



ARRAY FORMULAS

MORE FORMULAS IN EXCEL

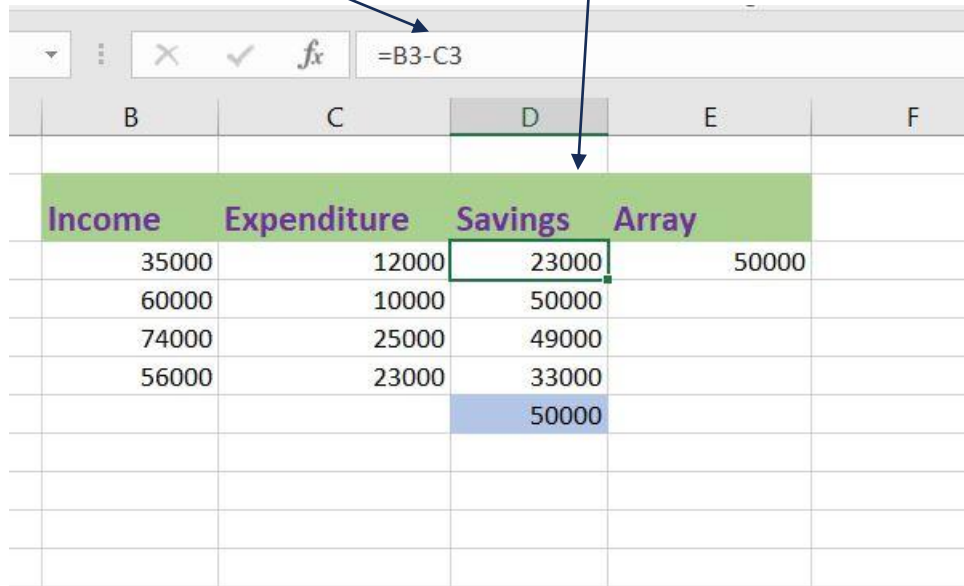


ARRAY FORMULAS

- Array formulas are powerful formulas that enable you to perform complex calculations that often can't be done with standard worksheet functions.
- They are also referred to as "Ctrl-Shift-Enter" or "CSE" formulas, because you need to press **Ctrl+Shift+Enter** to enter them.
- You can use array formulas to do the seemingly impossible, such as:
- Count the number of characters in a range of cells.
- Sum numbers that meet certain conditions, such as the lowest values in a range or numbers that fall between an upper and lower boundary.
- Sum every n th value in a range of values.

WITHOUT ARRAY FORMULA

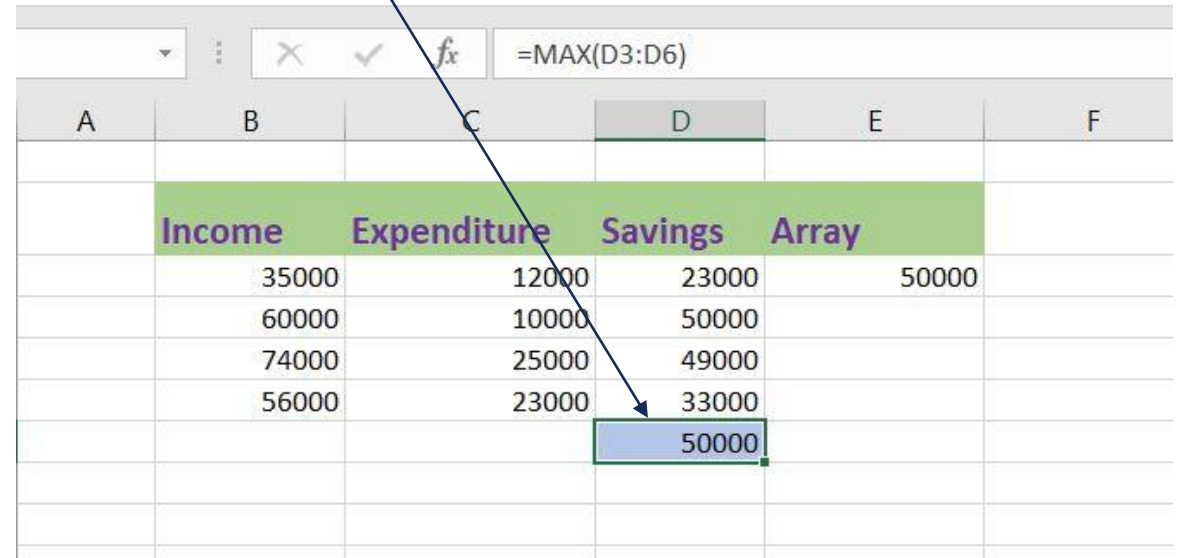
To calculate Maximum of savings, when we are given with Income and Expenditure. If we don't use Array formulas, first we need to calculate savings by subtracting Expenditure from Income.



The screenshot shows an Excel spreadsheet with columns B, C, D, E, and F. The formula bar at the top displays `=B3-C3`. The spreadsheet has a header row with 'Income' in B, 'Expenditure' in C, 'Savings' in D, and 'Array' in E. The data rows are as follows:

Income	Expenditure	Savings	Array
35000	12000	23000	50000
60000	10000	50000	
74000	25000	49000	
56000	23000	33000	
		50000	

After that, we need to calculate Max of Savings to get the desired output that is 50,000



The screenshot shows an Excel spreadsheet with columns A, B, C, D, E, and F. The formula bar at the top displays `=MAX(D3:D6)`. The spreadsheet has a header row with 'Income' in B, 'Expenditure' in C, 'Savings' in D, and 'Array' in E. The data rows are as follows:

Income	Expenditure	Savings	Array
35000	12000	23000	50000
60000	10000	50000	
74000	25000	49000	
56000	23000	33000	
		50000	

WITH ARRAY FORMULAS

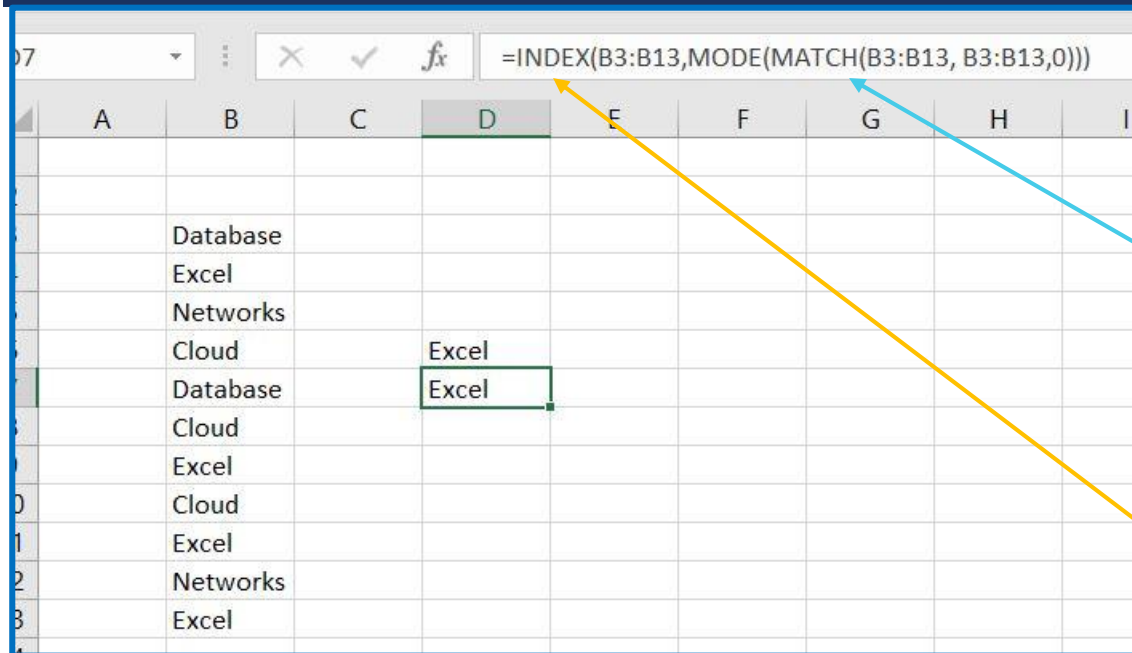
We don't need to store the range in column D. Excel can store this range in its memory. A range stored in Excel's memory is called an array constant. Instead of using D column, use ranges such as B3:B6 and C3:C6. Finish by pressing CTRL + SHIFT + ENTER.

Select B3:B6-C3:C6 in the formula. Press F9 and you will see that Elements in a vertical array constant are separated by semicolons. Elements in a horizontal array constant are separated by commas.

=MAX(B3:B6-C3:C6)					
A	B	C	D	E	F
	Income	Expenditure	Savings	Array	
	35000	12000	23000	50000	
	60000	10000	50000	50000	
	74000	25000	49000		
	56000	23000	33000		
			50000		

=MAX({23000;50000;49000;33000})					
A	B	C	D	E	F
	Income	Expenditure	Savings	Array	
	35000	12000	23000	50000	
	60000	10000	50000	50000	
	74000	25000	49000		
	56000	23000	33000		
			50000		

MOST FREQUENTLY OCCURRING WORD



The screenshot shows an Excel spreadsheet with the following data in column B:

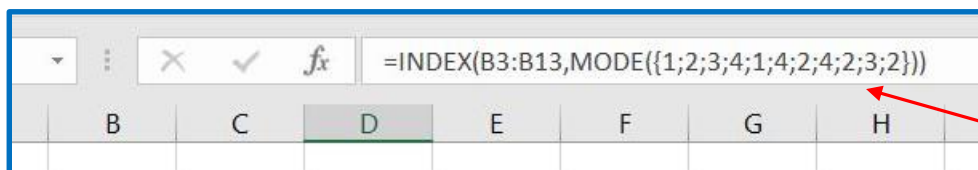
	A	B	C	D	E	F	G	H	I
		Database							
		Excel							
		Networks							
		Cloud		Excel					
		Database		Excel					
		Cloud							
		Excel							
		Cloud							
		Excel							
		Networks							
		Excel							

The formula bar shows the formula: `=INDEX(B3:B13,MODE(MATCH(B3:B13, B3:B13,0)))`. A yellow arrow points from the `MODE` function to the array constant in the second screenshot. A blue arrow points from the `MATCH` function to the array constant in the second screenshot.

You can use the MODE function to find the most frequently occurring number. However, the MODE function only works with numbers.

The MATCH function returns the position of a value in a given range. To find the position of the most frequently occurring word, we add the MODE function and B3:B13 with B3:B13

Use this result and the INDEX function to return the 2nd word in the range B3:B13, the most frequently occurring word.



The screenshot shows the Excel formula bar with the formula: `=INDEX(B3:B13,MODE({1;2;3;4;1;4;2;4;2;3;2}))`. A red arrow points from the array constant `{1;2;3;4;1;4;2;4;2;3;2}` to the text in the final block.

The range (array constant) created by the MATCH function is stored in Excel's memory, not in a range. The array constant looks as __This array constant is used as an argument for the MODE function, giving a result of 2 (the position of the most frequently occurring word).

SUM WITH OR CRITERIA

F3 =SUMIF(A1:A7,"Fries",D1:D7)+SUMIF(A1:A7,"Burger",D1:D7)

	A	B	C	D	E	F	G	H	I
1	Pizza	Dominos		4					
2	Fries	Burger King		3					
3	Burger	Kfc		2		12			
4	Burger	Subway		2					
5	Fries	Mcd		4					
6	Fries	Kfc		1					
7	Pizza	Pizza hut		3					
8									
9									

Consider the example to the left. We want to calculate the sum of cells that meet one certain criteria that is Fries or Burger (ONE CRITERIA RANGE). It will give correct results in One range.

F4 =SUMIF(A1:A7,"Burger",D1:D7)+SUMIF(B1:B7,"Kfc",D1:D7)

	A	B	C	D	E	F	G	H	I
1	Pizza	Dominos		4					
2	Fries	Burger King		3					
3	Burger	Kfc		2	4	12			
4	Burger	Subway		2	2	7			
5	Fries	Mcd		4					
6	Fries	Kfc		1	1				
7	Pizza	Pizza hut		3					
8									
9				5	7				
10									
11									

However, if we want to sum the cells that meet the following criteria: Burger or Kfc (two criteria ranges), we cannot simply use the SUMIF function twice (see the picture below). Cells that meet the criteria Burger and Kfc are added twice, but they should only be added once. 5 is the answer we are looking for, but here we got 7.

SUM WITH OR CRITERIA

D9									
	A	B	C	D	E	F	G	H	I
1	Pizza	Dominos		4					
2	Fries	Burger King		3					
3	Burger	Kfc		2		12			
4	Burger	Subway		2		7			
5	Fries	Mcd		4					
6	Fries	Kfc		1					
7	Pizza	Pizza hut		3					
8									
9				5					
10									
11									
12									
13									

Use SUM function with If function where two conditions are Ored. If either is True, value will be 1 otherwise 0.

The range (array constant) created by the IF function is stored in Excel's memory, not in a range. The array constant looks as follows:
{1;0;1;0;1;0;1;0}
multiplied by D1:D7 this yields:
{0;0;2;2;0;1;0;0}
This latter array constant is used as an argument for the SUM function, giving a result of 5.

SUM EVERY NTH ROW

The ROW function returns the row number of a cell.

The MOD function gives the remainder of a division. For example, for the first row, MOD(1,3) equals 1. 1 is divided by 3 (0 times) to give a remainder of 1. For the third row, MOD(3,3) equals 0. 3 is divided by 3 (exactly 1 time) to give a remainder of 0. As a result, the formula returns 0 for every 3th row. Change the formula as shown.

A11				fx		{=SUM(A1:A9*(MOD(ROW(A1:A9),3)=0))}	
	A	B	C	D	E	F	G
1	70						
2	74						
3	5						
4	4						
5	92						
6	66						
7	88						
8	52						
9	21						
10							
11	92						
12							
13							

To get the sum of the product of these two ranges (FALSE=0, TRUE=1), use the SUM function and finish by pressing CTRL + SHIFT + ENTER. The product of these two ranges (array constant) is stored in Excel's memory, not in a range. The array constant looks as follows.
{0;0;5;0;0;66;0;0;21}
This array constant is used as an argument for the SUM function, giving a result of 92.

SUM LARGEST NUMBERS

- Do it Yourself!
- Task -Create an array formula that sums largest numbers in a range.
- Hint- You can use Sum and Large functions