Last Name		
2	MS	Dhoni		
3	Virat	Kohli		
4	Rohit	Sharma		
5	Rishabh	Pant		
6	KL	Rahul		
7	Ravindra	Jadeja		
8	Jasprit	Bumrah		
9	Hardik	Pandya		
10	Krunal	Pandya		
11	Shikhar	Dhawan		
12	Deepak	Hooda		

The simple syntax to concatenate cell values divided by space can be defined as below:

1. =CONCATENATE( cell\_no\_1 , " ", cell\_no\_2)

Where "cell\_no" represents the cell reference containing strings that need to be concatenated.

We must perform the below steps to concatenate text values in different cells to create full names, respectively:

Before using the CONCATENATE function to join names, we are first required to insert a new column to create a combined name. Let's say we use column C. We name its header as '*Combined Name*'.

	C1		Combined Name	
	A	B	C	D
1	First Name	Last Name	Combined Name	
2	MS	Dhoni		
3	Virat	Kohli		
4	Rohit	Sharma		
5	Rishabh	Pant		
6	KL	Rahul		
7	Ravindra	Jadeja		
8	Jasprit	Bumrah		
9	Hardik	Pandya		
10	Krunal	Pandya		
11	Shikhar	Dhawan		
12	Deepak	Hooda		



Next, we must type the function name and supply respective arguments in it. First, we concatenate the text (first and last names) in cells A2 and B2. Therefore, we write the function in cell C2 in the following way:

=CONCATENATE(A2, B2)

After entering the function, we must press the **Enter** key to obtain the respective output.

	A	B	C	D
1	First Name	Last Name	Combined Name	
2	MS	Dhoni	MSDhoni	
3	Virat	Kohli		
4	Rohit	Sharma		
5	Rishabh	Pant		
6	KL	Rahul		
7	Ravindra	Jadeja		
8	Jasprit	Bumrah		
9	Hardik	Pandya		
10	Krunal	Pandya		
11	Shikhar	Dhawan		
12	Deepak	Hooda		

The above example sheet shows that the first and last names are concatenated from cells A2 and B2 in cell C2. However, there is no space between the first and last names. It is because the CONCATENATE function only combines values as exactly as they are supplied and nothing more. So, if we need to insert a space, any punctuation, or other details in the resultant cell, we must include it accordingly while inserting the CONCATENATE function.

Since we need to include a space between the first and last names in the resultant cell (C2), we must add another argument in the CONCATENATE. We need to insert a space as an argument closed within the double quotes (" "), i.e.,

=CONCATENATE(A2," ",B2)

After pressing the Enter key, the above function returns the combined name, where the space separates the first and last names.

	A	B	C	D
1	First Name	Last Name	Combined Name	
2	MS	Dhoni	MS Dhoni	
3	Virat	Kohli		
4	Rohit	Sharma		
5	Rishabh	Pant		
6	KL	Rahul		
7	Ravindra	Jadeja		
8	Jasprit	Bumrah		
9	Hardik	Pandya		
10	Krunal	Pandya		
11	Shikhar	Dhawan		
12	Deepak	Hooda		

Lastly, we can use the **Fill Handle** to copy-paste the formula from cell C2 to the below/remaining cells in the column. This will instantly combine other names, as shown below:

	A	B	C	D
1	First Name	Last Name	Combined Name	
2	MS	Dhoni	MS Dhoni	
3	Virat	Kohli	Virat Kohli	
4	Rohit	Sharma	Rohit Sharma	
5	Rishabh	Pant	Rishabh Pant	
6	KL	Rahul	KL Rahul	
7	Ravindra	Jadeja	Ravindra Jadeja	
8	Jasprit	Bumrah	Jasprit Bumrah	
9	Hardik	Pandya	Hardik Pandya	
10	Krunal	Pandya	Krunal Pandya	
11	Shikhar	Dhawan	Shikhar Dhawan	
12	Deepak	Hooda	Deepak Hooda	

### Example 2: Using CONCATENATE function to join cell value and string

We can join one or more cell values with the desired string using the CONCATENATE function. We need to apply the formula and input the desired string directly as an argument. The string can be added to the formula's starting, middle, and ending as per our requirements.

Suppose that we have the first and last names in corresponding cells A2 and B2. We want to join first name and last name and include the desired string (is a cricketer) in cell C2.

	A	B	C	D	E
1	First Name	Last Name	Occupation		
2	Virat	Kohli			
3					
4					

The simple syntax to concatenate cell values and a custom string can be defined as below:

- =CONCATENATE( cell\_number(s), "text\_string" )
- or
- =CONCATENATE("text\_string", cell\_number(s) )

Like the previous example, we are first required to concatenate the text (first name and last name) present in cells A2 and B2 and then add our string in the following way:

=CONCATENATE(A2," ",B2," ","is a cricketer")

	C2						
1	A	B	C	D	E	F	G
2	First Name	Last Name	Occupation				
	Virat	Kohli	Virat Kohli is a cricketer				
3							
4							

We also added a space character in the formula to divide the words in the resultant string.

In the following example sheet, we concatenate a cell value with a string where the string is the starting argument.

	C2						
1	A	B	C	D	E	F	G
2	javaTpoint		Hello User, you are navigating javaTpoint				
3							
4							

We can notice that the CONCATENATE function only joins the values, irrespective of the existing formatting of the cell. Although the value in cell A2 is in the bold format, the resultant cell C2 displays a default formatting. That means the source cell formatting is not used in CONCATENATE.

In another example, we concatenate a cell value with start and ending strings, i.e., the cell value is in the mid.

	C2						
1	A	B	C	D	E	F	G
2	javaTpoint		Hello User, its javaTpoint and you are learning CONCATENATE function				
3							
4							
5							

### Example 3: Using CONCATENATE to join cells with a space, comma, and other symbols or characters

Using Excel's CONCATENATE function, we can join one or more cell values along with the special symbols, characters, etc. We can apply the CONCATENATE formula and directly input the desired symbol as an argument. The formula can contain up to 255 strings, including the symbols and cell values.

Suppose that we have the first and last names in corresponding cells A2 and B2. We want to join first and last names and include the desired symbol (-) between them in cell C2.

	A	B	C	D	E
1	First Name	Last Name	Occupation		
2	Virat	Kohli			
3					
4					



The simple syntax to concatenate cell values divided by a symbol can be defined as below:

1. =CONCATENATE( cell\_no\_1 , "Sign\_or\_Symbol" , cell\_no\_2)

In previous examples, we have concatenated cell values divided by a space. Similarly, we are first required to concatenate the text (first name and last name) present in cells A2 and B2 and then add an additional argument (sign or symbol) in between them in the following way:

=CONCATENATE(A2,"-",B2)

	A	B	C	D
1	First Name	Last Name	Full Name divided by Hyphen or Dash (-)	
2	Virat	Kohli	Virat-Kohli	
3				
4				

Likewise, we can add any desired sign or symbol to join our strings using CONCATENATE function.

The example below also includes a custom string along with the cell values and a symbol while concatenation:

C2	A	B	C	D	E
1					
2	Assignment	1	Assignment-1 is completed.		
3					
4					

#### Example 4: Using CONCATENATE to join Text String and Formula Calculated Value

Using Excel's CONCATENATE function, we can join one or more cell values and text strings along with the formula calculated value(s).

Suppose that we have some information like the time and date of different articles. We want to record complete information in a message explaining it more clearly.

H7	A	B	C	D	E	F
1	Post Name/Topic	Date	Time	Message		
2	Post 1	09-01-2022	21:29:00			
3	Post 2	25-01-2022	08:49:00			
4	Post 3	03-02-2022	12:59:00			
5	Post 4	15-02-2022	23:54:00			
6	Post 5	23-02-2022	15:09:00			
7	Post 6	27-02-2022	03:19:00			
8	Post 7	09-03-2022	17:34:00			
9	Post 8	18-03-2022	00:29:00			
10						
11						



Since we want to use the dates and time from our recorded cells, we only need to include the date (mm/dd/yyyy) and time (hh:mm:ss) formatting in the CONCATENATE formula. Therefore, we apply the CONCATENATE formula in the following way to get meaningful context about what date and time our posts went live.

```
=CONCATENATE(A2," went live on ",TEXT(B2,"mm/dd/yyyy")," at ",TEXT(C2,"hh:mm:ss"))
```

	D2	=CONCATENATE(A2," went live on ",TEXT(B2,"mm/dd/yyyy")," at ",TEXT(C2,"hh:mm:ss"))						
	A	B	C	D	E	F	G	H
1	Post Name/Topic	Date	Time	Message				
2	Post 1	09-01-2022	21:29:00	Post 1 went live on 01/09/2022 at 21:29:00				
3	Post 2	25-01-2022	08:49:00					
4	Post 3	03-02-2022	12:59:00					
5	Post 4	15-02-2022	23:54:00					
6	Post 5	23-02-2022	15:09:00					
7	Post 6	27-02-2022	03:19:00					
8	Post 7	09-03-2022	17:34:00					
9	Post 8	18-03-2022	00:29:00					
10								

By copy-pasting the formula onto other remaining cells or dragging the Fill handle, we can get the concatenated message for other cells in the column.

	D2	=CONCATENATE(A2," went live on ",TEXT(B2,"mm/dd/yyyy")," at ",TEXT(C2,"hh:mm:ss"))						
	A	B	C	D	E	F	G	H
1	Post Name/Topic	Date	Time	Message				
2	Post 1	09-01-2022	21:29:00	Post 1 went live on 01/09/2022 at 21:29:00				
3	Post 2	25-01-2022	08:49:00	Post 2 went live on 01/25/2022 at 08:49:00				
4	Post 3	03-02-2022	12:59:00	Post 3 went live on 02/03/2022 at 12:59:00				
5	Post 4	15-02-2022	23:54:00	Post 4 went live on 02/15/2022 at 23:54:00				
6	Post 5	23-02-2022	15:09:00	Post 5 went live on 02/23/2022 at 15:09:00				
7	Post 6	27-02-2022	03:19:00	Post 6 went live on 02/27/2022 at 03:19:00				
8	Post 7	09-03-2022	17:34:00	Post 7 went live on 03/09/2022 at 17:34:00				
9	Post 8	18-03-2022	00:29:00	Post 8 went live on 03/18/2022 at 00:29:00				
10								
11								

### How do we concatenate a range of cells?

Combining multiple values from different cells or a range using the CONCATENATE function requires additional effort compared to other Excel functions. Unlike other typical functions, the CONCATENATE function does not support arrays. That means we have to supply each desired cell reference in the formula for each argument.

For example, if we need to concatenate cells from A1 to A4, we have to use the following formula:

=CONCATENATE(A1, A2, A3, A4)

When dealing with a small number of cells, it is easy to enter cell references manually. However, **if we have several cells or a large range to concatenate**, we can press the Ctrl key and supply each cell in the CONCATENATE formula as an argument. Here are the respective steps:

- First, we need to select a cell to type CONCATENATE formula.
- Next, we must type the formula (=CONCATENATE) in the respective cell, followed by the opening parenthesis.

- After entering the formula, we must supply the desired arguments (or cells) separately. We can use the **Ctrl** key to select multiple cells to be concatenated. We must hold the **Ctrl** key on the keyboard and click on each cell individually that we want to concatenate.
- Lastly, we must release the **Ctrl** key, type the closing parenthesis at the end of the formula and press the **Enter** key.

SUM		C	D	E	F	G	H	I	J	K
A	B	=CONCATENATE(A1,A2,A3,A4,A5,A6,A7,A8,A9,A10)								
1	1	=CONCATENATE(A1,A2,A3,A4,A5,A6,A7,A8,A9,A10)								
2	2	CONCATENATE(text1, [text2], [text3], [text4], [text5], [text6], [text7], [text8], [text9], [text10], [text11], ...)								
3	3									
4	4									
5	5									
6	6									
7	7									
8	8									
9	9									
10	10									
11										
12										

Press and Hold Ctrl,  
and click each cell to concatenate

- Using the ampersand "&" operator: =A2&B2

E9		f <sub>x</sub>			
A	B	C	D	E	F
1 Source Data		Formula with CONCATENATE	Formula with Ampersand	Result	
2 Virat	Kohli	=CONCATENATE(A2,B2)	=A2&B2	ViratKohli	
3					

- Concatenation of values in A2 and B2 separated with a Space

- Using CONCATENATE Function: =CONCATENATE(A2, " ",B2)

- Using the ampersand "&" operator: =A2&" "&B2

E11		f <sub>x</sub>			
A	B	C	D	E	F
1 Source Data		Formula with CONCATENATE	Formula with Ampersand	Result	
2 Virat	Kohli	=CONCATENATE(A2, " ",B2)	=A2&" "&B2	Virat Kohli	
3					

- Concatenation of values in A2 and B2 and a Text String

- Using CONCATENATE Function: =CONCATENATE(A2,B2," completed")

- Using the ampersand "&" operator: =A2 & B2 & " completed"

E9		f <sub>x</sub>			
A	B	C	D	E	F
1 Source Data		Formula with CONCATENATE	Formula with Ampersand	Result	
2 Project	1	=CONCATENATE(A2,B2," completed")	=A2 & B2 & " completed"	Project1 completed	
3					

### Concatenation of String and the result of the TEXT/ TODAY function

**Using CONCATENATE Function:** =CONCATENATE("Today is ",TEXT(TODAY()),"dd-mmm-yy"))

**Using the ampersand "&" operator:** "Today is " & TEXT(TODAY(), "dd-mmm-yy")

A	B	C	D
Formula with CONCATENATE	Formula with Ampersand	Result	
=CONCATENATE("Today is ",TEXT(TODAY()),"dd-mmm-yy"))	"Today is " & TEXT(TODAY(), "dd-mmm-yy")	Today is 05-Apr-22	
3			

### What is TRIM function?

The Excel TRIM function removes before and following spaces from the words, i.e., leading and trailing spaces. It also eliminates extra spaces in-between the texts but does not remove the single space separating two different texts. In other words, we can say that the TRIM function is used to clean the unwanted space characters from your data.

#### Syntax

=TRIM (Text)

#### Parameter

**Text (Required):** This parameter represents the text from which you want to remove the extra space.

The TRIM function removes all leading, trailing and in-between spaces **leaving a single space** character in between the text. To trim your data follow the below given steps:

#### STEP 1: Add a helper column named Trimmed Output

Place your mouse cursor to the cell next to "string1" and name the new column as "Trimmed Output".

It will look similar to the below image:

		C3	Trimmed Output				
1		A	B	C	D	E	F
2							
3	String1		Trimmed Output				
4	S001 A						
5	S001 A						
6	S002						
7	S003						
8							
9							

Add the helper column

In this column we will type our TRIM formula and place the trimmed data for different text values.

**NOTE:** Format the helper column and match it with the first column to make your Excel sheet more attractive.

### STEP 2: Type the TRIM formula

Put your cursor to the second row and start typing the function =TRIM(

It will look similar to the below image:

		SUM	X ✓ F =TRIM				
1		A	B	C	D	E	F
2							
3	String1		Trimmed Output				
4	S001 A		=TRIM(				
5	S001 A		TRIM(text)				
6	S002						
7	S003						
8							
9							

As shown here, enter the formula

### STEP 3: Insert the text parameter

The text parameter represents the input value from which you want to remove the extra spaces. Here, B4 represents the text cell.

It will look similar to the below image:

SUM	X ✓ f/x	=TRIM(B4)
A	B	C
1		
2		
3	<b>String1</b>	<b>Trimmed Output</b>
4	S001 A	=TRIM(B4)
5	S001 A	
6	S002	
7	S003	
8		
9		

#### STEP 4: TRIM will return the result

The TRIM will return the data after removing the extra leading, trailing or in-between spaces leaving only a single space between words.

It will look similar to the below image:

C4	A	B	C	D	E	F	G
1							
2							
3	<b>String1</b>	<b>Trimmed Output</b>					
4	S001 A	S001 A					
5	S001 A						
6	S002						
7	S003						
8							
9							

#### STEP 5: Drag the formula to other rows to repeat

Place your mouse cursor on the formula cell and point the cursor to the right corner of the cell. To your surprise, the mouse pointer will turn into a '+' icon.

Refer to the below image:

A screenshot of Microsoft Excel showing a table with two columns: "String1" and "Trimmed Output". The "String1" column contains values like "S001 A", "S001 A", "S002", and "S003". The "Trimmed Output" column contains the same values but with extra spaces removed. A red box highlights the bottom-right corner of the "Trimmed Output" column's header cell. A red arrow points from this box to the text "Drag the '+' icon". The formula bar at the top shows "=TRIM(B4)".

	C4	B4	=TRIM(B4)
1	A	B	C
2			D
3	String1	Trimmed Output	
4	S001 A	S001 A	
5	S001 A		
6	S002		
7	S003		

Drag the '+' icon down the cells. It will copy the TRIM function to all your cells changing the cell reference as respective to the cell. As you can see below, the extra spaces from your data has been removed.

It will look similar to the below image:

A screenshot of Microsoft Excel showing the same table after the TRIM function has been copied down. The "Trimmed Output" column now contains the correctly trimmed values: "S001 A", "S001 A", "S002", and "S003". A red box highlights the entire "Trimmed Output" column. A red arrow points from this box to the text "All the data has been trimmed. Hence, removing the extra spaces from the text." The formula bar at the top still shows "=TRIM(B4)".

	C4	B4	=TRIM(B4)
1	A	B	C
2			D
3	String1	Trimmed Output	
4	S001 A	S001 A	
5	S001 A	S001 A	
6	S002	S002	
7	S003	S003	

That's it; following the above few steps, you can easily remove the extra spaces from your text.

**Exercise for text function here:**

## VLookup Function in excel

### What is the VLOOKUP function in Excel?

In Excel, VLOOKUP stands for '**Vertical Lookup**', meaning the function only works vertically for the organized or structured table to be searched for the desired value. It is a built-in Excel function that searches for a specific value in the desired column to retrieve the respective value from a different column but on the same row.

In simple words, the VLOOKUP function enables us to search for any specific piece of information within our worksheet while working with the large data sets.

For example, the VLOOKUP function tells Excel to look for the desired piece of information (i.e., RAM) in the given data set or a range (i.e., table) and return some other respective information about that (i.e., the price of RAM).

	A	B	C	D	E	F
1	Item	Sold	Stock	Price		
2	Charger	22	55	99		
3	HDMI Cable	45	45	49		
4	HDD	18	28	3999		
5	SSD	25	42	6999		
6	Mouse	42	16	499		
7	RAM	14	39	1299		
8	Keyboard	14	33	899		
9	Joystick	22	44	5999		
10	USB Cable	35	54	99		
11	Pen Drive	31	46	599		
12	DVD	29	36	39		
13						

To enter a VLOOKUP formula in the desired cell (s), we need to type =VLOOKUP and select the function from the list by pressing the TAB key on the keyboard. After that, we can supply the respective arguments based on the syntax of the VLOOKUP.

### Syntax of VLOOKUP

The syntax of the VLOOKUP function is defined as below:

1. VLOOKUP(lookup\_value, table\_array, col\_index\_num, [range\_lookup])

Where, -lookup\_value," -table\_array," -col\_index\_num," and -range\_lookup" are the arguments of VLOOKUP function.

	A	B	C	D	E	F	G
1							
2		=VLOOKUP(					
3		VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])					
4							

### Arguments of VLOOKUP

The VLOOKUP function requires the following arguments in which the first three arguments are mandatory while the last argument (range\_lookup) is optional:

#### Lookup\_value

It is a required argument to specify the value we need to search for in the first column of the supplied table array or range. A lookup value can be in the form of any value like text, number, and date or the value obtained by any other function in the sheet. Unlike the numeric values or cell references, we must always enclose the text values within the straight double-quotes.

#### Table\_array

It is another required argument used to specify the data array or a range of cells where the function will search for the lookup value. The function always looks up in the table array's leftmost column (first column) and retrieves a corresponding match. The table array may contain multiple numeric values, text values, dates, and/ or logical values.

#### Col\_index\_num

Like the above two arguments, the col\_index\_num is also a required argument. It is specified as an integer to represent the number of a specific column from which we want to obtain the desired value. It must be selected from the supplied table array or a range only.

#### Range\_lookup

It is an optional argument of the VLOOKUP function used to define what the function must return when it does not find an exact match to the lookup table. We can specify this argument as either TRUE or FALSE.

- o **TRUE:** When the argument is set as TRUE, the function tries to find the approximate match in the event if no exact match is found. The function then finds the closest match below the lookup\_table. We can also use '1' to specify the argument as TRUE.

- **FALSE:** The function only tries to find the exact match when the argument is set as FALSE. The function returns an error if no exact match is found below the lookup\_table. We can also use '0' to specify the argument as FALSE.

### Examples

Let us discuss examples to look for values in exact and approximate matches using VLOOKUP:

#### Example 1: Exact Match in VLOOKUP

Consider the following excel sheet as an example where we have data containing a list of some items with their prices. We need to use VLOOKUP to find the price of any specific item (i.e., 'Mouse') from the table.

	A	B	C	D	E	F	G
1	Item	Sold	Stock	Price			
2	Charger	22	55	99			
3	HDMI Cable	45	45	49			
4	RAM	14	39	1299			
5	HDD	18	28	3999			
6	SSD	25	42	6999			
7	Mouse	42	16	499			
8	Keyboard	14	33	899			
9	Joystick	22	44	5999			
10	USB Cable	35	54	99			
11	Pen Drive	31	46	599			
12	DVD	29	36	39			
13							

We must perform the following steps to find the price of Mouse from our data table:

First, we need to select a cell to record the price of the Mouse. In our example sheet, we select cell G2.

	A	B	C	D	E	F	G	H
1	Item	Sold	Stock	Price			Price of	
2	Charger	22	55	99			Mouse	
3	HDMI Cable	45	45	49				
4	RAM	14	39	1299				
5	HDD	18	28	3999				
6	SSD	25	42	6999				
7	Mouse	42	16	499				
8	Keyboard	14	33	899				
9	Joystick	22	44	5999				
10	USB Cable	35	54	99				
11	Pen Drive	31	46	599				
12	DVD	29	36	39				
13								

- After selecting a resultant cell, we start typing the VLOOKUP function starting with an equal sign and select from the function list by pressing the **TAB** key on the keyboard.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Item	Sold	Stock	Price			Price of					
2	Charger	22	55	99			Mouse	=VLOOKUP()				
3	HDMI Cable	45	45	49								
4	RAM	14	39	1299								
5	HDD	18	28	3999								
6	SSD	25	42	6999								
7	Mouse	42	16	499								
8	Keyboard	14	33	899								
9	Joystick	22	44	5999								
10	USB Cable	35	54	99								
11	Pen Drive	31	46	599								
12	DVD	29	36	39								
13												

- Next, we select the cell with a value that we want to look up. We select or type the cell F2 in the VLOOKUP function as the first argument in our example.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Item	Sold	Stock	Price			Price of					
2	Charger	22	55	99			Mouse	=VLOOKUP(F2)				
3	HDMI Cable	45	45	49								
4	RAM	14	39	1299								
5	HDD	18	28	3999								
6	SSD	25	42	6999								
7	Mouse	42	16	499								
8	Keyboard	14	33	899								
9	Joystick	22	44	5999								
10	USB Cable	35	54	99								
11	Pen Drive	31	46	599								
12	DVD	29	36	39								
13												

- After supplying the first argument, we type Comma (,) and select the range (or table array) in which we want to search for the lookup value and obtain the desired output. In our case, we select the range (A2:D12) without brackets.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Item	Sold	Stock	Price	Price of							
2	Charger	22	55	99	<code>=VLOOKUP(F2,A2:D12</code>							
3	HDMI Cable	45	45	49	<code>=VLOOKUP(F2,A2:D12</code>							
4	RAM	14	39	1299	<code>=VLOOKUP(F2,A2:D12</code>							
5	HDD	18	28	3999	<code>=VLOOKUP(F2,A2:D12</code>							
6	SSD	25	42	6999	<code>=VLOOKUP(F2,A2:D12</code>							
7	Mouse	12	16	499	<code>=VLOOKUP(F2,A2:D12</code>							
8	Keyboard	14	33	899	<code>=VLOOKUP(F2,A2:D12</code>							
9	Joystick	22	44	5999	<code>=VLOOKUP(F2,A2:D12</code>							
10	USB Cable	35	54	99	<code>=VLOOKUP(F2,A2:D12</code>							
11	Pen Drive	31	46	599	<code>=VLOOKUP(F2,A2:D12</code>							
12	DVD	29	36	39	<code>=VLOOKUP(F2,A2:D12</code>							
13					<code>=VLOOKUP(F2,A2:D12</code>							

- After entering the range, we again type Comma (,) to separate arguments. After that, we need to type the column number within the supplied range in which we want to look up the output value. In our case, it is the price column, so we select type 4.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Item	Sold	Stock	Price	Price of							
2	Charger	22	55	99	<code>=VLOOKUP(F2,A2:D12,4</code>							
3	HDMI Cable	45	45	49	<code>=VLOOKUP(F2,A2:D12,4</code>							
4	RAM	14	39	1299	<code>=VLOOKUP(F2,A2:D12,4</code>							
5	HDD	18	28	3999	<code>=VLOOKUP(F2,A2:D12,4</code>							
6	SSD	25	42	6999	<code>=VLOOKUP(F2,A2:D12,4</code>							
7	Mouse	12	16	499	<code>=VLOOKUP(F2,A2:D12,4</code>							
8	Keyboard	14	33	899	<code>=VLOOKUP(F2,A2:D12,4</code>							
9	Joystick	22	44	5999	<code>=VLOOKUP(F2,A2:D12,4</code>							
10	USB Cable	35	54	99	<code>=VLOOKUP(F2,A2:D12,4</code>							
11	Pen Drive	31	46	599	<code>=VLOOKUP(F2,A2:D12,4</code>							
12	DVD	29	36	39	<code>=VLOOKUP(F2,A2:D12,4</code>							
13					<code>=VLOOKUP(F2,A2:D12,4</code>							

- Lastly, we enter the last argument as FALSE or 0 to find an exact match for the lookup value 'Mouse'. After that, we type the ending parentheses and press the Enter key to obtain results.

	A	B	C	D	E	F	G	H
1	Item	Sold	Stock	Price		Price of		
2	Charger	22	55	99		Mouse	499	
3	HDMI Cable	45	45	49				
4	RAM	14	39	1299				
5	HDD	18	28	3999				
6	SSD	25	42	6999				
7	Mouse	42	16	499				
8	Keyboard	14	33	899				
9	Joystick	22	44	5999				
10	USB Cable	35	54	99				
11	Pen Drive	31	46	599				
12	DVD	29	36	39				
13								

In our example sheet, we can change the item name in cell F2 and get the corresponding price for that item in real-time.

### Example 2: Approximate Match in VLOOKUP

Consider the following excel sheet as an example where we have recorded data containing a list of scores with their respective grades. We need to use VLOOKUP to look up the value 75 and find the corresponding grade from the table.

	A	B	C	D	E	F	G
1							
2		Scores	Grade				
3		0	F		Score	75	
4		50	E		Grade		
5		60	D				
6		70	C				
7		80	B				
8		90	A				
9		100	A+				
10							

Since our table does not contain the value 75 in the leftmost column, we use VLOOKUP to return an approximate match. We must perform the following steps to find the nearest match (grade) for our lookup value (75) from our data table:

- First, we must sort the leftmost column of our data range in ascending order. It is essential when using the VLOOKUP function in an approximate match mode. After that, we need to select a cell to record a grade. In our example sheet, we select a cell F4.

	A	B	C	D	E	F	G
1							
2		Scores	Grade				
3		0	F				
4		50	E				
5		60	D				
6		70	C				
7		80	B				
8		90	A				
9		100	A+				
10							

- In the next step, we enter the VLOOKUP formula similar to the previous example. We first type "=VLOOKUP(" without quotes, select the cell with a lookup value (F3, in our case), select the data table (B2:C9, in our case), and type the column number (2, in our case) from which we want to retrieve the output.

	A	B	C	D	E	F	G	H	I	J	K
1											
2		Scores	Grade								
3		0	F								
4		50	E								
5		60	D								
6		70	C								
7		80	B								
8		90	A								
9		100	A+								
10											

- Unlike the previous example, we now enter TRUE as a fourth argument. It tells the VLOOKUP function to return an approximate match when no exact match is found. In our case, the function does not find the lookup value 75 in the first column of the supplied range, so it returns the largest value smaller than 75.
- In our example sheet, the approximate match value is 70. Therefore, after pressing the Enter key on the keyboard, the VLOOKUP function returns the output grade C, which is the grade for score 70.

F4		=VLOOKUP(F3,B3:C9,2,TRUE)	F	G
A	B	C	D	E
1				
2	Scores	Grade		
3	0	F		
4	50	E		
5	60	D		
6	70	C		
7	80	B		
8	90	A		
9	100	A+		
10				

We can type other random scores (or numbers) to get their respective grades. If an exact match is found, the function will return its respective grade accordingly.

### Limitations of VLOOKUP

Although VLOOKUP is a powerful function, it has certain limitations, i.e.:

#### VLOOKUP always looks right

One of the major limitations of the VLOOKUP function is that it cannot return the value or output from any of the left side columns of the lookup value. The function always works by looking up the value in the leftmost column of the selected table while returning the respective value from the desired column to its right.

For instance, consider the following sheet as an example data set where we have some employees' names with their salaries.

J10					
A	B	C	D	E	F
1					
2	Employee Name	Salary			
3	Anupam	35,000			
4	Bipin	30,000			
5	Chunmun	20,000			
6	Dara	56,000			
7	Farhan	38,000			
8	Gaurav	1,10,000			
9	Sapna	30,000			
10	Zaid	80,000			
11					

We can use the VLOOKUP function to find the salary of any desired employee in the following way:

	A	B	C	D	E	F
1						
2		<b>Employee Name</b>	<b>Salary</b>		<b>Employee Name</b>	<b>Salary</b>
3	Anupam	35,000		Bipin	30000	
4	Bipin	30,000				
5	Chunmun	20,000				
6	Dara	56,000				
7	Farhan	38,000				
8	Gaurav	1,10,000				
9	Sapna	30,000				
10	Zaid	80,000				
11						

However, we cannot find the employee's name based on his salary. The VLOOKUP function cannot use the salary as a lookup value while returning the value from its left side column. Instead, it will return an error.

	A	B	C	D	E	F
1						
2		<b>Employee Name</b>	<b>Salary</b>		<b>Employee Name</b>	<b>Salary</b>
3	Anupam	35,000		Bipin	30000	
4	Bipin	30,000				
5	Chunmun	20,000				
6	Dara	56,000				
7	Farhan	38,000		Salary	Employee Name	
8	Gaurav	1,10,000		30000	#N/A	
9	Sapna	30,000				
10	Zaid	80,000				
11						

To use Left Lookup, we can use the combination of INDEX and MATCH functions in Excel.

### VLOOKUP is Case-insensitive

The VLOOKUP function in Excel works in a case-insensitive way. This means the function treats uppercase and lowercase values equally when looking through the table. For instance, we will still get the results if we try to lookup an employee name in the UPPERCASE (i.e., BIPIN).

	A	B	C	D	E	F
1						
2		<b>Employee Name</b>	<b>Salary</b>			
3		Anupam	35,000			
4		Bipin	30,000			
5		Chunmun	20,000			
6		Dara	56,000			
7		Farhan	38,000			
8		Gaurav	1,10,000			
9		Sapna	30,000			
10		Zaid	80,000			
11						

Since VLOOKUP is case-sensitive, it will work the same for lookup values BIPIN, Bipin, bipin, bipIN, etc.

### VLOOKUP always finds the first match

The VLOOKUP function always produces a result for the first lookup value it finds vertically in a table column. If there are duplicates in the column, all such values will be ignored. For example, the VLOOKUP function returns the salary for the employee name 'Bipin' from cell B4, not from B10. It is because the function always matches the first instance and is case-insensitive.

	A	B	C	D	E	F	G
1							
2		<b>Employee Name</b>	<b>Salary</b>				
3		Anupam	35,000				
4		Bipin	30,000				
5		Chunmun	20,000				
6		Dara	56,000				
7		Farhan	38,000				
8		Gaurav	1,10,000				
9		Sapna	30,000				
10		X BIPIN	80,000				
11							

### Excel VLOOKUP Errors

When using VLOOKUP in Excel, we often encounter unexpected errors instead of the desired results. Some such errors include the #N/A, #NAME?, #REF!, and #VALUE!.

- **VLOOKUP #N/A Error:** It primarily occurs when the lookup value is misspelled or not present in the selected table, the lookup column is not the leftmost column, hidden spaces in lookup values, and/ or numerical values are formatted as texts.
- **VLOOKUP #NAME? Error:** It occurs when the function name is misspelled or wrong.
- **VLOOKUP #REF! Error:** It occurs when the column number (col\_index\_num) is higher than the range selected.
- **VLOOKUP #VALUE! Error:** It mainly occurs when the lookup value contains more than 255 characters, missing parameters/ arguments, and/ or column number (col\_index\_num) is below 1.

#### Important Points to Remember

- If we do not specify range-lookup in VLOOKUP, the function returns an exact match if it exists; otherwise, non-exact (approximate) match.
- If the sheet already has the VLOOKUP formula, it is recommended not to insert a new column or delete an existing column in the table range. When we insert/delete a column in the table, the column index number does not change accordingly, resulting in incorrect results or an error.
- VLOOKUP can lookup values with signs or symbols. For example, an asterisk (\*), question mark (?), etc.

#### Vlookup Errors

##### What are the common VLOOKUP Errors in Excel?

In Excel, VLOOKUP is a widely used function that helps extract specific values from various data sources. However, the function also has several limitations. When we do not follow certain limitations or specifications of VLOOKUP, it usually leads to unexpected results and errors. This is why many Excel experts consider VLOOKUP to be one of the most complex Excel functions.

The following are the most common errors that often appear while using the VLOOKUP function in Excel:

- VLOOKUP #N/A Error
- VLOOKUP #NAME? Error
- VLOOKUP #REF! Error

- o VLOOKUP #VALUE! Error

To avoid VLOOKUP errors, we must ensure to use properly formatted data without the blank cells, incorrectly formatted values, and deleted formulas. Also, we can use the IFERROR function with VLOOKUP. It helps to ignore the error and return whatever is placed in the place of the error.

Let us now discuss each VLOOKUP error in detail and know the ways to fix it accordingly:

### #N/A Error in VLOOKUP

The #N/A error in VLOOKUP usually occurs when the formula does not find the desired lookup value to produce results. The term N/A means 'Not Available'. This error can occur due to one of the following reasons:

#### 1. The lookup value is misspelled

led

We may type a lookup value with some spelling mistakes when dealing with a large data set. In that case, the VLOOKUP formula returns the #N/A error because it does not find the mistyped value in the defined table range.

	A	B	C	D	E	F
1	Item	Units Sold				
2	Mouse	599				
3	Keyboard	455				
4	Speakers	674				
5	RAM	143				
6	UPS	455				
7	Headphones	367				
8	USB Wire	854				
9	PEN Drive	666				
10						

	A	B	C	D	E	F
1	Item	Sales				
2	Speaker	#N/A				

lookup value is misspelt

In the above sheet, the formula searches for a value 'Speaker' while the table range has a value entered as 'Speakers'. The formula does not find the exact match as one 's' is missing in the lookup value. Correcting the typo in the lookup value fixes the #N/A error.

	A	B	C	D	E	F
1	Item	Units Sold				
2	Mouse	599				
3	Keyboard	455				
4	Speakers	674				
5	RAM	143				
6	UPS	455				
7	Headphones	367				
8	USB Wire	854				
9	PEN Drive	666				
10						

## 2. #N/A error in exact match VLOOKUP

When we apply the VLOOKUP to search for an exact match (range\_lookup argument is FALSE), the formula returns the #N/A error if no exact match is found in the defined table range.

	A	B	C	D	E	F
1	ID	Name				
2	101	Akash				
3	102	Ankur				
4	103	Gautami				
5	104	Rinku				
6	105	Sonam				
7	106	Taimoor				
8	107	Varun				
9	108	Yash				
10						

In the above sheet, the formula is searching for an ID with the number 100 (in cell D4) returns an #N/A error because the minimum ID number in the range is 101. The formula does not find the exact match. Giving the proper matched lookup value fixes the #N/A error.

	A	B	C	D	E	F
1	ID	Name				
2	101	Akash				
3	102	Ankur				
4	103	Gautami				
5	104	Rinku				
6	105	Sonam				
7	106	Taimoor				
8	107	Varun				
9	108	Yash				
10						

### 3. #N/A error in approximate match VLOOKUP

When we apply the VLOOKUP to search for the closest or approximate match (range\_lookup argument is TRUE), the formula returns the #N/A error in the following two cases:

- The value column in a defined table (lookup array) is not sorted as ascending.

	A	B	C	D	E	F
1	ID	Name				
2	101	Akash				
3	108	Yash				
4	105	Gautami				
5	102	Rinku				
6	104	Sonam				
7	103	Taimoor				
8	107	Varun				
9	100	Ankur				
10						

In the above sheet, the order of recorded IDs is mixed up. Despite a value of 100 existing in the defined range, the formula cannot lookup for a value with the range\_lookup argument set to TRUE, causing the #N/A error. It is because column A or IDs are sorted in ascending order. Sorting the range column as ascending fixes the

#N/A

error.

	A	B	C	D	E	F
1	ID	Name				
2	100	Ankur				
3	101	Akash				
4	102	Rinku				
5	103	Taimoor				
6	104	Sonam				
7	105	Gautami				
8	107	Varun				
9	108	Yash				
10						

Sorted as ascending

- The lookup/ search value is smaller than the lowest value written in the range.

	A	B	C	D	E	F
1	ID	Name				
2	101	Akash				
3	102	Ankur				
4	103	Gautami				
5	104	Rinku				
6	105	Sonam				
7	106	Taimoor				
8	107	Varun				
9	108	Yash				
10						

The formula returns the #N/A error in the above sheet while looking for the number 100 (in cell D4), even if it is set to look for an approximate result. The reason for this error in the above sheet is the smaller value (100) than the lowest value (101) in the range.

We must not look for smaller values when using approximate match VLOOKUP. However, the formula works perfectly when the lookup value is greater than the defined value in the range.

	A	B	C	D	E	F
1	ID	Name				
2	101	Akash				
3	102	Ankur				
4	103	Gautami				
5	104	Rinku				
6	105	Sonam				
7	106	Taimoor				
8	107	Varun				
9	108	Yash				
10						

ID	Name
109	Yash



#### 4. The lookup column is not the left-most column

One of the most common reasons for the #N/A error in VLOOKUP is that it is given a table array or a range that does not contain the lookup column to the left. The LOOKUP formula cannot return a value from its left.

Therefore, a lookup column must always be structured to the left-most side in the table array. We usually forget this limitation of the VLOOKUP formula and get the respective error.

	A	B	C	D	E	F
1	Name	ID				
2	Akash	101				
3	Ankur	102				
4	Gautami	103				
5	Rinku	104				
6	Sonam	105				
7	Taimoor	106				
8	Varun	107				
9	Yash	108				
10						

ID	Name
101	#N/A

→ **Lookup Column**

Moving the lookup column to the left-most side in the defined table array fixes the #N/A error. After moving the column to the left-most side, we must specify the array table or a range again.

	A	B	C	D	E	F
1	ID	Name				
2	101	Akash				
3	102	Ankur				
4	103	Gautami				
5	104	Rinku				
6	105	Sonam				
7	106	Taimoor				
8	107	Varun				
9	108	Yash				
10						

Lookup Column



If it is not possible to switch the columns or reorganize data to make the lookup column the left-most column due to some reasons, we must avoid using the VLOOKUP formula. Instead, we can use INDEX and MATCH functions together as an alternative to the VLOOKUP.

## 5. Numerical values formatted as text

The formatting of cells also plays an important role in VLOOKUP. If our data set contains numbers formatted as text, either in the main or lookup table, the VLOOKUP formula will usually return a #N/A error. This usually happens when we copy or import data from other sources instead of entering it manually. Also, the numbers starting with an apostrophe are interpreted as text by Excel.

If our sheet has text-formatted numbers, the error indicator is displayed for such cells. If we select such cell(s), Excel also displays a message accordingly.

	A	B	C	D	E	F
1	ID	Name				
2	101	101				
3	102					
4	103					
5	104					
6	105					
7	106					
8	107					
9	108					
10						

Number Stored as Text

ID	Name
101	#N/A



Converting the text-formatted numbers to numbers usually fixes the #N/A error. To convert numbers that are stored as text into exact numbers, we must first select all such problematic cells/numbers. After that, we need to click the error icon and select the 'Convert to Number' option from the list.

E4		=VLOOKUP(D4,A2:B9,2,TRUE)			
A	B	C	D	E	F
1 ID	Name				
2 101	Akash				
3 102	Ankur				
4 103	Gautami			ID	Name
5 104	Rinku			101	Akash
6 105	Sonam				
7 106	Taimoor				
8 107	Varun				
9 108	Yash				
10					

## 6. Leading or trailing spaces

Another common reason behind the #N/A error in VLOOKUP is the presence of one or more extra spaces, either in the beginning or the ending of the cell value. There can be the following two cases when dealing with spaces in VLOOKUP:

- Extra Spaces in the lookup value:** If the cell used for the lookup value contains an extra space before and/or after the value, the VLOOKUP formula returns the #N/A error.

D4				Speakers	
A	B	C	D	E	F
1 Item	Units Sold				
2 Mouse	599				
3 Keyboard	455				
4 Speakers	674			Item	Sales
5 RAM	143			Speakers	#N/A
6 UPS	455				
7 Headphones	367				
8 USB Wire	854				
9 PEN Drive	666				
10					

If our sheet has many cells with extra spaces, we can use the TRIM function and wrap the lookup value inside it to get the desired result by VLOOKUP.

				E4	=VLOOKUP(TRIM(D4),A2:B9,2,FALSE)
1	Item	Units Sold			
2	Mouse	599			
3	Keyboard	455			
4	Speakers	674			
5	RAM	143			
6	UPS	455			
7	Headphones	367			
8	USB Wire	854			
9	PEN Drive	666			
10					

- Extra spaces in the lookup column:** If one of the cells or the entire lookup column contains an extra space before and/or after the value, the VLOOKUP formula returns the #N/A error.

				A4					
1	Item	Units Sold							
2	Mouse	599							
3	Keyboard	455							
4	Speakers	674							
5	RAM	143							
6	UPS	455							
7	Headphones	367							
8	USB Wire	854							
9	PEN Drive	666							
10									

In this case, it is not easy to fix the error in VLOOKUP. We have to edit each respective cell and delete the spaces. However, if there are way too many cells with spaces in the lookup column, it is better to use a combination of INDEX, MATCH, and TRIM functions as an array formula in the following way:

	A	B	C	D	E	F	G	H
1	Item	Units Sold						
2	Mouse	599						
3	Keyboard	455						
4	Speakers	674						
5	RAM	143						
6	UPS	455						
7	Headphones	367						
8	USB Wire	854						
9	PEN Drive	666						
10								

It is essential to note that after typing the entire formula, we must press 'Ctrl + Shift + Enter' instead of only the Enter key. It is required because we are using an array formula.

### #NAME? Error in VLOOKUP

#NAME? error is one of the most common and easy to fix VLOOKUP error. This error typically appears when we accidentally enter the wrong or misspelled function name. For example, we may type VLOKUP or CLOOKUP in place of the VLOOKUP and see the #NAME? error instead of the expected results.

	A	B	C	D	E	F
1	Item	Units Sold				
2	Mouse	599				
3	Keyboard	455				
4	Speakers	674				
5	RAM	143				
6	UPS	455				
7	Headphones	367				
8	USB Wire	854				
9	PEN Drive	666				
10						

In the case of the misspelled function name, Excel does not find the function in the library and returns the values as #NAME? error type.

To fix the #NAME? error in VLOOKUP, we must ensure to enter the correct function or formula name. After the function name is corrected, the error is resolved.

	A	B	C	D	E	F
1	Item	Units Sold				
2	Mouse	599				
3	Keyboard	455				
4	Speakers	674				
5	RAM	143				
6	UPS	455				
7	Headphones	367				
8	USB Wire	854				
9	PEN Drive	666				
10						

### #REF! Error in VLOOKUP

The #REF! error in VLOOKUP appears because of the wrong reference number. When we enter the VLOOKUP formula, we must specify the exact column index number; a column used to obtain a result. If we accidentally type the column index number higher than the selected range, the VLOOKUP formula will return the #REF! error.

	A	B	C	D	E	F
1	Item	Units Sold				
2	Mouse	599				
3	Keyboard	455				
4	Speakers	674				
5	RAM	143				
6	UPS	455				
7	Headphones	367				
8	USB Wire	854				
9	PEN Drive	666				
10						

We have supplied the correct table range and the lookup value in the above sheet, but the entered column index number (which is 3) is out of the selection range. Since we have selected the range A2:B9, only two columns are supplied within the table range. Correcting the column index number fixes the #REF! error in VLOOKUP.

Since we have only two columns and column second is the main column we need to extract the resultant value from, we specify the column index number as 2, not 3.

	A	B	C	D	E	F
1	Item	Units Sold				
2	Mouse	599				
3	Keyboard	455				
4	Speakers	674				
5	RAM	143				
6	UPS	455				
7	Headphones	367				
8	USB Wire	854				
9	PEN Drive	666				
10						

### #VALUE! Error in VLOOKUP

Generally, the #VALUE! error in VLOOKUP occurs when a value supplied in the respective formula is of a wrong data type. In addition to this, there are some other reasons as below:

#### 1. Lookup value contains more than 255 characters

Unfortunately, Excel's VLOOKUP formula cannot look up values exceeding 255 characters. If there are more than 255 characters in the Lookup value, the formula returns the #VALUE! error.

	A	B	C	D	E	F
1	ID	Name				
2	jtp1001245	Ankur				
3	jtp1014575	Akash				
4	jtp10278964	Rinku				
5	jtp1032145789791215	Taimoor				
6	jtp10434579	Sonam				
7	jtp1052245	Gautami				
8	jtp1075547879	Varun				
9	jtp108554763145	Yash				
10						
11						

more than 255 characters

To fix #VALUE! errors in such cases, we must use a combination of INDEX, MATCH functions in the following way:

	A	B	C	D	E	F
1	ID	Name		ID	Name	
2	jtp1001245	Ankur				
3	jtp1014575	Akash				
4	jtp10278964	Rinku				
5	jtp1032145789791215	Taimoor				
6	jtp10434579	Sonam				
7	jtp1052245	Gautami				
8	jtp1075547879	Varun				
9	jtp108554763145	Yash				
10						

After entering the entire INDEX and MATCH combination formula, we must ensure to press 'Ctrl + Shift + Enter' instead of only the Enter key.

## 2. Missing Parameters or Arguments

If the VLOOKUP formula is applied with any missing argument, it can lead to #VALUE! error. The VLOOKUP formula must be supplied with the LOOKUP value, then the table range, followed by a column index number and match type.

In the following sheet, the #VALUE! error appears due to a missing LOOKUP value in the applied formula.

	A	B	C	D	E	F
1	Item	Units Sold		Item	Sales	
2	Mouse	599				
3	Keyboard	455				
4	Speakers	674		Speakers	#VALUE!	
5	RAM	143				
6	UPS	455				
7	Headphones	367				
8	USB Wire	854				
9	PEN Drive	666				
10						

To fix the #VALUE! error in VLOOKUP, we must supply all the necessary parameters and ensure they are in proper order.

## 3. The col\_index\_num is less than 1

If we accidentally type the column index number less than 1, the VLOOKUP formula will return the #VALUE! error.

	A	B	C	D	E	F
1	Item	Units Sold				
2	Mouse	599				
3	Keyboard	455				
4	Speakers	674				
5	RAM	143				
6	UPS	455				
7	Headphones	367				
8	USB Wire	854				
9	PEN Drive	666				
10						

In the above sheet, we have supplied the correct table range and the lookup value, but the entered column index number (which is 0) is less than 1. It is unusual that a user intentionally types a column number below 1 because we use VLOOKUP to obtain results from a specific column. That means there must be at least a column within the sheet. However, there may be cases when a number is less than 1, especially when this argument is returned by some other function nested in our VLOOKUP formula.

Correcting the column index number fixes the #VALUE! error in VLOOKUP.

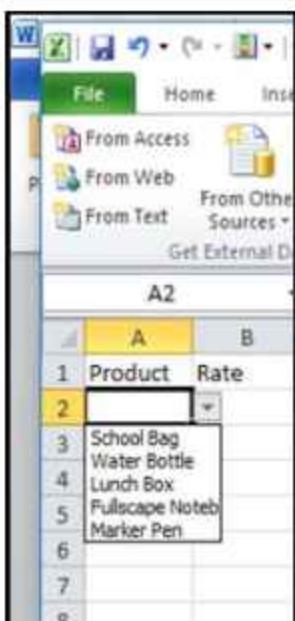
	A	B	C	D	E	F
1	Item	Units Sold				
2	Mouse	599				
3	Keyboard	455				
4	Speakers	674				
5	RAM	143				
6	UPS	455				
7	Headphones	367				
8	USB Wire	854				
9	PEN Drive	666				
10						

## Vlookup with data validation

Create a table of the following data:-

Product Number	Name Of Product	Rate Of Product
1	School Bag	400
2	Water Bottle	60
3	Lunch Box	120
4	Fullscape Notebook	15
5	Marker Pen	10

Create a new sheet containing the following titles product number, product name, and rate. Prepare a list of all the products and apply data validation "list" on the product name column in the new sheet.



Now you don't have to enter product name every time, just select it from the list and use with v lookup function.

## Exercise for Vlookup

Prepare a table of 10 records showing field products, quantity, price, and amount.

Show the full details of any 5 records using Vlookup function in new sheet.

Amount should be calculated automatically.

### Vlookup with approximate match:

**Exercise:-**

Create a table with the following criteria:

Criteria for commission	Sales Amount	Commission Paid
0<=2000	0	0
2000<=3000	2000	40
3000<=5000	3000	200
5000<=10000	5000	500
10000>=	10000	1400

Find the commission of the following sales

amount 1000, 2000, 5000, 4500, 2500, 1750,

4440, 2, 8.

## Hlookup in Excel

### HLOOKUP formula in Excel

**HLOOKUP** is a “**Horizontal lookup**” to search the value in the topmost rows. It is an Excel function, which helps the users to search and retrieve the data from the topmost row in an Excel worksheet. This function runs a bit differently than the other Excel functions.

In the name of HLOOKUP, “H” refers to **Horizontal**. It means that the searching and retrieve operations are performed horizontally on rows moving to the right. Hence, **HLOOKUP** is also known as **Horizontal LOOKUP**.

**Note:** Unlike the MATCH() function, it does not return the position of the matched item; it returns matched value.

HLOOKUP() is a sibling to the VLOOKUP() method. It looks for the value according to the topmost row within the defined range. Basically, it performs two (search and retrieve) operations on the heading of the Excel data.

#### Uses of HLOOKUP

Like the MATCH() function, HLOOKUP() also supports exact and approximate matches of data. Besides that, it also supports the wildcards (\*, ?) operators for the partial matching on Excel data.

The users can use these operators to perform partial matching on data. It looks for the data within the defined range and row.

#### Syntax and parameters

HLOOKUP function consists of four parameters, and here is the syntax for it:

`HLOOKUP(LOOKUP_value, table, row_index, [LOOKUP_range])`

Here, the first three parameters are mandatory and LOOKUP\_range is an optional one.

**Parameter list**

Parameter	Description
<b>LOOKUP_value</b>	It is the value specified to be searched in the first row of the table. You can pass the value as a string or cell reference.
<b>table</b>	It is the range of cells within which you want to search for data. E.g., A1:H10
<b>row_index</b>	Define the row number of your Excel table from which you want to retrieve data. E.g., 3 (row 3)
<b>[LOOKUP_range]</b>	<p>It is an optional parameter of the HLOOKUP function that contains a Boolean value (1, 0) to perform operation accordingly.</p> <ul style="list-style-type: none"> <li>◦ 1 for approximation match (default)</li> <li>◦ for the exact value match</li> </ul>

These parameter values of the HLOOKUP() are separated by comma.

**Return value**

1. The HLOOKUP() function returns the value to which the user is looking for.
2. If the value is not found within the specified detail, it returns a **#N/A error**.  
The **#N/A** refers to the **Value Not Available**

**Important points to be remembered**

Following are some essential points to be remembered while performing the HLOOKUP() function on your Excel data.

- HLOOKUP is a **case-insensitive** Hence, **Orange** and **ORANGE** both are the same for it.
- The first parameter (LOOKUP\_value) should contain a value from the topmost row. Or we can say that it must be one of heading of the table.
- HLOOKUP function support for wildcard characters (\*, ?) in the LOOKUP\_value parameter for the partial match of data.

## Errors generated by HLOOKUP() function

The HLOOKUP function generates an error if the specified value matches the criteria. These errors are -

1. #N/A error
2. #VALUE! error
3. #REF! error

### #N/A error

If the value is not found within the specified detail, it returns the **#N/A error**. The **#N/A** refers to the **Value Not Available** error.

### #VALUE! error

If the row\_index parameter consists of value less than 1, i.e.,  $\text{row\_index} < 1$ . LOOKUP() returns the **#Value! error**. The **#VALUE!** refers to the **Error in Value** error.

$\text{row\_index} < 1 = \#Value!$

For example, range\_index is 0 or less than 0.

### #REF! error

If the row\_index is greater than (>) the number of columns in table parameter, i.e.,  $\text{row\_index} > 1$ . LOOKUP() returns the **#REF! error**. The **#REF!** refers to the **Invalid Cell Reference Error** error.

$\text{row\_index} > \text{number of columns in table parameter} = \#Value!$

Remember that - HLOOKUP() will return only one value or error at a time.

An Example with formula

Let's understand with the help of syntax example.

**=HLOOKUP("Headphones",B1:G10,5,0)**

Here,

- o **Headphones** is the value of one of the columns heading we are looking for.
- o **B2:H9** is the range in your Excel worksheet within which we are looking for data.

- **5** is the row number in which the value will be searched.
- **0** is optional, but here specified for the exact match of data.

How to perform HLOOKUP() on your Excel worksheet?

HLOOKUP function executes differently than the other Excel functions. Let's consider an example to understand the working of the HLOOKUP() function.

We have some electronics sell data of 7 days (1 week) in an Excel worksheet. We will now use the HLOOKUP() function to find a particular electronic sell of a specific day. In this way, it will help us to find the data from the large dataset very easily.

	A	B	C	D	E	F	G	H
row_index		Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
1								
2	01-May-20	15	17	11	23	19	12	
3	02-May-20	8	24	18	14	21	26	
4	03-May-20	13	12	9	24	17	21	
5	04-May-20	25	15	12	17	11	18	
6	05-May-20	14	9	21	15	7	13	
7	06-May-20	27	13	19	22	13	7	
8	07-May-20	19	16	7	16	29	22	
9	table_range							
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sold Headphone							

See the steps below:

### Example 1

We will find the one-day sell of headphones. In this example, we look up the **day 3 sell of headphones**. For this, follow some easy steps for the HLOOKUP formula:

**Step 1:** Select a cell to store the outcome and write the HLOOKUP formula in such a way, as shown below:

=HLOOKUP("Headphones",B1:G8,4,0)

The screenshot shows a Microsoft Excel spreadsheet. The formula bar at the top contains the formula `=HLOOKUP("Headphones",B1:G8,4,0)`. A red arrow points from the text "HLOOKUP formula" in the title bar to the formula in the formula bar. The main table has columns labeled Powerbank, Pendrive, Airpads, Adapter, Headphones, and Speaker. Row 11 contains the formula `=G8,4,0` in cell D11, with a green box highlighting the range `:G8,4,0`.

	A	B	C	D	E	F	G	H
1		Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2	01-May-20		15	17	11	23	19	12
3	02-May-20		8	24	18	14	21	26
4	03-May-20		13	12	9	24	17	21
5	04-May-20		25	15	12	17	11	18
6	05-May-20		14	9	21	15	7	13
7	06-May-20		27	13	19	22	13	7
8	07-May-20		19	16	7	16	29	22
9								
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sold Headphone				:G8,4,0			

**Step 2:** Get the total number of headphones sold on 4<sup>th</sup> May by pressing the **Enter** key and see that it returned 11. It means that total 11 headphones have been sold on 3<sup>rd</sup> May.

The screenshot shows the same Excel spreadsheet after the formula was executed. Cell D11 now contains the value "17 Returned value". A red box highlights the cell D11, and another red box highlights the formula `:G8,4,0` in cell D11.

	A	B	C	D	E	F	G	H
1		Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2	01-May-20		15	17	11	23	19	12
3	02-May-20		8	24	18	14	21	26
4	03-May-20		13	12	9	24	17	21
5	04-May-20		25	15	12	17	11	18
6	05-May-20		14	9	21	15	7	13
7	06-May-20		27	13	19	22	13	7
8	07-May-20		19	16	7	16	29	22
9								
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sold Headphone				17 Returned value			

You can verify that the HLOOKUP formula is working properly or not by finding the data manually. See below how to verify this:

	A	B	C	D	E	F	G	H
1		Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2	01-May-20	15	17	11	23	19	12	
3	02-May-20	8	24	18	14	21	26	
4(Day 3)	03-May-20	13	12	9	24	17	21	
5	04-May-20	25	15	12	17	11	18	
6	05-May-20	14	9	21	15	7	13	
7	06-May-20	27	13	19	22	13	7	
8	07-May-20	19	16	7	16	29	22	
9								
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sold Headphone				17			

### Error Message Example

Following are three different examples for each error (#N/A, #REF, #VALUE) generated by the HLOOKUP(). These errors with their examples are described below.

#### Example 1: When exact match not found - #N/A error

As we already discussed with you that the HLOOKUP() function returns the **#N/A error** if the value is not found within the specified detail. The **#N/A** refers to the **Value Not Available** error.

See an example for it below:

**Step 1:** You can see that we are looking the **Headphone** inside the HLOOKUP() formula with an exact match (0) parameter value. But in the Excel table, the heading is **Headphones**, which is not the same.

	A	B	C	D	E	F	G	H
1		Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2	01-May-20	15	17	11	23	19	12	
3	02-May-20	8	24	18	14	21	26	
4	03-May-20	13	12	9	24	17	21	
5	04-May-20	25	15	12	17	11	18	
6	05-May-20	14	9	21	15	7	13	
7	06-May-20	27	13	19	22	13	7	
8	07-May-20	19	16	7	16	29	22	
9								
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sold Headphone				:G8,6,0]			

**Step 2:** Once you write the formula (=HLOOKUP("Headphone",B1:G8,6,0)) for the value whose exact match is not available and press the **Enter** key, you will get #N/A error.

	A	B	C	D	E	F	G	H
1		Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2	01-May-20	15	17	11	23	19	12	
3	02-May-20	8	24	18	14	21	26	
4	03-May-20	13	12	9	24	17	21	
5	04-May-20	25	15	12	17	11	18	
6	05-May-20	14	9	21	15	7	13	
7	06-May-20	27	13	19	22	13	7	
8	07-May-20	19	16	7	16	29	22	
9								
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sold Headphone			#N/A				

### Example 2: When row\_index > selected range (table) - #REF! error

The HLOOKUP() function returns the **#REF! error** if the row index parameter value is greater than the number of columns selected in the table parameter.

row\_index > number of columns selected in table parameter = #REF!

See an example for it below:

**Step 1:** You can see that we have selected a range for **table** parameter between **B1:G8** in HLOOKUP() formula, i.e., till Row 8. But we are looking for row\_index 9, which does not come within the defined range.

	A	B	C	HLOOKUP(lookup_value, table_array, row_index_num, [range_lookup])				
1		Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2	01-May-20	15	17	11	23	19	12	
3	02-May-20	8	24	18	14	21	26	
4	03-May-20	13	12	9	24	17	21	
5	04-May-20	25	15	12	17	11	18	
6	05-May-20	14	9	21	15	7	13	
7	06-May-20	27	13	19	22	13	7	
8	07-May-20	19	16	7	16	29	22	
9								
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sold Headphone			1:G8,9,0				
12								

**Step 2:** Once you write the formula (=HLOOKUP("Headphone",B1:G8,9,0)) where row\_index is higher than the selected range and press the **Enter** key, you will get **#REF!** error as showing below.

The screenshot shows an Excel spreadsheet with data from May 1st to May 7th. Row 11 is labeled "Day 1" through "Day 7". Cell D11 contains the formula =HLOOKUP("Headphone",B1:G8,9,0). The cell displays the error "#REF!". A red box highlights this cell.

	A	B	C	D	E	F	G	H
2	01-May-20	15	17	11	23	19	12	
3	02-May-20	8	24	18	14	21	26	
4	03-May-20	13	12	9	24	17	21	
5	04-May-20	25	15	12	17	11	18	
6	05-May-20	14	9	21	15	7	13	
7	06-May-20	27	13	19	22	13	7	
8	07-May-20	19	16	7	16	29	22	
9								
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sold Headphone			#REF!				
12								

### Example 3: When row\_index < 1 - #VALUE! error

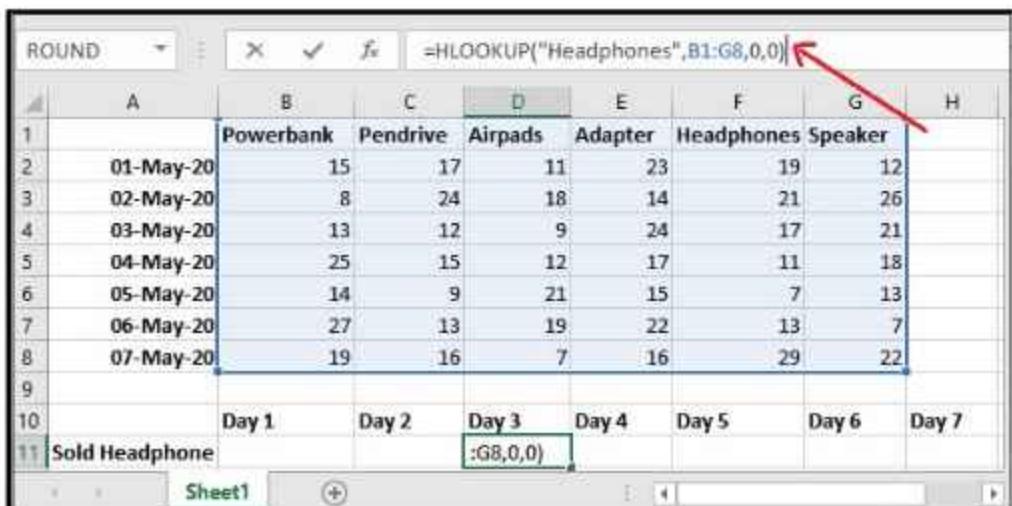
The HLOOKUP() function returns the **#VALUE! error** if the row index parameter value is less than the 1 in the targeted Excel worksheet.

row\_index < 1 = #VALUE!

The **#VALUE!** refers to the **Error in Value** error.

See an example for it below:

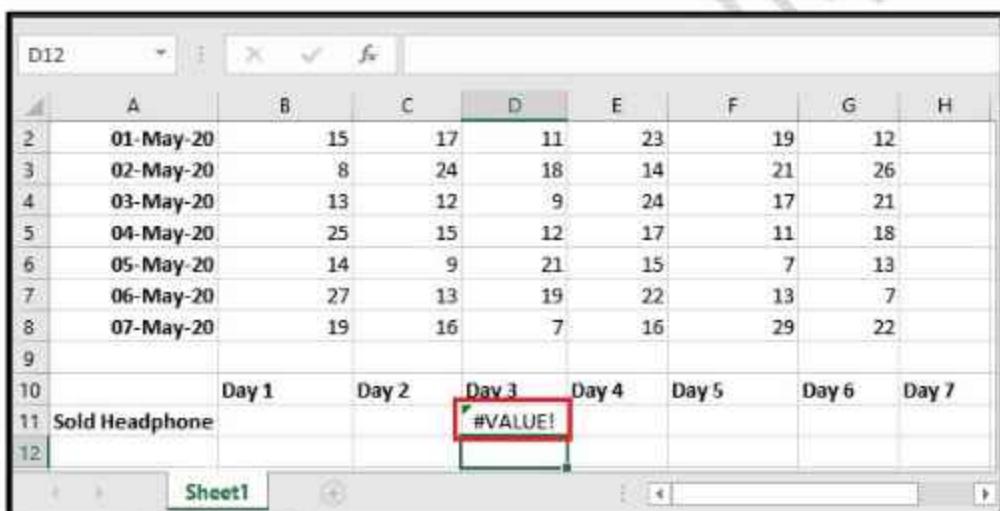
**Step 1:** You can see that we have selected a range for **table** parameter between **B1:G8** in the HLOOKUP() formula. But we are looking for **row\_index = 0**, which is less than 1, i.e., the row is not available in the Excel worksheet.



A screenshot of an Excel spreadsheet titled "ROUND". The formula bar at the top shows the formula `=HLOOKUP("Headphones",B1:G8,0,0)`. The main table below has columns labeled Powerbank, Pendrive, Airpads, Adapter, Headphones, and Speaker. Row 11 contains the text "Sold Headphone" and row 12 contains the formula `:G8,0,0)`. The cell D12 is highlighted with a green border.

A	B	C	D	E	F	G	H
1	Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2 01-May-20	15	17	11	23	19	12	
3 02-May-20	8	24	18	14	21	26	
4 03-May-20	13	12	9	24	17	21	
5 04-May-20	25	15	12	17	11	18	
6 05-May-20	14	9	21	15	7	13	
7 06-May-20	27	13	19	22	13	7	
8 07-May-20	19	16	7	16	29	22	
9							
10	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11 Sold Headphone			:G8,0,0)				

**Step 2:** Once you write the formula (`=HLOOKUP("Headphone",B1:G8,0,0)`) where row\_index is less than 1 and press the **Enter** key, you will get **#VALUE!** error as showing below.



A screenshot of an Excel spreadsheet titled "ROUND". The formula bar at the top shows the formula `=HLOOKUP("Headphones",B1:G8,0,0)`. The main table below has columns labeled Powerbank, Pendrive, Airpads, Adapter, Headphones, and Speaker. Row 11 contains the text "Sold Headphone" and row 12 contains the formula `:G8,0,0)`. The cell D12 is highlighted with a red border and displays the error message `#VALUE!`.

A	B	C	D	E	F	G	H
1	Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2 01-May-20	15	17	11	23	19	12	
3 02-May-20	8	24	18	14	21	26	
4 03-May-20	13	12	9	24	17	21	
5 04-May-20	25	15	12	17	11	18	
6 05-May-20	14	9	21	15	7	13	
7 06-May-20	27	13	19	22	13	7	
8 07-May-20	19	16	7	16	29	22	
9							
10	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11 Sold Headphone			:G8,0,0)				
12							

### Use of wildcards in HLOOKUP ()

HLOOKUP function can use wildcard operators. We will use the same Excel workbook in its example below -

**Step 1:** We will look for the sell of the fourth day for the product whose name starts with P. For this, use asterisk (\*) operator with the first parameter and copy the below formula:

`=HLOOKUP("P*",B1:G8,5,FALSE)`

	A	B	C	D	E	F	G	H
1		Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2	01-May-20	15	17	11	23	19	12	
3	02-May-20	8	24	18	14	21	26	
4	03-May-20	13	12	9	24	17	21	
5	04-May-20	25	15	12	17	11	18	
6	05-May-20	14	9	21	15	7	13	
7	06-May-20	27	13	19	22	13	7	
8	07-May-20	19	16	7	16	29	22	
9								
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sell P*					,FALSE]		

We used **FALSE** in the 4<sup>th</sup> parameter for the exact match.

**Step 2:** Now, by pressing the **Enter** button, get the 4<sup>th</sup> day sell of a product whose name starts with P.

	A	B	C	D	E	F	G	H
1		Powerbank	Pendrive	Airpads	Adapter	Headphones	Speaker	
2	01-May-20	15	17	11	23	19	12	
3	02-May-20	8	24	18	14	21	26	
4	03-May-20	13	12	9	24	17	21	
5	4th day 04-May-20	25	15	12	17	11	18	
6	05-May-20	14	9	21	15	7	13	
7	06-May-20	27	13	19	22	13	7	
8	07-May-20	19	16	7	16	29	22	
9								
10		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
11	Sell P*					25	Returned Value	

It returned the value of the fourth day when it finds the first product, whose name starts with P. See the above result.

Similarly, you can use another wildcard operator in it.

## Index & Match function

What is the INDEX function in Excel?

The use of the INDEX function is mainly seen in advanced Excel formulas. In particular, the INDEX function helps us retrieve the value at a specified location in a range. In other words, the INDEX function typically returns the content of a cell at the intersection of a row and column that we specify. However, it is essential to note that the function only returns a specific value in a one-dimensional range.

### Syntax of INDEX Function

The syntax of the INDEX function is defined as below:

1. =INDEX(reference, [row], [column])

Where reference, row, and column are the respective parameters or arguments of the INDEX function.

### Parameters/ Arguments

- **reference:** It is a compulsory parameter used to specify the array of cells that need to be offset into. A reference can be specified as a single range or an entire dataset within a specific table.
- **row:** It is an optional parameter used to specify the number of offset rows. Using this parameter, we specify the vertical distance at which we want to extract the values in the specified range. Suppose we enter the reference range as 'A1:A6'. In that case, we will have to use 1 for A1, 2 for A2, etc. If we enter row as 5, the function will extract from A5. If we do not specify any value for a row, the function will extract all the rows specified in the reference range, i.e., A1 to A6.
- **column:** It is another optional parameter used to specify the number of offset columns. Using this parameter, we specify the horizontal distance at which we want to extract the values in the specified range. Suppose we enter the reference range as 'A1:B6'. In that case, for A1, the row and column both will be 1. However, for B1, the row will be 1, but the column will be 2. If we enter row as 5 and column as 2, the function will extract the value from B5. If we do not specify any value for a column, the function will extract all the columns specified in the reference range.

**Note:** If we do not specify both the row and column, the INDEX function will extract the entire reference range supplied within it.

### Examples

Let us understand INDEX function applications with the help of examples for various use-cases. Consider the following excel sheet as an example dataset for all the cases of the INDEX function. In our example sheet, the first cell starts from cell B2 (Item) and ends at the last diagonal cell F9 (1797).

B	C	D	E	F	G	H	Result
Item	Category	Cost	Quantity	Total Cost			
Mouse	Peripheral	399	8	3192			
Keyboard	Peripheral	699	6	4194			
Noodles	Food	50	12	600			
Biscuit	Food	50	15	750			
T-shirt	Clothes	899	5	4495			
Mobile	Electronics	5999	9	53991			
Hammer	Tool	599	3	1797			

### Case 1: When rows and columns are not specified

When inserting an INDEX function in cell G2 in our example sheet, the INDEX function returns the following result if we do not specify the optional parameters rows and columns, i.e., =INDEX(B2:C9):

					Result	
Item	Category	Cost	Quantity	Total Cost	Item	Category
Mouse	Peripheral	399	8	3192	Mouse	Peripheral
Keyboard	Peripheral	699	6	4194	Keyboard	Peripheral
Noodles	Food	50	12	600	Noodles	Food
Biscuit	Food	50	15	750	Biscuit	Food
T-shirt	Clothes	899	5	4495	T-shirt	Clothes
Mobile	Electronics	5999	9	53991	Mobile	Electronics
Hammer	Tool	599	3	1797	Hammer	Tool

### Case 2: When a reference range and rows are specified

If we only specify a row along with the reference range but not the column in the INDEX function, we get the following results:

Result					
Item	Category	Cost	Quantity	Total Cost	
Mouse	Peripheral	399	8	3192	Mouse
Keyboard	Peripheral	699	6	4194	Peripheral
Noodles	Food	50	12	600	
Biscuit	Food	50	15	750	
T-shirt	Clothes	899	5	4495	
Mobile	Electronics	5999	9	53991	
Hammer	Tool	599	3	1797	

### Case 3: When a reference range and columns are specified

If we only specify a column along with the reference range but not the row in the INDEX function, we get the following results:

Result					
Item	Category	Cost	Quantity	Total Cost	Category
Mouse	Peripheral	399	8	3192	Peripheral
Keyboard	Peripheral	699	6	4194	Peripheral
Noodles	Food	50	12	600	Food
Biscuit	Food	50	15	750	Food
T-shirt	Clothes	899	5	4495	Clothes
Mobile	Electronics	5999	9	53991	Electronics
Hammer	Tool	599	3	1797	Tool

### Case 4: When all parameters are specified

If we specify all the parameters like row, column, and the reference range in the INDEX function, we get the following results:

Result					
Item	Category	Cost	Quantity	Total Cost	
Mouse	Peripheral	399	8	3192	Food
Keyboard	Peripheral	699	6	4194	
Noodles	Food	50	12	600	
Biscuit	Food	50	15	750	
T-shirt	Clothes	899	5	4495	
Mobile	Electronics	5999	9	53991	
Hammer	Tool	599	3	1797	

The limitation with the INDEX function is that the function requires row and column values to locate any specific data from the reference table.

That means, if we use the INDEX function to deal with the ML dataset of 10,000 or more rows and columns, it will be very difficult for us to specify any specific row and/or column value in the INDEX function. It is where we will need to use the MATCH

function that allows us to identify rows and columns based on certain rules or conditions.

## What is the MATCH function in Excel?

Like the INDEX function, the application of the MATCH function is also mostly seen in advanced Excel functions. In particular, the MATCH function helps us retrieve the position of an item/ value at a specified location in a range. In other words, the function helps us find the lookup value position in the given array.

The MATCH function is considered a less refined form of Excel's VLOOKUP or HLOOKUP functions and only returns the location information without copying or extracting the actual data. It is case-insensitive and irrespective of the position of the range, be it vertical or horizontal.

### Syntax of MATCH Function

The syntax of the MATCH function is defined as below:

1. =MATCH(search\_key, range, [search\_type])

Where the search\_key, range, and search\_type are the respective parameters or arguments of the MATCH function.

### Parameters/ Arguments

- **search\_key:** It is a required parameter for the MATCH function to specify the value to look for. For example, any specific name (Akash), item (Mouse), number (907), ID (JTP-001), etc.
- **range:** It is another required parameter for the MATCH function to specify the one-dimensional array we want to look for. It can be represented in either a single row or a single column. For example, A1:D1, A1:A9, C1:C10, etc.
- **search\_type:** It is the search method that can be supplied in the MATCH function. It is an optional parameter. It typically uses the following three values: 1, 0, -1.
  - **When search\_type = 1:** It is the default search value used by the MATCH function if we don't supply the desired one. In this case, the function finds the largest value less than or equal to search\_key when the defined range is sorted as ascending. It usually accepts a near-match, rounded down to the next available value.

- When **search\_type = 0**: In this case, the function finds the exact value while the defined range is sorted in ascending or descending order. If the function finds no exact match, it returns an error.
- When **search\_type=-1**: In this case, the function finds the smallest value greater than or equal to **search\_key** when the defined range is sorted as descending. It usually accepts a near-match, rounded up to the next available value.

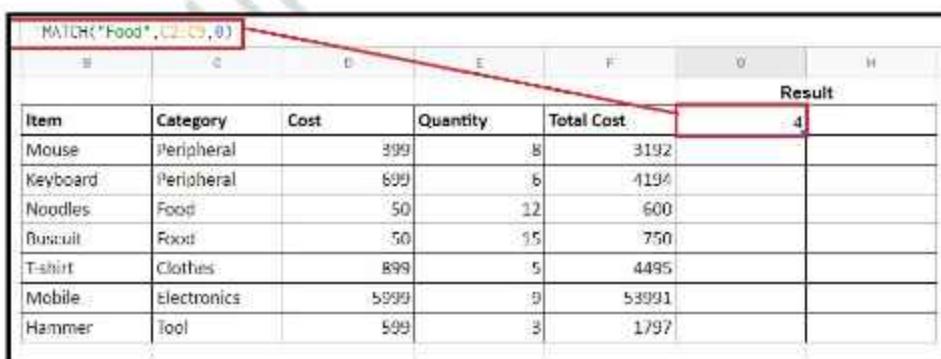
### Examples

Let us understand MATCH function applications with the help of examples for various use-cases. Now, let's again consider the same sheet as an example data for all the cases of the MATCH function.

B	C	D	E	F	G	H
Result						
Item	Category	Cost	Quantity	Total Cost		
Mouse	Peripheral	399	8	3192		
Keyboard	Peripheral	699	6	4194		
Noodles	Food	50	12	600		
Buscuit	Food	50	15	750		
T-shirt	Clothes	899	5	4495		
Mobile	Electronics	5999	9	53991		
Hammer	Tool	599	3	1797		

### Case 1: When search type is zero (0), which means Exact Match

When inserting a MATCH function in cell G2 in our example sheet, the function returns the following result if we specify the optional parameter **search\_type** as 0 (Exact Match), i.e., **=MATCH("Tool",C2:C9,0)**:



B	C	D	E	F	G	H
Result						
Item	Category	Cost	Quantity	Total Cost		
Mouse	Peripheral	399	8	3192		
Keyboard	Peripheral	699	6	4194		
Noodles	Food	50	12	600		
Buscuit	Food	50	15	750		
T-shirt	Clothes	899	5	4495		
Mobile	Electronics	5999	9	53991		
Hammer	Tool	599	3	1797		

### Case 2: When search type is one (1), or Default

If we specify the search\_type as 1, which is the default parameter value, we get the following results:

Item	Category	Cost	Quantity	Total Cost	Result
Mouse	Peripheral	399	8	3192	
Keyboard	Peripheral	699	6	4194	
Noodles	Food	50	12	600	
Biscuit	Food	50	15	750	
T-shirt	Clothes	899	5	4495	
Mobile	Electronics	5999	9	53991	
Hammer	Tool	599	3	1797	

It is essential to note that the result will be the same if we don't specify anything for the search\_type parameter. The reason for the same value is that the MATCH function automatically considers it as 1 by default.

### Case 3: When the search type is a negative one (-1)

If we specify the search\_type as -1, we get the following result:

Item	Category	Cost	Quantity	Total Cost	Result
Mouse	Peripheral	399	8	3192	
Keyboard	Peripheral	699	6	4194	
Noodles	Food	50	12	600	
Biscuit	Food	50	15	750	
T-shirt	Clothes	899	5	4495	
Mobile	Electronics	5999	9	53991	
Hammer	Tool	599	3	1797	

We typically use the exact match in most cases, so we specify the search\_type as 0. We usually find the row/ column number with the help of the MATCH function and then use the values within the INDEX function. That way, if the INDEX function finds the information (or value) regarding the supplied row/column number, the corresponding information is extracted in the resultant cell.

### Combining INDEX and MATCH functions together

We have already learned the basics of INDEX and MATCH functions. However, it is more beneficial if we use both functions together by combining them within a single formula. When both the functions are combined together, they become the most popular Excel tool to perform advanced lookups. Because of its usefulness, many users even choose to use INDEX and MATCH functions combined instead of using the VLOOKUP.

Combining the INDEX and MATCH functions typically enables us to look at a range of data and extract the desired value at the intersection of a specific row and column. Nesting these two functions is so flexible and efficient that we can perform **vertical and horizontal lookups, left lookups, two-way lookups, case-sensitive lookups, closest match, and even lookups as per custom-defined rules or conditions.**

Excel's VLOOKUP function can only search for a value in the first column (left-most column) of data to provide the specific adjacent value. However, we can utilize the INDEX and MATCH functions together to navigate any column and retrieve a value in any row.

### Syntax

The syntax of the INDEX and MATCH functions combined can be defined as below:

- =INDEX(Reference Table , [Match(SearchKey,Range,Type)/StaticRowPosition], [Match(SearchKey,Range,Type)/StaticColumnPosition])

### Examples

Let us consider the same example sheet again and apply the combined formula on the INDEX and MATCH functions to find the desired value.

B	C	D	E	F
Item	Category	Cost	Quantity	Total Cost
Mouse	Peripheral	399	8	3192
Keyboard	Peripheral	699	6	4194
Noodles	Food	50	12	600
Buscuit	Food	50	15	750
T-shirt	Clothes	899	5	4495
Mobile	Electronics	5999	9	53991
Hammer	Tool	599	3	1797

Suppose we want to find the cost of the Keyboard. It is visible that the costs of all the items are recorded in column D (which is column 3 in our range B2:F9).

If there is a large data set, the position of a row will not be known. So, let's consider that the position of the row for the Keyboard is not known. In that case, we apply the combination formula of INDEX and MATCH in the following two steps:

- First, we need to find the position of the item Keyboard by using the MATCH function in the following way:  
**=MATCH("Keyboard",B2:B9,0)**

Here, the range B2:B9 represents the column that contains a list of items, and

the search type is set as 0 to find the exact match. This way, we find the exact row number or position of the item Keyboard.

- Next, we need to find the cost of the item Keyboard. For this, we need to apply the INDEX function for the entire range and combine the MATCH function query within the INDEX function. The column number where costs are recorded is already known. Therefore, we apply the combined formula in a cell (I3) where we want to calculate the cost of the Keyboard in the following way:

**=INDEX(B2:F9, MATCH("Keyboard", B2:B9, 0), 3)**

The screenshot shows a Microsoft Excel spreadsheet. The formula bar at the top contains the formula `=INDEX(B2:F9, MATCH("Keyboard", B2:B9, 0), 3)`. The main table below has columns for Item, Category, Cost, Quantity, and Total Cost. A secondary table on the right shows Item and Cost. The cell containing the formula (I3) has a red border. The cell in the secondary table corresponding to the Keyboard item also has a red border.

I	J	K	L	M	N	O	P	Q
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

Item	Category	Cost	Quantity	Total Cost	Item	Keyboard
					Cost	
Mouse	Peripheral	399	8	3192		
Keyboard	Peripheral	699	6	4194		
Noodles	Food	50	12	600		
Biscuit	Food	50	15	750		
T-shirt	Clothes	899	5	4495		
Mobile	Electronics	5999	9	53991		
Hammer	Tool	599	3	1797		

Let us explore other examples of the INDEX and MATCH function together in different cases:

### Two Way Lookup using INDEX and MATCH

In the previous example, the position of the column with costs was known. So, the process was not fully dynamic. Let us consider that we don't know the column position, and we need to find the cost of the item Keyboard.

In that case, we have to use Two-Way Lookup using the INDEX and MATCH functions. When we find both the row and column values using the MATCH function (without supplying any static value) and supply it in the INDEX function to obtain a specific result, it is termed Two-Way Lookup.

In our example, we have first to apply the MATCH formula in the following way:

**=MATCH("Cost", B2:F2, 0)**

The above formula will find the column number of costs. Here, B2:F2 represents headers.

Now, we supply the above formula in the INDEX function, making it a two-way lookup in the following way:

=INDEX(B2:F9,MATCH("Keyboard",B2:B9,0),MATCH("Cost",B2:F2,0))

	A	B	C	D	E	F	G	H	I
1									
2		Item	Category	Cost	Quantity	Total Cost		Item	Keyboard
3		Mouse	Peripheral	399	8	3192			
4		Keyboard	Peripheral	699	6	4194			
5		Noodles	Food	50	12	600			
6		Buscuit	Food	50	15	750			
7		T-shirt	Clothes	899	5	4495			
8		Mobile	Electronics	5999	9	53991			
9		Hammer	Tool	599	3	1797			
10									

### Left Lookup using INDEX and MATCH

Performing a 'left lookup' is one of the primary advantages of the INDEX and MATCH functions, which is not possible using the VLOOKUP. It is the ability to extract the position of a row for the desired item from the right and find the respective value from the left.

In simple terms, suppose we want to find an item to purchase that costs us 699 Rs. In our example data, we can see that we refer to a Keyboard. Here, the cost is known, and the item name must be found.

	A	B	C	D	E	F	G	H	I
1									
2		Item	Category	Cost	Quantity	Total Cost		Item	???
3		Mouse	Peripheral	399	8	3192			
4		Keyboard	Peripheral	699	6	4194			
5		Noodles	Food	50	12	600			
6		Buscuit	Food	50	15	750			
7		T-shirt	Clothes	899	5	4495			
8		Mobile	Electronics	5999	9	53991			
9		Hammer	Tool	599	3	1797			
10									
11									

Since the cost column is placed on the right side of the item column, finding the desired result (item name) is not possible using the VLOOKUP. Let us now find the item name that costs 699 by using the INDEX-MATCH function:

- First, we need to apply the following formula to extract the row position that consists of our desired cost value (i.e., 699):  
**=MATCH(699,D2:D9,0)**

Where D2:D9 represents the range in a cost column where the formula will look for the desired cost.

- Once the row number is located, we need to apply the INDEX function in a resultant cell (I2) to extract the respective item name. Thus, we combine the MATCH formula within the INDEX function in the following way:

**=INDEX(B2:B9,MATCH(699,D2:D9,0))**

Where B2:B9 represents the range in an item column where the formula will look for the respective item (i.e., Keyboard).

2									
3									
4									
5									
6									
7									
8									
9									
10									

2									
3									
4									
5									
6									
7									
8									
9									
10									

### Case-Sensitive Lookup using INDEX and MATCH

By default, Excel's MATCH function is case-insensitive. It means when we use the MATCH function to get the row position of an item Keyboard but supply the term as 'KEYBOARD', 'keyboard' or 'KeyBoard', the function will return the same results.

Therefore, we must utilize the EXACT function when using the MATCH function in the combination of the INDEX function to perform the case-sensitive lookup, respecting the upper and lower cases.

The EXACT function is typically used to compare two different strings, considering their match cases (upper and lower character cases), and returns TRUE if they are the same exactly. If they don't exactly match, the EXACT function returns FALSE. That's because the EXACT function is case-sensitive.

Suppose we want to find the category of our desired item 'Keyboard' but in a strictly Case-sensitive way.

2									
3									
4									
5									
6									
7									
8									
9									
10									

We can use the following combination of INDEX-MATCH and EXACT function:

**=INDEX(C2:C9,MATCH(TRUE,EXACT("Keyboard", B2:B9) ,0))**

In the above formula, the MATCH function returns TRUE only if it finds the exact value 'Keyboard' in the defined range B2:B9; otherwise, it returns FALSE. After that, the MATCH function will search in a range B2:B9 and find the row position of the value that returns TRUE. Lastly, the INDEX function will extract the respective value (item name) in a range C2:C9 at the located row of the MATCH function. That is how the INDEX-MATCH lookup works in a case-sensitive way.

	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

Item	Category	Cost	Quantity	Total Cost	Item	Category
Mouse	Peripheral	300	8	2400		
Keyboard	Peripheral	699	6	4194		
Noodles	Food	50	12	600		
Biscuit	Food	50	15	750		
T-shirt	Clothes	899	5	4495		
Mobile	Electronics	5999	9	53991		
Hammer	Tool	599	3	1797		

Apart from this, we try to find the category of an item 'Keyboard' using the upper case characters (KEYBOARD); the formula will return #N/A! error because no TRUE value will be found in the MATCH function evaluation.

### Multiple Criteria Lookup using INDEX and MATCH

It is a bit tricky to perform a lookup using multiple criteria in Excel. In such cases, we have to lookup for values that get matched on multiple columns simultaneously. We can utilize the INDEX-MATCH function in combination with the Boolean logic to find matches on more than one column simultaneously.

Suppose we want to find out the total cost of an Item 'Keyboard' where its individual cost is '699' and the total number of quantities is '6'. So, we have to perform a Match for three different criteria, such as an item, individual cost, and quantity. We can do this using the steps below:

- First, we need to match an Item column (B2:B9) with 'Keyboard' using the below condition:

**"Keyboard"=B2:B9**

This way, we convert the range B2:B9 (i.e., our Item column) values into Boolean. That returns TRUE when an item is 'Keyboard', otherwise FALSE.

- Similarly, we need to match the Cost criteria using the below condition:

**699=D2:D9**

This way, we convert the range D2:D9 (i.e., our Cost column) values into Boolean. That returns TRUE when the cost is 699; otherwise, FALSE.

- Next, we need to match the third criteria, 'Quantity', using the below condition:

**6=E2:E9**

This way, we convert the range E2:E9 (which represents the quantities) values into Boolean. It returns TRUE when the quantity will be 6; otherwise, FALSE.

- After that, we have to multiply the results of all three criteria. It will be the intersection of all desired conditions and transform Boolean TRUE and False into 1 and 0.
- After converting the Boolean TRUE/FALSE into 1/0, the resultant value will be a column with either 0 or 1. Now, we need to apply the MATCH function to locate the row position of the respective columns containing values as 1. If the column has a value of 1, it satisfies the first, second, and third criteria of our example data.
- Once we extract the row position, we supply it in the INDEX function to find the total cost of the corresponding row in the following way:

**=INDEX(F2:F9,MATCH(1,("Keyboard"=B2:B9)\*(699=D2:D9)\*(6=E2:E9),0))**

Where a range F2:F9 represents the column consisting of the total costs of items.

Item	Category	Cost	Quantity	Total Cost	Item	Keyboard
Mouse	Peripheral	399	8	3192	Cost	699
Keyboard	Peripheral	699	6	4194	Quantity	6
Noodles	Food	50	12	600	Total Cost	4194
Biscuit	Food	50	15	750		
T-shirt	Clothes	899	5	4495		
Mobile	Electronics	5999	5	59995		
Hammer	Tool	599	3	1797		

### Advantages of INDEX-MATCH over VLOOKUP

- INDEX-MATCH is faster and easier to use.
- INDEX-MATCH can work for vertical as well as horizontal ranges.
- INDEX-MATCH can work for both left and right lookups.
- INDEX-MATCH can work with ascending and descending both the data arrangements.

- INDEX-MATCH is independent of the actual position of the column.

## Vlookup with match Function

- You had already studied in previous topic that what a match function can do, so now we are using v lookup along with match function in this topic.
- First of all create the following table.

Products	code	qty	price
pc		1	100
lappy		2	120
tv		3	150
mobile		4	35000

- This will be very useful when we have to find the data using the titles or the titles is changing You can use the following formula to use match function along with Vlookup

The screenshot shows an Excel spreadsheet with the following data:

Products	code	qty	price
pc		1	100
lappy		2	120
tv		3	150
mobile		4	35000

In cell B8, the formula is displayed as =VLOOKUP(\$A\$8,\$A\$2:\$D\$5,MATCH(B7,\$A\$1:\$D\$1,0),0). The cell B7 contains the value "mobile". The formula uses the MATCH function to find the index of "mobile" in the first column of the table range (\$A\$2:\$D\$5). The VLOOKUP then returns the value from the fourth column of the row where the match was found.

## Date and time functions

### 1. The now() Function:-

If you want the current date and time together than use now() function.

The date and time will change automatically as it was connected to system date and time

### 2. The day() function:-

If you want to know the day from the whole date, then it will become very useful. for eg. Date is 02/02/2018. It is confusing which is month and which is day so write simply =day(cell number) and you will get the answer.

### 3. The month() function:-

Similarly, if you want to know the month from the date, then it is useful for e.g. Date is 04/03/2018. To find out the month write =month(cell number) and you will get the answer.

### 4. The year() function:-

Similarly, if you want to know the year from the date, then it is useful for e.g. Date is 04/03/2018. To find out the year write =year(cell number) and you will get the answer.

In case, you want to combine the day, month, and year from the different data cells then use date function as studied earlier.

### 5. Add/Sub day:-

You had already studied today function in the previous topic. In this topic you will see how we can add or subtract days from the any date, if you want to add 5 days to the today's date/any date or want to subtract 5 days from the today's/any date. Here how you can use it.

First of all write date in the cell as seen below:



Use add function in the next cell i.e. write =b1+5(no. of days you want to add), that's it you will get the result.

Similarly, write =b1-5(no. of days you want to subtract) for using subtract function.

#### 6. Add/Sub Month:-

You had seen in the previous example how you can add or subtract day from the date, but if you want to add or subtract month from the date then it will not work.

So, to add or subtract month from the date use function EDATE in the excel sheet.

#### **For addition of month:**

Type =edate(date,+5(no.of months you want

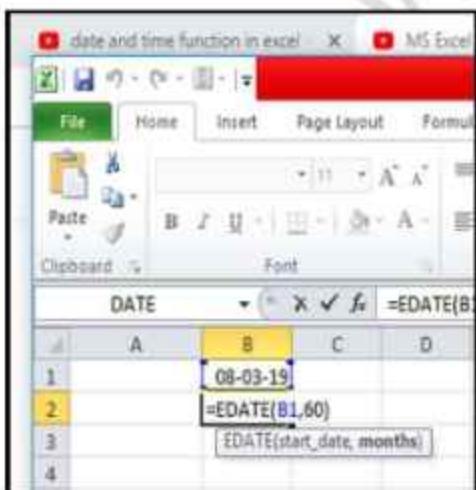
#### **to add)) For subtraction of month:**

Type =edate(date,-5(no.of months you want to subtract))

#### 7. Add/sub year:-

To add/subtract year from the date use the same edate function, just simply convert the year into month for e.g. 5 years=60months.

#### **You can see it in the below example:**



### 8. Net working days:-

Suppose you work in a company and in the company sat and sun will be given off(leave), so you want to calculate how many days you had been working in the company.

For example:

Start date: 1/1/2016

End date: 31/12/2016

As you all know there are 52 weeks in a year and in this 52 weeks there are total 104 sat's and sun's. So if we calculate then the net working days will be 261 days, but sometimes it might be possible that the first day or the last day is sat or sun.

Here you can use the function

```
=networkdays(start_date,end_date,[holidays])
```

E.g. =networkdays(b2,b3).

In the above function holidays is in the square bracket that means it is optional.

In the above case we have seen that the no. of working days excluding sat and Sundays, but suppose you have a list of holidays in the particular year than it will be calculated in this way.

Holidays:

15/8/16-Independence Day

2/10/16-Gandhi jayanti

Here you can use the function:

```
=networkdays(start_date,end_date,[holidays])
```

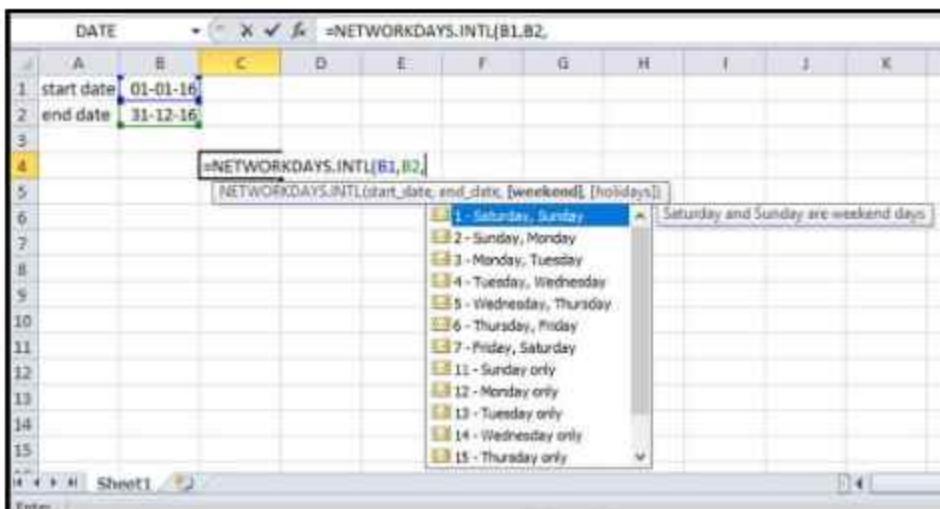
E.g. =networkdays(b2,b3,d11:d12{here I will not write the number of holidays i.e.2 in this example, because either of them will fall on sat and sun so the excel will automatically for that drag the cell number into the function.}).

### 9. Network.intl:-

In the above case we have seen that the company has sat and sun off in the week but in other countries or cities there might be Monday off or any other day off so how we calculate that?

So use the function:

=networkdays.intl(start\_date,end\_date,[weekend],[holidays])



As you have seen in the above image we can see that as we apply the function the excel will show the list of the days for which there can be off in any country. We have to select the day from it and for holiday it will be same as above case (i.e. drag and drop).

### 10. Date difference function:-

Suppose, you want to calculate your exact age how many years, how many months, how many days old are you, so this way we can calculate using datedif function.

Start date: 30/3/1988

End date: 14/7/2016

	DATE	
1	start date	30-03-88
2	end date	14-07-16
3		
4		
5	total year	=datedif()
6	total month	DATEDIF()
7	total days	
8		
9		
10		
11		
12		
13		
14		
15		

Function is =datedif(start\_date,end\_date/m/d), as you will see it will not show you the hints as other functions do because it is a hidden function in the excel.

For years: =datedif(b1,b2,"y").

	DATE	
1	start date	30-03-88
2	end date	14-07-16
3		
4		
5	total year	=datedif(B1,B2,"y")
6	total months	
7	total days	
8		
9		

The output will be 28 years.

For months: =datedif(b1,b2,"M").

	A	B	C	D	E	F	G
1	start date	30-03-88					
2	end date	14-07-16					
3							
4							
5	total year	28					
6	total mon	=datedif(B1,B2,"m")					
7	total days						
8							
9							
10							
11							
12							
13							
14							
15							

The output will be 339 Months.

For days: =datedif(b1,b2,"D").

	A	B	C	D	E	F	G	H	I
1	start date	30-03-88							
2	end date	14-07-16							
3									
4									
5	total year	28							
6	total mon	339							
7	total days	=datedif(B1,B2,"D")							
8									
9									
10									
11									
12									
13									
14									
15									

The output will be 10333 Days.

In case if I want the data in the format i.e. 28 years, 4 months, and 4 days old. For this format we have to do in this way.

a) For years: =datedif(b1,b2,"y").

The screenshot shows an Excel spreadsheet with the following data:

	DATE	Formula
1. start date	30-03-88	=datedif(B1,B2,"y")
2. end date	14-07-16	
3.		
4.		
5. total year	28	
6. total month	339	
7. total days	10333	
8.		
9. years	28	=datedif(B1,B2,"y")
10. months		
11. days		
12.		
13.		
14.		

Here the function will be the same as the above. The output will be 28 years.

b) For months: =datedif(b1,b2,"YM").

The screenshot shows an Excel spreadsheet with the following data:

	DATE	Formula
1. date of birth	30-03-88	=datedif(B1,B2,"YM")
2. today date	14-07-16	
3.		
4.		
5. total years	28	
6. total months	339	
7. total days	10333	
8.		
9. years	28	
10. months	3	=datedif(B1,B2,"YM")
11. days		
12.		
13.		
14.		
15.		

The output will be 3 months. Now understand the meaning of YM it will divide the difference between the date with years and whatever months will be remainder that will be shown.

In the above case the person is 28years and 3 months old.

c) **For days:**

=datedif(b1,b2,"MD").

DATE								
A	B	C	D	E	F	G	H	I
1 date of birth	30-03-88							
2 today date	14-07-16							
3								
5 total years	28							
6 total months	339							
7 total days	10333							
8								
9 years	28							
10 months	3							
11 days	=datedif(B1,B2,"md")							
12								

In this case the output is 14 days. The MD means it will divide the difference with the month and show the remaining in the days.

So the person is now 28years, 3months and 14 days old.

### Exercise for Date & time function

- Find out the current date and time.
- Find out the day, month, and year of the date 13/3/19.
- Find out the date of 10days before & 10 days after from the date 13/3/19.
- Find the date of 5 months before and after from 1/8/19.
- Calculate the net working days between the period 1/4/18 to 31/3/19.
- Calculate the net working days between the period 1/4/18 to 31/3/19, including 4 holidays i.e. on 5/4/18, 12/8/18, 15/9/18, 23/10/18 .
- Find the net working days for the company where there is off on Friday and Saturday and no other holidays between the period 1/1/18 to 31/12/19.
- Find out the current age of the person who is born on 1/9/1967 in years.
- Find out the current age of the person who is born on 1/9/1967 in months.
- Find out the current age of the person who is born on 1/9/1967 in days.
- Find out how many years, month, and days old he is if he had born on 1/11/1987.

## Logical Functions in excel

### AND Function in excel

Syntax of the AND Function

The syntax is stated as follows:

=AND(  
    AND(logical1, [logical2], ...)

The function accepts the following arguments:

- **Logical 1:** This is the first condition or logical value to evaluate.
- **Logical 2:** This is the second condition or logical value to evaluate.

The "logical 1" is a mandatory argument and "logical 2" is an optional argument.

### The Characteristics of AND Function

- It returns "true" if all conditions or logical values evaluate to true.
- It returns "false" if any of the conditions or logical values evaluates to false.
- It can have more logical values depending on the situation and the requirement.
- It treats the value zero as "false" and all non-zero values as "true" while evaluating numbers.
- It ignores empty cells provided as an argument.
- It is often used in combination with other **Excel functions** like IF, OR, and so on.

### The Output of AND Function

The output in different situations is given as follows:

Formula	Output
=AND(TRUE,TRUE)	TRUE
=AND(TRUE,FALSE)	FALSE
=AND(FALSE,FALSE)	FALSE
=AND(FALSE,TRUE)	FALSE

The output while evaluating numbers is given as follows:

Formula	Output
=AND(1)	TRUE
=AND(0)	FALSE
=AND(5)	FALSE

**Example #1-AND Function**

There are three levels and ten players in a game. To be a winner, a player has to clear all three levels. The player loses if he/she fails in any of the three levels.

The performance of the players in different levels is given in the following table. We are required to determine the winner.

A	B	C	D	E
Player Name	Level 1 Clears?	Level 2 Clears?	Level 3 Clears?	Is Player Winner?
Player 1	Yes	Yes	No	?
Player 2	Yes	Yes	Yes	?
Player 3	Yes	Yes	No	?
Player 4	Yes	Yes	No	?
Player 5	No	Yes	Yes	?
Player 6	Yes	No	No	?
Player 7	No	Yes	Yes	?
Player 8	No	Yes	No	?
Player 9	Yes	Yes	No	?
Player 10	Yes	Yes	Yes	?

We apply AND formula in column E.

A	B	C	D	E	
4	Player Name	Level 1 Clears?	Level 2 Clears?	Level 3 Clears?	Is Player Winner?
5	Player 1	Yes	Yes	No	=AND(B6="yes",C6="yes",D6="yes")
6	Player 2	Yes	Yes	Yes	=AND(B7="yes",C7="yes",D7="yes")
7	Player 3	Yes	Yes	No	=AND(B8="yes",C8="yes",D8="yes")
8	Player 4	Yes	Yes	No	=AND(B9="yes",C9="yes",D9="yes")
9	Player 5	No	Yes	Yes	=AND(B10="yes",C10="yes",D10="yes")
10	Player 6	Yes	No	No	=AND(B11="yes",C11="yes",D11="yes")
11	Player 7	No	Yes	Yes	=AND(B12="yes",C12="yes",D12="yes")
12	Player 8	No	Yes	No	=AND(B13="yes",C13="yes",D13="yes")
13	Player 9	Yes	Yes	No	=AND(B14="yes",C14="yes",D14="yes")
14	Player 10	Yes	Yes	Yes	=AND(B15="yes",C15="yes",D15="yes")

The output of the formula appears in column E.

	A	B	C	D	E
?	Player Name	Level 1 Clears?	Level 2 Clears?	Level 3 Clears?	Is Player Winner?
4	Player 1	Yes	Yes	No	FALSE
5	Player 2	Yes	Yes	Yes	TRUE
6	Player 3	Yes	Yes	No	FALSE
7	Player 4	Yes	Yes	No	FALSE
8	Player 5	No	Yes	Yes	FALSE
9	Player 6	Yes	No	No	FALSE
10	Player 7	No	Yes	Yes	FALSE
11	Player 8	No	Yes	No	FALSE
12	Player 9	Yes	Yes	No	FALSE
13	Player 10	Yes	Yes	Yes	TRUE

Player 2 and player 10 have cleared all the levels. Since all the logical conditions for these two players are met, the AND function gives the output "true."

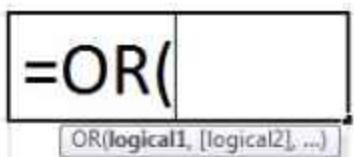
The rest of the players were unable to clear all three levels. If any of the levels is not cleared, the AND function returns "false."

	A	B	C	D	E
?	Player Name	Level 1 Clears?	Level 2 Clears?	Level 3 Clears?	Is Player Winner?
4	Player 1	Yes	Yes	No	FALSE
5	Player 2	Yes	Yes	Yes	TRUE
6	Player 3	Yes	Yes	No	FALSE
7	Player 4	Yes	Yes	No	FALSE
8	Player 5	No	Yes	Yes	FALSE
9	Player 6	Yes	No	No	FALSE
10	Player 7	No	Yes	Yes	FALSE
11	Player 8	No	Yes	No	FALSE
12	Player 9	Yes	Yes	No	FALSE
13	Player 10	Yes	Yes	Yes	TRUE

## OR Function in Excel

### Syntax of the OR Function of Excel

The syntax of the OR function in excel is given in the following image:



The OR function accepts the following arguments:

- **Logical1:** This is the first condition to be tested.
- **Logical2:** This is the second condition to be tested.

"Logical1" is required, while "logical2" and the subsequent "logical" arguments are optional.

The OR function can be used either alone or in combination with the IF function of Excel. The benefits of using the OR function are expanded when it is combined with the AND and **IF functions of Excel**. For such combinations, the OR and/or **AND functions** can be nested within the IF function.

#### *Example #1—Test Two Conditions Containing Numeric Values*

The succeeding image shows a number and the name of an unavailable website in cells A1 and A2 respectively. With the help of the OR function of Excel, evaluate the following conditions together:

- The value of cell A1 is less than 10
- The value of cell A1 is equal to 40

The steps to test the given conditions by using the OR function in excel are listed as follows:

**Step 1:** Insert the required logical operators in the given conditions. So, enter the following formula in cell C1.

"=OR(A1<10,A1=40)"

Here, the first condition is  $A1 < 10$  and the second condition is  $A1 = 40$ .

**Step 2:** Press the "Enter" key. The output in cell C1 is "false." This is because both the given conditions are false. Neither the value of cell A1 is less than 10, nor is it equal to 40.

The formula and the output are shown in the following image.

C1	A	B	C
			=OR(A1<10,A1=40)
1	45		FALSE
2	e2esols.com		
3			

## Mathematical Functions in Excel

### 1. The AVERAGE Function

- Function Objective:

The **AVERAGE function** calculates the average of numbers in a range of cells.

- Syntax:

`AVERAGE(number1, [number2], ...)`

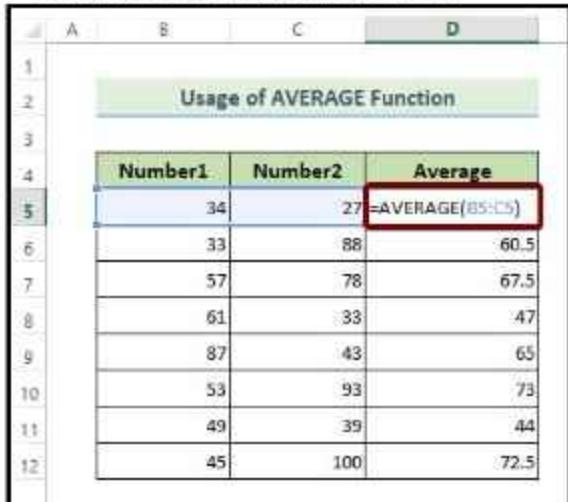
- Arguments Explanation:

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number1</b>	Required	The first number for which you want to calculate the average.
<b>number2</b>	Optional	The second number for which you want to calculate the average.

- Return Parameter:

The average of all the numbers in a range of cells.

- AVERAGE Function in Action:



	A	B	C	D
1				
2				
<b>Usage of AVERAGE Function</b>				
3				
4	Number1	Number2	Average	
5	34	27	=AVERAGE(B5:C5)	
6	33	88	60.5	
7	57	78	67.5	
8	61	33	47	
9	87	43	65	
10	53	93	73	
11	49	39	44	
12	45	100	72.5	

## 2. The AVERAGEA Function

- **Function Objective:**

The **AVERAGEA function** calculates the arithmetic mean of numbers in a range of cells.

- **Syntax:**

`AVERAGEA(value1, [value2], ...)`

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>value1</b>	Required	The first number for which you want to calculate is the arithmetic mean.
<b>value2</b>	Optional	The second number for which you want to calculate is the arithmetic mean.

- **Return Parameter:**

The arithmetic means of all the numbers in a range of cells.

- **AVERAGEA Function in Action:**

A	B	C	D
1			
2			Usage of AVERAGEA Function
3			
4			
5	34	27	=AVERAGEA(B5:C5)
6	33	88	60.5
7	57	78	67.5
8	61	33	47
9	87	43	65
10	53	93	73
11	49	39	44
12	45	100	72.5

### 3. The CEILING Function

- **Function Objective:**

The **CEILING function** rounds a number away from zero, to the nearest multiple of the significance.

- **Syntax:**

*CEILING(number, significance)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number</b>	Required	The fraction number that you want to round off.
<b>significance</b>	Required	The number to which you want to round off values.

- **Return Parameter:**

Rounded off version of an input number.

- **CEILING Function in Action:**

A	B	C
1		
2		
3		
4		
5	Number1	Rounded off
6	34.3	=CEILING(B5,3)
7	3.3	6
8	5.7	6
9	6.1	9
10	8.7	9
11	5.3	6
12	4.9	6
	4.5	6

#### 4. The COUNT Function

- **Function Objective:**

The **COUNT function** counts the number of cells that contain numbers.

- **Syntax:**

$\text{COUNT}(\text{value1}, [\text{value2}], \dots)$

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>value1</b>	Required	The first cell to count.
<b>value2</b>	Optional	The second cell to count.

- **Return Parameter:**

The count value of a number of cells that contain numbers.

- **COUNT Function in Action:**

A	B	C	D
<b>Usage of COUNT Function</b>			
Number1	Number2	Count	
34	27	=COUNT(B5:C5)	
33	88	2	
57	78	2	
61	33	2	
87	43	2	
53	93	2	
49	39	2	
45	100	2	

## 5. The COUNTA Function

- **Function Objective:**

The **COUNTA function** counts the number of cells that are not blank.

- **Syntax:**

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

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>value1</b>	Required	The first cell to count.
<b>value2</b>	Optional	The second cell to count.

- **Return Parameter:**

The count value of a number of cells that are not empty.

- **COUNTA Function in Action:**

A	B	C	D	
1				
2	Usage of COUNTA Function			
3				
4	Number1	Number2	Count	
5	34	27	=COUNTA(B5:C5)	
6	33		1	
7	57	78	2	
8	61		1	
9	87		1	
10	53		1	
11	49	39	2	
12	45	100	2	

## 6. The COUNTBLANK Function

- **Function Objective:**

The **COUNTBLANK function** counts the number of blank cells in a range of cells.

- Syntax:**

*COUNTBLANK(range)*

- Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
range	Required	The range within which you want to count the number of blank cells.

- Return Parameter:**

The count number of the blank cells.

- COUNTBLANK Function in Action:**

A	B	C	D
1			
2			
3			
4			
5	34	27	=COUNTBLANK(B5:C5)
6	33		1
7	57	78	0
8	61		1
9	87		1
10	53		1
11	49	39	0
12	45	100	0

## 7. The GCD Function

- Function Objective:**

The **GCD function** calculates the greatest common divisor of two or more integer numbers.

- Syntax:**

*GCD(number1, [number2], ...)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number1</b>	Required	The first number to calculate the GCD.
<b>number2</b>	Required	The second number to calculate the GCD.

- **Return Parameter:**

GCD of two or more integers.

- **GCD Function in Action:**

A	B	C	D
Usage of GCD Function			
Number1	Number2	GCD	
34	27	=GCD(B5:C5)	
33	88	11	
57	78	3	
61	33	1	
87	43	1	
53	93	1	
49	39	1	
45	100	5	

## 8. The INT Function

- **Function Objective:**

The **INT function** rounds up numbers to the nearest integer.

- **Syntax:**

*INT(number)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number</b>	Required	The number is to be rounded up to the nearest integer.

- **Return Parameter:**

The rounded-up number to the nearest integer.



- **INT Function in Action:**

A	B	C
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

**Usage of INT Function**

Number1	Nearest Integer
34.5	=INT(B5)
3.3	3
5.7	7
6.1	7
8.7	9
5.3	7
4.9	5
4.5	5

## 9. The LARGE Function

- **Function Objective:**

The **LARGE function** returns the k-th largest value in a range of numbers or arrays.

- **Syntax:**

*LARGE(array, k)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>array</b>	Required	The range of numbers where to find the largest number.
<b>k</b>	Required	The position in a range of numbers of arrays that is to return.

- **Return Parameter:**

The k-th largest number in an array.

- **LARGE Function in Action:**

Number1
34.3
3.0
5.7
6.1
8.7
5.3
4.9
4.5

## 10. The LCM Function

- **Function Objective:**

The **LCM function** calculates the least common multiple of two or more integer numbers.

- **Syntax:**

*LCM(number1, [number2], ...)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number1</b>	Required	The first number to calculate the LCM.
<b>number2</b>	Required	The second number to calculate the LCM.

- **Return Parameter:**

LCM of two or more integers.

- **LCM Function in Action:**

A	B	C	D
1			
2	Usage of LCM Function		
3			
4			
5	34	27	=LCM(B5:C5)
6	33	88	264
7	57	78	1482
8	61	33	2013
9	87	43	3741
10	53	93	4929
11	49	39	1911
12	45	100	900

## 11. The MAX Function

- **Function Objective:**

The **MAX function** returns the largest number in a set of numbers.

- **Syntax:**

**MAX(number1, [number2], ...)**

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number1</b>	Required	The first number in the list to return the largest among them.
<b>number2</b>	Optional	The second number in the list to return the largest among them.

- **Return Parameter:**

The largest number in a set of numbers.

- **MAX Function in Action:**

A	B	C	D
1			
2	Usage of MAX Function		
3			
4	Number1	Number2	Largest Number
5	34	27	=MAX(B5:C5)
6	33	88	88
7	57	78	78
8	61	33	61
9	87	43	87
10	53	93	93
11	49	39	49
12	45	100	100

## 12. The MIN Function

- **Function Objective:**

The **MIN function** returns the smallest number in a set of numbers.

- **Syntax:**

**MIN(number1, [number2], ...)**

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number1</b>	Required	The first number in the list to return the smallest among them.
<b>number2</b>	Optional	The second number in the list to return the smallest among them.

- **Return Parameter:**

The smallest number in a set of numbers.

- **MIN Function in Action:**

A	B	C	D
1			
2			
3			
4			
5	34	27	=MIN(B5:C5)
6	33	88	33
7	57	78	57
8	61	33	33
9	87	43	43
10	53	93	53
11	49	39	39
12	45	100	45

### 13. The PRODUCT Function

- **Function Objective:**

The **PRODUCT function** multiplies all the numbers given as arguments.

- **Syntax:**

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

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number1</b>	Required	The first number to multiply.
<b>number2</b>	Optional	The second number to multiply.

- **Return Parameter:**

The product of input numbers.

- **PRODUCT Function in Action:**

Usage of PRODUCT Function			
	Number1	Number2	Product
5	34	27	=PRODUCT(B5:C5)
6	33	88	2904
7	57	78	4446
8	61	33	2013
9	87	43	3741
10	53	93	4929
11	49	39	1911
12	45	100	4500

## 14. The RAND Function

- **Function Objective:**

The **RAND function** returns a random value between 0 and 1.

- **Syntax:**

*RAND()*

- **Arguments Explanation:**

It has no argument.

- **Return Parameter:**

A random value between 0 and 1.

- **RAND Function in Action:**

A	B
1	
2	<b>Usage of RAND Function</b>
3	
4	<b>Random Numbers</b>
5	=RAND()
6	0.568030737
7	0.945127954
8	0.972475188
9	0.371765166
10	0.967998599
11	0.022501157
12	0.322255189

## 15. The RANDBETWEEN Function

- **Function Objective:**

The **RANDBETWEEN function** returns a random number between a top and a bottom number.

- **Syntax:**

*RANDBETWEEN(bottom, top)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>bottom</b>	Required	The lowest number of the range.
<b>top</b>	Required	The highest number of the range.

- **Return Parameter:**

A random number between a top and a bottom number.

- **RANDBETWEEN Function in Action:**

A	B
1	
2	Usage of RANDBETWEEN Function
3	
4	
5	<b>Random Numbers</b>
6	=RANDBETWEEN(10,20)
7	14
8	13
9	10
10	12
11	20
12	14
	17

## 16. The ROUND Function

- **Function Objective:**

The **ROUND function** rounds a number to a certain decimal place.

- **Syntax:**

*ROUND(number, num\_digits)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number</b>	Required	The fraction number that you want to round off.
<b>num_digits</b>	Required	The number of digits that you want to allow after the decimal point.

- **Return Parameter:**

Rounded off version of an input number.

- ROUND Function in Action:

A	B	C
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

**Usage of ROUND Function**

Number1	Rounded off
34.33	=ROUND(B5,1)
3.53	3.5
5.77	5.8
6.561	6.6
8.567	8.6
5.733	5.7
4.656359	4.7
4.556	4.6

## 17. The ROUNDUP Function

- Function Objective:

The **ROUNDUP function** rounds a number off, away from zero.

- Syntax:

*ROUNDUP(number, num\_digits)*

- Arguments Explanation:

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number</b>	Required	The fraction number that you want to round off.
<b>num_digits</b>	Required	The number of digits that you want to allow after the decimal point.

- Return Parameter:

Rounded off version of an input number.

- ROUNDUP Function in Action:

	A	B	C	
1				
2				
3	Usage of ROUNDUP Function			
4				
5	Number1	Rounded off		
6	34.33	=ROUNDUP(B5,1)		
7	3.53	3.6		
8	5.77	5.8		
9	6.561	6.6		
10	8.567	8.6		
11	5.733	5.8		
12	4.656359	4.7		
13	4.556	4.6		

## 18. The ROUNDDOWN Function

- Function Objective:

The **ROUNDDOWN function** rounds a number towards zero.

- Syntax:

*ROUNDDOWN(number, num\_digits)*

- Arguments Explanation:

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number</b>	Required	The fraction number that you want to round off.
<b>num_digits</b>	Required	The number of digits that you want to allow after the decimal point.

- Return Parameter:

Rounded off version of an input number.

- **ROUNDDOWN Function in Action:**

A	B	C
1		
2		
<b>Usage of ROUNDDOWN Function</b>		
4	Number1	Rounded off
5	34.33	=ROUNDDOWN(B5,1)
6	3.53	3.5
7	5.77	5.7
8	6.561	6.5
9	8.567	8.5
10	5.733	5.7
11	4.656359	4.6
12	4.556	4.5

## 19. The SQRT Function

- **Function Objective:**

The **SQRT function** returns the square root of a given number.

- **Syntax:**

*SQRT(number)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
number	Required	The number to calculate the square root.

- **Return Parameter:**

The square root value of a given number.

- **SQRT Function in Action:**

A	B	C
1		
2		Usage of SQRT Function
3		
4	Number1	Square Root
5	34.3	=SQRT(B5)
6	3.3	1.816590212
7	5.7	2.387467277
8	6.1	2.469817807
9	8.7	2.949576241
10	5.3	2.302172887
11	4.9	2.213594362
12	4.5	2.121320344

## 20. The SMALL Function

- **Function Objective:**

The **SMALL function** returns the k-th smallest value in a range of numbers or arrays.

- **Syntax:**

*SMALL(array, k)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>array</b>	Required	The range of numbers where to find the smallest number.
<b>k</b>	Required	The position in a range of numbers of arrays that is to return.

- **Return Parameter:**

The k-th smallest number in an array.

- **SMALL Function in Action:**

C14	<input type="button" value="x"/>	<input type="button" value="y"/>	<input type="button" value="z"/>	<input type="button" value="f4"/>	-SMALL(R5:R12;1)
A	B	C	D	E	F
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14				K-th Smallest Number	3.3

## 21. The SUM Function

- **Function Objective:**

The **SUM function** adds values to a range of cells.

- **Syntax:**

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

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
number1	Required	The first number that you want to add.
number2	Required	The second number that you want to add.

- **Return Parameter:**

The summation of all the numbers in a range of cells.

- **SUM Function in Action:**

A	B	C	D
1			
2	Usage of SUM Function		
3			
4	Number1	Number2	SUM
5	34	27	=SUM(B5:C5)
6	33	88	121
7	57	78	135
8	61	33	94
9	87	43	130
10	53	93	146
11	49	39	88
12	45	100	145

## 22. The SUMPRODUCT Function

- **Function Objective:**

The **SUMPRODUCT function** calculates the sum of the product of a range of numbers or arrays.

- **Syntax:**

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

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
array1	Required	The first array to calculate the sum of the product.
array2	Required	The second array to calculate the sum of the product.

- **Return Parameter:**

The sum of the product of the arrays.

- SUMPRODUCT Function in Action:

A	B	C	D
1			
2			
3	Usage of SUMPRODUCT Function		
4	Number1	Number2	Sum of Product
5	34	27	=SUMPRODUCT(B5:B12,C5:C12)
6	33	88	24444
7	57	78	21540
8	61	33	17094
9	87	43	15081
10	53	93	11340
11	49	39	6411
12	45	100	4500

## 24. The ABS Function

- Function Objective:

The **ABS function** calculates the absolute value of a number.

- Syntax:

*ABS(number)*

- Arguments Explanation:

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number</b>	Required	The number to calculate the absolute value.

- Return Parameter:

The absolute value of a given number.

- **ABS Function in Action:**

A	B	C
1		
2		Usage of ABS Function
3		
4	Number1	Absolute Value
5	-34.3	=ABS(B5)
6	-3.3	3.3
7	-5.7	5.7
8	-6.1	6.1
9	-8.7	8.7
10	-5.3	5.3
11	-4.9	4.9
12	-4.5	4.5

## 25. The FACT Function

- **Function Objective:**

The **FACT function** returns the factorial of a number.

- **Syntax:**

*FACT(number)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
number	Required	The number to calculate the factorial.

- **Return Parameter:**

The factorial of a given number.

- **FACT Function in Action:**

A	B	C
1		
2	Usage of FACT Function	
3		
4	Number1	Factorial
5	1	=FACT(B5)
6	2	2
7	3	6
8	4	24
9	5	120
10	6	720
11	7	5040
12	8	40320

## 26. The MEDIAN Function

- **Function Objective:**

The **MEDIAN function** calculates the median of a range of cells of numbers.

- **Syntax:**

*MEDIAN(number1, [number2], ...)*

- **Arguments Explanation:**

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number1</b>	Required	The first number to calculate the median.
<b>number2</b>	Optional	The second number is to calculate the median.

- **Return Parameter:**

The median of all the numbers in a range of cells.

- MEDIAN Function in Action:

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
Usage of MEDIAN Function				
	Number1	Number2	Median	
5	34	27	=MEDIAN(B5:C5)	
6	33	88	60.5	
7	57	78	67.5	
8	61	33	47	
9	87	43	65	
10	53	93	73	
11	49	39	44	
12	45	100	72.5	

## 27. The MROUND Function

- Function Objective:

The **MROUND function** rounds off a number to the desired multiple.

- Syntax:

*MROUND(number, multiple)*

- Arguments Explanation:

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number</b>	Required	The fraction number that you want to round off.
<b>multiple</b>	Required	The number to which you want to round off your number to.

- Return Parameter:

Rounded off version of an input number.

- MROUND Function in Action:

A	B	C
1		
2		Usage of MROUND Function
3		
4	Number1	Rounded off
5	34.33	=MROUND(B5,2)
6	3.53	4
7	5.77	6
8	6.561	6
9	8.567	8
10	5.733	6
11	4.656359	4
12	4.556	4

## 28. The POWER Function

- Function Objective:

The **POWER function** calculates the number raised to a power.

- Syntax:

*POWER(number, power)*

- Arguments Explanation:

ARGUMENT	REQUIRED/OPTIONAL	EXPLANATION
<b>number</b>	Required	The base number to insert.
<b>power</b>	Required	The exponent to which the base number is raised.

- Return Parameter:

The result of a number raised to an exponent.

- POWER Function in Action:

A	B	C	D
1			
2			
3	Usage of POWER Function		
4	Number1	Number2	Result
5	2	1	=POWER(B5,C5)
6	4	2	16
7	6	3	216
8	8	4	4096
9	10	5	100000
10	12	6	2985984
11	14	7	105413504
12	16	8	4294967296

### 29. AVERAGEIFS:

Finds average (arithmetic mean) for the cells specified by a given set of conditions or criteria.

Syntax: =AVERAGEIFS (average\_range, criteria\_range, criteria,...)

**Average range:** The range of cells for that you want to derive an average.

**Criteria range:** The range of cells from which you want criteria to evaluate.

**Criteria:** The criteria define which cells to average.

Let's take an example to understand how and where we can use the Averageifs Excel function.

We have data in range A1:C10. Column A contains Date, Column B contains Agent and Column C contains Amount. We want to return the average to the amount for an Agent and date wise.

	A	B	C	D
1	Date	Agent	Amount (\$)	
2	1-Jan-14	Agent 1	108	
3	1-Jan-14	Agent 2	12	
4	2-Jan-14	Agent 1	76	
5	3-Jan-14	Agent 4	244	
6	1-Jan-14	Agent 5	80	
7	1-Jan-14	Agent 4	100	
8	2-Jan-14	Agent 2	248	
9	3-Jan-14	Agent 3	156	
10	1-Jan-14	Agent 2	140	
11				
12				
13	1-Jan-14	Agent 2	76	AVERAGEIFS
14				
15				

Follow below given steps to return the average for two criteria:-

- Select the cell C13, and write the formula.
- =AVERAGEIFS(C1:C10,A1:A10,A13,B1:B10,B13)
- Press Enter on your keyboard.
- You will get the average amount according to an Agent and date wise.

	A	B	C	D	E	F	G
1	Date	Agent	Amount (\$)				
2	1-Jan-14	Agent 1	108				
3	1-Jan-14	Agent 2	12				
4	1-Jan-14	Agent 2	76				
5	3-Jan-14	Agent 4	244				
6	1-Jan-14	Agent 5	80				
7	1-Jan-14	Agent 4	100				
8	2-Jan-14	Agent 2	248				
9	3-Jan-14	Agent 3	156				
10	1-Jan-14	Agent 2	140				
11							
12							
13	1-Jan-14	Agent 2	76	AVERAGEIFS			
14							
15							

### 30. SUMIFS

This function is used for adding the cells specified by a given set of condition or criteria.

#### The syntax of SUMIFS

formula:- =SUMIFS(sum\_range,criteria\_range1,criteria1,...)

#### How to use SUMIFS formula in Excel?

We want to return the total to the amount for an Agent and date wise.

	A	B	C	D
1	Date	Agent	(\\$)	Amount
2	1-Jan-14	Agent 1		106
3	1-Jan-14	Agent 2		12
4	1-Jan-14	Agent 2		76
5	3-Jan-14	Agent 4		244
6	1-Jan-14	Agent 5		80
7	1-Jan-14	Agent 4		100
8	2-Jan-14	Agent 2		248
9	3-Jan-14	Agent 3		250
10	1-Jan-14	Agent 2		140
11				
12				
13	1-Jan-14	Agent 2	SUMIFS	
14				
15				

Follow below given steps to return the total according to two criteria:-

- Select the cell C13, and write the formula.
- =SUMIFS(C1:C10,A1:A10,A13,B1:B10,B13)
- Press Enter on your keyboard.
- You will get the total amount according to an Agent and date wise.

	A	B	C	D	E	F	G
1	Date	Agent	Amount (\$)				
2	1-Jan-14	Agent 1	108				
3	1-Jan-14	Agent 2	12				
4	1-Jan-14	Agent 2	76				
5	3-Jan-14	Agent 4	244				
6	1-Jan-14	Agent 5	80				
7	1-Jan-14	Agent 4	100				
8	2-Jan-14	Agent 2	248				
9	3-Jan-14	Agent 3	156				
10	1-Jan-14	Agent 2	140				
11							
12							
13	1-Jan-14	Agent 2	228	SUMIFS			
14							
15							

### 31. COUNTIFS

This function is used to count the entries in multiple range based on multiple criteria.

**Syntax of "COUNTIFS" function:**

=COUNTIFS (criteria\_range1, criteria1, [criteria\_range2, criteria2]...)

**How to use COUNTIFS function in Excel?**

We want to return the total of the amount for an Agent and date wise.

	A	B	C	D
1	Date	Agent	Amount	
2	1-Jan-14	Agent 1	108	
3	1-Jan-14	Agent 2	12	
4	1-Jan-14	Agent 2	76	
5	3-Jan-14	Agent 4	244	
6	1-Jan-14	Agent 5	80	
7	1-Jan-14	Agent 4	100	
8	2-Jan-14	Agent 2	248	
9	3-Jan-14	Agent 3	156	
10	1-Jan-14	Agent 2	140	
11				
12				
13	1-Jan-14	Agent 2	228	COUNTIFS
14				
15				

Follow below given steps to return the total according to two criteria:-

- Select the cell C13, and write the formula.
- =COUNTIFS(A1:A10,A13,B1:B10,B13)
- Press Enter on your keyboard.

- You will get the no. of agents according to an Agent and date wise.

The screenshot shows an Excel spreadsheet with a table of sales data. The table has columns for Date, Agent, and Amount (\$). A formula =COUNTIFS(A1:A10,A13,B1:B10,B13) is entered in cell C13, which counts the number of agents for the date in cell A13 (1-Jan-14) and amount range in cell B13 (\$12 to \$144). The formula is highlighted in yellow.

	A	B	C	D	E	F	G
1	Date	Agent	Amount (\$)				
2	1-Jan-14	Agent 1	108				
3	1-Jan-14	Agent 2	12				
4	1-Jan-14	Agent 2	76				
5	3-Jan-14	Agent 4	244				
6	1-Jan-14	Agent 5	80				
7	1-Jan-14	Agent 4	100				
8	2-Jan-14	Agent 2	248				
9	3-Jan-14	Agent 3	156				
10	1-Jan-14	Agent 2	140				
11							
12							
13	1-Jan-14	Agent 2		3	COUNTIFS		
14							
15							

Sheet1 Sheet2 Sheet3

## 32. Excel COUNTA Function

Excel's COUNTA function counts cells that are not empty.

That means it includes error values, like #VALUE!, numbers and blank spaces. I don't mean blank cells, I mean cells with empty text like for example if you entered a space in a cell then COUNTA would count that cell.

COUNTA doesn't count empty or blank cells. You need the COUNTBLANK function for that. More on COUNTBLANK below.

**COUNTA Function Syntax**

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

Ditto COUNT function formula examples. That is; the 'value' in the COUNTA function syntax works the same as they do for the COUNT function.

## 33. Excel's COUNTBLANK Function

**COUNTBLANK Function Syntax**

```
=COUNTBLANK(range)
```

You'll notice that the syntax is 'range' and there's only one of them. This is because unlike COUNT and COUNTA, the COUNTBLANK function cannot handle non-contiguous ranges.

The solution to this is to add COUNTBLANK functions together like this:

```
=COUNTBLANK(A4:B10)+COUNTBLANK(D4:D10)
```

## COUNT, COUNTA and COUNTBLANK Examples

A	B	C	D	E	F
1	Excel COUNT, COUNTA and COUNTBLANK Functions				
2	Function	Numbers	Text	Combination	
4		56	Monday	56 Monday	
5		54	Tuesday	Tuesday	
6		58	Wednesday	58	
7		65	Thursday		
8		71	Friday	71	
9		65	Saturday	#VALUE!	
10		49	Sunday		
11	COUNT	7	0	2	
12	COUNTA	7	7	6	
13	COUNTBLANK	0	0	1	
14		=COUNT(B4:B10)			
15			=COUNTA(C4:C10)		
16				=COUNTBLANK(D4:D10)	

Cell D10 has a space entered in it. That's why the total is 6.

In rows 11-13 you can see the different results each formula returns depending on the Function used.

Exercise for above functions

### Exercise:-

Create a table of 10 records as shown below.

A	B	C	
Name	Day	Sales	
Salman	Monday	50,000.00	
Akshay	Tuesday	250,000.00	
Sharukh	Wednesday	320,000.00	
Ranvir	Thursday	150,000.00	
Salman	Friday	65,423.00	
Akshay	Saturday	14,231.00	
Sharukh	Monday	11,100.00	
Ranvir	Monday	25,896.00	

- Find the sum of the sales of Monday
- Find the sum of sales of amount less than 1,00,000.
- Count the number of sales less than 1,00,000.
- Find sum of sales belonging to ranvir and Monday.
- Find the average of sales less than 1,00,000.
- Count the number of sales greater than 1,00,000 but less than 3,00,000.

## Financial Function in Excel

### 1. PMT

Formula: =PMT(rate, number of periods, present value)

This is a very common function in Excel for finance professionals working with **real estate financial modelling**. The formula is most easily thought of as a mortgage payment calculator.

Given an interest rate, and a number of time periods (years, months, etc.) and the total value of the loan (e.g., mortgage) you can easily figure out how much the payments will be.

Remember this produces the total payment, which includes both principal and interest.

See an example below that shows what the annual and monthly payments will be for a \$1 million mortgage with a 30-year term and a 4.5% interest rate.

	B	C	D
1			
2			
3			
4			
5	Rate (per period)	4.5%	
6			
7	# of Periods	30	
8			
9	Present value	1,000,000	
10			
11	PMT	(61,392)	
12	PMT	=PMT(C5,C7,C9)	
13			
14	Monthly PMT	(5,115)	
15			

Shortcuts for excel	
Shortcut	Description
F2	Edit the active cell.
Ctrl+End	Move the cursor to the end of the text when in the formula bar.
Ctrl+Shift+End	Select all text in the formula bar from the cursor position to the end.

Exercise here

## Chapter-6 Histogram in Excel

### Creating a Histogram Using Data Analysis Tool pack

To create a histogram using Data Analysis tool pack, you first need to install the Analysis Tool Pak add-in.

This add-in enables you to quickly create the histogram by taking the data and data range (bins) as inputs.

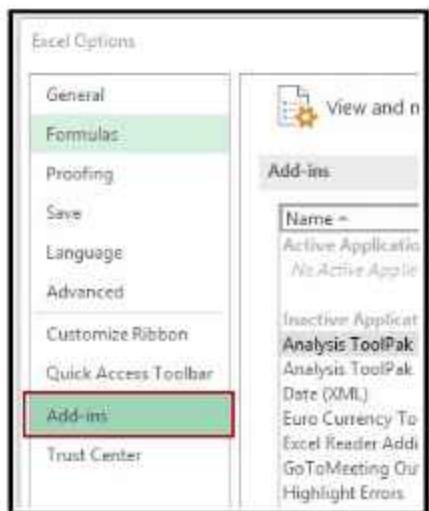
#### Installing the Data Analysis Tool Pack

To install the Data Analysis Tool Pak add-in:

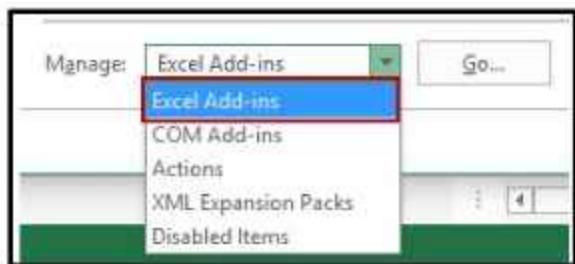
- Click the File tab and then select 'Options'.



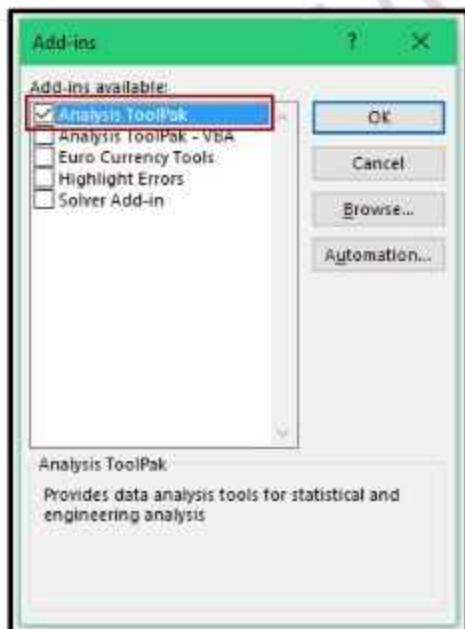
- In the Excel Options dialog box, select Add-ins in the navigation pane.



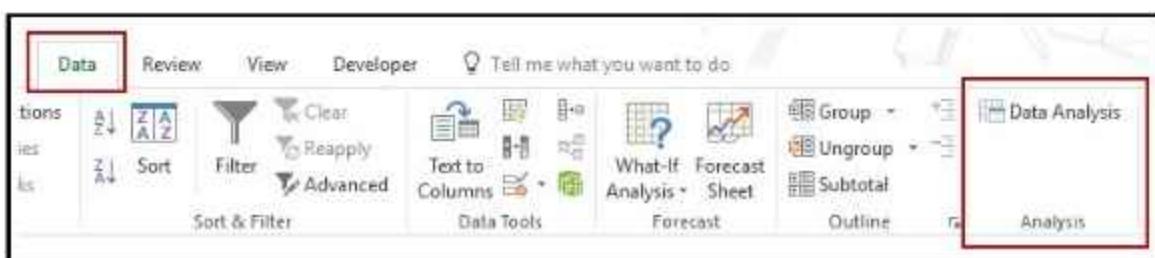
- In the Manage drop-down, select Excel Add-ins and click Go.



- In the Add-ins dialog box, select Analysis Toolpak and click OK.



This would install the Analysis Toolpak and you can access it in the Data tab in the Analysis group.



## Creating a Histogram using Data Analysis Toolpak

Once you have the Analysis Toolpak enabled, you can use it to create a histogram in Excel. Suppose you have a dataset as shown below. It has the marks (out of 100) of 40 students in a subject.

	A	B
1	Students	Marks
2	Student 1	62
3	Student 2	61
4	Student 3	68
5	Student 4	47
6	Student 5	77
7	Student 6	71
8	Student 7	83
9	Student 8	77
10	Student 9	69
11	Student 10	61
12	Student 11	30
13	Student 12	79
14	Student 13	72
15	Student 14	78

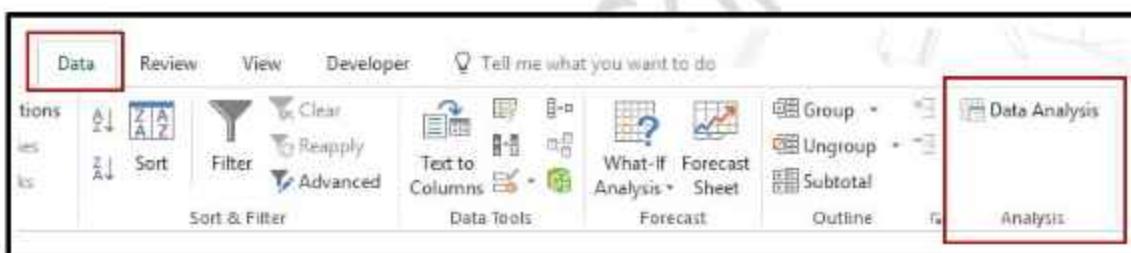
To create a histogram using this data, we need to create the data intervals in which we want to find the data frequency. These are called bins.

With the above dataset, the bins would be the marks intervals. You need to specify these bins separately in an additional column as shown below:

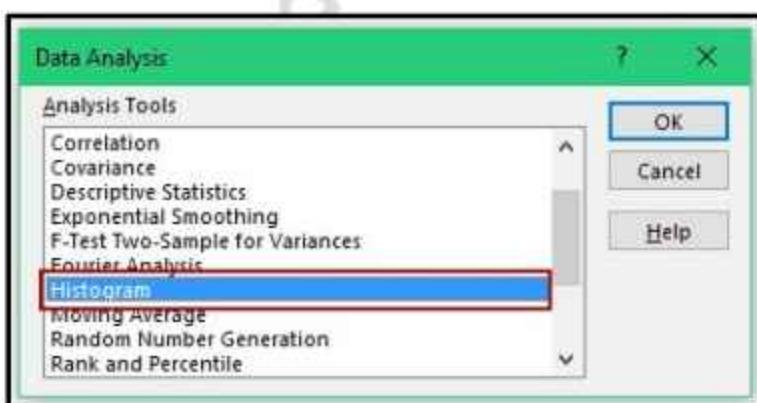
	A	B	C	D
1	Students	Marks		Bins
2	Student 1	62		35
3	Student 2	61		50
4	Student 3	68		60
5	Student 4	47		70
6	Student 5	77		80
7	Student 6	71		90
8	Student 7	83		
9	Student 8	77		
10	Student 9	69		

Now that we have all the data in place, let's see how to create a histogram using this data:

- Click the Data tab.
- In the Analysis group, click on Data Analysis.

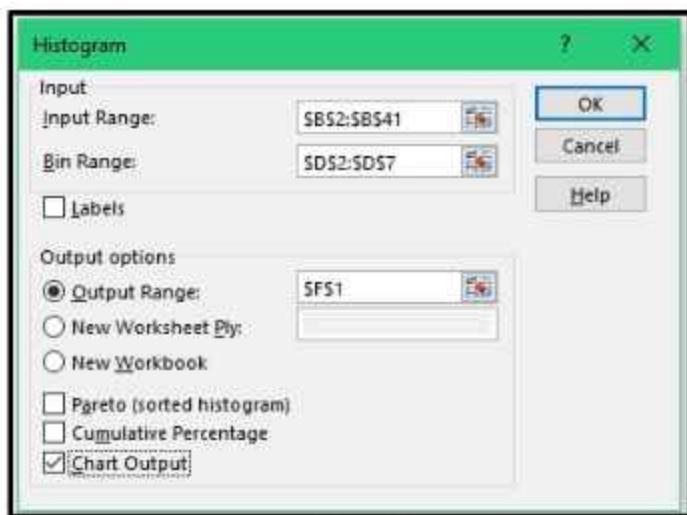


- In the 'Data Analysis' dialog box, select Histogram from the list.



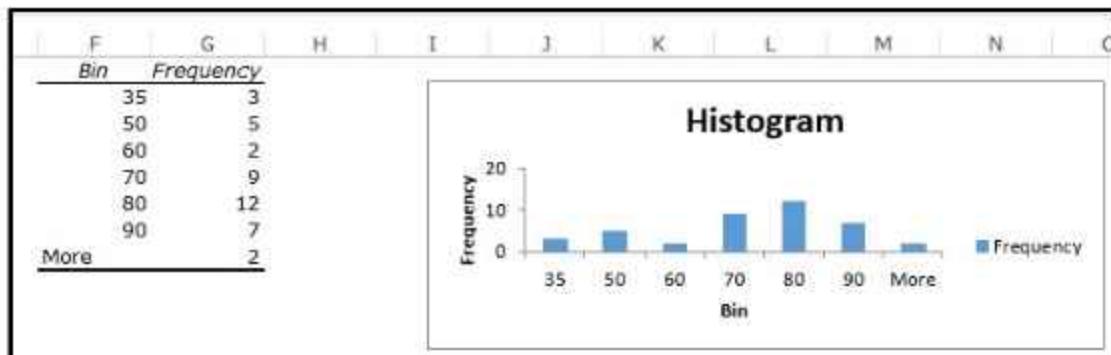
- Click OK.
- In the Histogram dialog box:

- Select the Input Range (all the marks in our example)
- Select the Bin Range (cells D2:D7)
- Leave the Labels checkbox unchecked (you need to check it if you included labels in the data selection).
- Specify the Output Range if you want to get the Histogram in the same worksheet. Else, choose New Worksheet/Workbook option to get it in a separate worksheet/workbook.
- Select Chart Output.



- Click OK.

This would insert the frequency distribution table and the chart in the specified location.



## Final Exercise-2

Modem Consultancy services hires some consultants on hourly basis. The details of the hours worked by the consultants in (four Weeks of December month are given in consultant worksheet)

First Name	Last Name	Week	Mon	Tue	Wed	Thurs	Fri	Sat	Total Hrs.	Payment
Shabana	Malek	1	5	3	7	4	2	8		
Krish	Raval	1	8	5	3	8	6	4		
Parul	Kapoor	1	7	4	9	5	3	8		
Vikas	Gupta	1	8	2	4	9	6	4		
Shabana	Malek	2	5	3	7	4	2	8		
Krish	Raval	2	8	5	3	8	6	4		
Parul	Kapoor	2	9	3	7	4	2	8		
Vikas	Gupta	2	8	5	3	8	6	4		
Shabana	Malek	3	7	4	9	5	3	8		
Krish	Raval	3	8	5	3	8	6	4		
Parul	Kapoor	3	4	4	9	5	3	8		
Vikas	Gupta	3	8	6	4	9	6	4		
Shabana	Malek	4	5	3	7	4	2	8		
Krish	Raval	4	3	5	3	9	6	4		
Parul	Kapoor	4	7	4	4	5	3	8		
Vikas	Gupta	4	2	6	4	9	6	4		

Use subtotal feature of Excel to find out total hours worked by each person in each week and each day.

Compute payment of each person by multiplying total number of hours consultant has worked in the entire month and the pay rate. The consultants are paid Rs.3000 per hour.

Find out the person who is second highest in receiving payment

Generate a report containing three columns, like Full Name of person, Week number, total hours worked.

- A shirt manufacturing company maintains records of orders received by his company using spreadsheets. The company sells shirts under three brand names as shown in the following worksheet. The sheet also contains price of shirts of each brand according to their sizes.

	L	M	XL	XXL
Honey	200	225	225	250
Candid	500	525	550	550
Trendy	700	750	750	800

Prepare a spreadsheet containing details of orders received by 'the company from the retailers for manufacturing of shirts as shown below:

Retailer name, City, Brand, Size, Quantity, Rate, Amount

Enter at least 10 records. Rate and amount should be calculated automatically.

Using histogram prepare a chart of sales of each brand.

Find out the most frequently ordered Size.

3. The annual rate of a bank if money is borrowed for 1, 5, 10 or 30 years is given in the following table

Duration of Loan (Years)	Annual Loan Rate (Percent)
	6
5	7
10	9
30	10

Prepare a worksheet containing at least 10 customers borrowing loan from a bank. The headings of the worksheet will be, Loan no., Customer name, Amount, Duration of loan, Annual Loan rate (Prepare lookup table), and Monthly instalment.

Monthly instalment should be. Calculated automatically. (Hint: Use PMT function to calculate monthly instalment)

<b>Shortcuts for excel</b>	
<b>Shortcut</b>	<b>Description</b>
<b>F11</b>	Create a chart of the data in the current range in a separate Chart sheet.
<b>Ctrl+F5</b>	Refresh data in the current worksheet.
<b>Ctrl+Spacebar</b>	Select the current column.

## Chapter-7 What If Analysis in Excel

### What-if Analysis in Excel

In Excel, What-if analysis is a process of changing cells' values to see how those changes will affect the worksheet's outcome. You can use several different sets of values to explore all the different results in one or more formulas.

What-if Excel is used by almost every data analyst and especially middle to higher management professionals to make better, faster and more accurate decisions based on data. What-if analysis is useful in many situations, such as:

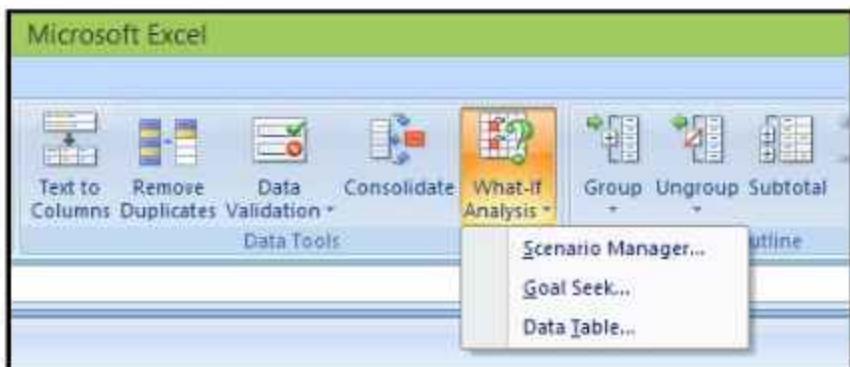
- You can propose different budgets based on revenue.
- You can predict the future values based on the given historical values.
- If you expect a certain value due to a formula, you can find different sets of input values that produce the desired result.

To enable the what-if analysis tool go to the **Data** menu tab and click on the What-If Analysis option under the Forecast section.



Now click on the **What-If Analysis**. Excel has the following What-if analysis tools that can be used based on the data analysis needs:

- Scenario Manager
- Goal Seek
- Data Tables



Data Tables and Scenarios take sets of input values and project forward to determine possible results. Goal seek differs from Data Tables and Scenarios in that it takes a result and projects backward to determine possible input values that produce that result.

### **1. Scenario Manager**

A scenario is a set of values that Excel saves and can substitute automatically in cells on a worksheet. Below are the following key features, such as:

- You can create and save different groups of values on a worksheet and then switch to any of these new scenarios to view different results.
- A scenario can have multiple variables, but it can accommodate only up to 32 values.
- You can also create a scenario summary report, which combines all the scenarios on one worksheet. For example, you can create several different budget scenarios that compare various possible income levels and expenses, and then create a report that lets you compare the scenarios side-by-side.
- Scenario Manager is a dialog box that allows you to save the values as a scenario and name the scenario.

### **2. Goal Seek**

Goal Seek is useful if you want to know the formula's result but unsure what input value the formula needs to get that result. For example, if you want to borrow a loan and know the loan amount, tenure of loan and the EMI that you can pay, you can use Goal Seek to find the interest rate at which you can avail of the loan.

Goal Seek can be used only with one variable input value. If you have more than one variable for input values, you can use the Solver add-in.

### 3. Data Table

A Data Table is a range of cells where you can change values in some of the cells and answer different answers to a problem. For example, you might want to know how much loan you can afford for a home by analysing different loan amounts and interest rates. You can put these different values and the **PMT** function in a Data Table and get the desired result.

A Data Table works only with one or two variables, but it can accept many different values for those variables.

#### What-If Analysis Scenario Manager

Scenario Manager is one of the What-if Analysis tools in Excel. Scenario Manager is useful in a case where you have more than two variables in the sensitivity analysis. Scenario Manager creates scenarios for each set of the input values for the variables under consideration. Scenarios help you to explore a set of possible outcomes, supporting the following:

- Varying as many as 32 input sets.
- Merging the scenarios from several different worksheets or workbooks.

If you want to analyze more than 32 input sets, and the values represent only one or two variables, you can use **Data Tables**.

#### Initial Values for Scenarios

Before you create several different scenarios, you need to define a set of initial values on which the scenarios will be based. Consider an example of a company that wants to buy Metals for their needs. Due to the scarcity of funds, the company wants to understand how much cost will happen for different buying possibilities.

In these cases, we can use the scenario manager for applying different scenarios to understand the results and make the decision accordingly. Now below are the following steps for setting up the initial values for Scenarios:

**Step 1:** Define the cells that contain the input values.

**Step 2:** Name the cells **Metals\_name** and **Cost**.

**Step 3:** Define the cells that contain the results.

**Step 4:** Name the result cell **Total\_cost**.

**Step 5:** place the formula in the result cell.

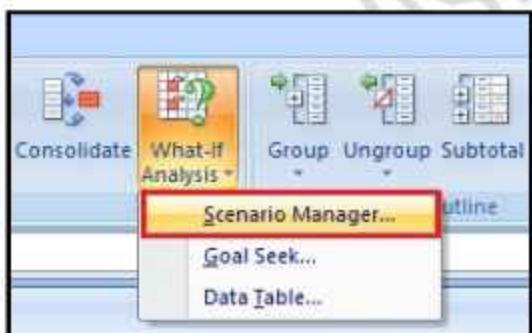
**Step 6:** Below is the created table.

	A	B	C	D	E
1	Metals_name	Cost			
2					
3	Iron	2000			
4	Copper	5000			
5	Silver	10000			
6	Gold	25000			
7	Bronze	15000			
8					
9	Total_cost		57000		
10					
11					

To create an analysis report with Scenario Manager, follow the following steps, such as:

**Step 1:** Click the **Data** tab.

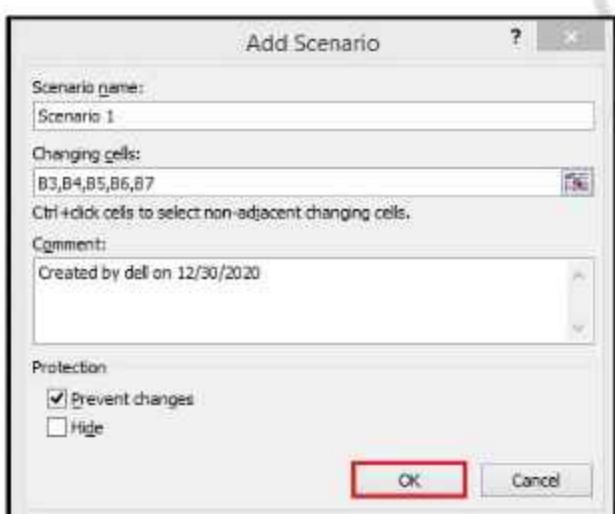
**Step 2:** Go to the **What-If Analysis** button and click on the **Scenario Manager** from the dropdown list.



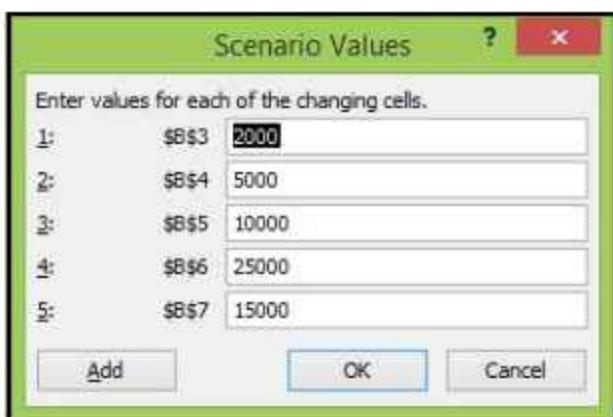
**Step 3:** Now a scenario manager dialog box appears, click on the **Add** button to create a scenario.



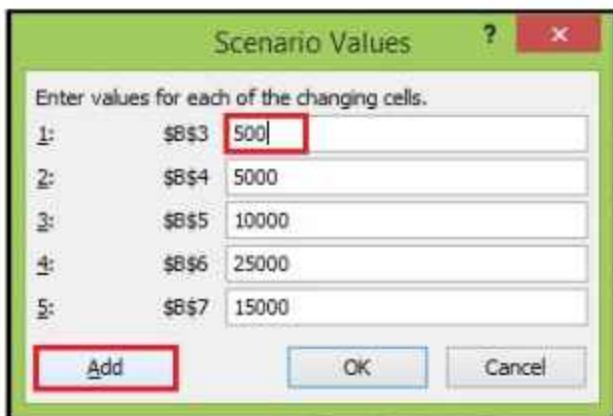
**Step 4:** Create the scenario, name the scenario, enter the value for each changing input cell for that scenario, and then click the **Ok** button.



**Step 5:** Now, B3, B4, B5, B6, and B7 appear in the cells box.



**Step 6:** Now, change the value of B3 to 500 and click the **Add** button.

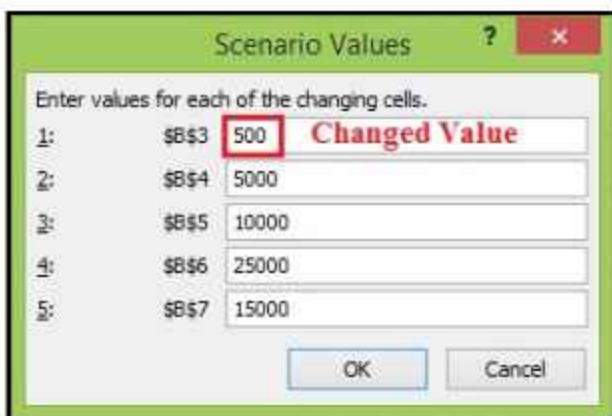


**Step 7:** After clicking on the Add button, the add scenario dialog box appears again.

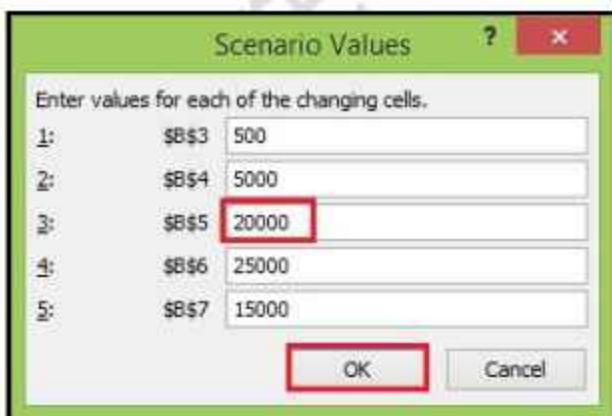
- In the scenario name box, create scenario 2.
- Select the prevent changes.
- And click on the **Ok**



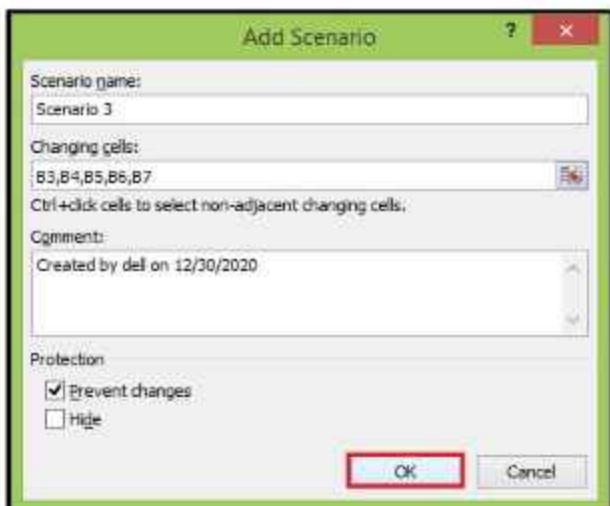
**Step 8:** Again appears scenario values box with the changed value of B3 cell.



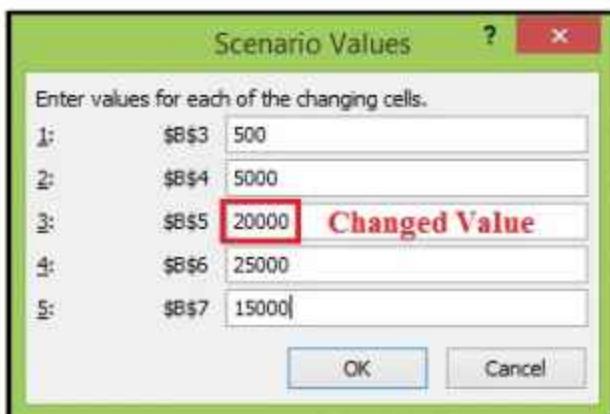
**Step 9:** Change the value of B5 to 20000 and click the **Ok** button.



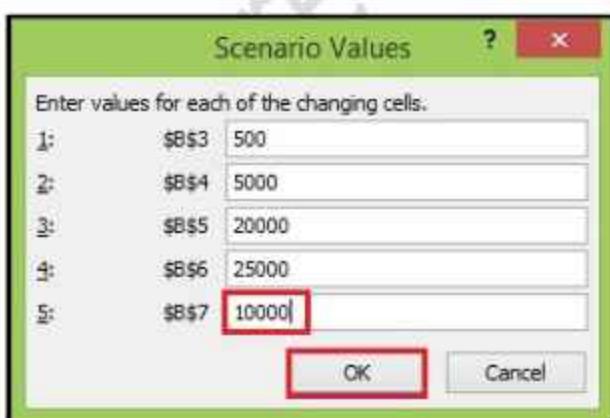
**Step 10:** Similarly, create Scenario 3 and click the **Ok** button.



**Step 11:** Again, appears scenario values box with a changed value of the B5 cell.



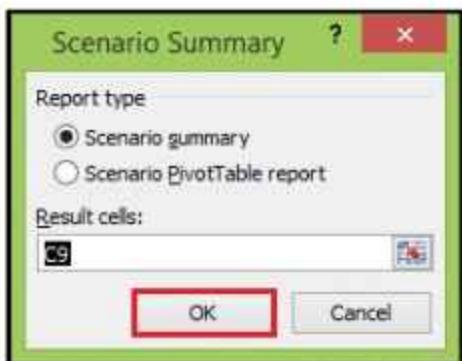
**Step 12:** Change the value of B7 to 10000 and click the **Ok** button.



The **Scenario Manager** Dialog box appears. In the box under Scenarios, You will find the names of all the scenarios that you have created.



**Step 13:** Now, click on the **Summary** button. The Scenario Summary dialog box appears.



Excel provides two types of Scenario Summary reports:

1. Scenario summary.
2. Scenario PivotTable report.

**Step 14:** Select **Scenario summary** under Report type and click **Ok**. Scenario Summary report appears in a new worksheet. You will get the following Scenario summary report.

	B	C	D	E	F	G
	Current Values:	Scenario 1	Scenario 2	Scenario 3		
<b>Changing Cells:</b>						
\$B\$3	2000	500	2000	2000		
\$B\$4	5000	5000	5000	5000		
\$B\$5	10000	10000	20000	10000		
\$B\$6	25000	25000	25000	25000		
\$B\$7	15000	15000	15000	10000		
<b>Result Cells:</b>						
\$C\$9	57000	55500	67000	52000		
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.						

You can observe the following in the Scenario Summary report:

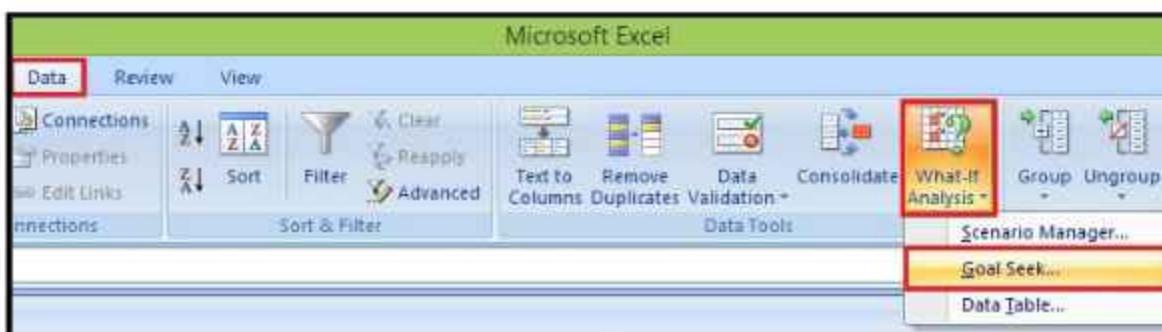
- **Changing Cells:** Enlists all the cells used as changing cells.
- **Result Cells:** Displays the result cell specified.
- **Current Values:** It is the first column and enlists the values of that scenario selected in the Scenario Manager Dialog box before creating the summary report.
- For all the scenarios you have created, the changing cells will be highlighted in gray.
- In the \$C\$9 row, the result values for each scenario will be displayed.

### What-If Analysis Goal Seek

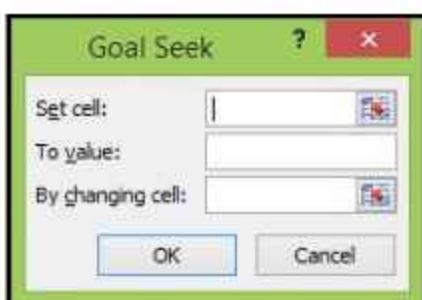
Goal Seek is a What-If Analysis tool that helps you to find the input value that results in a target value that you want. **Goal Seek** requires a formula that uses the input value to give the result in the target value. Then, by varying the formula's input value, Goal Seek tries to solve the input value.

Goal Seek works only with one variable input value. If you have more than one input value to be determined, you have to use the Solver add-in. below are the following steps to use the Goal Seek feature in Excel.

**Step 1:** On the **Data** tab, go **What-If Analysis** and click on the **Goal Seek** option.



**Step 2:** The **Goal Seek** dialog box appears.

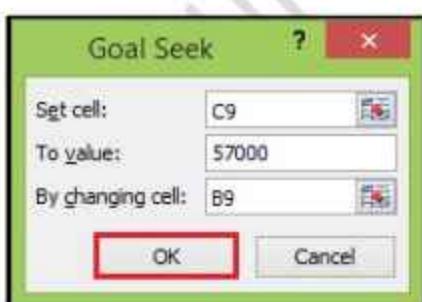


**Step 3:** Type C9 in the **Set cell** box. This box is the reference for the cell that contains the formula that you want to resolve.

**Step 4:** Type 57000 in the **to value** box. Here, you get the formula result.

**Step 5:** Type B9 in the **by changing cell** box. This box has the reference of the cell that contains the value you want to adjust.

**Step 6:** This cell that the formula must reference goal Seek changes in the cell that you specified in the Set cell box. Click **Ok**.



**Step 7:** Goal Seek box produces the following result.

A	B	C	D	E	F	G	H
1 Metals_name	Cost						
2							
3 Iron	2000						
4 Copper	5000						
5 Silver	10000						
6 Gold	25000						
7 Bronze	15000						
8							
9 Total_cost	0	57000					
10							
11							

As you can observe, Goal Seek found the solution using B9, and it returns 0 in the B9 cell because the target value and current value are the same.

#### Goal Seek Exercise:

For example, consider the following what-if analysis questions.

Example 1 : I am a student. My target is to achieve 80 % marks. My scores in two subjects are 70 and 77. How much should I score in third subject to gain 80% ?

Example 2 : I am a shopkeeper. I have introduced new item in my shop. I have invested Rs. 100000 in purchasing item. Selling cost of item is Rs 15.

- a) How many items I need to sell to break even ?
- b) What should be selling price of item if I can sell 5000 items a year to break even in a year ?

Example 3 : I have decided to purchase a car through a bank loan. The maximum monthly installment that I can pay is Rs.10000. I would like to select tenure of 3 years. Current rate of interest is 12%. What amount should I spend in buying a car ?

Goal seek feature of Excel can be used to find out answers to all the above questions.

#### What-If Analysis Data Tables

With a Data Table in Excel, you can easily vary one or two inputs and perform a What-if analysis. A Data Table is a range of cells where you can change values in some of the cells and answer different answers to a problem. There are two types of Data Tables, such as:

1. One-variable data tables
2. Two-variable data tables

If you have more than two variables in your analysis problem, you need to use the Excel Scenario Manager Tool.

### One-variable Data Tables

A one-variable Data Table can be used to see how different values of one variable in one or more formulas will change those formulas' results. In other words, with a one-variable Data Table, you can determine how changing one input changes any number of outputs. Below is an example of creating a one-variable data table.

A good example of a data table employs the **PMT** function with different loan amounts and interest rates to calculate the loan.

There is a loan of 1 00,000 for a tenure of 5 years. You want to know the monthly payments (EMI) for varied interest rates. You also want to know the amount of interest and Principal that is paid in the second year.

#### Step 1: Create the required table.

- o Assume that the interest rate is 10%.
- o List all the required values.
- o Name the cells containing the values.
- o Set the calculation for EMI, Cumulative Interest and Cumulative Principal with the Excel functions PMT, CUMIPMT and CUMPRINC, respectively.
- o Below is the created table.

A:	B:	C:
1 Rate per Anm.		10 Interest_Rate
2 No of monthly payments		60 NPER
3 Loan amount		100000 Loan_Amount
4 Type		0 Type
5 EMI	=PMT(Interest_Rate/12,NPER,Loan_Amount,0,Type)	EMI
6 Start Period		13 Start_period
7 End Period		24 End_Period
8 Interest paid in the 2nd Year	CUMIPMT(Interest_Rate/12,NPER,Loan_Amount,Start_Period,End_Period,Type)	Cum_Interest
9 Principal paid in the 2nd Year	CUMPRINC(Interest_Rate/12,NPER,Loan_Amount,Start_Period,End_Period,Type)	Cum_Principal
10		
11		

#### Step 2: Type the list of interest rate values that you want to substitute in the input cell.

D	E	F	G
Interest Rate	EMI	Cum Interest	Cum Principal
10.00%			
10.20%			
10.40%			
10.60%			
10.80%			
11.00%			
11.20%			
11.40%			
11.60%			
11.80%			
12.00%			

As you observe, there is an empty row above the Interest Rate values. This row is for the formulas.

**Step 3:** Type the first function (**PMT**) in the cell one row above and one cell to the right of the column of values. Type the other functions (**CUMIPMT** and **CUMPRINC**) in the cells to the first function's right.

D	E	F	G
Interest Rate	EMI	Cum Interest	Cum Principal
10.00%	=EMI	=Cum_Interest	=Cum_Principal
10.20%			
10.40%			
10.60%			
10.80%			
11.00%			
11.20%			
11.40%			
11.60%			
11.80%			
12.00%			

**Step 4:** The Data Table looks as given below.

B	C	D	E	F	G	H
			Interest Rate	EMI	Cum Interest	Cum Principal
Rate per Annum.	10% Interest_Rate			(\$2,124.70)	\$757,048,243.26	-17925.97122
No of Monthly Payments	60 NPER		10.00%			
Loan Amount	100000 Loan_Amount		10.20%			
Type	0 Type		10.40%			
EMI	(\$2,124.70) EMI		10.60%			
Start Period	13 Start_period		10.80%			
End Period	24 End_Period		11.00%			
Interest paid in the 2nd Year	\$757,048,243.26 Cum_Interest		11.20%			
Principal paid in the 2nd Year	-17925.97122 Cum_Principal		11.40%			
			11.60%			
			11.80%			
			12.00%			

**Step 5:** Select the range of cells that contains the formulas and values that you want to substitute, E2:H13.

A	B	C	D	E	F	G	H
1				Interest Rate	EMI	Cum Interest	Cum Principal
2	Rate per Annum.	10% Interest_Rate			(\$2,124.70)	\$757,048,243.26	-17925.97122
3	No of Monthly Payments	60 NPER		10.00%			
4	Loan Amount	100000 Loan_Amount		10.20%			
5	Type	0 Type		10.40%			
6	EMI	(\$2,124.70) EMI		10.60%			
7	Start Period	13 Start_period		10.80%			
8	End Period	24 End_Period		11.00%			
9	Interest paid in the 2nd Year	\$757,048,243.26 Cum_Interest		11.20%			
10	Principal paid in the 2nd Year	-17925.97122 Cum_Principal		11.40%			
11				11.60%			
12				11.80%			
13				12.00%			
14							

**Step 6:** Go to the **Data** tab, select **What-if Analysis** and click on the **Data Table** tool in the dropdown list.

**Step 7:** Data Table dialog box appears.

- o Click in the Column input cell box.
- o And click on the Interest\_Rate cell, which is C2.

	A	B	C	D	E	F	G	H
1								
2	Rate per Annum.		10% Interest_Rate					
3	No of Monthly Payments		60 NPER					
4	Loan Amount		100000 Loan_Amount					
5	Type		0 Type					
6	EMI		(\$2,124.70) EMI					
7	Start Period		13 Start_period					
8	End Period		24 End_Period					
9	Interest paid in the 2nd Year		\$757,048,243.26 Cum_Interest					
10	Principal paid in the 2nd Year		-17925.97122 Cum_Principal					
11								
12								
13								
14								

You can see that the Column input cell is taken as \$C\$2.

#### Step 8: Click on the **Ok** button.

	A	B	C	D	E	F	G	H
1								
2	Rate per Annum.		10% Interest_Rate					
3	No of Monthly Payments		60 NPER		10.00%	-2124.70447	757048243.3	-17925.97122
4	Loan Amount		100000 Loan_Amount		10.20%	-2124.70447	757048243.3	-17925.97122
5	Type		0 Type		10.40%	-2124.70447	757048243.3	-17925.97122
6	EMI		(\$2,124.70) EMI		10.60%	-2124.70447	757048243.3	-17925.97122
7	Start Period		13 Start_period		10.80%	-2124.70447	757048243.3	-17925.97122
8	End Period		24 End_Period		11.00%	-2124.70447	757048243.3	-17925.97122
9	Interest paid in the 2nd Year		\$757,048,243.26 Cum_Interest		11.20%	-2124.70447	757048243.3	-17925.97122
10	Principal paid in the 2nd Year		-17925.97122 Cum_Principal		11.40%	-2124.70447	757048243.3	-17925.97122
11					11.60%	-2124.70447	757048243.3	-17925.97122
12					11.80%	-2124.70447	757048243.3	-17925.97122
13					12.00%	-2124.70447	757048243.3	-17925.97122
14								

The Data Table is filled with the calculated results for each input value.

## Two-variable Data Tables

A two-variable Data Table can be used to see how different values of two variables in a formula will change that formula's results. In other words, with a two-variable Data Table, you can determine how changing two inputs changes a single output.

For example, a loan of 100000, and you want to know how different combinations of interest rates will affect the monthly payment.

**Step 1:** Create the following table.

A	B	C	D
1			
2 Rate per Ann.			10% Interest_rate
3 No. of monthly payments			60 NPER
4 Loan amount			100000 Loan_amount
5 Type			0 Type
6 EMI	PMT(Interest_rate/12,NPER,Loan_amount,0,Type)		EMI
7			
8			

**Step 2:** Now create the Data Table

- o Write =EMI in F2 cell.
- o Type the first list of input values, i.e., interest rates, down the column F, starting with the cell below the formula, i.e., F3.
- o Type the second list of input values, i.e., number of payments across row 2, starting with the cell to the right of the formula, i.e., G2.
- o The Data Table looks as follows.

F	G	H	I	J	K	L
Interest Rates	Number of Payments					
(\$2,124.70)	15	25	30	40	50	60
10.00%						
10.20%						
10.40%						
10.60%						
10.80%						
11.00%						
11.20%						
11.40%						
11.60%						
11.80%						
12.00%						

**Step 3:** Select the range of cells that contains the formula and the two sets of values that you want to substitute, i.e., F2:L13.

The screenshot shows a Microsoft Excel spreadsheet with data in columns A through L. Columns A, B, C, D, and E contain static data: Row 2 has "Rate per Anm." in A2, "10%" in B2, "Interest\_rate" in C2, and "EMI" in E2; Row 3 has "No. of monthly payments" in A3, "60" in B3, and "NPER" in C3; Row 4 has "Loan amount" in A4, "100000" in B4, and "Loan\_amount" in C4; Row 5 has "Type" in A5, "0" in B5, and "Type" in C5; Row 6 has "EMI" in A6, "(\$2,124.70)" in B6, and "EMI" in C6. Column F is titled "Interest Rates" and contains a list of values from 10.00% to 12.00% in increments of 0.20%. The range F2:L13 is selected, highlighted with a black border.

**Step 4:** Go to the **Data** tab, click **What-if Analysis** and select **Data Table** from the dropdown list.

**Step 5:** Data Table dialog box appears.

The screenshot shows the same Excel spreadsheet as above, but with a "Data Table" dialog box overlaid on the screen. The dialog box has a green header bar with "Data Table" and a red close button. It contains two input fields: "Row input cell:" with "\$C\$3" selected and "Column input cell:" with "\$C\$2" selected. At the bottom are "OK" and "Cancel" buttons. The background spreadsheet remains the same, with the range F2:L13 still selected.

**Step 6:** Click in the Row input cell box.

- Click on the **NPER** cell, which is C3.
- Again, click in the Column input cell box.
- Click the Interest\_Rate cell, which is C2.

A	B	C	D	E	F	G	H	I	J	K	L
1											
2	Rate per Annuity	10%	Interest_rate	EMI	Interest Rates	(52,124.70)	15	25	30	40	50
3	No. of monthly payments	60	NPER			10.00%					
4	Loan amount	100000	Loan_amount			10.20%					
5	Type	0	Type			10.40%					
6	EMI		(52,124.70)	EMI		10.60%					
7						10.80%					
8						11.00%					
9						11.20%					
10						11.40%					
11						11.60%					
12						11.80%					
13						12.00%					
14											

You will see that the Row input cell is taken as \$C\$3, and the Column input cell is taken as \$C\$2.

**Step 7:** Click on the **Ok** button.

The Data Table gets filled with the calculated results for each combination of the two input values.

### Data Table Calculations

Data Tables are recalculated each time the worksheet containing them is recalculated, even if they have not changed.

To speed up the calculations in a worksheet that contains a Data Table, you need to change the calculation options to **Automatically Recalculate** the worksheet but not the Data Tables.

Data Table Exercise:

First of all create the following table in the excel

A	B	C
1 Sale Quantity	40000	
2		
3 per unit sell price	8	
4 fixed cost	38400	
5 per unit cost	4	
6		
7		
8 revenue	320000	=b1*b3
9 fixed cost	38400	
10 variable cost	160000	=b1*b5
11		
12 net profit	121600	=b8-b9-b10
13		
14		
15		

As you see all the calculations should be done through formulas only as mentioned above.

In the above case we have seen that if the sale of the product is 40,000 units at the rate of rs8/unit, then the profit of the company will be Rs. 1,21,600/- but what if we sold only 20,000 units of product at same price or sell 25,000 units at 10/unit.

Similarly, you have different cases in the company regarding changing quantity, price, or cost or any other data, so at that time it will not possible to find the data for a single particular change so here data table will be helpful.

**First of all create the following table as shown below:**

	units sold							
	5000	10000	15000	20000	25000	30000	35000	40000
5								
5.5								
6								
6.5								
7								
7.5								
8								
8.5								
9								
9.5								
10								

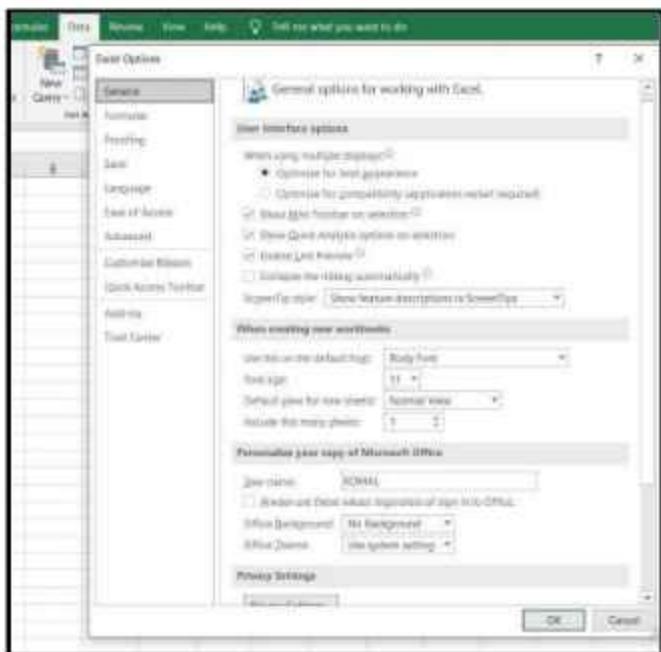
Here you can see there are different prices and different units of sale. To make sure that this table will calculate the profits make sure that the upper left corner of the table shows net profit using cell no.

## Solver in Excel

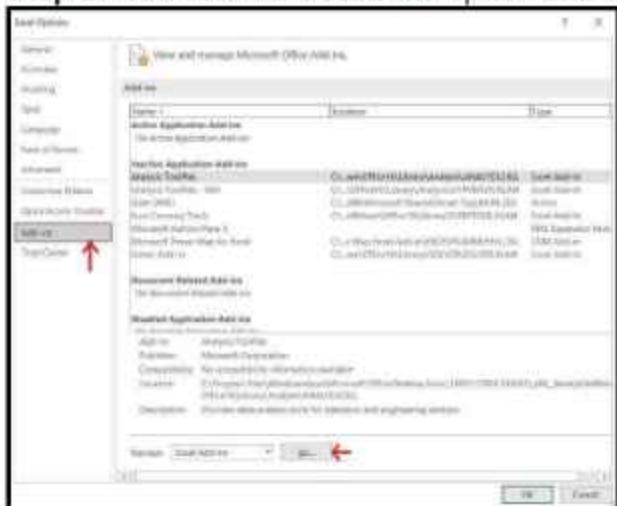
A solver is a mathematical tool present in MS-Excel that is used to perform calculations by working under some constraints/conditions and then calculates the solution for the problem. It works on the objective cell by changing the variable cells any by using sum constraints.

Solver is present in MS- Excel but for using it we need to activate it. For activating the solver tool we need to do the following steps:

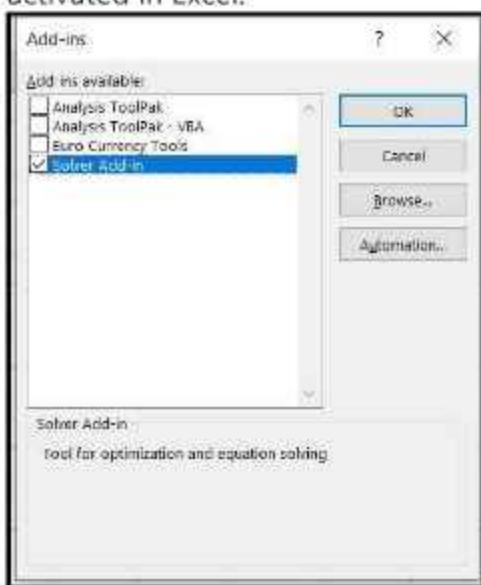
**Step 1:** Go to **File** and select **options**. The following dialog box will appear.



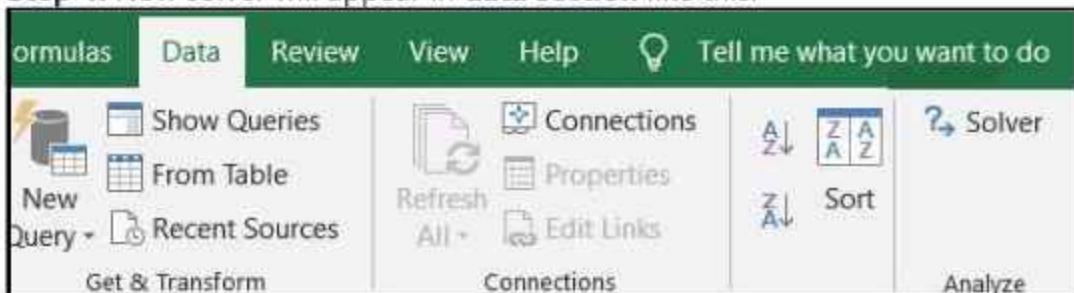
**Step 2:** Now select the **Add-ins** option and click on **Go** and finally click on **OK**.



**Step 3:** After clicking OK, Select **Solver Add-in** and press **OK**. Now solver will be activated in Excel.



**Step 4:** Now solver will appear in **data section** like this.



Now let's understand how to use solver with the help of an example.

**Example:**

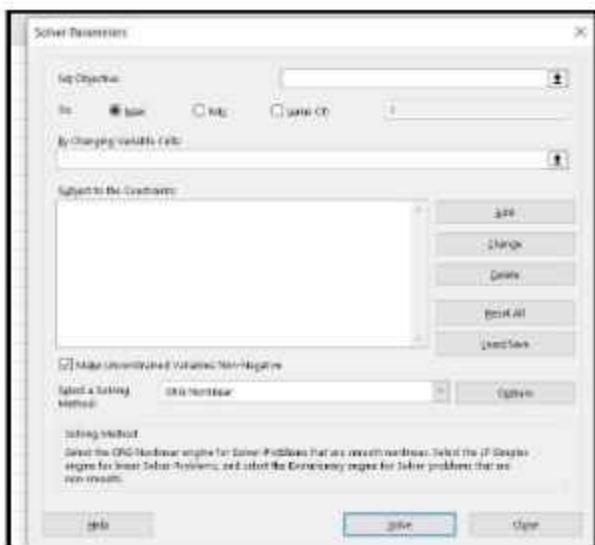
We went to a mall and we also have a gift voucher worth rs.10,000 and We want to purchase items in such a manner that all the money of the gift voucher gets utilized.

So, suppose we purchased the following items.

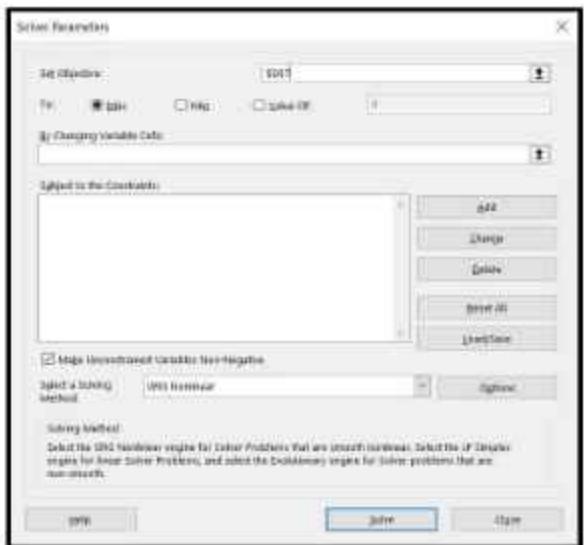
A	B	C	D	E
1 Items	Quantity	Price	Total	
2 Iron	1	700	700	
3 Mobile	1	5000	5000	
4 Headphones	1	400	400	
5 kettle	1	900	900	
6 watch	1	2300	2300	
7	5		<b>9300</b>	
8				
9				
10				
11 Voucher=		<b>10000</b>		
12				
13				

Suppose we purchased the above items in only one quantity and the total came out to be 9300 but the voucher was for rs.10,000. So now we want to use Solver for this purpose. Now let's see how it will be done.

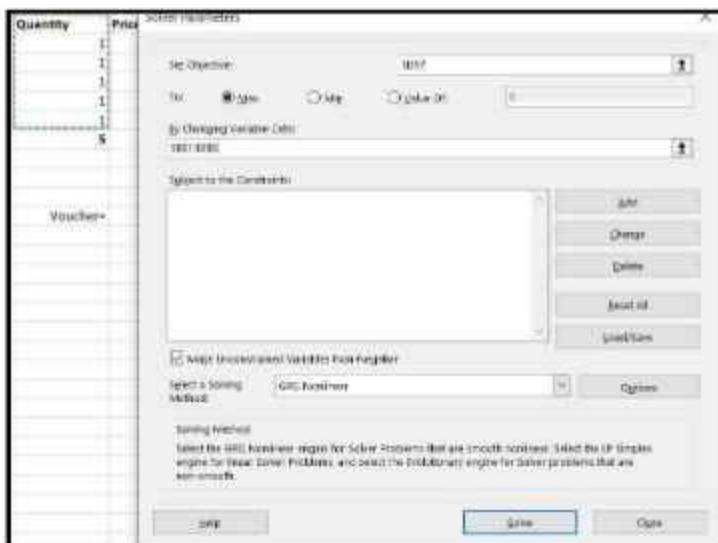
**Step 1:** Firstly go on data and find solver there and click it. The following dialog box will appear. Now in this, we have to select the objective in which we want to change our value.



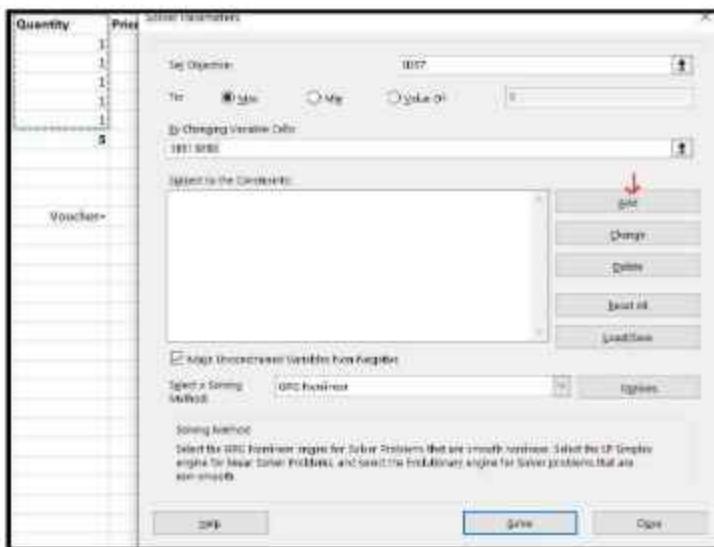
**Step 2:** In the set objective we have to select the total of the D column because want the value to change from 9300 to 10,000. After clicking on D7 following thing will be displayed on the set objective block.



**Step 3:** Now in the 'By changing Variable cell' we will select the Quantity cell because we want to change the quantity in such a way so that the total amount comes to 10,000.



**Step 4:** Now we have to set some conditions under which we want our work to get done. So for setting some conditions /constraints, we will click on Add.



**Step 5**– Now, a dialog box will appear and we will add 3 conditions. The first condition is that the total amount should be equal to the voucher amount. So we will select cell D7 in a cell reference and then = sign, and finally, we will select cell C11. Now the first condition is added. To add the next condition press Add.

A	B	C	D	E	F	G	H	I	J	K
1	Items	Quantity	Price	Total						
2	Iron	1	700	700						
3	Mobile	1	5000	5000						
4	Headphones	1	400	400						
5	kettle	1	900	900						
6	watch	1	2300	2300						
7		5		9300						
8										
9										
10										
11	Voucher=			10000						

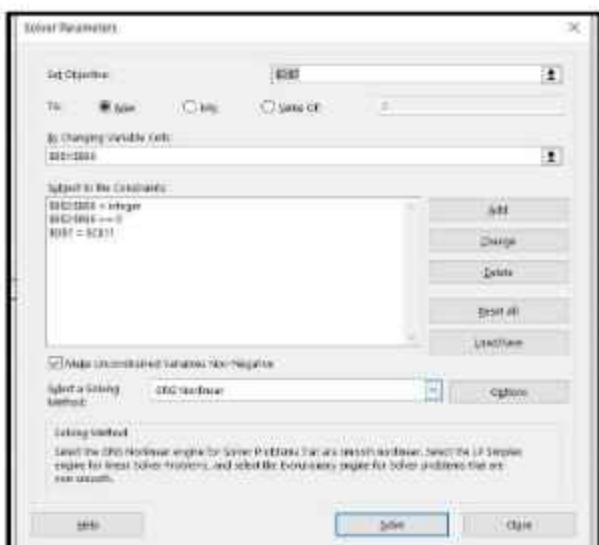
**Step 6:** For the second condition we will select the Quantity cell because we want the quantity to be an integer value, a whole value. So in cell reference, we will select from B2 to B6 then **int**, and then again will press Add.

A	B	C	D	E	F	G	H	I	J	K
1	Items	Quantity	Price	Total						
2	Iron	1	700	700						
3	Mobile	1	5000	5000						
4	Headphones	1	400	400						
5	kettle	1	900	900						
6	watch	1	2300	2300						
7		5		9300						
8										
9										
10										
11	Voucher=			10000						

**Step 7-** Now for the third condition, we want that our item quantity should never be un negative which is not possible in real life. So we will select cells from B2 to B6 and should be  $\geq$  to zero. Then click Add and cancel.

A	B	C	D	E	F	G	H	I	J	K
1	Items	Quantity	Price	Total						
2	Iron	1	700	700						
3	Mobile	1	5000	5000						
4	Headphones	1	400	400						
5	kettle	1	900	900						
6	watch	1	2300	2300						
7		5		9300						
8										
9										
10										
11	Voucher			10000						

**Step 8:** Now the following dialog box will show all the 3 conditions that we used and now click on Solve.



**Step 9:** By clicking Solve the solver will provide the desired output and to keep the answer we will click on keep solver solution.

A	B	C	D	
1	Items	Quantity	Price	Total
2	Iron	0	700	0
3	Mobile	2	5000	10000
4	Headphones	0	400	0
5	kettle	0	900	0
6	watch	0	2300	0
7		2		10000
8				
9				
10				
11	Voucher			10000
12				
13				
14				
15				
16				
17				
18				

So, this is what a solver is. How it is activated by not by default present in Excel and this is how it is used.

### Solver Extra Example

	Initial set-up cost	Boarding and Lodging	Fixed Cost	Advertising Cost	Total cost
Pre-primary	15000	30000	25000	30000	100000
Primary	15000	35000	25000	30000	105000
Secondary	18000	35000	25000	40000	118000
Higher Secondary	18000	40000	25000	40000	123000
				Estimated cost	446000

#### Conditions:

Maximum cost per section	100000
Boarding and lodging constraint (Not less than )	25000
Total Budget	400000

Shortcuts for excel	
Shortcut	Description
Shift+Spacebar	Select the current row.
Shift+Page down	Select all cells from the current location to the last cell of the column.
Shift+Page up	Select all cells from the current location to the first cell of the column.

### Final Exercise-3

#### Question 1:

Develop a spread sheet to compute the following:

You want to take a loan which I would like to continue for 15 years. The annual rate of interest is 10%. I can afford monthly payment of Rs4000. How much should I borrow?

**Question 2:**

What will be the operating income for the following cases:

Best Case (Profit is achieved) —> Revenue = 150,000 & Cost = 30,000

Normal Case —> Revenue = 100,000 & Cost = 35,000

Worst Case (Incurs Loss) —> Revenue = 50,000 & Cost = 55,000

Operating Income can be calculated as Revenue minus cost. What should be the Revenue amount if the operating income should be Rs.100,000/- ? Give a table of values for the Operating Income for various values of Revenue, say Rs.70,000, 75,000, 80,000.....150,000 considering cost to be 30,000.

**Question 3:**

A large software company with 4 different offices in different States needs a large supply of DVDs on a monthly basis in each of those buildings. The company has different offers from several DVD manufacturers. Table 11.1 shows the manufacturers and their rates.

Rates per 100 DVDs	Office 1	Office 2	Office 3	Office 4
Manufacturer1	45	45	50	52
Manufacturer2	52	48	51	45
Manufacturer3	49	55	50	52

Contract awarded per 100 DVDs	Office1	Office2	Office3	Office4	Total	Available
Manufacturer1	5	5	5	5	20	25
Manufacturer2	5	5	5	5	20	30
Manufacturer3	5	5	5	5	20	25
Total	15	15	15	15		
Required	20	25	15	15		
Total Cost	730	740	755	745		
	2970					

The contracts awarded need to meet the demand of the Software company and should not exceed the number of disk available from each manufacturer.

**Conditions:**

Contracts\_given  $\geq$  Contracts\_required

Total\_contracts  $\leq$  Contracts\_available

Use Excel solver to find out which combination of offers should the company accept in order to minimize the cost

## Chapter-8 Consolidation

**There are 2 topics:-**

1. 3d sum
  2. Consolidation Tool

a. 3d sum:

If you want to calculate sum of different sheets (2 or 3 sheets) into the new sheet. So first of all create 3 different sheets named 2016, 2017, 2018 as shown below:

1) 2016:

A	B	C	D	E	F
	jan	feb	mar	apr	
mike	40	25	40	55	
john	20	29	38	47	
simon	30	33	36	39	
randy	40	37	34	31	
jinson	50	41	32	23	
george	60	45	30	11	
jhonny	70	49	28	7	

2) 2017:

A	B	C	D	E	F	G
	jan	feb	mar	apr		
mike	20	20	30	40		
john	25	29	33	37		
simon	40	38	36	34		
randy	55	48	39	31		
jinson	10	20	30	40		
george	25	29	33	37		
jhonny	40	38	36	34		

	A	B	C	D	E	F	G
	jan	feb	mar	apr			
mike	30	5	25	10			
john	20	10	30	15			
simon	30	15	35	20			
randy	40	20	40	25			
jinson	50	25	45	30			
george	60	30	50	35			
jhonny	70	35	55	40			

Now you have to calculate data of all the 3 sheets into the new sheet so we can use 3D sum here.

If you observe the no. starts in the cell no. B2 and in other sheets also the no. starts in cell no. B2.

So what you have to do is to keep the cursor in the cell no. B2 in the sheet named 3D sum. There is a prerequisite that all the data in all the sheets should be in the same position, the position should not change

Now, write the formula of the "sum" in the cell B2 in the 3D sum sheet in this way

	A	B	C	D
1				
2		=SUM()		
3		SUM(number1, [number2], ...)		
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

After that click on the sheet named 2016 and select the no. in the cell b2 in the 2016 sheet.

The screenshot shows a Microsoft Excel spreadsheet titled "DATE". The data starts at row 2, column A, with columns labeled "jan", "feb", "mar", and "apr". Row 1 contains the month names. The formula bar shows the formula =SUM('2016'!B2). The cell B2 is highlighted with a red box. The status bar at the bottom indicates "3dsun staticallname".

	A	B	C	D	E	F
1		jan	feb	mar	apr	
2	mike	40	25	40	55	
3	john	=SUM(number1, [number2], ...)				47
4	simon	30	33	36	39	
5	randy	40	37	34	31	
6	jinson	50	41	32	23	
7	george	60	45	30	11	
8	jhonny	70	49	28	7	
9						
10						
11						
12						
13						
14						
15						

Your formula should be look like this, after that press shift and click on the sheet named 2018, as you see excel has selected all the 3 sheets and cell B2 in all the sheets.

The screenshot shows the same Microsoft Excel spreadsheet as before, but now the formula bar shows the completed formula =SUM('2016:2018'!B2). The cell B2 is still highlighted with a red box. The status bar at the bottom indicates "3dsun staticallname".

	A	B	C	D	E	F
1		jan	feb	mar	apr	
2	mike	40	25	40	55	
3	john	=SUM(number1, [number2], ...)				47
4	simon	30	33	36	39	
5	randy	40	37	34	31	
6	jinson	50	41	32	23	
7	george	60	45	30	11	
8	jhonny	70	49	28	7	
9						
10						
11						
12						
13						
14						
15						

As you can see above the formula has somewhat changed; now if you just press enter you will get the exact data you want in the cell B2 of 3D sum sheet.

	B2		=SUM('2016:2018'!B2)			
1	A	B	C	D	E	F
2		90				
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Now if you want the total of all the remaining cells then simply drag and drop either of one side.

	B2		=SUM('2016:2018'!B2)			
1	A	B	C	D	E	F
2		90	50	95	105	
3		65	68	101	99	
4		100	86	107	93	
5		135	105	113	87	
6		110	86	107	93	
7		145	104	113	83	
8		180	122	119	81	
9						
10						
11						
12						
13						
14						
15						

In case if you get 0 as result in any cell than it means that those cell don't have data in the particular sheet.

The main limitation of 3D sum was that the position of all the data in the entire sheet should be the same.

	jan	feb	mar	apr
mike	130	50	95	105
john	65	68	101	99
simon	100	86	107	93
randy	135	105	113	87
jinson	110	86	107	93
george	145	104	113	83
jhonny	180	122	119	81

Now if you change in the any source sheet then the data of this sheet will also be changed.

## b. Consolidation tool

To summarize and report results from separate worksheets, you can consolidate data from each sheet into a master worksheet.

The sheets can be in the same workbook as the master worksheet, or in other workbooks. When you consolidate data, you assemble data so that you can more easily update and aggregate as necessary.

For example, if you have an expense worksheet for each of your regional offices, you might use consolidation to roll these figures into a master corporate expense worksheet.

This master worksheet might also contain sales totals and averages, current inventory levels, and highest selling products for the entire enterprise.

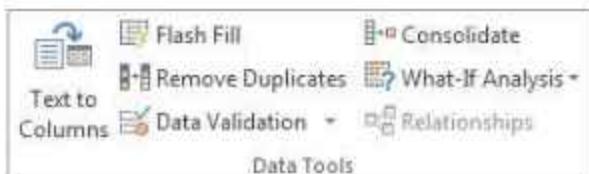
Follow these steps to consolidate several worksheets into a master worksheet:

1. If you haven't already, set up the data in each constituent sheet by doing the following:
  - Ensure that each range of data is in list format. Each column must have a label (header) in the first row and contain similar data. There must be no blank rows or columns anywhere in the list.
  - Put each range on a separate worksheet, but don't enter anything in the master worksheet where you plan to consolidate the data. Excel will do this for you.
  - Ensure that each range has the same layout.

- In the master worksheet, click the upper-left cell of the area where you want the consolidated data to appear.

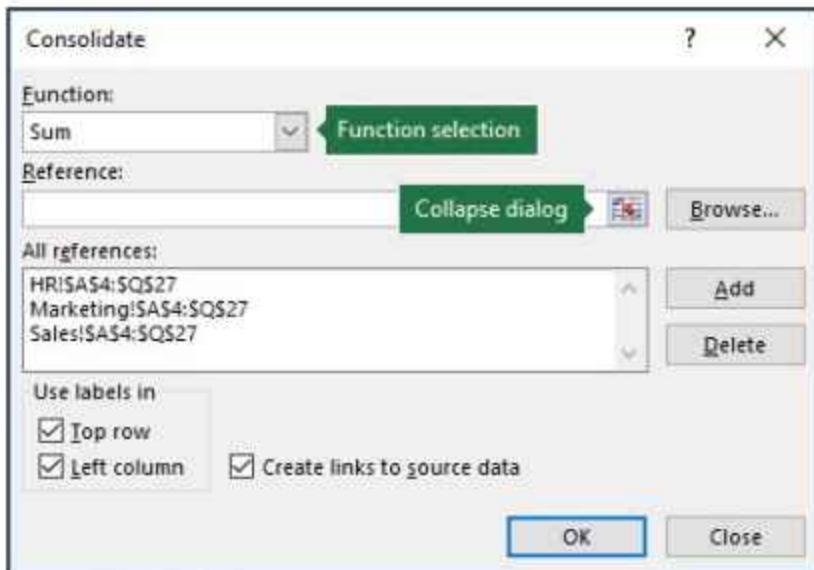
**Note:** To avoid overwriting existing data in the master worksheet, ensure that you leave enough cells to the right and below this cell for the consolidated data.

- Click **Data > Consolidate** (in the **Data Tools** group).



- In the **Function** box, click the summary function that you want Excel to use to consolidate the data. The default function is SUM.

Here is an example in which three worksheet ranges have been chosen:



- Select your data.

Next, in the **Reference** box, click the **Collapse** button to shrink the panel and select the data in the worksheet.

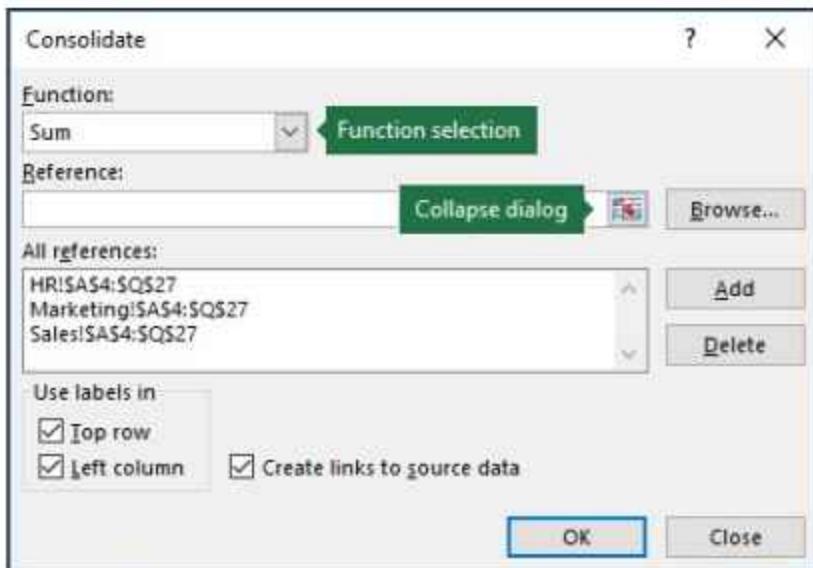


Click the worksheet that contains the data you want to consolidate, select the data, and then click the **Expand Dialog** button on the right to return to the **Consolidate** dialog.

If a worksheet containing data that you need to consolidate is in another

workbook, click **Browse** to locate that workbook. After locating and clicking **OK**, Excel will enter the file path in the **Reference** box and append an exclamation point to that path. You can then continue to select other data.

Here is an example in which three worksheet ranges have been chosen selected:



- In the **Consolidate** popup window, click **Add**. Repeat this to add all of the ranges that you consolidate.
- Automatic vs. Manual updates:** If you want Excel to update your consolidation table automatically when the source data changes, simply check the **Create links to source data** box. If this box remains unchecked, you can update the consolidation manually.

#### Notes:

- You cannot create links when source and destination areas are on the same sheet.
  - If you need to change the extent of a range—or replace a range—click the range in the Consolidate popup and update it using the steps above. This will create a new range reference, so you'll need to delete the previous one before you consolidate again. Simply choose the old reference and press the Delete key.
- Click **OK**, and Excel will generate the consolidation for you. Optionally, you can apply formatting. It's only necessary to format once, unless you rerun the consolidation.
  - Any labels that don't match up with labels in the other source areas result in separate rows or columns in the consolidation.

- Ensure that any categories that you don't want to consolidate have unique labels that appear in only one source range.

<b>Shortcuts for excel</b>	
<b>Shortcut</b>	<b>Description</b>
<b>Shift+End</b>	Select all cells from the current location to the last cell of the row.
<b>Shift+Home</b>	Select all cells from the current location to the first cell of the row.

### Exercise:

Create data table for 3 years and consolidate using all the 3 methods as you studied earlier.

2019:

	Jan	Feb	Mar	Apr
Mike1	10	25	40	55
Mike2	20	29	38	47
Mike3	30	33	36	39
Mike4	40	37	34	31
Mike5	50	41	32	23
Mike6	60	45	30	15
John	6	49	28	7

2020:

	Jan	Feb	Mar	Apr
Mike1	84	20	30	40
Mike2	25	29	33	37
John	5	38	36	34
Mike4	55	47	39	31
Mike5	10	20	30	40
Mike6	25	29	33	37
Mike7	10	38	36	34

2021:

	Jan	Feb	Mar	Apr
John	8	5	25	10
Mike2	20	10	30	15
Mike3	30	15	35	20
Mike4	40	20	40	25
Mike5	50	25	45	30
Mike6	60	30	50	35
Mike7	15	35	55	40

## Chapter-9 Fill Series in Excel

### Fill a Linear Series into Adjacent Cells

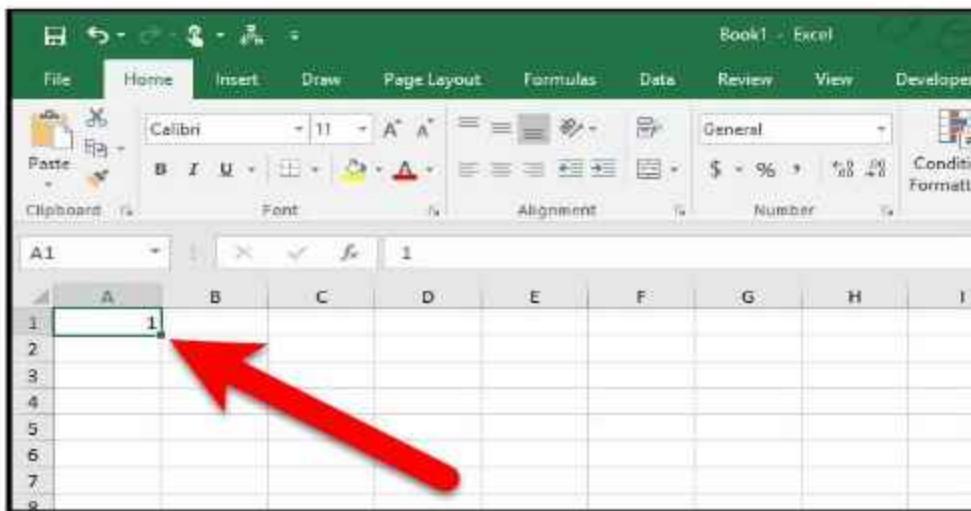
One way to use the fill handle is to enter a series of linear data into a row or column of adjacent cells. A linear series consists of numbers where the next number is obtained by adding a “step value” to the number before it.

The simplest example of a linear series is 1, 2, 3, 4, 5. However, a linear series can also be a series of decimal numbers (1.5, 2.5, 3.5...), decreasing numbers by two (100, 98, 96...), or even negative numbers (-1, -2, -3). In each linear series, you add (or subtract) the same step value.

Let's say we want to create a column of sequential numbers, increasing by one in each cell. You can type the first number, press Enter to get to the next row in that column, and enter the next number, and so on.

Very tedious and time consuming, especially for large amounts of data. We'll save ourselves some time (and boredom) by using the fill handle to populate the column with the linear series of numbers.

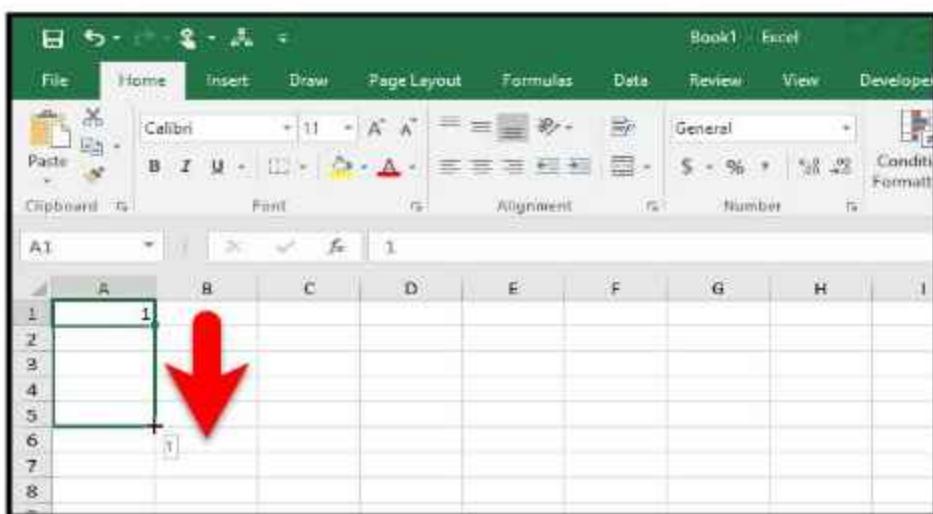
To do this, type a 1 in the first cell in the column and then select that cell. Notice the green square in the lower-right corner of the selected cell? That's the fill handle.



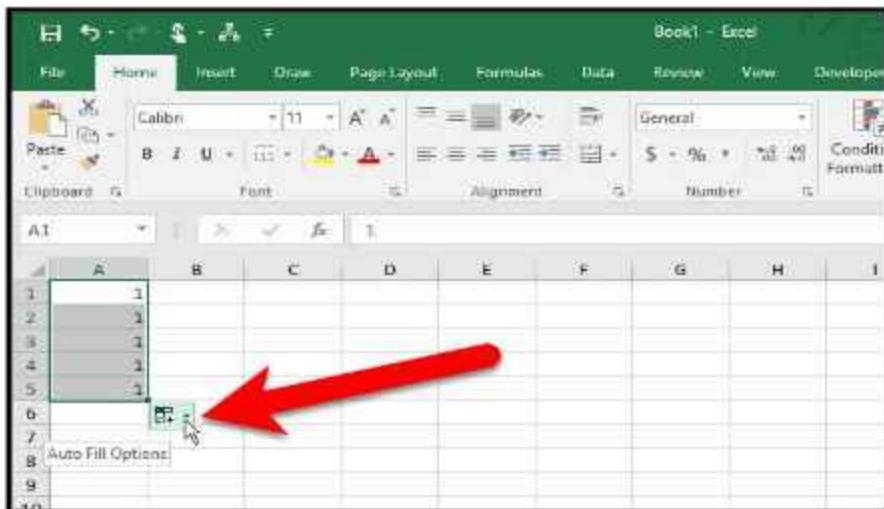
When you move your mouse over the fill handle, it turns into a black plus sign, as shown below.



With the black plus sign over the fill handle, click and drag the handle down the column (or right across the row) until you reach the number of cells you want to fill.



When you release the mouse button, you'll notice that the value has been copied into the cells over which you dragged the fill handle.

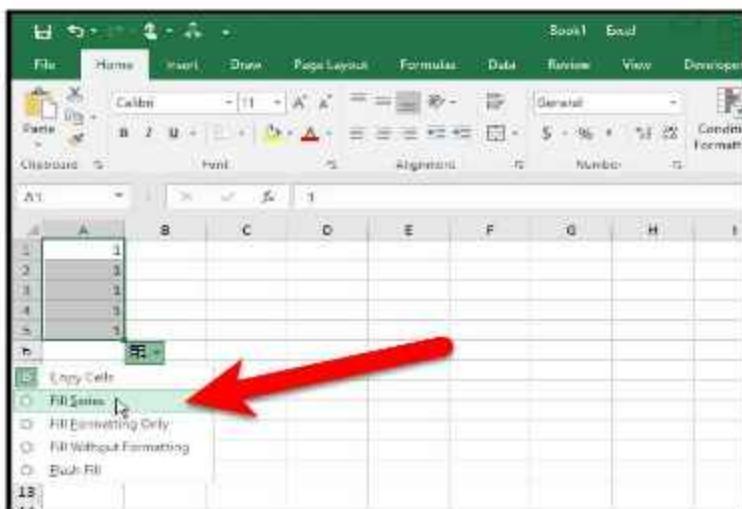


Why didn't it fill the linear series (1, 2, 3, 4, 5 in our example)? By default, when you enter one number and then use the fill handle, that number is copied to the adjacent cells, not incremented.

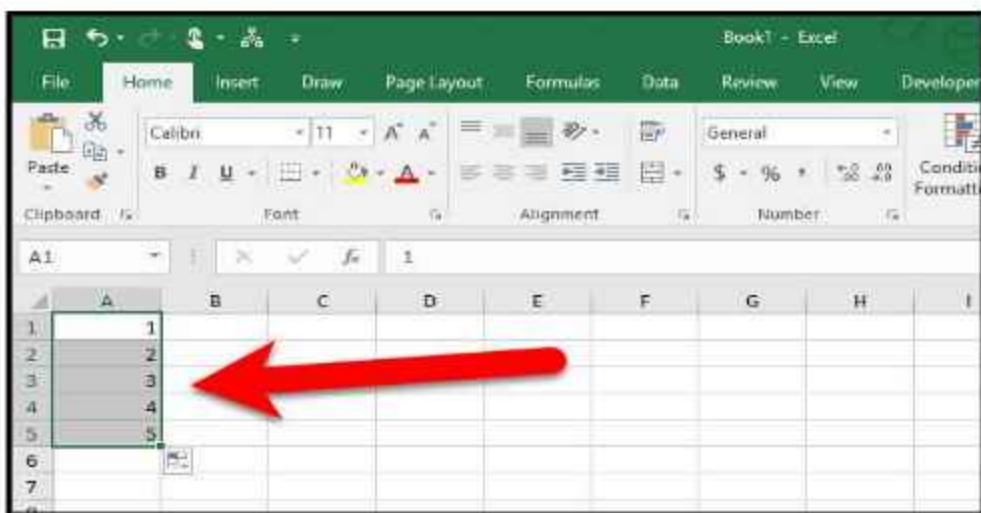
**NOTE:** To quickly copy the contents of a cell above the currently selected cell, press **Ctrl+D**, or to copy the contents of a cell to the left of a selected cell, press **Ctrl+R**. Be warned that copying data from an adjacent cell replaces any data that is currently in the selected cell.

To replace the copies with the linear series, click the "Auto Fill Options" button that displays when you're done dragging the fill handle.

The first option, **Copy Cells**, is the default. That's why we ended up with five 1s and not the linear series of 1–5. To fill the linear series, we select "**Fill Series**" from the popup menu.

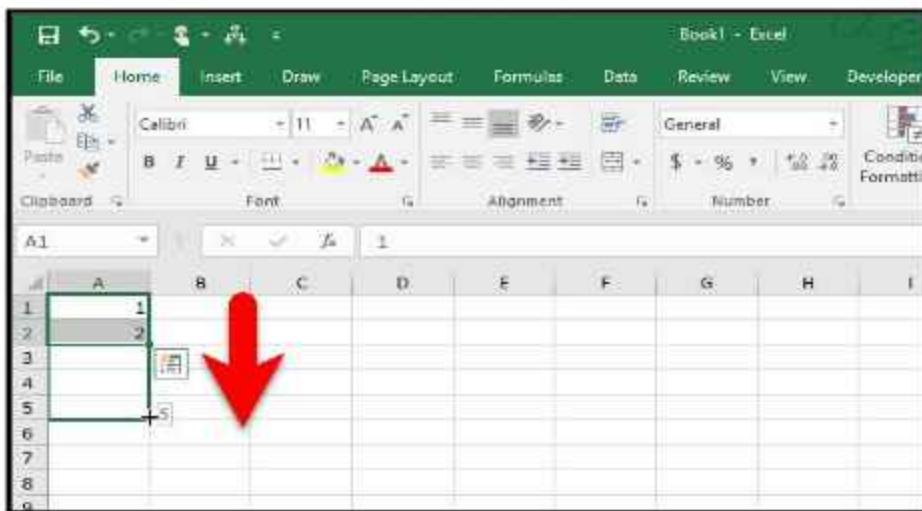


The other four 1s are replaced with 2–5 and our linear series is filled.

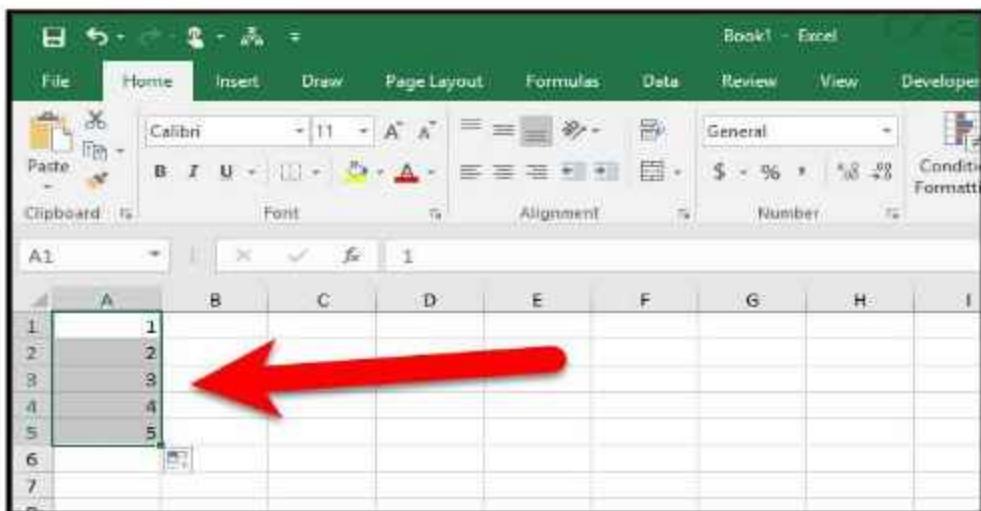


You can, however, do this without having to select Fill Series from the Auto Fill Options menu. Instead of entering just one number, enter the first two numbers in the first two cells.

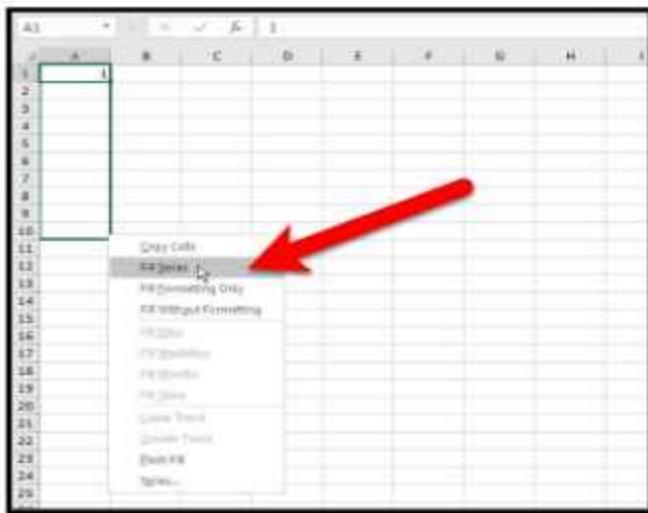
Then, select those two cells and drag the fill handle until you've selected all the cells you want to fill.



Because you've given it two pieces of data, it will know the step value you want to use, and fill the remaining cells accordingly.



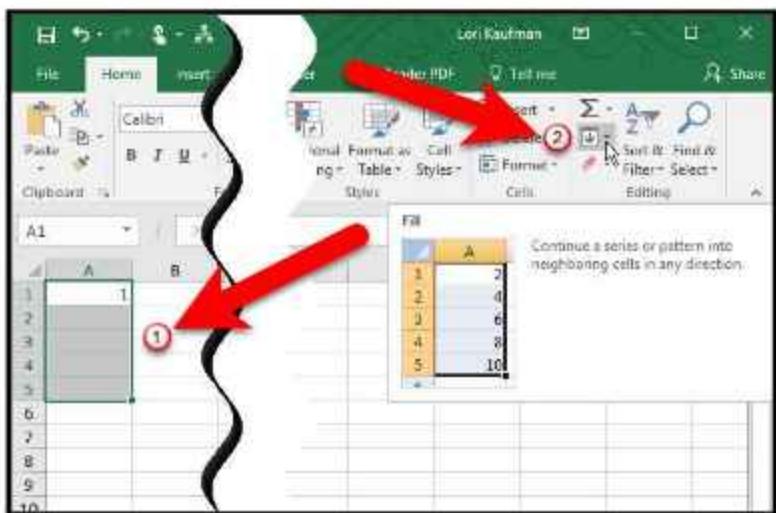
You can also click and drag the fill handle with the *right* mouse button instead of the left. You still have to select "Fill Series" from a popup menu, but that menu automatically displays when you stop dragging and release the right mouse button, so this can be a handy shortcut.



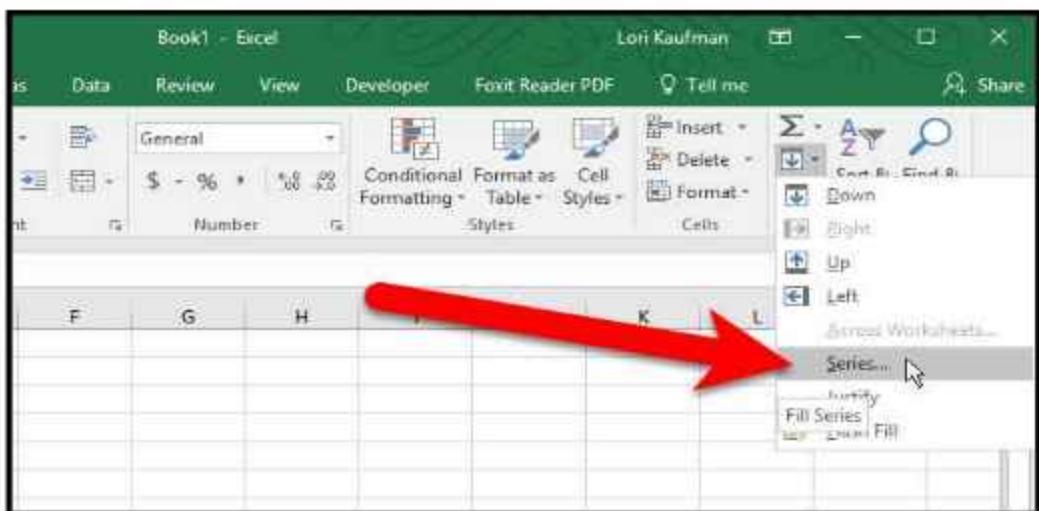
### Fill a Linear Series into Adjacent Cells Using the Fill Command

If you're having trouble using the fill handle, or you just prefer using commands on the ribbon, you can use the Fill command on the Home tab to fill a series into adjacent cells. The Fill command is also useful if you're filling a large number of cells, as you'll see in a bit.

To use the Fill command on the ribbon, enter the first value in a cell and select that cell and all the adjacent cells you want to fill (either down or up the column or to the left or right across the row). Then, click the "Fill" button in the Editing section of the Home tab.

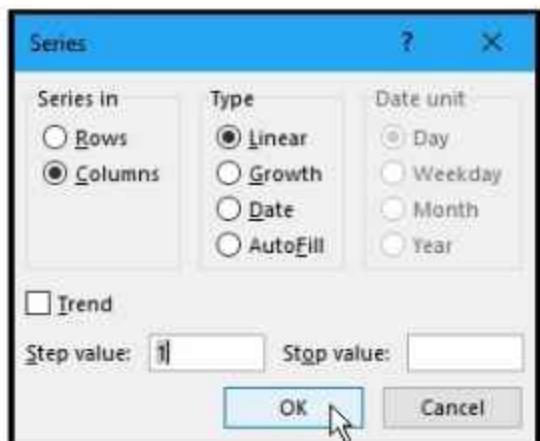


Select "Series" from the drop-down menu.



On the Series dialog box, select whether you want the Series in Rows or Columns. In the Type box, select "Linear" for now. We will discuss the Growth and Date options later, and the AutoFill option simply copies the value to the other selected cells.

Enter the "Step value", or the increment for the linear series. For our example, we're incrementing the numbers in our series by 1. Click "OK".



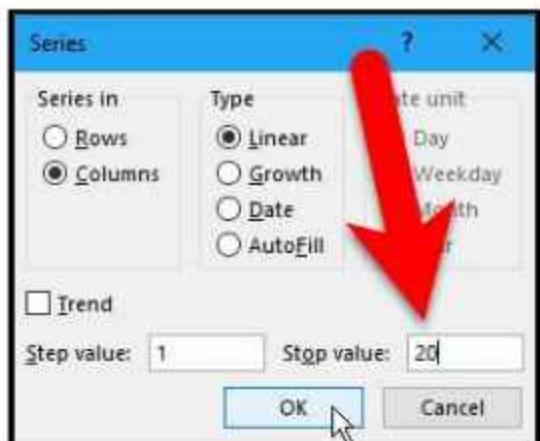
The linear series is filled in the selected cells.

A	1	2	3	4	5
1	1				
2	2				
3	3				
4	4				
5	5				

If you have a really long column or row you want to fill with a linear series, you can use the Stop value on the Series dialog box.

To do this, enter the first value in the first cell you want to use for the series in the row or column, and click "Fill" on the Home tab again. In addition to the options we discussed above, enter the value into the "Stop value" box that you want as the last value in the series. Then, click "OK".

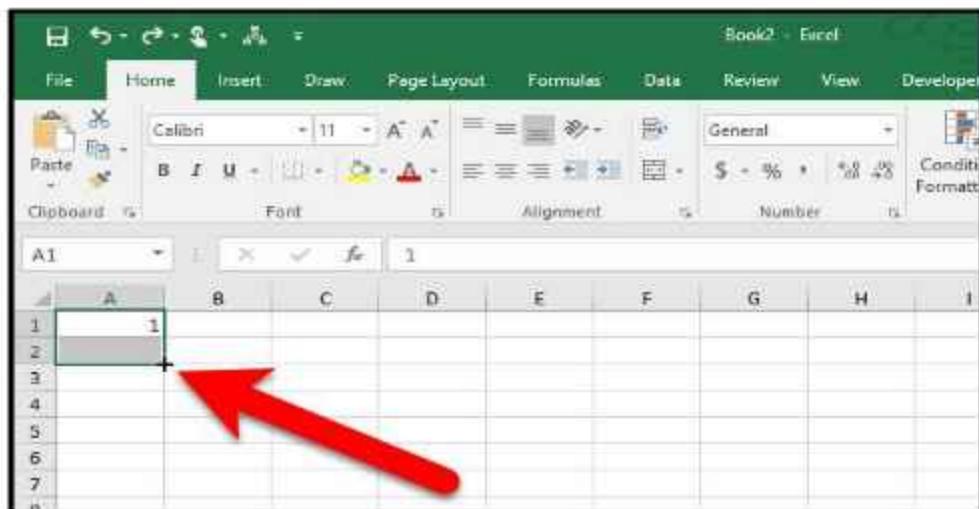
In the following example, we put a 1 in the first cell of the first column and the numbers 2 through 20 will be entered automatically into the next 19 cells.



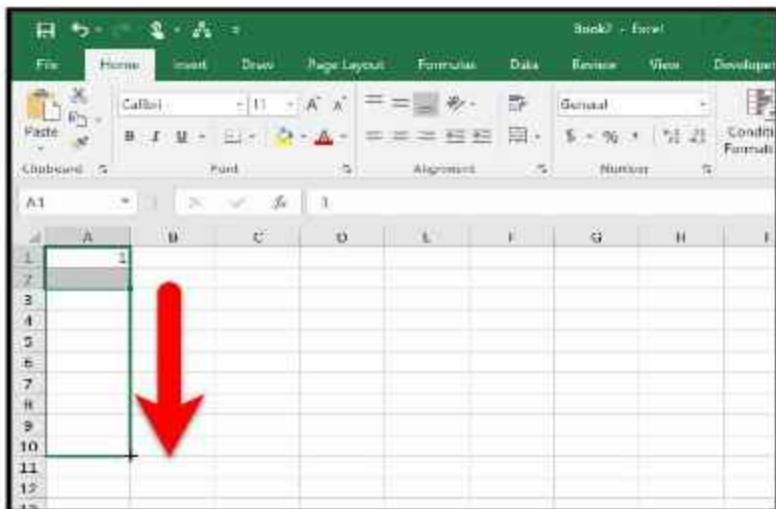
### Fill a Linear Series While Skipping Rows

To make a full worksheet more readable, we sometimes skip rows, putting blank rows in between the rows of data. Even though there are blank rows, you can still use the fill handle to fill a linear series with blank rows.

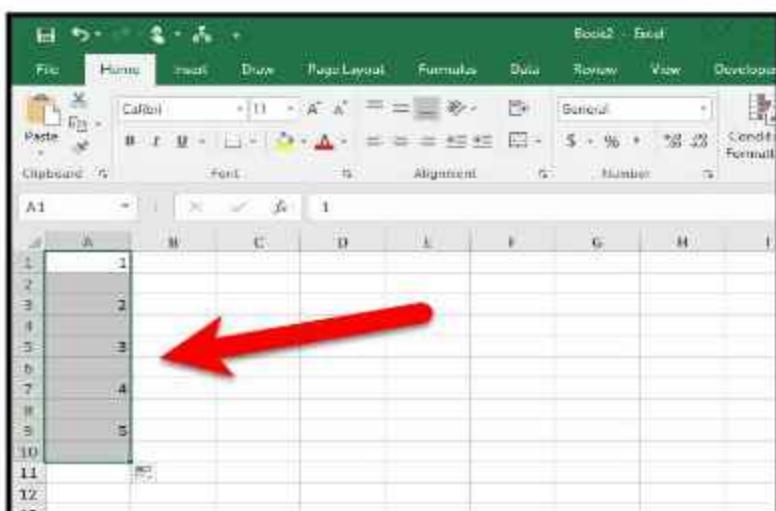
To skip a row when filling a linear series, enter the first number in the first cell and then select that cell and one adjacent cell (for example, the next cell down in the column).



Then, drag the fill handle down (or across) until you fill the desired number of cells.



When you're finished dragging the fill handle, you will see your linear series fills every other row.



If you want to skip more than one row, simply select the cell containing the first value and then select the number of rows you want to skip right after that cell. Then, drag the fill handle over the cells you want to fill. You can also skip columns when you are filling across rows.

### **Fill Formulas into Adjacent Cells**

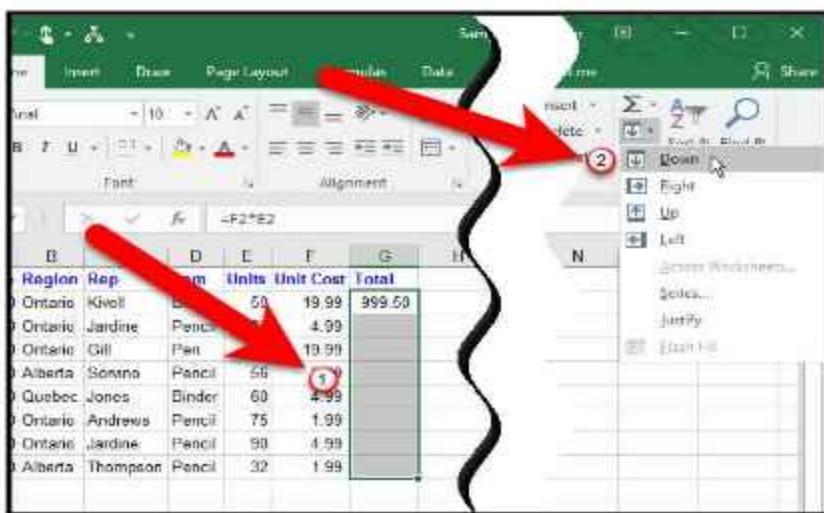
You can also use the fill handle to propagate formulas to adjacent cells. Simply select the cell containing the formula you want to fill into adjacent cells and drag the fill handle down the cells in the column or across the cells in the row that you want to fill.

The formula is copied to the other cells. If you used relative cell references, they will change accordingly to refer to the cells in their respective rows (or columns).

	A	B	C	D	E	F	G	H	I	J	K
1	Order Date	Region	Rep	Item	Units	Unit Cost	Total				
2	1/23/10	Ontario	Kivoll	Binder	50	19.99	999.50				
3	2/9/10	Ontario	Jardine	Pencil	36	4.99					
4	2/26/10	Ontario	Gill	Pen	27	19.99					
5	3/15/10	Alberta	Sonsma	Pencil	56	2.99					
6	4/1/10	Quebec	Jones	Binder	60	4.99					
7	4/18/10	Ontario	Andrews	Pencil	75	1.99					
8	5/5/10	Ontario	Jardine	Pencil	90	4.99					
9	5/22/10	Alberta	Thompson	Pencil	32	1.99					
10											

You can also fill formulas using the Fill command on the ribbon. Simply select the cell containing the formula and the cells you want to fill with that formula.

Then, click "Fill" in the Editing section of the Home tab and select Down, Right, Up, or Left, depending on which direction you want to fill the cells.



### Fill a Linear Series by Double Clicking on the Fill Handle

You can quickly fill a linear series of data into a column by double clicking the fill handle. When using this method, Excel only fills the cells in the column based on the longest adjacent column of data on your worksheet.

An adjacent column in this context is any column that Excel encounters to the right or left of the column being filled, until a blank column is reached.

If the columns directly on either side of the selected column are blank, you cannot use the double click method to fill the cells in the column. Also, by default, if some of the cells in the range of cells you're filling already have data, only the empty cells above the first cell containing data are filled.

For example, in the image below, there's a value in cell G7 so when you double click on the fill handle on cell G2, the formula is only copied down through cell G6.

The screenshot shows a Microsoft Excel spreadsheet with a data table. The table has columns labeled A through K. Row 1 contains headers: Order Date, Region, Rep, Item, Units, Unit Cost, and Total. Rows 2 through 9 contain data. Cell G2 contains the formula =F2\*E2. A red arrow points from the text "Fill a Growth Series (Geometric Pattern)" to the fill handle of cell G7, which is currently highlighted.

	A	B	C	D	E	F	G	H	I	J	K
1	Order Date	Region	Rep	Item	Units	Unit Cost	Total				
2	1/23/10	Ontario	Kivell	Binder	50	19.99	999.50				
3	2/9/10	Ontario	Jardine	Pencil	36	4.99					
4	2/26/10	Ontario	Gill	Pen	27	19.99					
5	3/15/10	Alberta	Savina	Pencil	66	2.99					
6	4/1/10	Quebec	Jones	Binder	60	4.99					
7	4/18/10	Ontario	Andrews	Pencil	75	1.99	149.25				
8	5/5/10	Ontario	Jardine	Pencil	90	4.99					
9	6/22/10	Alberta	Thompson	Pencil	32	1.99					
10											

### Fill a Growth Series (Geometric Pattern)

Up until now, we've been discussing filling linear series, where each number in the series is calculated by adding the step value to the previous number.

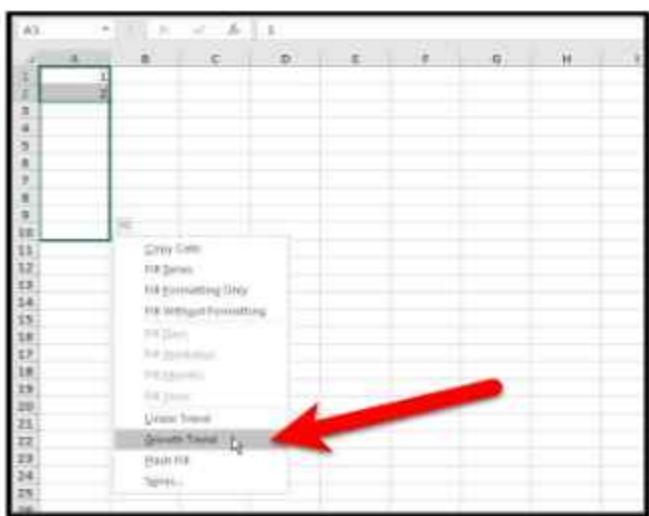
In a growth series, or geometric pattern, the next number is calculated by *multiplying* the previous number by the step value. There are two ways to fill a growth series, by entering the first two numbers and by entering the first number and the step value.

#### Method One: Enter the First Two Numbers in the Growth Series

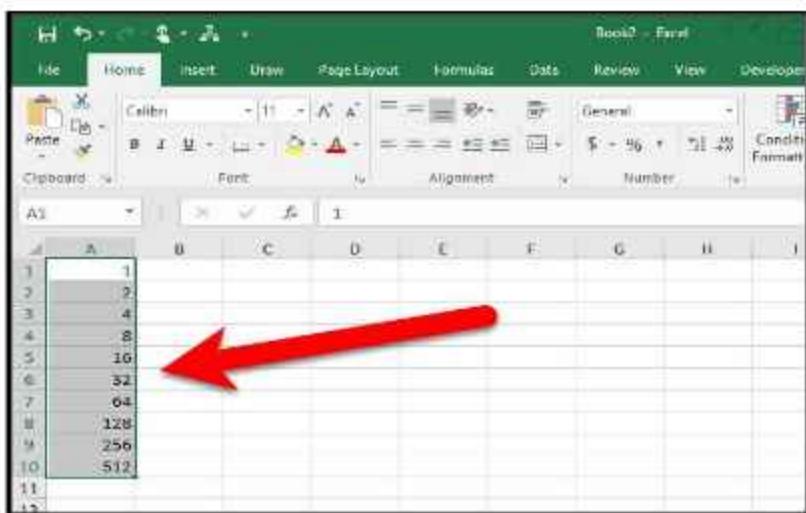
To fill a growth series using the first two numbers, enter the two numbers into the first two cells of the row or column you want to fill. Right-click and drag the fill handle over as many cells as you want to fill.

When you're finished dragging the fill handle over the cells you want to fill, select "Growth Trend" from the popup menu that automatically displays.

NOTE: For this method, you must enter two numbers. If you don't, the Growth Trend option will be grayed out.



Excel knows that the step value is 2 from the two numbers we entered in the first two cells. So, every subsequent number is calculated by multiplying the previous number by 2.

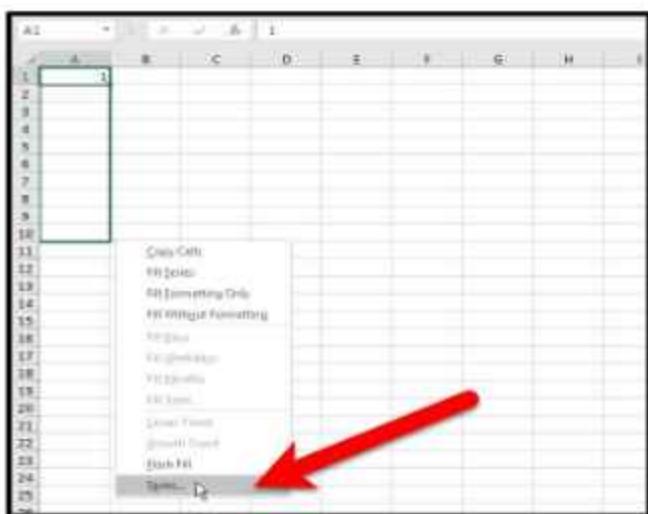


What if you want to start at a number other than 1 using this method? For example, if you wanted to start the above series at 2, you would enter 2 and 4 (because  $2 \times 2 = 4$ ) in the first two cells.

Excel would figure out that the step value is 2 and continue the growth series from 4 multiplying each subsequent number by 2 to get the next one in line.

### Method Two: Enter the First Number in the Growth Series and Specify the Step Value

To fill a growth series based on one number and a step value, enter the first number (it doesn't have to be 1) in the first cell and drag the fill handle over the cells you want to fill. Then, select "Series" from the popup menu that automatically displays.



On the Series dialog box, select whether your filling the Series in Rows or Columns. Under Type, select :"Growth".

In the "Step value" box, enter the value you want to multiply each number by to get the next value. In our example, we want to multiply each number by 3. Click "OK".



The growth series is filled in the selected cells, each subsequent number being three times the previous number.

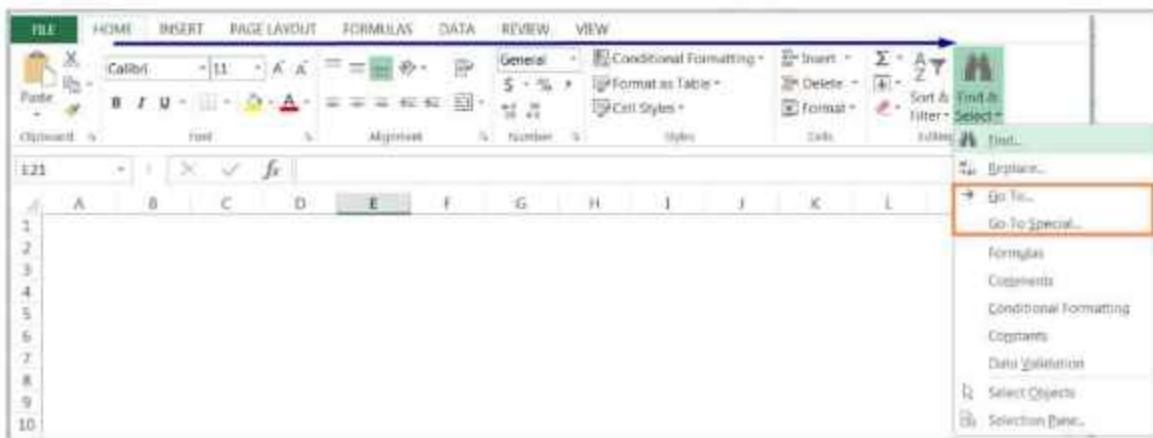
A	B	C	D	E	F	G	H	I
1								
2	3							
3	9							
4	27							
5	81							
6	243							
7	729							
8	2187							
9	6561							
10	19683							
11								

## Chapter-10 Go To Special in Excel

### (A) HOW TO ACTIVATE EXCEL GO TO SPECIAL?

We can activate the Excel Go To Special dialog box either in 03 ways:

- (01) **Using the Excel Shortcut:** Press **Ctrl+G**  $\Rightarrow$  **Go To** dialog box opens  $\Rightarrow$  Either click **Special** button or press **Alt+S**  $\Rightarrow$  **Go To Special** dialog box opens.
- (02) **Using the Function Key:** Press **F5**  $\Rightarrow$  **Go To**  $\Rightarrow$  **Click Special** or **Alt+S**  $\Rightarrow$  **Go To Special**
- (03) **Using the Ribbon:** Go to the **Home** tab  $\Rightarrow$  **Find & Select** dropdown in the *Editing* section  $\Rightarrow$  Either select **Go To** or **Go To Special** (both options are available).



**Note:** We had detail explained the **Excel Shortcut** in two separate tutorials and requested you to read these tutorials:

### 02) EXCEL 'GO TO' COMMAND HELPS TO SELECT BIG RANGE OF CELLS

Suppose we want to select the range **A2:J11** of the current worksheet:

Sales Manager	Bonus Date	01-May-20	05-May-20	09-May-20	12-May-20	16-May-20	20-May-20	24-May-20	AVERAGE (between >=5 & <=10)	Total sale
Jackson	08-May-20	3	10	10	8	9	5	9	8.5	54
Mathew	10-May-20	1	5	7	3	3	6	8	6.5	33
Everton	11-May-20	10	1	8	9	1	5	8	8	42
Shreyasi	11-May-20	9	7	10	6	6	9	6	8	56
Thomas	17-May-20	4	3	4	2	3	8	3	8	27
Samuel	13-May-20	3	2	6	4	5	8	5	6	33
Robert	10-May-20	6	1	6	9	4	9	3	7.5	38
Olivier	12-May-20	4	6	4	7	3	8	6	7	36
Lucas	09-May-20	8	1	10	4	6	5	7	7.2	41

Place the cursor anywhere in the worksheet  $\Leftrightarrow$  Press **Ctrl+G / F5** which will launch the Excel '**Go To**' dialog box  $\Leftrightarrow$  Simply enter a cell range we want to select (for example, **A2:J11**) in the Reference box at the bottom of the dialog box  $\Leftrightarrow$  choose **OK** or press **Enter**.

Sales Manager	Bonus Date	01-May-20	05-May-20	09-May-20	12-May-20	16-May-20	20-May-20	24-May-20	AVERAGE (between >=5 & <=10)	Total sale
Jackson	08-May-20	3	10	10	8	9	5	9	8.5	54
Mathew	10-May-20	1	5	7	3	3	6	8	6.5	33
Everton	11-May-20	10	1	8	9	1	5	8	8	42
Shreyasi	11-May-20	9	7	10	6	6	9	6	8	56
Thomas	17-May-20	4	3	4	2	3	8	3	8	27
Samuel	13-May-20	3	2	6	4	5	8	5	6	33
Robert	10-May-20	6	1	6	9	4	9	3	7.5	38
Olivier	12-May-20	4	6	4	7	3	8	6	7	36
Lucas	09-May-20	8	1	10	4	6	5	7	7.2	41

Excel will activate and display the cell range.

#### Example-2: HOW TO USE EXCEL 'GO TO SPECIAL' CONSTANTS OPTION?

Select any cell in a range  $\Leftrightarrow$  Press **Ctrl+G** or **F5** which will open the '**Go To**' dialog box  $\Leftrightarrow$  Click '**Special**' button or press **Alt+S** which will open the '**Go To Special**' dialog box  $\Leftrightarrow$  Choose '**Constants**' radio button; additionally, Excel by default selects the **Numbers**, **Text**, **Logicals** and **Error** checkboxes  $\Leftrightarrow$  Click **OK** or press **Enter** which will select all cells that contain numbers, texts, errors, but it does not select the cells with formulas.

A	B	C	D	E	F	G	H	Sales Quantity			Formula		
								Count of Sale >=10	AVERAGE (between >=5 & <=10)	Total sale			
Jackson	08-May-20	3	10	10	8	9	5	2	8.4	47			
Mathew					3	3	6	0	6	25			
Everton					9	1	5	1	8	35			
Shreyasi					10	9	9	2	9	56			
Thomas					2	3	8	0	8	24			
Samuel					10	5	8	1	7.25	35			
Robert					10	4	9	1	7.25	37			
Oliver					7	3	8	0	7.5	30			
Lucas					4	6	5	1	7.25	35			

The screenshot shows the 'Go To Special' dialog box open over a table in Excel. The 'Formulas' radio button is selected. The formula bar shows three formulas: =COUNTIFS(C3:H3,>="10"), =SUM(C3:I3), and =AVERAGEIFS(\$C\$1:\$H\$1,\$C\$1:\$H\$1,>="5",\$C\$3:\$H\$3,<="10"). A note at the bottom says 'Selects all cells with values, not formula'.

### Example-3: HOW TO USE EXCEL 'GO TO SPECIAL' FORMULAS OPTION?

Select any cell in a range  $\Rightarrow$  Press **Ctrl+G** or **F5** which will open the '**Go To**' dialog box  
 $\Rightarrow$  Click '**Special**' button or press **Alt+S** which will open the '**Go To Special**' dialog box  
 $\Rightarrow$  Choose '**Formulas**' radio button;

additionally, Excel by default selects the **Numbers**, **Text**, **Logicals** and **Error** checkboxes  $\Rightarrow$  Click **OK** or press **Enter** which will select all the cells with formulas (starting with an equal sign).

A	B	C	D	E	F	G	H	Sales Quantity			Formula		
								Count of Sale >=10	AVERAGE (between >=5 & <=10)	Total sale			
Jackson	08-May-20	3	10	10	8	9	5	2	8.4	47			
Mathew					3	3	6	0	6	25			
Everton					9	1	5	1	8	35			
Shreyasi					10	9	9	2	9	56			
Thomas					2	3	8	0	8	24			
Samuel					10	5	8	1	7.25	35			
Robert					10	4	9	1	7.25	37			
Oliver					7	3	8	0	7.5	30			
Lucas					4	6	5	1	7.25	35			

The screenshot shows the 'Go To Special' dialog box open over a table in Excel. The 'Formulas' radio button is selected. The formula bar shows three formulas: =COUNTIFS(C3:H3,>="10"), =SUM(C3:I3), and =AVERAGEIFS(\$C\$1:\$H\$1,\$C\$1:\$H\$1,>="5",\$C\$3:\$H\$3,<="10"). A note at the bottom says 'Selects all cells with values, not formula'.

### Example-4: HOW TO USE EXCEL 'GO TO SPECIAL' ERROR OPTION?

If we select the **Constants** radio button and **Errors** checkbox, it will select all the errors except in the formula.

The screenshot shows a Microsoft Excel spreadsheet with a table titled "Sales Quantity". The table has columns for "Sales Manager" and "Bonus Date" followed by eight date columns from "02-May-20" to "24-May-20". The last two columns are "AVERAGE" (with a formula: =AVERAGE(B2:I2)) and "Total sale". The "AVERAGE" column contains values like 8.2, 6.5, 9, etc. The "Total sale" column contains values like 33, 56, 5, etc. A red arrow points to cell I2, which contains "#N/A". The "Go To Special" dialog box is open, with the "Constants" radio button selected and the "Errors" checkbox checked. Other options like "Formulas" and "Blanks" are also available.

Similarly, when we select the **Formulas** radio button and **Errors** checkbox, which will select all the errors in the formula.

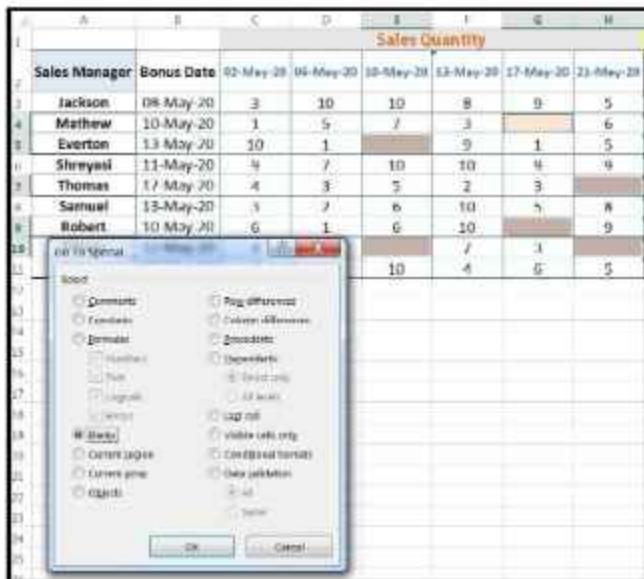
This screenshot is similar to the previous one, showing the "Sales Quantity" table in Excel. The "Go To Special" dialog box is open, with the "Formulas" radio button selected and the "Errors" checkbox checked. A red arrow points to cell I2, which contains the formula =AVERAGE(B2:I2). The rest of the table and dialog box are identical to the first screenshot.

### Example-5: HOW TO USE EXCEL 'GO TO SPECIAL' BLANKS OPTION?

⇒ Fill Blank Cells with Zero Value

Select any cell in a range ⇒ Press **Ctrl+G** or **F5** which will open the '**Go To**' dialog box  
⇒ Click '**Special**' button or press **Alt+S** which will open the '**Go To Special**' dialog

box  $\Rightarrow$  Choose 'Blanks' radio  $\Rightarrow$  Click **OK** or press **Enter** which will select all the cells that are blank.



After selecting cells, we can fill the color, put any values (e.g., zero '0'). As selected, put 0 in one cell and then press **Alt+Enter**. As a result, all cells are filled with the value 0.

Sales Quantity								
Sales Manager	Bonus Date	02-May-20	06-May-20	10-May-20	13-May-20	17-May-20	21-May-20	
Jackson	08-May-20	3	10	10	8	9	5	
Mathew	10-May-20	1	5	7	3	0	6	
Everton	13-May-20	10	1	0	9	1	5	
Shreyasi	11-May-20	9	7	10	10	9	9	
Thomas	17-May-20	4	3	5	2	3	0	
Samuel	13-May-20	3	2	6	10	5	8	
Robert	10-May-20	6	1	6	10	0	9	
Olivier	12-May-20	4	4	0	7	3	0	
Lucas	09-May-20	8	1	10	4	6	5	

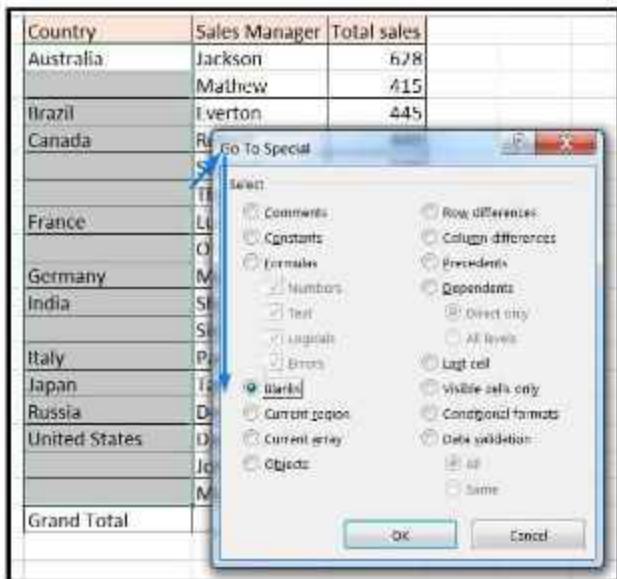
Place a zero(0) in a cell > then press Ctr+Enter

$\Rightarrow$  Fill Blank Cells from the Respective Above Cell

In the second example, we put the Country name in blank cells based on the Country name from the respective above cell.

Select any cell in a range  $\Rightarrow$  Press **Ctrl+G** or **F5** which will open the '**Go To**' dialog box  
 $\Rightarrow$  Click '**Special**' button or press **Alt+S** which will open the '**Go To Special**' dialog

box  $\Rightarrow$  Choose 'Blanks' radio  $\Rightarrow$  Click **OK** or press **Enter** which will select all the cells that are blank.



Then place an equal sign and select the above cell reference.

Then press **Ctrl+Enter** which will apply the respective Country name in the blank cells.

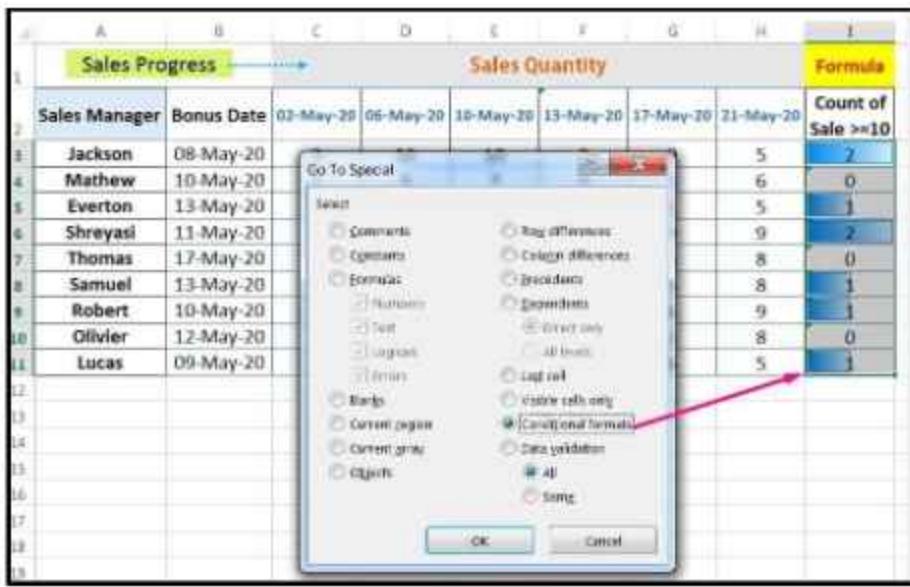
Country	Sales Manager	Total sales
Australia	Jackson	628
=C4	Mathew	415
Brazil	Everton	445
Canada	Robert	449
	Samuel	598
	Thomas	570
France	Lucas	488
	Olivier	411
Germany	Mario	380
India	Shreyasi	944
	Siddhart	601
Italy	Paolo	228
Japan	Takumi	548
Russia	Denis	468
United States	Daniel	481
	Johnson	466
	Michael	566
Grand Total		8686

Then convert the formula into text with the help of Excel Paste Special. Copy the range  $\Rightarrow$  Press **Alt+E+S+V** (sequentially press **Alt**, **E**, **S**, **V**) or **Alt+Ctrl+V+V** (sequentially press **Alt+Ctrl+V**, **V**) which will select the **Value** option in the Paste Special dialog box  $\Rightarrow$  Click **OK** or press **Enter** which will convert all the formulas into value.

Country	Sales Manager	Total sales
Australia	Jackson	628
Australia	Mathew	415
Brazil	Everton	445
Canada	Robert	449
Canada	Samuel	598
Canada	Thomas	570
France	Lucas	488
France	Olivier	411
Germany	Mario	380
India	Shreyasi	911
India	Sidhart	611
Italy	Paolo	228
Japan	Takumi	548
Russia	Denis	468
United States	Daniel	481
United States	Johnson	466
United States	Michael	566
Grand Total		8686
Press " <b>Shift</b> " and select above cell > then press <b>Ctrl+Enter</b> > then Paste Special Value		

### Example-7: HOW TO USE EXCEL 'GO TO SPECIAL' CONDITIONAL FORMATS OPTION?

Select any cell in a range  $\Rightarrow$  Press **Ctrl+G** or **F5** which will open the '**Go To**' dialog box  
 $\Rightarrow$  Click '**Special**' button or press **Alt+S** which will open the '**Go To Special**' dialog box  
 $\Rightarrow$  Choose '**Conditional Formats**' radio  $\Rightarrow$  Click **OK** or press **Enter** which will select only cells that contain *conditional formatting*.



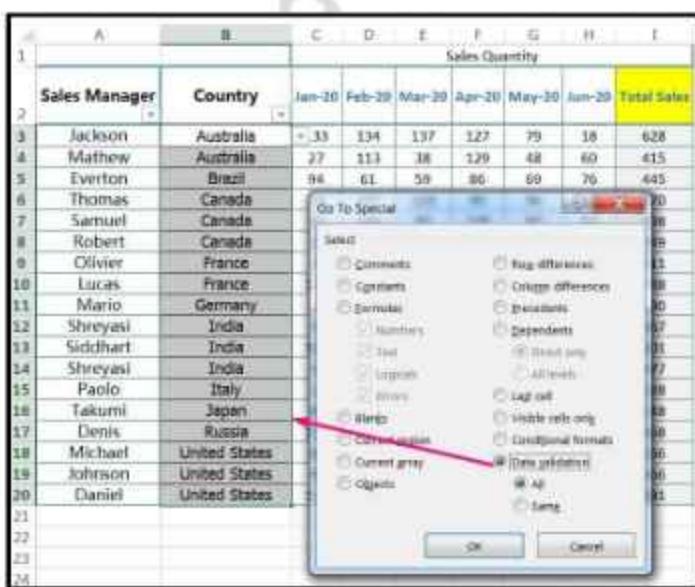
➤ Example-8: HOW TO USE EXCEL 'GO TO SPECIAL' DATA VALIDATION OPTION?

In the given example, validation rules applied to the Country column (i.e., column B).

Sales Manager	Country	Sales Quantity							Total Sales
		Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20		
Jackson	Australia	33	134	137	127	79	18	628	
Mathew	Australia	27	113	38	129	48	60	415	
Everton	Brazil	94	61	59	86	69	76	445	
Thomas	Canada	14	141	129	45	96	145	570	
Samuel	Canada	92	146	83	138	87	52	598	
Robert	India	11	142	23	119	44	30	449	
Olivier	Japan	29	140	30	80	71	61	411	
Lucas	France	123	75	80	74	120	16	488	
Mario	Germany	45	34	66	82	66	87	380	
Shreyasi	India	55	87	29	123	42	131	467	
Siddhart	India	100	126	116	50	128	111	601	
Shreyasi	India	59	100	18	103	140	57	477	
Paolo	Italy	13	59	21	24	47	64	228	
Takumi	Japan	89	46	57	139	105	112	548	
Denis	Russia	133	137	55	69	47	27	468	
Michael	United States	84	74	109	84	108	107	566	
Johnson	United States	99	15	94	101	42	115	466	
Daniel	United States	132	13	46	61	140	89	481	

Select any cell in a range ⇰ Press **Ctrl+G** or **F5** which will open the 'Go To' dialog box  
 ⇰ Click 'Special' button or press **Alt+S** which will open the 'Go To Special' dialog box  
 ⇰ Choose 'Data Validation' radio ⇰ Click **OK** or press **Enter** which will select cells that contain data validation rules.

- **All** – Selects all cells that contain the data validation rule (Excel by default select this option).
- **Same** – Selects all cells that contain a similar validation rule as the current cell.



## Final Exercise-3

### **Exercise 1**

	A	B	C	D	E	F	G
1	Payroll						
2	Date:	1/1/2011					
3	EMPL Number	EMPL Name	Hourly Rate	Hours Worked	Gross Pay	S.S Tax	Net Pay
4	E00001	Ford	7.5	35	?	?	?
5	E00002	Mino	8	30	?	?	?
6	?	Bell	6.5	25	?	?	?
7	?	Davis	9	40	?	?	?
8	?	Turro	10	39	?	?	?

Objectives:

1. Open a new workbook and save the file with the name "Payroll".
2. Enter the labels and values in the exact cells locations as desired.
3. Use AutoFill to put the Employee Numbers into cells A6:A8.
4. set the columns width and rows height appropriately.
5. Format cell B2 to Short Date format.
6. Format cells E4:G8 to include dollar sign with two decimal places.
7. Calculate the Gross Pay for employee; enter a formula in cell E4 to multiply Hourly Rate by Hours Worked.
8. Calculate the Social Security Tax (S.S Tax), which is 6% of the Gross Pay; enter a formula in cell F4 to multiply Gross Pay by 6%.
9. Calculate the Net Pay; enter a formula in cell G4 to subtract Social Security Tax from Gross Pay.

**Exercise 2**

3	Name	No. calls	Hours worked	Calls per Hour	Bonus
4	Adam	42	5	?	?
5	Jhon	6	4		
6	Jamse	39	6		
7	Alex.	15	6		
8	Emma	2	7	↓	↓
9					
10	<b>TOTAL</b>	?	?	?	?
11					
12	<b>Bonus Rate</b>	25%			

Objectives:

1. Open a new workbook and save the file with the name "Call Statistics".
2. Set the row height of rows 1 & 3 to size 30; and rows 4 until 10 to size 20.
3. Use Warp Text, Orientation and merge cells as desired.
4. Apply border, gridlines and shading to the table as desired.
5. Format column E to include Rupees sign with two decimal places.
6. Format cell B12 to include % sign with 0 Decimal places.
7. Calculate the Calls per Hour, enter a formula in cell D4 to divide numbers of calls by Hours worked. Using AutoFill, copy the formula to the remaining cells.
8. Calculate the Bonus. Enter a formula in cell E4 to multiply 'Calls per Hours' by the fixed Bonus Rate in cell B12. Using AutoFill, copy the formula to the remaining cells.
9. Calculate the 'TOTAL'

**Exercise 3**

Monthly Sales Report - July						
	Emp. No.	Name	Salary	Sales Amount	Comission	Total Salary
5	S101	Ahmed	1600	2500	?	?
6	S105	Hassan	1800	3000		
7	S112	Ali	1500	2200		
8	S107	Waleed	2000	4500		
9	S110	Mohammed	1700	3500		
10	S103	Samir	1600	2500		
11						
12	<b>Totals</b>	?	?	?	?	?
13	<b>Average</b>	?	?	?	?	?
14	<b>Highest</b>	?	?	?	?	?
15	<b>Lowest</b>	?	?	?	?	?
16	<b>Count</b>	?				

1. Create the worksheet shown above.
2. Set the column widths as follows: Column A: 8, Column B: 14, Columns C & D: 15, Columns E & F: 14.
3. Enter the formula to find COMMISSION for the first employee.  
The commission rate is 2% of sales,  $\text{COMMISSION} = \text{SALES} * 2\%$  Copy the formula to the remaining employees.
4. Enter the formula to find TOTAL SALARY for the first employee where:  
 $\text{TOTAL SALARY} = \text{SALARY} + \text{COMMISSION}$  Copy the formula to the remaining employees.
5. Enter formula to find TOTALS, AVERAGE, HIGHEST, LOWEST, and COUNT values.  
Copy the formula to each column.
6. Format numeric data to include commas and two decimal places.
7. Align all column title labels horizontally and vertically at the center.

**Exercise 4**

A	B	C	D	E	F	G
ITEM NO.	NO. OF ITEMS	ITEM PRICE	TAX	TOTAL PRICE BEFORE TAX	TOTAL PRICE AFTER TAX	RATE
100	115	30				
101	256	12				
	49	56				
	23	150				
	840	5				
	200	56				
	294	300				
	4	90				
Count of items	?					
Average of tax	?					
Min ITEM PRICE	?					
Max ITEM PRICE	?					

1. TAX (If ITEM PRICE is less than 100, TAX is 50, and otherwise it should be 100).
2. TOTAL PRICE BEFORE TAX = NO. OF ITEMS \* ITEM PRICE.
3. TOTAL PRICE AFTER TAX = TOTAL PRICE BEFORE TAX + TAX.
4. RATE (If TOTAL PRICE AFTER TAX > 3500 then the rate is "HIGH", otherwise it is REASONABLE).
5. Find Count of Items, Average of Taxes, Min Item PRICE and Max Item PRICE.

**Exercise 5**

	A	B	C	D	E	F	G
1	Sales and Profit Report - First Quarter 2012						
2	No	City	Jan	Feb	Mar	Average	Maximum
3	C001	New York	\$22,000.00	\$29,000.00	\$19,000.00	?	?
4	C002	Los Angeles	\$42,000.00	\$39,000.00	\$43,000.00	?	?
5	?	London	\$18,000.00	\$20,000.00	\$22,000.00	?	?
6	?	Paris	\$35,000.00	\$26,000.00	\$31,000.00	?	?
7	?	Munich	\$12,000.00	\$15,000.00	\$13,000.00	?	?
8	Total Sales		?	?	?		
9	Cost		\$83,000.00	\$84,000.00	\$43,000.00		
10	Profit		?	?	?		
11	10% Bonus		?	?	?		
12							
13	Total Sales greater than 30,000		?	?	?		
14	No Sales greater than 30,000		?	?	?		

1. Create the worksheet shown above.
2. Use AutoFill to put the Series Numbers into cells A5:A7.
3. Format cells C3:G7, C8:E11, C13:E13 to include dollar sign with two decimal places.
4. Find the Average Sales and Maximum Sales for each City.
5. Find the Total Sales for each Month.
6. Calculate the Profit for each month , where profit = Total Sales – Cost
7. Calculate the 10% Bonus, which is 10% of the Profit.
8. Find the Total Sales for each Month; only for sales greater than 30,000.
9. Find the No of Sales for each Month; only for sales greater than 30,000.
10. Create the following Charts:

-Column Chart

-Pie Chart

**Exercise 6**

Objectives:

	Customer ID	Gender	City	Education	Annual Purchases	Annual Salary
2						
3	C11	M	New York	University	\$6,233	\$7,500
4	C12	M	New York	High School	\$4,233	\$4,999
5		F	Seattle	University	\$6,560	\$6,750
6		M	Chicago	University	\$5,001	\$12,000
7		F	New York	University	\$7,034	\$17,500
8		F	Chicago	University	\$5,345	\$13,150
9		F	Seattle	High School	\$790	\$3,799
10		F	Seattle	None	\$240	\$2,150
11		M	Seattle	University	\$4,300	\$22,450
12	V	F	New York	None	\$232	\$2,500
13						
14						
15	City	Total Annual Purchases		Annual Salary	Gender	
16	New York	?		City	Male	Female
17	Chicago	?		New York	?	?
18	Seattle	?		Chicago	?	?
19				Seattle	?	?
20	Education	Average Annual Purchases				
21	University	?				
22	High School	?				
23	None	?				
24						
25	Gender	Population				
26	Male	?				
27	Female	?				

1. Open a new workbook and create the above worksheet.
2. Make sure that your worksheet looks like the picture (Alignment, Shading, Borders, Wrap text, Orientation ...).
3. Find the entire customer IDs.
4. Format Column E & D to Currency with dollar sign and two decimal places.
5. Find the Total Annual Purchases for each City.
6. Find the Average Annual Purchases for each Education.
7. Find the total number of customers from each gender.
8. Find the total annual salary for each gender in each city.
9. Create the following Chart: Column Chart, Pie Chart, Bar Chart, Line Chart