EXCEL – LEARNING FORMULAS

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WHAT ARE FORMULAS?

= - The start of a formula.

=SUM – The total value of the cell range.

=SUM(A1:A2, - This is the process of adding multiple cell ranges to the formula.

=SUMIF – Adds the cells specified by a given condition or criteria.

=COUNT – Counts the number of cells in a range that contain numbers.

=COUNTA – Counts the number of cells in a range that are not empty.

=COUNTBLANK – Counts the number of empty cells in a specified range of cells.

=COUNTIF – Counts number of cells within a range that meet the given condition.

EXERCISE WALKTHROUGH
Learning how to use Formulas
Formulas

Open a blank spreadsheet and in cells A1 − B8 input the following.

	A	B
1	ProductA	100
2	ProductB	200
3	ProductA	300
4	ProductA	100
5	ProductA	100
6	ProductC	600
7	ProductA	9000
8	ProductB	500

We now have our starting table.
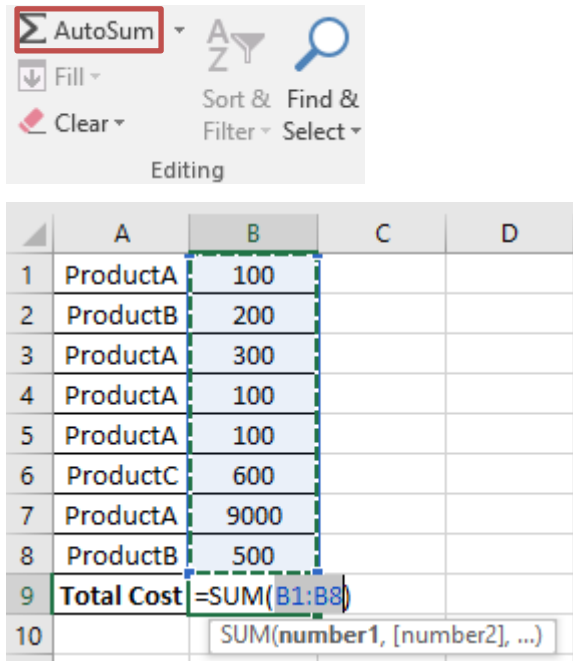
In cell A9 input the following.

	A	B
1	ProductA	100
2	ProductB	200
3	ProductA	300
4	ProductA	100
5	ProductA	100
6	ProductC	600
7	ProductA	9000
8	ProductB	500
9	**Total Cost**	

SUM

Now click into B9 and locate & select the "AutoSum" button.

	A	B	C	D
1	ProductA	100		
2	ProductB	200		
3	ProductA	300		
4	ProductA	100		
5	ProductA	100		
6	ProductC	600		
7	ProductA	9000		
8	ProductB	500		
9	Total Cost	=SUM(B1:B8)		
10		SUM(**number1**, [number2], ...)		

After pressing enter we should see "10900", this means our formula is calculating the total value of our cell range.

	A	B
1	ProductA	100
2	ProductB	200
3	ProductA	300
4	ProductA	100
5	ProductA	100
6	ProductC	600
7	ProductA	9000
8	ProductB	500
9	Total Cost	10900

Now re-enter cell B9 and input the following.

	A	B	C	D
1	ProductA	100		
2	ProductB	200		
3	ProductA	300		
4	ProductA	100		
5	ProductA	100		
6	ProductC	600		
7	ProductA	9000		
8	ProductB	500		
9		=SUM(B1:B8,D1:D5)		

As there are no values in our second cell range in column D, when we press enter the total will not change.

Now input the following in Cells D1 – D6, and each value you add will update the total in cell B9.

	A	B	C	D
1	ProductA	100		500
2	ProductB	200		300
3	ProductA	300		
4	ProductA	100		
5	ProductA	100		
6	ProductC	600		6000
7	ProductA	9000		
8	ProductB	500		
9	Total Cost	11700		
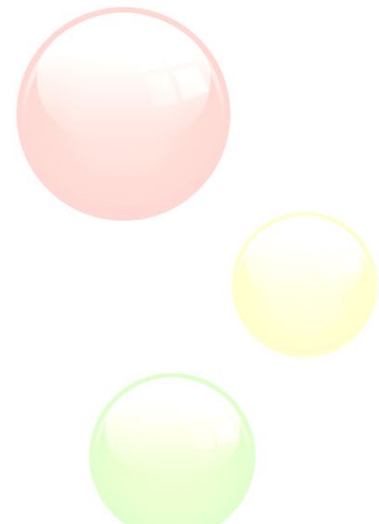
The value in cell D6 is not being added to the total in cell B9, this is because this cell is excluded from our formula. Let's change that.

	A	B	C	D
1	ProductA	100		500
2	ProductB	200		300
3	ProductA	300		
4	ProductA	100		
5	ProductA	100		
6	ProductC	600		6000
7	ProductA	9000		
8	ProductB	500		
9		=SUM(B1:B8,D1:D8)		

Now any value we add in the cell range D1 – D8 will update our formula in cell B9.

	A	B	C	D
1	ProductA	100		500
2	ProductB	200		300
3	ProductA	300		
4	ProductA	100		
5	ProductA	100		
6	ProductC	600		6000
7	ProductA	9000		
8	ProductB	500		
9	**Total Cost**	17700		

COUNT

Type the following and enter cell B10.

	A	B
1	ProductA	100
2	ProductB	200
3	ProductA	300
4	ProductA	100
5	ProductA	100
6	ProductC	600
7	ProductA	9000
8	ProductB	500
9	Total Cost	10900
10	Total Number	

Now type "=COUNT" and highlight cell range B1 – B8.

	A	B	C
1	ProductA	100	
2	ProductB	200	
3	ProductA	300	
4	ProductA	100	
5	ProductA	100	
6	ProductC	600	
7	ProductA	9000	
8	ProductB	500	
9	Total Cost	10900	
10	Total Number	=COUNT(B1:B8)	

When we press enter the value displayed is 8.

	A	B
1	ProductA	100
2	ProductB	200
3	ProductA	300
4	ProductA	100
5	ProductA	100
6	ProductC	600
7	ProductA	9000
8	ProductB	500
9	**Total Cost**	10900
10	**Total Number**	8

If we change the contents of cell B2 to "text" we can see that our "Total Number" decreases by 1.

	A	B
1	ProductA	100
2	ProductB	text
3	ProductA	300
4	ProductA	100
5	ProductA	100
6	ProductC	600
7	ProductA	9000
8	ProductB	500
9	**Total Cost**	10700
10	**Total Number**	7
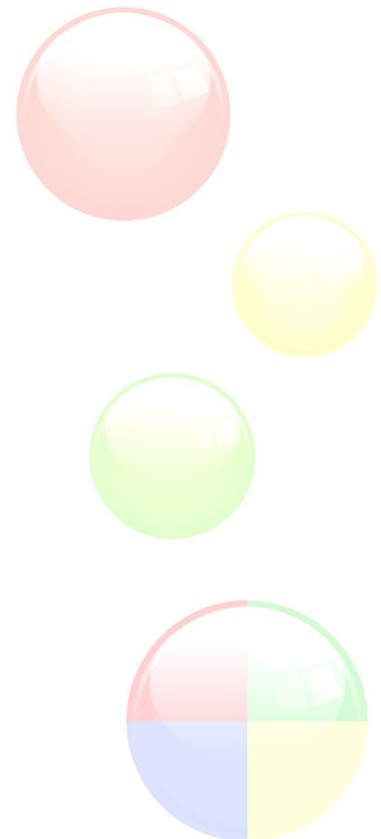
COUNTIF

Next we are going to add another table that will tell us how many of the different product types there are throughout the cell range.

Firstly, add the following table to your spreadsheet.

	Product	Total No.	Total Cost
12	**Product**	**Total No.**	**Total Cost**
13	ProductA		
14	ProductB		
15	ProductC		
16			

Now to add our formulas.

First we will add the formula to add up the amount of "ProductA"'s there are from the cell range.

	A	B	C
1	ProductA	100	
2	ProductB	200	
3	ProductA	300	
4	ProductA	100	
5	ProductA	100	
6	ProductC	600	
7	ProductA	9000	
8	ProductB	500	
9	**Total Cost**	10900	
10	**Total Number**	8	
11			
12	**Product**	**Total No.**	**Total Cost**
13	P	=COUNTIF(A1:A8,A13)	
14	ProductB		
15	ProductC		
16			

Now add the formula to add up the amount of "ProductB"'s there are from the cell range.

	A	B	C
1	ProductA	100	
2	ProductB	200	
3	ProductA	300	
4	ProductA	100	
5	ProductA	100	
6	ProductC	600	
7	ProductA	9000	
8	ProductB	500	
9	**Total Cost**	10900	
10	**Total Number**	8	
11			
12	**Product**	**Total No.**	**Total Cost**
13	ProductA	5	
14	P	=COUNTIF(A1:A8,A14)	
15	ProductC		
16			

Now add the formula to add up the amount of "ProductC"'s there are from the cell range.

	A	B	C
1	ProductA	100	
2	ProductB	200	
3	ProductA	300	
4	ProductA	100	
5	ProductA	100	
6	ProductC	600	
7	ProductA	9000	
8	ProductB	500	
9	**Total Cost**	10900	
10	**Total Number**	8	
11			
12	**Product**	**Total No.**	**Total Cost**
13	ProductA	5	
14	ProductB	2	
15	P	=COUNTIF(A1:A8,A15)	

SUMIF

Now in cell C13 input the following.

	A	B	C	D
1	ProductA	100		
2	ProductB	200		
3	ProductA	300		
4	ProductA	100		
5	ProductA	100		
6	ProductC	600		
7	ProductA	9000		
8	ProductB	500		
9	**Total Cost**	10900		
10	**Total Number**	8		
11				
12	**Product**	**Total No.**	**Total Cost**	
13	ProductA		=SUMIF(A1:A8,A13,B1:B8)	
14	ProductB	2		
15	ProductC	1		
16				

Next we will repeat this formula for cell C14.

	A	B	C	D
1	ProductA	100		
2	ProductB	200		
3	ProductA	300		
4	ProductA	100		
5	ProductA	100		
6	ProductC	600		
7	ProductA	9000		
8	ProductB	500		
9	**Total Cost**	10900		
10	**Total Number**	8		
11				
12	**Product**	**Total No.**	**Total Cost**	
13	ProductA	5	9600	
14	ProductB		=SUMIF(A1:A8,A14,B1:B8)	
15	ProductC	1		

Repeat the formula once more for the final cell C15.

	A	B	C	D
1	ProductA	100		
2	ProductB	200		
3	ProductA	300		
4	ProductA	100		
5	ProductA	100		
6	ProductC	600		
7	ProductA	9000		
8	ProductB	500		
9	**Total Cost**	10900		
10	**Total Number**	8		
11				
12	**Product**	**Total No.**	**Total Cost**	
13	ProductA	5	9600	
14	ProductB	2	700	
15	ProductC		=SUMIF(A1:A8,A15,B1:B8)	
16				

To check that our formulas have worked enter cell B16, then locate & select the "AutoSum" button.

∑ AutoSum ▾

⬇ Fill ▾

◆ Clear ▾

A Z ▾ Sort & Filter ▾

🔍 Find & Select ▾

Editing
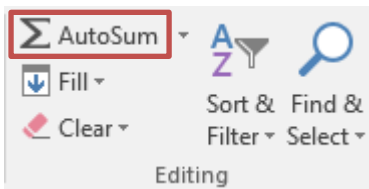
	Product	Total No.	Total Cost
11			
12	**Product**	**Total No.**	**Total Cost**
13	ProductA	5	9600
14	ProductB	2	700
15	ProductC	1	600
16		=SUM(B13:B15)	
17			

After pressing enter repeat this in cell C16

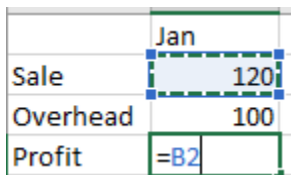|	Product	Total No.	Total Cost
11			
12	**Product**	**Total No.**	**Total Cost**
13	ProductA	5	9600
14	ProductB	2	700
15	ProductC	1	600
16		8	10900
17			

EXCEL HELP FILE

Create a formula that refers to values in other cells
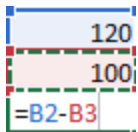
1. Select a cell.

2. Type the equal sign =.

   Note: Formulas in Excel always begin with the equal sign.

3. Select a cell or type its address in the selected cell.

	Jan
Sale	120
Overhead	100
Profit	=B2

4. Enter an operator. For example, – for subtraction.

5. Select the next cell, or type its address in the selected cell.

120
100
=B2-B3

6. Press Enter. The result of the calculation appears in the cell with the formula.

See a formula

1. When a formula is entered into a cell, it also appears in the **Formula bar.**

× ✓ ƒx	
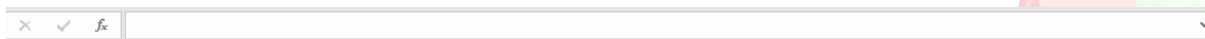
2. To see a formula, select a cell, and it will appear in the formula bar.

× ✓ ƒx	=SUM(B2,B3)

Enter a formula that contains a built-in function

1. Select an empty cell.

2. Type an equal sign = and then type a function. For example, =SUM for getting the total sales.

3. Type an opening parenthesis (.

4. Select the range of cells, and then type a closing parenthesis).

	Jan	Feb	Mar	Apr	May	Jun	Total
Sales	100	200	250	150	300	500	=SUM(B2:G2

5. Press Enter to get the result.

Download our Formulas tutorial workbook

We've put together a Get started with Formulas workbook that you can download. If you're new to Excel, or even if you have some experience with it, you can walk through Excel's most common formulas in this tour. With real-world examples and helpful visuals, you'll be able to Sum, Count, Average, and VLOOKUP like a pro.
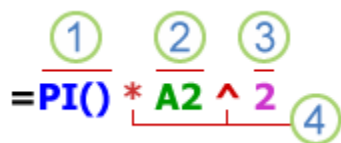
Formulas in-depth

You can browse through the individual sections below to learn more about specific formula elements.

The parts of an Excel formula

A formula can also contain any or all of the following: **functions**, **references**, **operators**, and **constants**.

Parts of a formula

$$=PI() * A2 \wedge 2$$

1. **Functions**: The PI() function returns the value of pi: 3.142...

2. **References**: A2 returns the value in cell A2.

3. **Constants**: Numbers or text values entered directly into a formula, such as 2.

4. **Operators**: The ^ (caret) operator raises a number to a power, and the * (asterisk) operator multiplies numbers.

Using constants in Excel formulas

A constant is a value that is not calculated; it always stays the same. For example, the date 10/9/2008, the number 210, and the text "Quarterly Earnings" are all constants. An expression or a value resulting from an expression is not a constant. If you use constants in a formula instead of references to cells (for example, =30+70+110), the result changes only if you modify the formula. In general, it's best to place constants in individual cells where they can be easily changed if needed, then reference those cells in formulas.

Using references in Excel formulas

A reference identifies a cell or a range of cells on a worksheet, and tells Excel where to look for the values or data you want to use in a formula. You can use references to use data contained in different parts of a worksheet in one formula or use the value from one cell in several formulas. You can also refer to cells on other sheets in the same workbook, and to other workbooks. References to cells in other workbooks are called links or external references.

- **The A1 reference style**

By default, Excel uses the A1 reference style, which refers to columns with letters (A through XFD, for a total of 16,384 columns) and refers to rows with numbers (1 through 1,048,576). These letters and numbers are called row and column headings. To refer to a cell, enter the column letter followed by the row number. For example, B2 refers to the cell at the intersection of column B and row 2.

To refer to	Use
The cell in column A and row 10	A10
The range of cells in column A and rows 10 through 20	A10:A20
The range of cells in row 15 and columns B through E	B15:E15
All cells in row 5	5:5
All cells in rows 5 through 10	5:10
All cells in column H	H:H
All cells in columns H through J	H:J

To refer to	Use

The range of cells in columns A through E and rows 10 through 20 A10:E20

- **Making a reference to a cell or a range of cells on another worksheet in the same workbook**

  In the following example, the AVERAGE function calculates the average value for the range B1:B10 on the worksheet named Marketing in the same workbook.

  1. Refers to the worksheet named Marketing

  2. Refers to the range of cells from B1 to B10

  3. The exclamation point (!) Separates the worksheet reference from the cell range reference

  Note: If the referenced worksheet has spaces or numbers in it, then you need to add apostrophes (') before and after the worksheet name, like ='123'!A1 or ='January Revenue'!A1.

- **The difference between absolute, relative and mixed references**

a. **Relative references**   A relative cell reference in a formula, such as A1, is based on the relative position of the cell that contains the formula and the cell the reference refers to. If the position of the cell that contains the formula changes, the reference is changed. If you copy or fill the formula across rows or down columns, the reference automatically adjusts. By default, new formulas use relative references. For example, if you copy or fill a relative reference in cell B2 to cell B3, it automatically adjusts from =A1 to =A2.

Copied formula with relative reference

b. **Absolute references**   An absolute cell reference in a formula, such as $A$1, always refer to a cell in a specific location. If the position of the cell that contains the formula changes, the absolute reference remains the same. If you copy or fill the formula across rows or down columns, the absolute reference does not adjust. By default, new formulas use relative references, so you may need to switch them to absolute references. For example, if you copy or fill an absolute reference in cell B2 to cell B3, it stays the same in both cells: =$A$1.

Copied formula with absolute reference

	A	B
1	▬	
2		=$A$1
3		=$A$1

c. **Mixed references** A mixed reference has either an absolute column and relative row, or absolute row and relative column. An absolute column reference takes the form $A1, $B1, and so on. An absolute row reference takes the form A$1, B$1, and so on. If the position of the cell that contains the formula changes, the relative reference is changed, and the absolute reference does not change. If you copy or fill the formula across rows or down columns, the relative reference automatically adjusts, and the absolute reference does not adjust. For example, if you copy or fill a mixed reference from cell A2 to B3, it adjusts from =A$1 to =B$1.

Copied formula with mixed reference

	A	B	C
1	▬	▬	
2		=A$1	
3			=B$1

- **The 3-D reference style**

  Conveniently referencing multiple worksheets If you want to analyze data in the same cell or range of cells on multiple worksheets within a workbook, use a 3-D reference. A 3-D reference includes the cell or range reference, preceded by a range of worksheet names. Excel uses any worksheets stored between the starting and ending names of the reference. For example, =SUM(Sheet2:Sheet13!B5) adds all the values contained in cell B5 on all the worksheets between and including Sheet 2 and Sheet 13.

a. You can use 3-D references to refer to cells on other sheets, to define names, and to create formulas by using the following functions: SUM, AVERAGE, AVERAGEA, COUNT, COUNTA, MAX, MAXA, MIN, MINA, PRODUCT, STDEV.P, STDEV.S, STDEVA, STDEVPA, VAR.P, VAR.S, VARA, and VARPA.

b. 3-D references cannot be used in array formulas.

c. 3-D references cannot be used with the intersection operator (a single space) or in formulas that use implicit intersection.

  What occurs when you move, copy, insert, or delete worksheets The following examples explain what happens when you move, copy, insert, or delete worksheets that are included in a 3-D reference. The examples use the formula =SUM(Sheet2:Sheet6!A2:A5) to add cells A2 through A5 on worksheets 2 through 6.

d. **Insert or copy** If you insert or copy sheets between Sheet2 and Sheet6 (the endpoints in this example), Excel includes all values in cells A2 through A5 from the added sheets in the calculations.

e. **Delete** If you delete sheets between Sheet2 and Sheet6, Excel removes their values from the calculation.

f.   **Move**   If you move sheets from between Sheet2 and Sheet6 to a location outside the referenced sheet range, Excel removes their values from the calculation.

g.   **Move an endpoint**   If you move Sheet2 or Sheet6 to another location in the same workbook, Excel adjusts the calculation to accommodate the new range of sheets between them.

h.   **Delete an endpoint**   If you delete Sheet2 or Sheet6, Excel adjusts the calculation to accommodate the range of sheets between them.

- **The R1C1 reference style**

   You can also use a reference style where both the rows and the columns on the worksheet are numbered. The R1C1 reference style is useful for computing row and column positions in macros. In the R1C1 style, Excel indicates the location of a cell with an "R" followed by a row number and a "C" followed by a column number.

Reference	Meaning
R[-2]C	A relative reference to the cell two rows up and in the same column
R[2]C[2]	A relative reference to the cell two rows down and two columns to the right
R2C2	An absolute reference to the cell in the second row and in the second column
R[-1]	A relative reference to the entire row above the active cell
R	An absolute reference to the current row

When you record a macro, Excel records some commands by using the R1C1 reference style. For example, if you record a command, such as clicking the **AutoSum** button to insert a formula that adds a range of cells, Excel records the formula by using R1C1 style, not A1 style, references.

You can turn the R1C1 reference style on or off by setting or clearing the **R1C1 reference style** check box under the **Working with formulas** section in the **Formulas** category of the **Options** dialog box. To display this dialog box, click the **File** tab.

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Need more help?