



Arrays Part III

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This article continues our discussion of arrays. Again, it may help to review the last two articles in *RCM Advisor* to refresh your memory on arrays. Part of learning arrays is to learn the syntax of arrays. An equally important part of learning arrays is to see several examples of how they can be used. Once you see what arrays can do, there is no limit to the ways you can apply array formulas to make your life easier and your spreadsheets more accurate.

The last article had examples of two and then three functions in the same array. This article begins with another example of three functions at the same time. The most important thing to remember as you follow the examples in this article is to enter the formulas with Ctrl+Shift+Enter to get the curly braces that surround Excel formulas.

Three Formulas at Once

Consider the spreadsheet in Figure 1 showing surgeries last quarter for five providers in a practice. The fifth provider, Dr. Russell, has #N/A for a value in cell C6. A #N/A value can result from an error in a formula, but #N/A can also result from looking up a value using the VLOOKUP function when the value is not available. Because there is a #N/A in our surgery counts, the SUM formula in cell C8 also results in #N/A.

The formula in cell C10 successfully sums the data, despite the error in cell C6. The formula in cell C10 is `{=SUM(IF(ISERROR(C2:C6),"",C2:C6))}`. Again, the easiest way to understand an array formula is often to work from the inside out. The innermost function is `(ISERROR(C2:C6))`. `ISERROR` returns `TRUE` if the cell has an error and `FALSE` if there is no `ERROR` in the cell. Note that Excel is only testing for errors that Excel can sense, such as dividing by zero or a `VLOOKUP` formula that cannot find a value. Excel cannot capture errors like a spreadsheet that adds expenses to revenues to calculate net income instead of subtracting expenses from revenue. The `ISERROR` function normally operates on one cell, such as C2. Because the `ISERROR` formula is contained in an array formula, `ISERROR` looks for errors in cells C2:C6 at the same time.

Working outward, the next formula is `IF` in this section of the formula: `IF(ISERROR(C2:C6),"",C2:C6))`. The `IF` formula

FIGURE 1

	A	B	C
1		Surgeries Last Quarter	
2		Dr. Alexander	51
3		Dr. Cruz	24
4		Dr. Griffin	73
5		Dr. Diaz	45
6		Dr. Russell	#N/A
7			
8		Total	#N/A
9			
10		Total despite error	193
11			
12		Average despite error	48.25
13			
14		Average despite error w/0 for error value	38.6
15			
16		Count the number of errors	1

has a logical test that returns true or false, followed by what to do if the formula is true, then what to do if the formula is false. If any of the cells in the C2:C6 range are true, which means `ISERROR` found an error, the `IF` function replaces the error with nothing, represented by empty quotation marks `""`. If the `IF` function does not find an error, the `IF` function simply returns the respective value in C2:C6. In other words, from cells C2:C5, Excel does not find an error, so it returns the values in C2:C5. Since Excel finds an error in C6, Excel replaces that error with nothing, the empty quotation marks.

Finally, the entire function is `{=SUM(IF(ISERROR(C2:C6),"",C2:C6))}`. The outermost function, `SUM`, simply sums the results of the `IF` function operating on the array in the `ISERROR` function. In other words, the `SUM` function will total the values from cells C2:C6, with the `IF` and `ISERROR` functions converting errors to blanks so the `SUM` formula will work properly. The formula looks complicated, but by breaking the formula into the component pieces it is much easier to understand.

Now consider the formula in cell C12, which is `{=AVERAGE(IF(ISERROR(C2:C6),"",C2:C6))}`. The only difference between

the formula in cell C10 and the formula in cell C12 is that where C10 summed the results of the array, C12 averages the results to get the average number of surgeries last quarter. Note that because we used nothing for Dr. Russell, the average does not include him in the results. The formula in cell C14 includes Dr. Russell in the results by using a 0 for his surgeries. Note the difference in the two formulas. Cell C12 is `=AVERAGE(IF(ISERROR (C2:C6),"",C2:C6)))` and cell C14 is `=AVERAGE(IF(ISERROR (C2:C6),0,C2:C6))`. The only difference between the two formulas is the IF formula in C14 replaces errors with a 0 instead of nothing. The 0 is highlighted to make it easier to see. The point is that once you have one array formula working, it is easy to tweak that formula to average instead of sum, to include errors in an average, or to do whatever else you need an array formula to do.

Finally, consider the formula in cell C16, `=SUM(IF (ISERROR(C2:C6),1))`. This formula has a slightly different IF function. If ISERROR identifies an error this time, the IF formula records a 1, otherwise IF does not do anything. The

outermost SUM formula simply sums the number of errors ISERROR finds. Cell C16 can thereby count the number of errors in cells C2:C6.

Continue to practice using array formulas with your data. Start small. Build test columns and take the array formulas a piece at a time to make sure you get the results you expect. Once the array formula plays nicely, arrays can add a lot of power and flexibility to your spreadsheets. There are more array examples in the Excel video playlists at mooresolutionsinc.com. ■

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