

## Using Formulas and Functions in Microsoft Excel

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This document provides instructions for using basic formulas and functions in Microsoft Excel.

### Opening Comments

**Formulas** are equations that perform calculations on values. A formula starts with an equal sign (=) and follows the order of operations (parentheses, exponents, multiplication & division, addition & subtraction).

For example, the following formula multiplies 2 by 3 and then adds 5 to the result.

`=5+2*3`

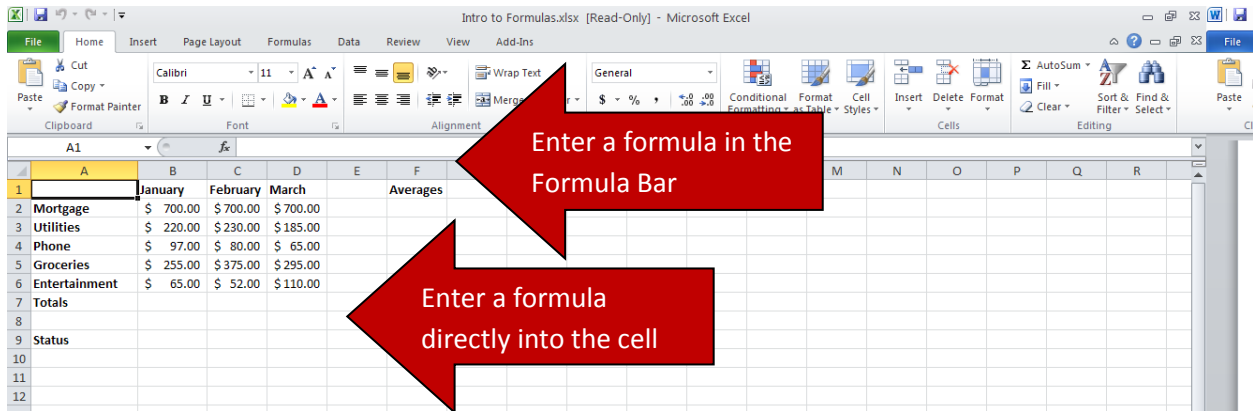
A **function** is a preset formula. Like formulas, functions begin with an equal sign (=) followed by the function's name and its arguments. The function name tells Excel what calculation to perform. The arguments are contained inside round brackets.

For example, the most used function in Excel is the SUM function, which is used to add together the data in selected cells. The SUM function is written as -

`=SUM(A1:A6)`

Here the function adds the contents of the cell range A1 to A6.

Formulas and functions can be entered directly into a cell or into the Formula Bar.

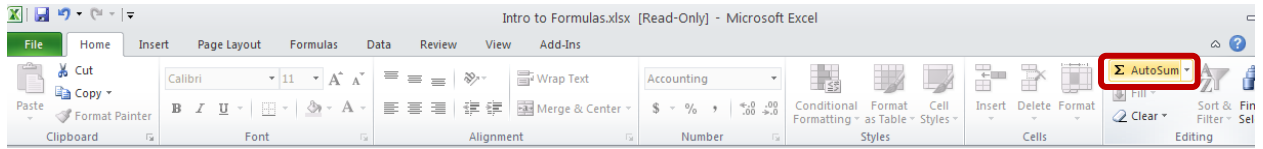


### Introduction to the SUM Function

The SUM function adds the contents of a series of cells.

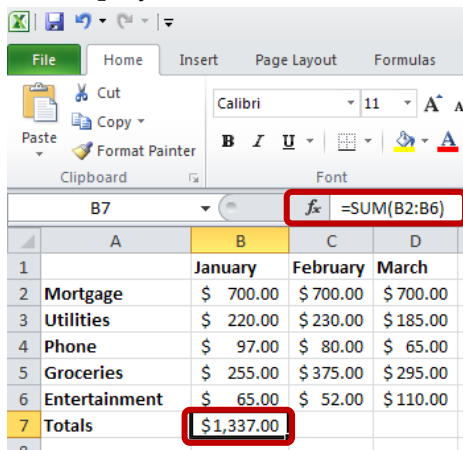
1. Click the cell in which you want the answer to appear.
2. Enter the formula: `=SUM(B2:B6)`.

3. Or click the **AutoSum** button. Excel will look for a series of adjacent numbers to which the function will be applied. Make sure the appropriate cells are selected.



	A	B	C	D
1		January	February	March
2	Mortgage	\$ 700.00	\$ 700.00	\$ 700.00
3	Utilities	\$ 220.00	\$ 230.00	\$ 185.00
4	Phone	\$ 97.00	\$ 80.00	\$ 65.00
5	Groceries	\$ 255.00	\$ 375.00	\$ 295.00
6	Entertainment	\$ 65.00	\$ 52.00	\$ 110.00
7	Totals	=SUM(B2:B6)		
8				

4. As soon as you press **Enter**, the formula runs and the result is displayed. The Formula Bar displays the function.

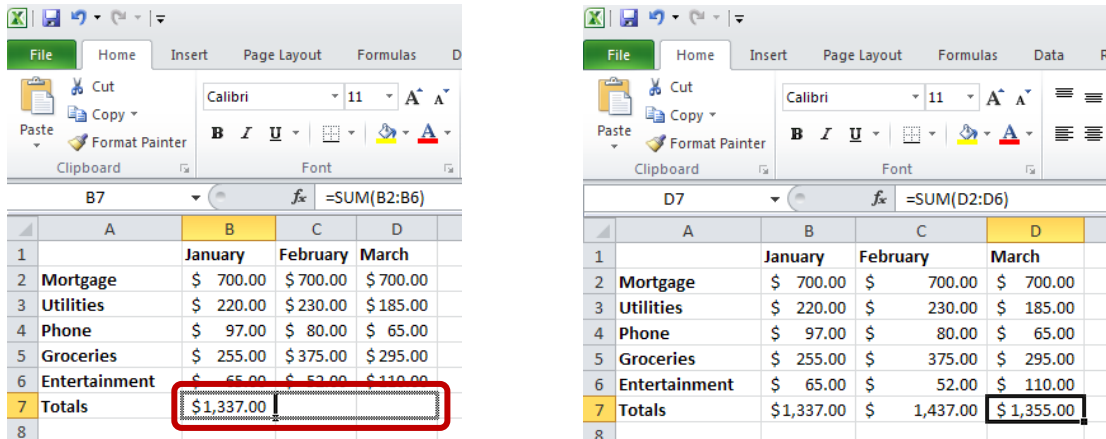


5. Instead of using the SUM function, you could have typed '=700+220+97+255=65'. However, if any of those numbers changed, you would have had to adjust the formula as well. The beauty of using functions is that if the contents of the cells being calculated change, the formula automatically recalculates.

Once the SUM function has been applied to one group of cells, it can easily be copied to additional groups of adjacent cells.

1. Select the cell that contains the SUM formula.

- Point to the small black 'handle' in the lower right corner of the cell. Drag the handle to the cell(s) to which you would like to copy the function.

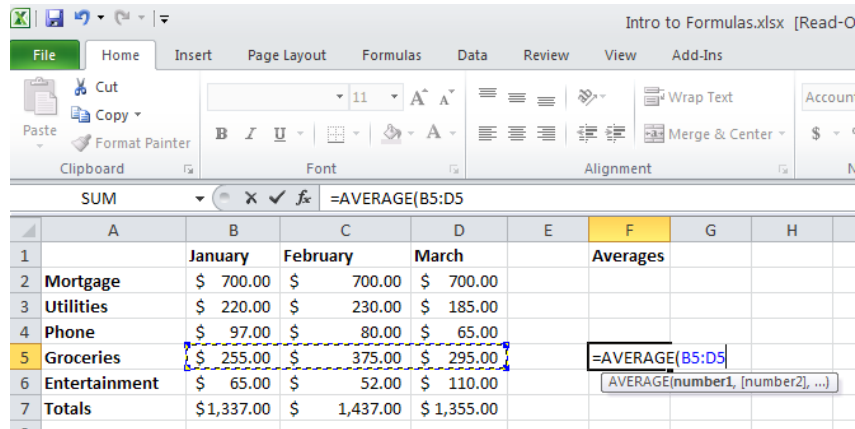


- You can also copy the formula using the **Copy** and **Paste** tools. This is helpful when you want to copy the formula to a non-adjacent cell.

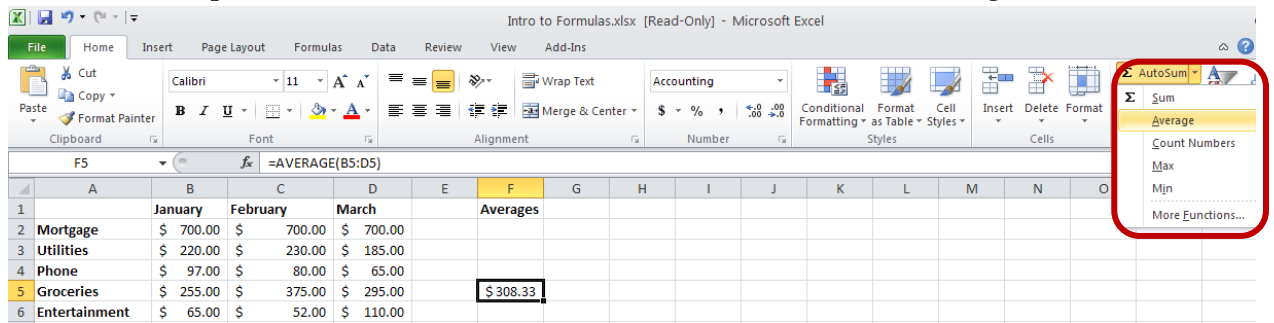
## Introduction to the AVERAGE Function

The AVERAGE function averages the contents of a series of cells.

- Click the cell in which you want the average to appear.
- Enter the formula: =AVERAGE(B4:D4)
  - You can also use the mouse to select the cells to which you want to apply the function once you have typed the beginning of the formula.



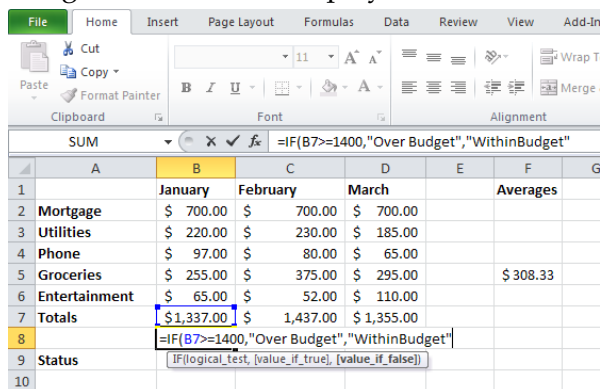
- Or click the dropdown arrow next to the **AutoSum** button and select **Average**.



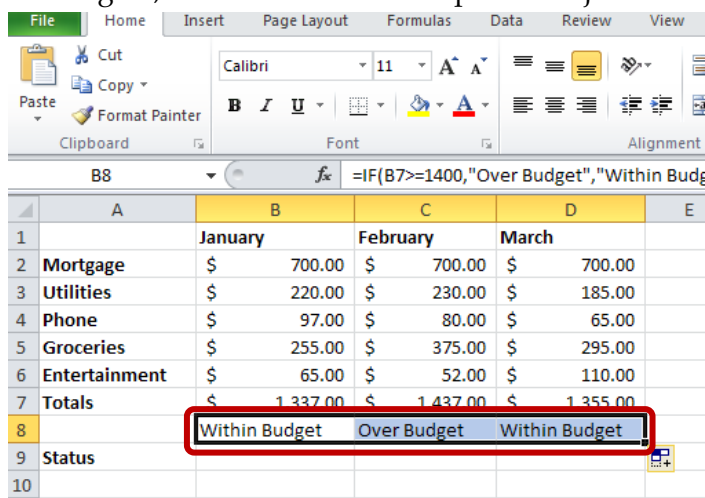
## Introduction to the IF Function

The IF function returns one value if a condition you specify evaluates to TRUE and another value if it evaluates to FALSE.

- Click the cell in which you want the result to appear.
- Enter the formula: `=IF(B8>=1400,"Over Budget","Within Budget")`
- In other words, if the total monthly expenses is over 1400, then display the text "Over Budget". Otherwise, display the text "Within Budget".



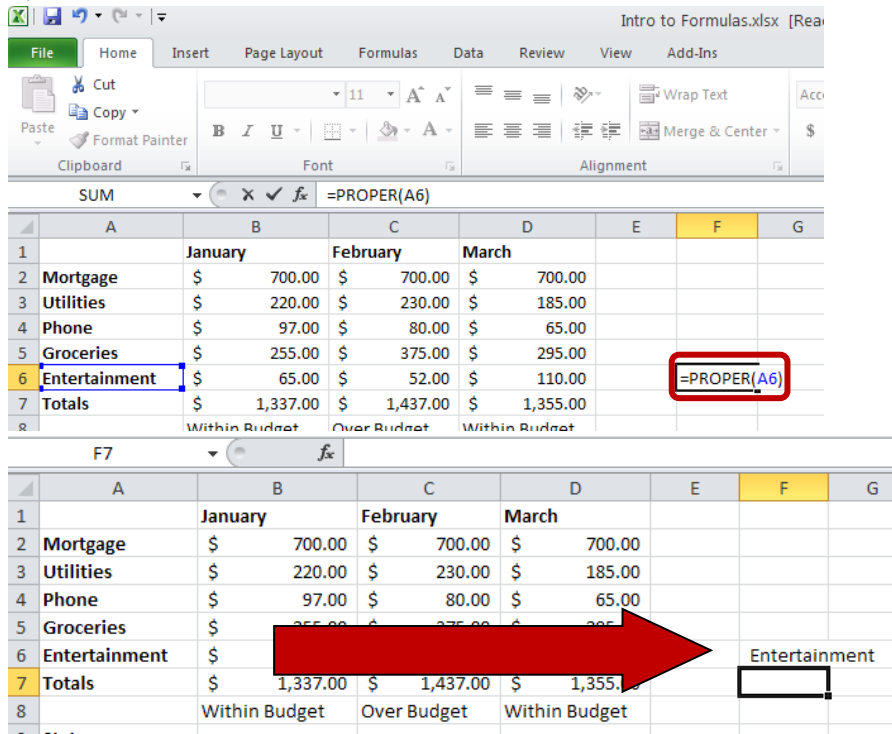
- Once again, this formula can be copied to adjacent cells to complete the worksheet.



## Introduction to UPPER, LOWER, and PROPER Functions

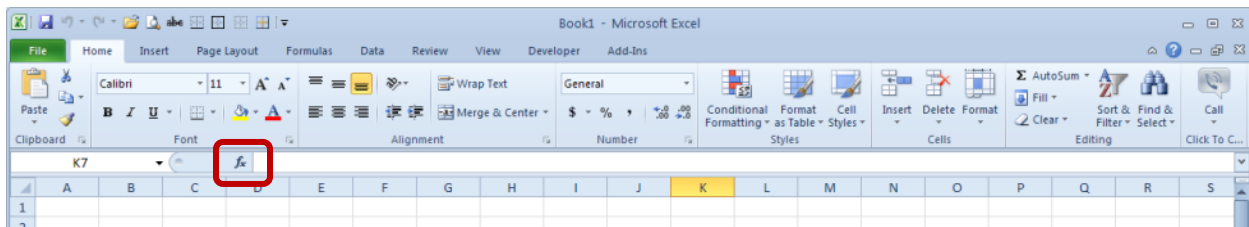
The UPPER function converts lowercase text to uppercase. The LOWER function converts uppercase text to lowercase. The PROPER function capitalizes the first letter in a text string and any other letters that follow any character other than a letter. All other letters are converted to lowercase letters.

1. Click the cell in which you want the converted text to appear.
2. Type the formula: =PROPER(A6)

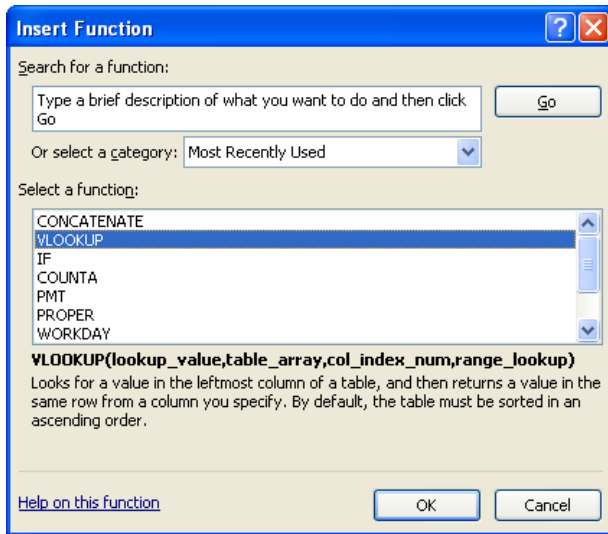


## More Information on Formulas

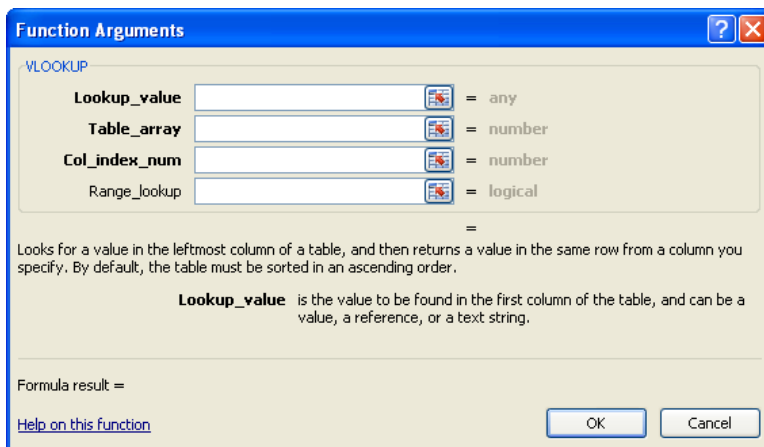
The **Insert Function** button, found to the left of the formula bar, can be helpful when building formulas.



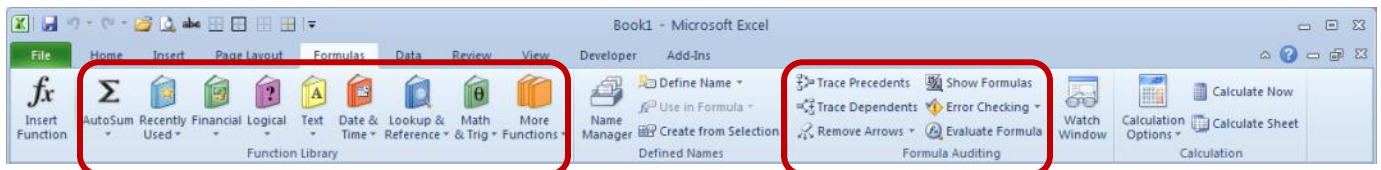
Clicking the **Insert Function** button brings up a dialog box that allows you to search the function library.



Once a function has been selected, another dialog box appears walking you through each argument of the function.



In addition, Excel has an entire tab on the Ribbon devoted to formulas. Many, many functions exist in the **Function Library**. The **Formula Auditing** group provides helpful tools for validating formulas.



## Common Errors When Creating Formulas

Formulas must begin with an equal sign (=). Without this, the formula will appear in the cell instead of the result.

	A	B	C	D
1		January	February	March
2	Mortgage	\$ 700.00	\$ 700.00	\$ 700.00
3	Utilities	\$ 220.00	\$ 230.00	\$ 185.00
4	Phone	\$ 97.00	\$ 80.00	\$ 65.00
5	Groceries	\$ 255.00	\$ 375.00	\$ 295.00
6	Entertainment	\$ 65.00	\$ 52.00	\$ 110.00
7	Totals	\$ 1,337.00	\$ 1,437.00	\$ 1,355.00
8		Within Budget	Over Budget	Within Budget
9	Status			
10				
11				
12		SUM(A2:A6)		
13				
14				

A formula cannot refer to itself. This will result in a circular reference error, which Excel cannot resolve. For example, =SUM(B2:B8) cannot appear in cell B8 because the contents of that cell are part of the formula.

	A	B	C	D
1		January	February	March
2	Mortgage	\$ 700.00	\$ 700.00	\$ 700.00
3	Utilities	\$ 220.00	\$ 230.00	\$ 185.00
4	Phone	\$ 97.00	\$ 80.00	\$ 65.00
5	Groceries	\$ 255.00	\$ 375.00	\$ 295.00
6	Entertainment	\$ 65.00	\$ 52.00	\$ 110.00
7	Totals	\$ 1,337.00	\$ 1,437.00	\$ 1,355.00
8		=SUM(B2:B8)		

The SUM function includes B8, which is where the result is supposed to appear. This creates a never-ending loop.

If a function name is misspelled, a name error will occur.

	A	B	C	D
1		January	February	March
2	Mortgage	\$ 700.00	\$ 700.00	\$ 700.00
3	Utilities	\$ 220.00	\$ 230.00	\$ 185.00
4	Phone	\$ 97.00	\$ 80.00	\$ 65.00
5	Groceries	\$ 255.00	\$ 375.00	\$ 295.00
6	Entertainment	\$ 65.00	\$ 52.00	\$ 110.00
7	Totals	\$ 1,337.00	\$ 1,437.00	\$ 1,355.00
8		#NAME?		

The SUM function was mistyped.

When a cell reference is not valid, a reference error will occur. For example, this occurs if cells are deleted that are referred to by other formulas, or if moved cells are pasted over cells referred to by other formulas.

	A	B	C	D	E	F
1		January	February	March		
2	Mortgage	700	700	700		
3	Utilities	220	230	185		
4	Phone	97	80	65		
5	Groceries	255	375	295		
6	Entertainment	65	52	110		
7						
8	Totals	1337	1437	Over Budget		
9	Budget?	Within Budget		#REF!		
10						
11						
12						
13						
14						
15						
16						
17						
18						

I pasted the contents of C9 into D8. But the formula in cell D9 refers to D8.

Microsoft Help provides the following table summarizing some of the most common errors made when entering a formula and how to correct those errors:

Make sure that you...	More information
<b>Match all open and close parentheses</b>	Make sure that all parentheses are part of a matching pair. When you create a formula, Excel displays parentheses in color as they are entered.
<b>Use a colon to indicate a range</b>	When you refer to a range of cells, use a colon (:) to separate the reference to the first cell in the range and the reference to the last cell in the range.
<b>Nest no more than 64 functions</b>	You can enter, or nest, no more than 64 levels of functions within a function.
<b>Enter numbers without formatting</b>	Do not format numbers as you enter them in formulas. For example, even if the value that you want to enter is \$1,000, enter <b>1000</b> in the formula.