In the Beginning

Well, here we are again TABULATE fans. I believe I have exhausted this topic (to DEATH some folks say), so I thought I would put it to rest in this FINAL CHAPTER with a paper on the truly advanced features of the TABULATE procedure. The problem is these advanced features are anything but simple. In this tutorial we look at some simpler advanced features, like FORMCHAR, column and row titling, and formatting, and then the one that is really a bear to understand - percentages (PCTN and PCTSUM).

The output from a CONTENTS procedure below is just so you know a little about the dataset we will be working with.

Here you see a column for the count (N) and mean of SCORE for each location.

TABLE ORG*LOC, SCORE*(N MEAN MAX PCTN)*F=5.1;

Here are the same numbers from the previous output. Location was simply moved from the column expression to the row expression.

TABLE ORG LOC, SCORE*(N MEAN MAX PCTN)*F=5.1;

Here are two tables in one: the N, MEAN, MAX, and PCTN statistics in the column expression allows you to use the row expression to see a summary by two different variables (ORG and LOC) in one table.
TABLE ORG ALL, (LOC ALL)*SCORE*(N MEAN)*F = 5.1;

<table>
<thead>
<tr>
<th>Location</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>ALL</th>
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</thead>
<tbody>
<tr>
<td>Score</td>
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</tbody>
</table>

What in the world happened in this last example? There’s no variable named ALL in the dataset? That’s right, but ALL is kind of like a built-in class variable that can be specified to accumulate totals for the entire row and/or column. In the above example it was used in the row expression to produce a set of totals after the ORG rows. If you placed it before the ORG variable (i.e. ALL ORG) you would get the totals as the first row of the table. The use of ALL in the column expression caused it to produce a column after the LOC columns. Also notice since it was grouped with LOC and then nested, the column contains the totals for all locations using the same statistics.

You may not be able to tell from this example, but TABULATE computes true statistics (i.e. MEAN above). That means it DOES NOT add-up the means from the tables and then divide by the number of tables entries; it accumulates each observation value and divides by the number of observations.

Titles and Labels

You can see that to have TABULATE put descriptive titles or labels for the variables you simply need to assign meaningful labels to them. You can either do this in earlier steps that create the dataset or with a LABEL statement in the PROC step. But what about the statistics and ALL? Simply attach a descriptive label to ANY variable or statistic right in the TABLE statement. Follow it with an equals sign (=) and a quoted label (‘This is a Label’) just like you do in a LABEL statement. Or if you want to use a certain label for every use of the statistic, use the KEYLABEL statement which looks exactly like the LABEL statement except you use the statistic’s name instead of a variable name. Here is an example of doing both.

TABLE ORG ALL, (LOC ALL)*SCORE*(N MEAN)*F = 5.1;

KEYLABEL
N = ‘Count’
MEAN = ‘Mean’
ALL = ‘Total’;

The above example has another tables option specified (BOX= ) that specifies what to put in the upper-left corner box of the table.

In the following example we added the MISSING and NOSEPS options to the PROC statement to have TABULATE treat missing values as a valid category (which it does not do by default) and remove the separation lines between the rows. I also specified some table options: BOX=SCORE to label the upper-left box with the SCORE variable’s label; and MISSTEXT= ‘None’ to label missing values in the tables with the text ‘None’ instead of the standard period.

PROC TABULATE DATA= CLASS
MISSING NOSEPS;
CLASS ORG LOC DATE;
VAR SCORE; /* TITLES & LABELS */ TABLE
ORG ALL = ‘--- Totals ---’, (LOC ALL = ‘Row Totals’)
*(SCORE*MEAN = ‘*F= 5.1) /
BOX=SCORE ROW=FLOAT
MISSTEXT=’None’;

 Notice that since the MEAN label was blank and the ROW=FLOAT was specified, that no space was wasted for it.

Now as one final farewell to labeling, a table that doesn’t look like a table.

PROC TABULATE DATA= CLASS
MISSING NOSEPS;
FORMCHAR= ‘/.
CLASS ORG LOC DATE;
VAR SCORE;
TABLE
ORG ALL = ‘--- Totals ---’, (LOC ALL = ‘Row Totals’)
*(SCORE = ‘*F= 6.1) /
BOX=SCORE ROW=FLOAT
MISSTEXT=’None’;
Above we see the nesting of (LOC ALL) in ORG. That tells TABULATE to concatenate an ALL row after all the LOC rows for each ORG value.

Subtotaling

The only real trick to doing subtotaling is the nesting of ALL in the row expression.

Percentages

In its simplest form the PCTN or PCTSUM is just another statistic like N or MEAN you can request.

PROC TABULATE DATA=CLASS FORMAT=6.1;
CLASS ORG LOC DATE;
VAR SCORE;
TABLE ORG, (LOC ALL)*(N*F=3.0 PCTN);

The above example shows the row expression in the denominator specification. Notice that none of the counts(N) have changed but the PCTN values have because the denominator has changed from the entire dataset (27 observations) to all the observations for ORG within that columns(LOC) value. Observe that since PCTN is nested in LOC that the denominator specification is saying to divide each cell under that location by the total number of observations that are in that location. So why do you specify the row expression? Because that is simply telling TABULATE which number of observations to total. So, in the above example, we see that location A cells are divided by 12, the total of all the ORG observations in that location. And for location C we see each cell is divided by 5, the total of all the ORG observations in that location. And for the ALL column we see each cell is divided by the total of all the ORG observations in all the locations.

Here is a handy rule-of-thumb:

To get percentages by column, use the row expression; to get percentages by row, use the column expression.
The following examples show that the same rules apply for variables in the dataset.

This example is just to show that the PCTSUM works in the same way. (The summing of exams scores doesn't seem to make much sense, but it is the only numeric variable in the dataset.)

The following examples show that the same rules apply for nesting variables and using ALL.

PROC TABULATE DATA=CLASS FORMAT=6.1 NOSEPS;
CLASS ORG LOC DATE;
VAR SCORE;

TABLE ORG, (LOC ALL)*(N*F=3.0 PCTN < LOC ALL>);

TABLE ORG*DATE, (LOC ALL)*(N*F=3.0 PCTN < ORG*DATE>);

TABLE ORG*DATE, (LOC ALL)*(N*F=3.0 PCTN < LOC ALL>);

TABLE ORG*DATE, (LOC ALL)*(N*F=3.0 PCTN < ORG*DATE>);

The same rules apply for denominator specifications that are NOT the entire expression.
With the denominator specification of DATE, TABULATE will use the total number of observations for all dates in that column as the denominator. But since DATE is nested within ORG, it will only use those observations that belong to that ORG. So, in the above example the total number of observations for location A in ORG 'Energy' is 6, which becomes the denominator for computing PCTN for that date in every ORG. If you leave it out of the denominator specification, you will get the messages:

ERROR: PCTN base is not in table.
ERROR: A PCTN crossing has no denominator.

Where the ALL gets real complicated is when you nest the ALLs in groupings, then you will need to expand the "crossings" as the SAS manuals indicate to be sure you get the proper denominator.

To get a better feel for the use of percentages, let's use the subtotaling example from earlier and add a subtotal.

With the denominator specification of ORG, TABULATE will use the total number of observations for all organizations in that column as the denominator. But since ORG is nested with DATE, it will only use those observations that belong to that DATE. So, in the above example the total number of observations for location A with a date of 07APR is 3, which becomes the denominator for computing PCTN for that date in every ORG in that location, thus the 33.3 percent for each one with a count of 1. The total number of observations for location A with a date of 120CT is 5, which becomes the denominator for computing PCTN for that date in every ORG, thus the 25 percent for each one with a count of 1. The ALL in the denominator specification gave me a real hard time at first until I discovered it is really only needed to satisfy the table expression expansion. Typically ALL is used to do some sort of totalling and is thus concatenated not nested. So, all(usually) you have to do is include it in your denominator as shown below.

TABLE ORG*DATE ALL, (LOC ALL)*(N+F = 3.0 PCTN < ORG ALL >);
In Summary

This paper is not intended to be a cure for all your TABULATE problems. Every use of TABULATE is unique in some ways. All I have attempted to do is give you a good starting point or foundation to better understand how to get TABULATE to give you what you want. The more complicated your "crossings", as the SAS manuals refer to them, the tougher it is going to be to determine the denominator specification. Most everything else about TABULATE is very straight forward.

So good luck and happy tabulating!!!

Acknowledgements


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Author

If you have any questions or comments, please write or call:

Dan Bruns
Tennessee Valley Authority
1101 Market Street(MP 2B)
Chattanooga, TN 37402
(423) 751-6430  FAX: (423) 751-3163
EMail: debruns@tva.gov