



# Arrays Part V

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**W**elcome back to our extended discussion about using arrays in Excel formulas. This article builds on the complexity of our discussion of arrays. Please review the first four articles in *RCM Advisor* to refresh your memory on arrays. This article will show another example of using arrays to calculate a common medical practice request and introduce arrays that span multiple cells. As in previous articles, 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. When you manually type the curly braces, Excel will not treat the formula as an array, so you will not get the results you expect. As you become more familiar with examples of array formulas, you will see more opportunities to use array formulas in your spreadsheets.

## Third Next Available Appointment

A common way to assess provider accessibility in a medical practice is to track and trend the third next available appointment for each physician. The reason the metric looks for the third next available appointment is to filter out some of the noise in the data that may have caused recent appointment cancellations, making a provider appear to be more accessible than he or she really is. The third next available appointment data is therefore smoother and easier to compare.

Figure 1 shows some sample available appointments for a provider. A formula to find the third next available appointment is `=SMALL(B3:B22,3)`. The **SMALL** function looks in a range of cells (B3:B22) and finds the smallest value indicated. The 3 in the formula tells Excel to find the

**FIGURE 1**

	A	B	C	D
1	<b>OPEN APPOINTMENT SLOTS</b>			
2	<b>Provider</b>	<b>Date and Time</b>	<b>Appt Type</b>	<b>Location</b>
3	Dr. Nelson	6/3/2019 2:00PM	Follow Up	South
4	Dr. Nelson	6/5/2019 10:00AM	Surgery	Hospital
5	Dr. Nelson	6/7/2019 7:00AM	Surgery	Hospital
6	Dr. Nelson	6/7/2019 1:15PM	Follow Up	South
7	Dr. Nelson	6/10/2019 11:45AM	Follow Up	Main
8	Dr. Nelson	6/11/2019 9:00AM	New	Main

third smallest value, or, in our case, the third next available appointment. It may be helpful to the practice to see how close the first and second next available appointments are to the third next available appointment. Formulas to show the first next available appointment and second next available appointment are simply `=SMALL($B$3:$B$22,1)` and `=SMALL($B$3:$B$22,2)`, respectively. The only differences between these formulas and our original formulas are changing the 3 to a 1 or a 2 and adding dollar signs to the cell reference B3:B22 so that that reference will not move when the formula is copied. Figure 2 shows the result of our formulas to this point.

## Array Constants

Rather than type three separate formulas to find the first three available appointments, we can type one formula using array constants that will work across multiple cells in Excel. Figure 3 shows the old formulas that calculate first, second, and third next available appointments one formula at a time

**FIGURE 2**

	A	B	C	D	E	F	G
1	<b>OPEN APPOINTMENT SLOTS</b>						
2	<b>Provider</b>	<b>Date and Time</b>	<b>Appt Type</b>	<b>Location</b>			
3	Dr. Nelson	6/3/2019 2:00PM	Follow Up	South		6/7/2019 7:00AM	3rd Next Available Appointment
4	Dr. Nelson	6/5/2019 10:00AM	Surgery	Hospital			
5	Dr. Nelson	6/7/2019 7:00AM	Surgery	Hospital		6/3/2019 2:00PM	1st Next Available Appointment
6	Dr. Nelson	6/7/2019 1:15PM	Follow Up	South		6/5/2019 10:00AM	2nd Next Available Appointment
7	Dr. Nelson	6/10/2019 11:45AM	Follow Up	Main		6/7/2019 7:00AM	3rd Next Available Appointment

FIGURE 3

	A	B	C	D	E	F	G
1	<b>OPEN APPOINTMENT SLOTS</b>						
2	<b>Provider</b>	<b>Date and Time</b>	<b>Appt Type</b>	<b>Location</b>			
3	Dr. Nelson	6/3/2019 2:00PM	Follow Up	South		6/7/2019 7:00AM	3rd Next Available Appointment
4	Dr. Nelson	6/5/2019 10:00AM	Surgery	Hospital			
5	Dr. Nelson	6/7/2019 7:00AM	Surgery	Hospital		6/3/2019 2:00PM	1st Next Available Appointment
6	Dr. Nelson	6/7/2019 1:15PM	Follow Up	South		6/5/2019 10:00AM	2nd Next Available Appointment
7	Dr. Nelson	6/10/2019 11:45AM	Follow Up	Main		6/7/2019 7:00AM	3rd Next Available Appointment
8	Dr. Nelson	6/11/2019 9:00AM	New	Main			
9	Dr. Nelson	6/12/2019 8:00AM	Follow Up	Main		6/3/2019 2:00PM	1st Next Available Appointment
10	Dr. Nelson	6/12/2019 1:00PM	New	Main		6/5/2019 10:00AM	2nd Next Available Appointment
11	Dr. Nelson	6/14/2019 8:15AM	New	Main		6/7/2019 7:00AM	3rd Next Available Appointment

FIGURE 4

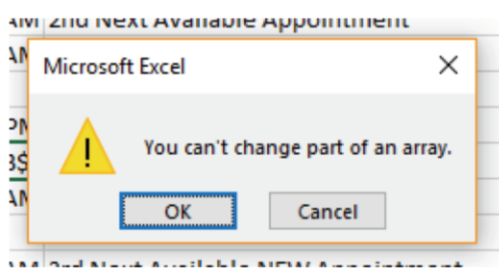


FIGURE 5

=SMALL(\$B\$3:\$B\$22,1)	1st Next Available Appointment
=SMALL(\$B\$3:\$B\$22,2)	2nd Next Available Appointment
=SMALL(\$B\$3:\$B\$22,3)	3rd Next Available Appointment
=SMALL(\$B\$3:\$B\$22,{1;2;3})	1st Next Available Appointment
=SMALL(\$B\$3:\$B\$22,{1;2;3})	2nd Next Available Appointment
=SMALL(\$B\$3:\$B\$22,{1;2;3})	3rd Next Available Appointment

in cells F5:F7. Each formula is different because the last parameter in each formula is 1, 2, or 3 depending on whether we are looking for the first, second, or third next available appointment. In contrast, the formula in cells F9:F11 is the same, even though the formula results in cells F9:F11 are different. The trick is to use array constants in the formula.

The formula in cells F9:F11 is {=SMALL(\$B\$3:\$B\$22,{1;2;3})}. Note that there are two sets of curly braces in this Excel formula. As you have come to expect in array formulas, the outside set of curly braces are entered by using Ctrl+Shift+Enter when entering the formula. The inner set of braces around 1;2;3 do need to be typed. In other words, you cannot type the outer curly braces but you must type the inner curly braces.

The inner curly braces allow us to use constants in our formula. The first thing to notice about array constants is

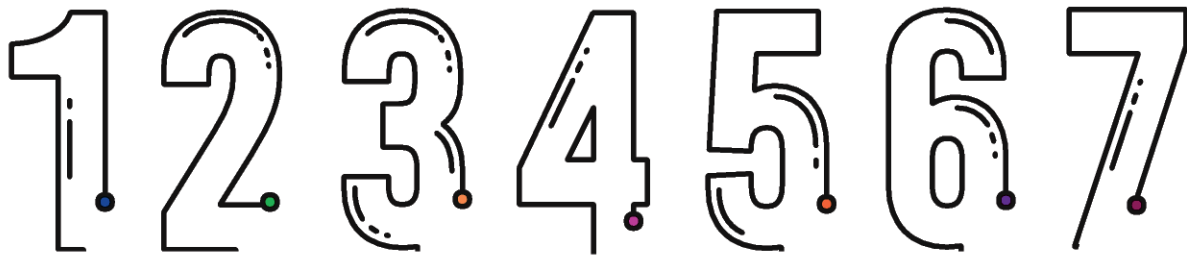
that they are separated with semicolons. The trick is to enter an array formula that spans multiple cells. One way to get an array formula in multiple cells is to create the formula first in one cell and then copy the formula to the other cells. In Figure 3, we create the formula in cell F9 first and then copy the formula in F9 to F10:F11. If you create a formula and then copy/paste, Excel will not recognize the pasted cells in the array. To treat the pasted cells in an array as an array formula, select the cells (F9:F11 in our example) and then Ctrl+Shift+Enter to re-enter the cells as an array. The other way to enter an array formula with constants in multiple cells is to select all the cells before entering the formula. In our example, select F9:F11, then type the formula in cell F9. Use Ctrl+Shift+Enter to save and Excel will create array formulas in all three cells.

This might seem like extra work, and it might appear easier to simply create three separate array formulas rather than use array constants. There are two advantages of using array constants. First, typing three separate formulas is not too time consuming, but imagine if you needed 20 or 50 array formulas. Array constants are very helpful with large spreadsheets. A second advantage comes if a user tries to edit one cell in a group of array formulas. Figure 4 shows the error message that results. If it is important to keep multiple formulas consistent so that users do not inadvertently change one formula without changing all formulas, building an array formula across all cells may make your spreadsheet more accurate and reliable. Figure 5 shows a comparison of the array formulas between cells F5:F7 and F9:F11. Please note that the screen capture does not include the outside curly braces required on all six array formulas.

In the next issue, we will take this sample data and add

more criteria to our third next available logic using the TRUE/FALSE addition and multiplication techniques described in the last issue of *RCM Advisor*. As we have discussed in past issues, build test columns and take the array formulas one piece at a time to make sure you get the results you expect. Once the array formula plays nicely, arrays add functionality, flexibility, and accuracy to your spreadsheets. Please review more array examples in the Excel Video playlists at [mooresolutionsinc.com](http://mooresolutionsinc.com) ■

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