Microsoft Excel Math Formula Guide

Microsoft Excel is a spreadsheet software that is used to organize and calculate data. This handout will focus on how to use built-in Excel functions to solve basic mathematical calculations.

You can navigate to specific sections of this handout by clicking the links below.

Basics of Excel

An Excel sheet is a grid consisting of cells, labeled by their column letter and row number. These labels are called the cell reference. For example, a combination of row 4 and column E results in the reference, E4. Below the ribbon, Excel shows the user the cell reference of the currently selected cell. An image details this below.

The ribbon contains all of Excel's commands in one convenient scroll bar.

Selected Cell's Reference
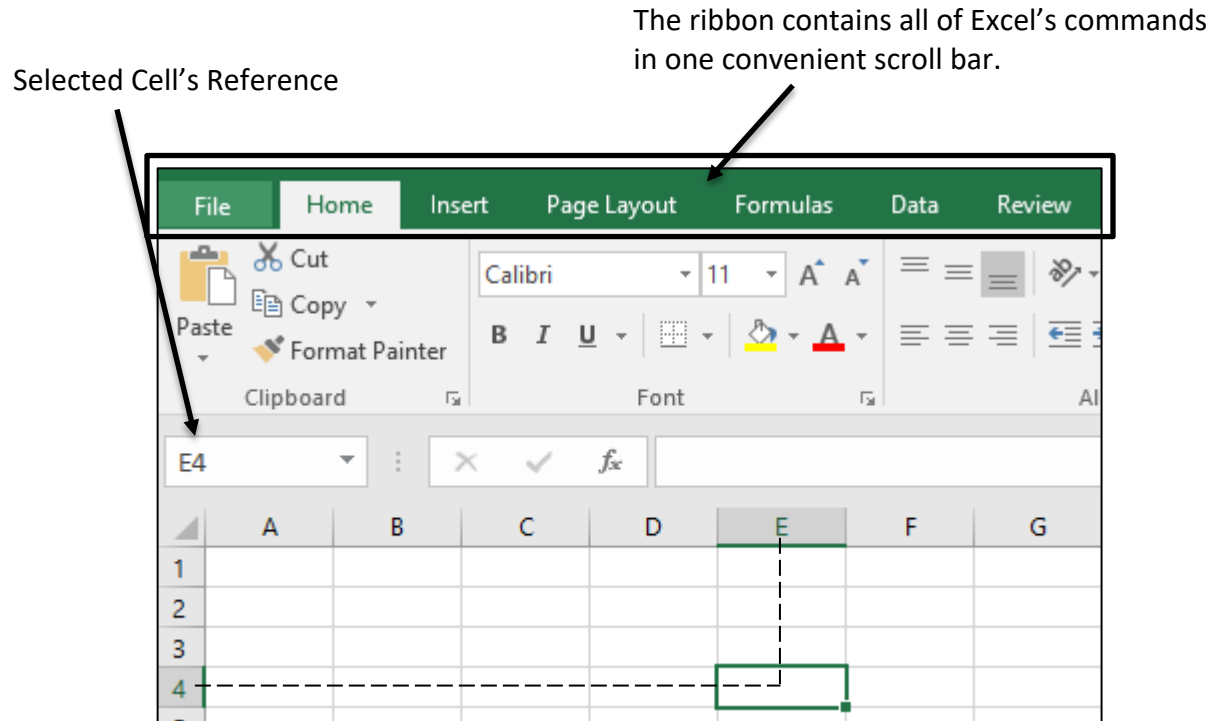
Introduction to Built-In Excel Functions

Excel has numerous built-in functions, such as **SUM**, **AVERAGE**, and **MIN**. For a list of commonly used built-in functions, review the Microsoft Excel Function Index handout. Every Excel calculation must begin with an equal sign (=) followed by the function name or formula. After the function name, use commas within parenthesis to list cell references as distinct data points.

Example:

Find the sum of the values in column A
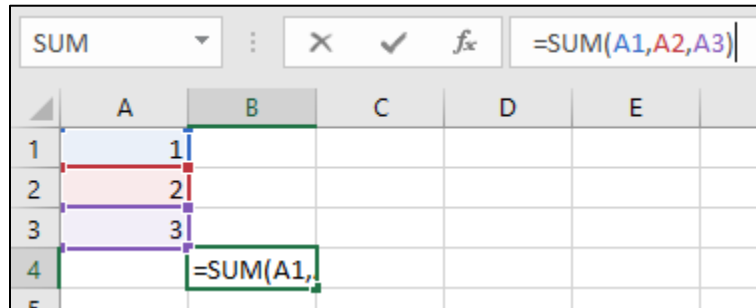
The built-in **SUM** function can be used to add the values within a certain range together, in this case the values in column A. Select the cell where the sum will be displayed and type:

$$= SUM(A1, A2, A3)$$

Instead of listing each reference individually, it is often easier to type the references as a range with a colon separating the first and last desired data points. Type A1:A3 or highlight the desired cells after typing the built-in function name followed by a parenthesis, as seen on the next page.
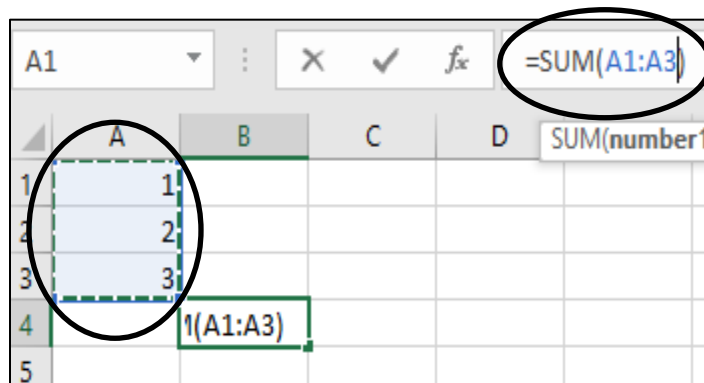
Using the Fill Handle

If a similar formula or built-in function is needed across multiple cells, the fill handle can be used to fill the other cells with the formula. To do this, hover over the bottom right corner of the cell until a black cross appears. Click and drag the cursor across the cells where the formula will be copied.

Example

Find the sum of column A and B

1) Use the built-in SUM function to find the sum of column A in A7.

2) Use the fill handle to fill the formula in A7 to B7. The fill handle is a small black cross that should appear when the cursor is placed over the lower right-hand corner of the box. Since the formula is shifted once to the right, the references used in the formula for A7 will also be shifted to the right.

fill handle

	A	B
1	2	1
2	2	1
3	4	1
4	3	1
5	5	10
6		
7	=SUM(A1:A5)	=SUM(B1:B5)

3) Check that the results are as expected. If not, review the formula again. The sum of column B is 14.

Absolute Cell References

When filling a formula, certain cell references may need to remain constant so that all future formulas reference the same cell. In order to make these cell references constant, place a dollar sign ($) before the section of the cell reference that needs to remain stationary during the fill. For example:

$A1	Column reference remains constant
A$2	Row reference remains constant
A2	Row and column references remain constant

Example 1:

Multiply the sum of each column (A, B, and C) by the value in E1.

	A	B	C	D	E	F
1	1	1	5		2	
2	2	1	5			
3	2	1	5			
4	5	1	0			
5						
6						

1.   Create a formula for the first calculation. Find the sum of A and multiply by E1 using the formula below.

$$= SUM(A1{:}A4) * E1$$

2.   Edit the formula to include absolute references. The image below shows what would happen if the unedited formula was filled to B6 and C6. Without constraints, all references in the formula are shifted relative to the direction of the fill. In this case, all references were shifted to the right resulting in the sums of column B and C being incorrectly multiplied by F1 and G1, respectively.

	A	B	C	D	E	F	G
1	1	1	5		2		
2	2	1	5				
3	2	1	5				
4	5	1	0				
5							
6	=SUM(A1:A4)*E1	=SUM(B1:B4)*F1	=SUM(C1:C4)*G1				

Should be E1, not G1

To fix this, add a dollar sign in front of the column reference to keep the reference to the E column constant during the fill. The correct formula for cell A6 is:

$$= SUM(A1{:}A4) * \$E1$$

3.   Fill the edited formula to the right. The result is shown below:

	A	B	C	D	E
1	1	1	5		2
2	2	1	5		
3	2	1	5		
4	5	1	0		
5					
6	20	8	30		

Example 2:

Given the time of three different runners to complete a marathon, find:

a) The speed (in mph) of each runner.

b) The average speed (in mph) of all runners.

	A	B	C	D	E	F	G	H	I	J
1			Runner A	Runner B	Runner C					
2	Time(hours):		2.5	2.25	5		Marathon Length:		26.2	miles
3										
4	Speed(mph):						Average Speed:			mph
5										

1.   Create a formula to calculate the speed of runner A. Speed is calculated by dividing the distance by time. The speed for runner A is calculated using the following formula:

$$= I2/C2$$

SUM	▼	⋮	✕	✓	f_x	=I2/C2				

	A	B	C	D	E	F	G	H	I	J
1			Runner A	Runner B	Runner C					
2	Time (hours):		2.5	2.25	5		Marathon Length:		26.2	miles
3										
4	Speed (mph):		=I2/C2				Average Speed			mph

2.   Edit the formula to include absolute references. Not making I2 an absolute reference before filling will result in the following errors, which are circled below.

C4			✗ ✓ f_x	=I2/C2					
	A	B	C	D	E	F	G	H	I	J
1			Runner A	Runner B	Runner C					
2	Time(hours):		2.5	2.25	5		Marathon Length:			26.2 miles
3										
4	Speed(mph):		10.48	#VALUE!	0		Average Speed:			mph

These errors occur when a formula references a cell that contains text or is an empty cell. To fix the errors, make I2 an absolute cell reference in the original formula. Since the column reference for distance will remain constant, place a dollar sign before the I in I2, which creates the formula: $= \$I2/C2$.

3.   Fill the edited formula to the right.

C4			✗ ✓ f_x	=$I2/C2					
	A	B	C	D	E	F	G	H	I	J
1			Runner A	Runner B	Runner C					
2	Time(hours):		2.5	2.25	5		Marathon Length:			26.2 miles
3										
4	Speed(mph):		10.48	11.64444	5.24		Average Speed:			mph

4.   Calculate the average speed using the built-in **AVERAGE** function. Type the following function into I4 to find the average speed of the three runners.

$$= AVERAGE(C4{:}E4)$$

I4			✗ ✓ f_x	=AVERAGE(C4:E4)					
	A	B	C	D	E	F	G	H	I	J
1			Runner A	Runner B	Runner C					
2	Time(hours):		2.5	2.25	5		Marathon Length:			26.2 miles
3										
4	Speed(mph):		10.48	11.64	5.24		Average Speed:		9.121481	mph

For more information about solving word problems like this one, review the Helpful Handout, "Introduction to Word Problems," on our website at https://www.germanna.edu/academic-center-for-excellence/.

Practice Problems

Create the following tables in Excel and solve accordingly.

1. Given the data below, calculate the speed of each car, and determine which car is faster.

	A	B	C	D	E
1					
2			Car 1	Car 2	
3	Time (minutes)		60	85	
4	Distance (miles)		45	65	
5	Speed (mph)				
6			Which car is faster?		
7					

2. You have the opportunity to buy several cars at different price points. Each car has a different mile-per-gallon rate. Determine which car is least expensive over a 10-year period if you drive 15,000 miles a year. Assume that gasoline is $2.00 a gallon.

	A	B	C	D	E	F
1		Camry	Gallardo	4Runner	Wrangler	Ranger
2	Cost (USD)	$24,000.00	$100,000.00	$35,000.00	$42,000.00	$55,000.00
3	Miles/Gallon	41	12	21	25	27
4	Other Costs per year	$ 1,000.00	$ 15,000.00	$ 500.00	$ 250.00	$ 500.00
5						
6	Total 10 year cost:					

Solutions

1. Car 2 is faster.

◢	A	B	C	D
1				
2			Car 1	Car 2
3	Time (minutes)		60	85
4	Distance (miles)		45	65
5	Speed (mph)		45	45.88235

Formula: $= \frac{C4}{C3} * 60$, written in C5 and filled to D5

2. The Camry is the least expensive.

◢	A	B	C	D	E	F
1		Camry	Gallardo	4Runner	Wrangler	Ranger
2	Cost (USD)	$24,000.00	$100,000.00	$35,000.00	$42,000.00	$55,000.00
3	Miles/Gallon	41	12	21	25	27
4	Other Costs per year	$ 1,000.00	$ 15,000.00	$ 500.00	$ 250.00	$ 500.00
5						
6	Total 10 year cost:	$41,317.07	$275,000.00	$54,285.71	$56,500.00	$71,111.11

Formula: $= B2 + \left(\frac{15000}{B3} * 2 * 10 \right) + (B4 * 10)$, written in B6 and filled to F6