

Microsoft Excel Pivot Table Data Crunching

(Office 2021 and Microsoft 365)

Bill Jelen



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Dedication

To Howie Dickerman at Microsoft. Have a great retirement!

—Bill Jelen

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—*Bill Jelen*

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About the Author



Bill Jelen, Excel MVP and the host of MrExcel.com, has been using spreadsheets since 1985, and he launched the MrExcel.com website in 1998. Bill was a regular guest on *Call for Help* with Leo Laporte and has produced more than 2,400 episodes of his daily video podcast, Learn Excel from MrExcel. He is the author of 64 books about Microsoft Excel and writes the monthly Excel column for *Strategic Finance* magazine. Before founding MrExcel.com, Bill spent 12 years in the trenches, working as a financial analyst for the finance, marketing, accounting, and operations departments of a \$500 million public company. He lives in Merritt Island, Florida, with his wife, Mary Ellen.

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Introduction

The pivot table is the single most powerful tool in all of Excel. Pivot tables came along during the 1990s, when Microsoft and Lotus were locked in a bitter battle for dominance of the spreadsheet market. The race to continually add enhanced features to their respective products during the mid-1990s led to many incredible features, but none as powerful as the pivot table.

With a pivot table, you can transform one million rows of transactional data into a summary report in seconds. If you can drag a mouse, you can create a pivot table. In addition to quickly summarizing and calculating data, pivot tables enable you to change your analysis on the fly by simply moving fields from one area of a report to another.

No other tool in Excel gives you the flexibility and analytical power of a pivot table. The Power Query tools that debuted between Excel 2013 and Excel 2016 come close to the power of a pivot table. You will see some Power Query examples in Chapter 17, “Pivoting without a pivot table using dynamic arrays or Power Query,” and Chapter 18, “Unpivoting in Power Query.”

What you will learn from this book

It is widely agreed that close to 60 percent of Excel customers leave 80 percent of Excel untouched—that is, most people do not tap into the full potential of Excel’s built-in utilities. Of these utilities, the most prolific by far is the pivot table. Despite the fact that pivot tables have been a cornerstone of Excel for almost 30 years, they remain one of the most underutilized tools in the entire Microsoft Office suite.

Having picked up this book, you are savvy enough to have heard of pivot tables—and you have perhaps even used them on occasion. You have a sense that pivot tables provide a power that you are not using, and you want to learn how to leverage that power to increase your productivity quickly.

Within the first two chapters, you will be able to create basic pivot tables, increase your productivity, and produce reports in minutes instead of hours. Within the first seven chapters, you will be able to output complex pivot reports with drill-down capabilities and accompanying charts. By the end of the book, you will be able to build a dynamic pivot table reporting system.

What is new in Microsoft 365 Excel's pivot tables

You can now create a pivot table while using Excel Online. It does not offer all the features of Excel for Windows, but being able to create a pivot table in Excel Online is a giant leap for the online version of Excel. It was just three years ago that I wrote in the previous edition of this book that Excel Online would never allow you to create pivot tables, and three years later, they do it. You can't tweak them like you can in Windows, but you can create pivot tables.

Office 365 offers a new Analyze Data feature that is powered by Artificial Intelligence. Select a data set with up to 250,000 cells and ask Excel to analyze the data. Excel will suggest about 30 interesting analyses, including several pivot tables.

The Analyze Data feature allows you to ask a question about your data. There is a fairly high chance that the answer will be provided as a pivot table or a pivot chart. So, Analyze Data and Ask a Question become new entry points for creating pivot tables.

If you missed the 2019 edition of this book, these features were new since Excel 2016:

- You can specify default settings for all future pivot tables.
- The automatic date grouping introduced in Excel 2016 pivot tables can now be turned off. A mix of empty cells and numeric cells will be treated like a numeric column and will default to Sum instead of Count.
- Power Pivot is now included in all Windows versions of Excel 2019 and Office 365.

Case Study: Life Without Pivot Tables

Say that your manager asks you to create a one-page summary of a sales database. He would like to see total revenue by region and product. Suppose you do not know how to use pivot tables. You will have to use dozens of keystrokes or mouse clicks to complete this task.

This sample data set (included with the download files for the book—see page xxxii) has headings in row 1 and data in rows 2 through 564 and columns in column A through column I.

First, you have to get a sorted, unique list of products down the left side of the summary report and a sorted unique list of products across the top. In the past, this might involve an Advanced Filter or the Remove Duplicates command. But today, it is easiest with a formula.

1. Enter `=SORT(UNIQUE(B2:B564))` in cell K2. You will have a list of the unique region names spilling to K2:K5.
2. To get a list of unique products across the top of the report, enter `=TRANSPOSE(SORT(UNIQUE(C2:C564)))` in cell L1.

At this point, with 57 keystrokes, you've built the shell of the final report, but there are no numbers inside yet (see Figure I-1).

	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Region	Product	Date	Customer	Quantity	Revenue	COGS	Profit			Doodads	Gadget	Gizmo	Widget
2	Midwest	Gizmo	1/1/2026	Ford	1000	22810	10220	12590		Midwest				
3	Northeast	Gadget	1/2/2026	Verizon	100	2257	984	1273		Northeast				
4	South	Gizmo	1/4/2026	Valero Ener	400	9152	4088	5064		South				
5	Midwest	Gadget	1/4/2026	Cardinal Hea	800	18552	7872	10680		West				
6	West	Gadget	1/7/2026	Wells Fargo	1000	21730	9840	11890						

FIGURE I-1 It took 57 keystrokes to get to this point.

Next, you need to build a SUMIFS function to total the revenue for each Region and Product. As shown in Figure I-2, the formula =SUMIFS(G2:G564,B2:B564,K2#,C2:C564,L1#) does the trick. It takes 40 characters plus the Enter key to finish the formula

	K	L	M	N	O
		Doodads	Gadget	Gizmo	Widget
Midwest		6036	544772	652651	537965
Northeast		38860	714009	751724	620019
South		0	839551	918588	844186
West		28663	65382	70057	75349

FIGURE I-2 If Before Dynamic Arrays were introduced, the formula in L2 would have needed dollar signs and then been copied to all sixteen cells showing numbers.

Enter the heading Total for the total row and for the total column. You can do this in nine keystrokes if you type the first heading, press Ctrl+Enter to stay in the same cell, and then use Copy, select the cell for the second heading, and use Paste.

If you select K1:P6 and press Alt+= (that is, Alt and the equal sign key), you can add the total formula in three keystrokes.

With this method, which takes 110 clicks or keystrokes, you end up with a nice summary report, as shown in Figure I-3. If you could pull this off in 5 or 10 minutes, you would probably be fairly proud of your Excel prowess; there are some good tricks among those 110 operations.

	K	L	M	N	O	P
		Gizmo	Gadget	Widget	Doodads	Total
Midwest		652651	544772	537965	6036	1741424
Northeast		751724	714009	620019	38860	2124612
South		918588	839551	844186	0	2602325
West		70057	65382	75349	28663	239451
Total		2393020	2163714	2077519	73559	6707812

FIGURE I-3 A mere 110 operations later, you have a summary report.

You hand the report to your manager. Within a few minutes, he comes back with one of the following requests, which will certainly cause a lot of rework:

- Could you put products down the side and regions across the top?
- Could you show me the same report for only the manufacturing customers?
- Could you show profit instead of revenue?
- Could you copy this report for each of the customers?

Invention of the pivot table

When the actual pivot table was invented is in dispute. The Excel team coined the term *pivot table*, which appeared in Excel in 1993. However, the concept was not new. Pito Salas and his team at Lotus were working on the pivot table concept in 1986 and released Lotus Improv in 1991. Before then, Javelin offered functionality similar to that of pivot tables.

The core concept behind a pivot table is that the data, formulas, and data views are stored separately. Each column has a name, and you can group and rearrange the data by dragging field names to various positions on the report.

Case Study: Life After Pivot Tables

Say that you're tired of working so hard to remake reports every time your manager wants a change. You're in luck: You can produce the same report as in the last case study but use a pivot table instead. Excel offers you 10 thumbnails of recommended pivot tables to get you close to the goal. Follow these steps:

1. Click the Insert tab of the ribbon.
2. Click Recommended PivotTables. The first recommended item is Revenue By Region (see Figure I-4).
3. Click OK to accept the first pivot table.
4. Drag the Product field from the PivotTable Fields list to the Columns area (see Figure I-5).

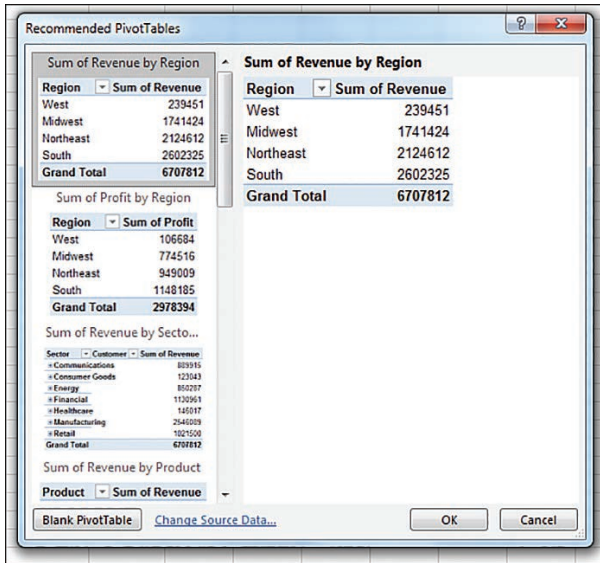


FIGURE I-4 The first recommended pivot table is as close as you will get to the required report.

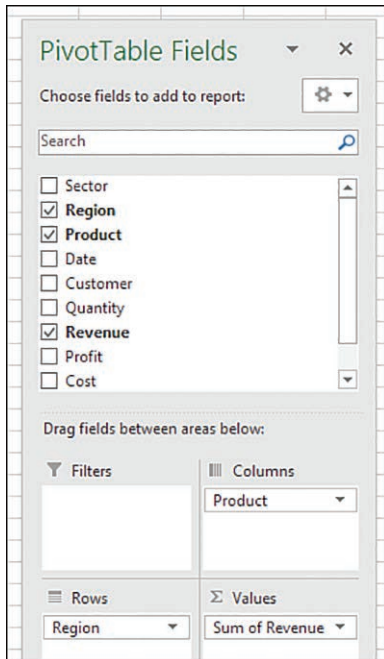


FIGURE I-5 To finish the report, drag the Product heading to the Columns area.

With just four clicks of the mouse, you have the report shown in Figure I-6.

3	Sum of Revenue	Product				
4	Region	Doodads	Gadget	Gizmo	Widget	Grand Total
5	West	28663	65382	70057	75349	239451
6	Midwest	6036	544772	652651	537965	1741424
7	Northeast	38860	714009	751724	620019	2124612
8	South	0	839551	918588	844186	2602325
9	Grand Total	73559	2163714	2393020	2077519	6707812

FIGURE I-6 It took five clicks to create this report.

In addition, when your manager comes back with a request like the ones near the end of the prior case study, you can easily use the pivot table to make the changes. Here's a quick overview of the changes you'll learn to make in the chapters that follow:

- Could you put products down the side and regions across the top? (This change will take you 10 seconds: Drag Product to Rows and Region to Columns.)
- Could you show me the same report for only the manufacturing customers? (15 seconds: Select Insert Slicer, Sector; click OK; click Manufacturing.)
- Could you show profit instead of revenue? (10 seconds: Clear the check box for Revenue, select the check box for Profit.)
- Could you copy this report for each of the customers? (30 seconds: Move Customer to Report Filter, open the tiny drop-down menu next to the Options button, choose Show Report Filter Pages, click OK.)

Creating a Pivot Table Using Artificial Intelligence

The new Analyze Data tool uses artificial intelligence to analyze a data set. You can type a question in natural language and Excel will create a pivot table.

With one cell in your data set selected, choose the Analyze Data command on the right side of the Home tab. The Analyze Data pane appears with several suggested analyses. In the Ask a Question box at the top, type **Revenue by Product and Region as Table** and press Enter.

Excel will draw a thumbnail of your report. Click +Insert PivotTable at the bottom of the thumbnail.

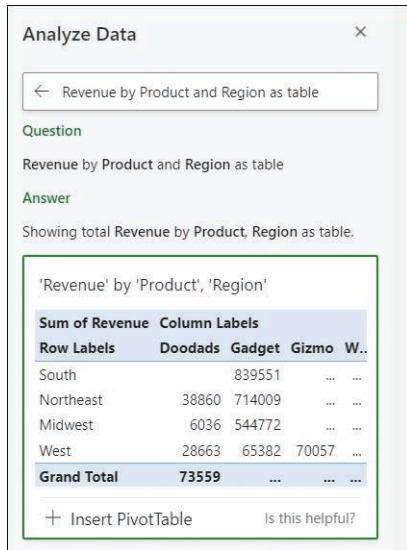


FIGURE I-7 Slightly more typing, but certainly easier to create

Who this book is for

This book is a comprehensive-enough reference for hard-core analysts yet relevant to casual users of Excel.

We assume that you are comfortable navigating in Excel and that you have some large data sets that you need to summarize.

How this book is organized

The bulk of the book covers how to use pivot tables in the Excel user interface. Chapter 10, "Unlocking features with the Data Model and Power Pivot," delves into the Power Pivot window. Chapter 13, "Using VBA or TypeScript to create pivot tables," describes how to create pivot tables in Excel's powerful VBA macro language. Anyone who has a firm grasp of basics such as preparing data, copying, pasting, and entering simple formulas should not have a problem understanding the concepts in this book.

About the companion content

The download files for this book include all of the data sets used to produce the book, so you can practice the concepts in the book. You can download this book's companion content from the following page:

MicrosoftPressStore.com/Excel365pivotdata/downloads

System requirements

You need the following software and hardware to build and run the code samples for this book:

Microsoft Excel running on a Windows computer. (Yes, Excel runs on an iPad, on an Android tablet but none of those are going to support creation of pivot tables anytime soon.) For people using Excel on a Mac, some of the basic pivot table concepts will apply. Power Query and Power Pivot will not run on a Mac. For people using Excel Online, you can make many of the pivot tables in this book, but you won't be able to do as much formatting.

Errata, updates, and book support

We've made every effort to ensure the accuracy of this book and its companion content. You can access updates to this book—in the form of a list of submitted errata and their related corrections—at the following page:

MicrosoftPressStore.com/Excel365pivotdata/errata

If you discover an error that is not already listed, please submit it to us at the same page.

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Customizing a pivot table

In this chapter, you will:

- Make common cosmetic changes
- Make report layout changes
- Customize a pivot table's appearance with styles and themes
- Change summary calculations
- Change the calculation in a value field
- Add and remove subtotals

Although pivot tables provide an extremely fast way to summarize data, sometimes the pivot table defaults are not exactly what you need. In such cases, you can use many powerful settings to tweak pivot tables. These tweaks range from making cosmetic changes to changing the underlying calculation used in the pivot table.

Many of the changes in this chapter can be customized for all future pivot tables using the new pivot table default settings. If you find yourself always making the same changes to a pivot table, consider making that change in the pivot table defaults.

In Excel, you find controls to customize a pivot table in myriad places: the PivotTable Analyze tab, Design tab, Field Settings dialog box, Data Field Settings dialog box, PivotTable Options dialog box, and context menus.

Rather than cover each set of controls sequentially, this chapter covers the following functional areas in making pivot table customizations:

- **Minor cosmetic changes**—Change blanks to zeros, adjust the number format, and rename a field. If you find yourself making the same changes to each pivot table, see Tip 5: Use Pivot Table Defaults To Change Behavior Of All Future Pivot Tables in Chapter 14.
- **Layout changes**—Compare three possible layouts, show/hide subtotals and totals, and repeat row labels.
- **Major cosmetic changes**—Use pivot table styles to format a pivot table quickly.
- **Summary calculations**—Change from Sum to Count, Min, Max, and more.

- **Advanced calculations**—Use settings to show data as a running total, percent of total, rank, percent of parent item, and more.
- **Other options**—Review some of the obscure options found throughout the Excel interface.

Making common cosmetic changes

You need to make a few changes to almost every pivot table to make it easier to understand and interpret. Figure 3-1 shows a typical pivot table. To create this pivot table, open the Chapter 3 data file. Select Insert, Pivot Table, OK. Select the Sector, Customer, and Revenue fields check boxes, and drag the Region field to the Columns area.

	C	D	E	F	G	H	I
3	Total Revenue		Region				
4	Sector	Customer	Midwest	Northeast	South	West	Grand Total
5	Associations			51240	34364		85604
6	Associations	IMA Houston Chapter		51240			51240
7	Associations	Association for Computers & Taxation					
8							
9	Consultants		89033				
10	Consultants	Andrew Spain Consulting					
11	Consultants	Data2Impact					
12	Consultants	Cambia Factor					
13	Consultants	Fintega Financial Modelling					
14	Consultants	Excelerator BI	46717				
15	Consultants	Construction Intelligence & An	42316				
16							
17	Professional						
18	Professional	Serving Brevard Realty					
19	Professional	WM Squared Inc.					
20	Professional	Juliet Babcock-Hyde CPA, PLLC					
21							
22	Retail		84740				
23	Retail	Hartville MarketPlace and Flea Market					
24	Retail	LaFrenier Sons Septic	50030				
25	Retail	New Hope Laundry	34710				
26	Retail	Bits of Confetti					
27							
28	Software		812907				
29	Software	Excel4Apps	750163				

FIGURE 3-1 A typical pivot table before customization.

This default pivot table contains several annoying items that you might want to change quickly:

- The default table style uses no gridlines, which makes it difficult to follow the rows and columns across and down.
- Numbers in the Values area are in a general number format. There are no commas, currency symbols, and so on.

- For sparse data sets, many blanks appear in the Values area. The blank cell in E5 indicates that there were no Associations sales in the Midwest. Most people prefer to see zeros instead of blanks.
- Excel renames fields in the Values area with the unimaginative name Sum Of Revenue. You can change this name.

You can correct each of these annoyances with just a few mouse clicks. The following sections address each issue.



Tip Excel MVP Debra Dalglish sells a Pivot Power Premium add-in that fixes most of the issues listed here. Debra's add-in offers a few more features than the new PivotTable Defaults. This add-in is great if you will be creating pivot tables frequently. For more information, visit <http://mrx.cl/pivpow16>.

Applying a table style to restore gridlines

The default pivot table layout contains no gridlines and is rather plain. Fortunately, you can apply a table style. Any table style that you choose is better than the default.

Follow these steps to apply a table style:

1. Make sure that the active cell is in the pivot table.
2. From the ribbon, select the Design tab. Three arrows appear at the right side of the PivotTable Style gallery.
3. Click the bottom arrow to open the complete gallery, which is shown in Figure 3-2.

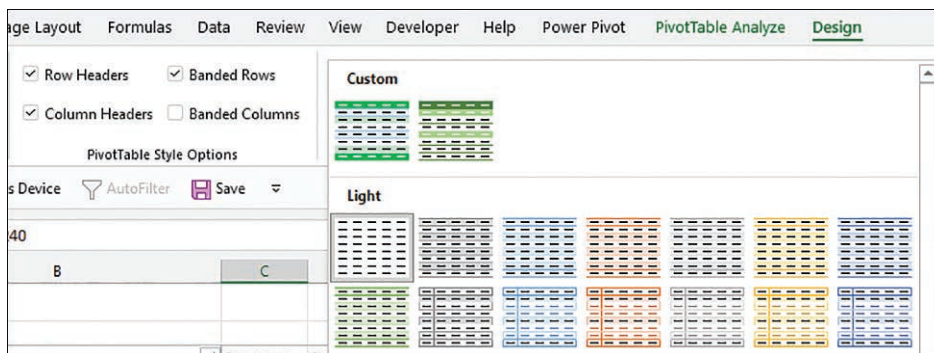


FIGURE 3-2 The gallery contains 85 styles to choose from.

4. Choose any style other than the first style from the drop-down menu. Styles toward the bottom of the gallery tend to have more formatting.
5. Select the check box for Banded Rows to the left of the PivotTable Styles gallery. This draws gridlines in light styles and adds row stripes in dark styles.

It does not matter which style you choose from the gallery; any of the 84 other styles are better than the default style.



Note For more details about customizing styles, see “Customizing a pivot table’s appearance with styles and themes,” later in this chapter.

Changing the number format to add thousands separators

If you have gone to the trouble of formatting your underlying data, you might expect that the pivot table will capture some of this formatting. Unfortunately, it does not. Even if your underlying data fields were formatted with a certain numeric format, the default pivot table presents values formatted with a general format. As a sign of some progress, when you create pivot tables from Power Pivot, you can specify the number format for a field before creating the pivot table. This functionality has not come to regular pivot tables yet.



Note For more about Power Pivot, read Chapter 10, “Unlocking features with the Data Model and Power Pivot.”

For example, in the figures in this chapter, the numbers are in the thousands or tens of thousands. At this level of sales, you would normally have a thousands separator and probably no decimal places. Although the original data had a numeric format applied, the pivot table routinely formats your numbers in an ugly general style.

What is the fastest way to change the number format? It depends if you have a single value field or multiple value fields.

In Figure 3-3, the pivot table Values area contains Revenue. There are many columns in the pivot table because Product is in the Columns area. In this case, right-click any number and choose Number Format.

Region	Doodads	Gadget	Gizmo	Widget	Grand Total
Midwest	605				741424
Northeast	3886				124612
South					502325
West	2866				239451
Grand Total	7355				6707812

FIGURE 3-3 For a single value field, right-click any number and choose Number Format.

In contrast to Figure 3-3, the pivot table in Figure 3-4 contains three fields in the Values area: Revenue, Cost, and Profit. Rather than applying the Number Format to each individual column, you can format the entire pivot table by following these steps:

1. Select from the first numeric cell to the last numeric cell, including the Grand Total row or column if it is present.
2. Press Ctrl+1 to display the Format Cells dialog box.
3. Choose the Number tab across the top of the dialog box.
4. Select a number format.
5. Click OK.

Until a coding change in Excel 2010, the preceding steps would not change the number format in cases where the pivot table became taller. However, provided you include the Grand Total in your selection, these steps will change the number format for all the fields in the Values area.

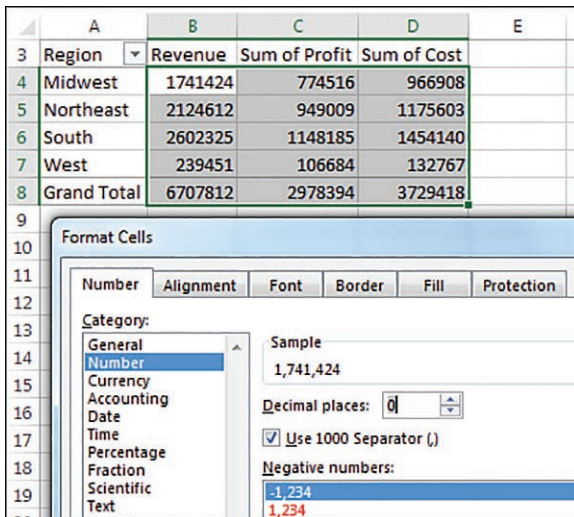


FIGURE 3-4 With multiple fields in the Values area, select all number cells as shown here and change the format using the Format Cells dialog box.

Replacing blanks with zeros

One of the elements of good spreadsheet design is that you should never leave blank cells in a numeric section of a worksheet.

A blank tells you that there were no sales for a particular combination of labels. In the default view, an actual zero is used to indicate that there was activity, but the total sales were zero. This value might mean that a customer bought something and then returned it, resulting in net sales of zero. Although

there are limited applications in which you need to differentiate between having no sales and having net zero sales, this seems rare. In 99% of the cases, you should fill in the blank cells with zeros.

Follow these steps to change this setting for the current pivot table:

1. Right-click any cell in the pivot table and choose PivotTable Options.
2. On the Layout & Format tab in the Format section, type **0** next to the field labeled For Empty Cells Show (see Figure 3-5). Alternatively, you can unselect the For Empty Cells Show option. Or, you can type anything here, such as a dash or even the words zip, nada, nothing.

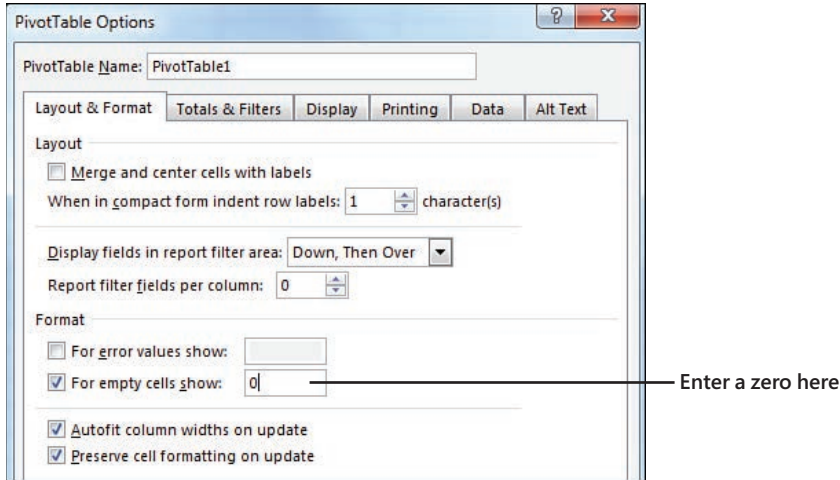


FIGURE 3-5 Enter a zero in the For Empty Cells Show box to replace the blank cells with zero.

3. Click OK to accept the change.

The result is that the pivot table is filled with zeros instead of blanks, as shown in Figure 3-6.

	A	B	C	D	E	F
1						
2						
3	Sum of Revenue	Column Labels				
4	Row Labels	Midwest	Northeast	South	West	Grand Total
5	Associations	\$0	\$51,240	\$34,364	\$0	\$85,604
6	Association for Computers & Taxation	\$0	\$0	\$34,364	\$0	\$34,364
7	IMA Houston Chapter	\$0	\$51,240	\$0	\$0	\$51,240
8	Consultants	\$89,033	\$0	\$926,970	\$115,132	\$1,131,135
9	Andrew Spain Consulting	\$0	\$0	\$869,454	\$0	\$869,454
10	Cambia Factor	\$0	\$0	\$57,516	\$0	\$57,516
11	Construction Intelligence & Analytics, Inc.	\$42,316	\$0	\$0	\$0	\$42,316
12	Data2Impact	\$0	\$0	\$0	\$59,881	\$59,881
13	Excelerator BI	\$46,717	\$0	\$0	\$0	\$46,717
14	Fintega Financial Modelling	\$0	\$0	\$0	\$55,251	\$55,251
15	Professional	\$0	\$0	\$437,695	\$39,250	\$476,945
16	Juliet Babcock-Hyde CPA, PLLC	\$0	\$0	\$31,369	\$0	\$31,369
17	Serving Brevard Realty	\$0	\$0	\$406,326	\$0	\$406,326
18	WM Squared Inc.	\$0	\$0	\$0	\$39,250	\$39,250
19	Retail	\$84,740	\$0	\$704,359	\$31,021	\$820,120

FIGURE 3-6 Your report is now a solid contiguous block of non-blank cells.

Changing a field name

Every field in a final pivot table has a name. Fields in the row, column, and filter areas inherit their names from the heading in the source data. Fields in the values section are given names such as Sum Of Revenue. In some instances, you might prefer to print a different name in the pivot table. You might prefer Total Revenue instead of the default name. In these situations, the capability to change your field names comes in quite handy.



Tip Although many of the names are inherited from headings in the original data set, when your data is from an external data source, you might not have control over field names. In these cases, you might want to change the names of the fields as well.

To change a field name in the Values area, follow these steps:

1. Select a cell in the pivot table that contains the appropriate type of value. You might have a pivot table with both Sum Of Quantity and Sum Of Revenue in the Values area. Choose a cell that contains a Sum Of Revenue value.
2. Go to the PivotTable Analyze tab in the ribbon. A Pivot Field Name text box appears below the heading Active Field. The box currently contains Sum Of Revenue.
3. Type a new name in the box, as shown in Figure 3-7. Click a cell in your pivot table to complete the entry and have the heading in A3 change. The name of the field title in the Values area also changes to reflect the new name.

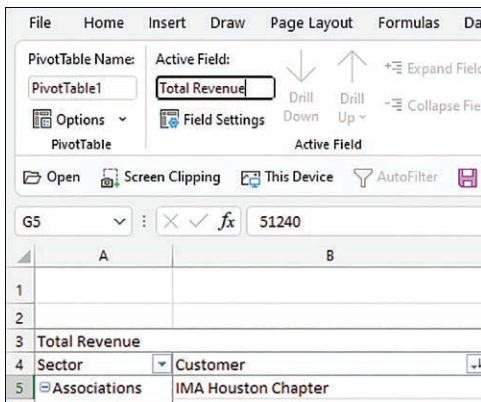


FIGURE 3-7 The name typed in the Custom Name box appears in the pivot table. Although names should be unique, you can trick Excel into accepting a name that's similar to an existing name by adding a space to the end of it.



Tip When you can see the value field name such as “Sum of Revenue” in the Excel worksheet, you can directly type a new value to rename the field. For example, in Figure 3-7, you could type Sales in cell A3 to rename the field.



Note One common frustration occurs when you would like to rename Sum Of Revenue to Revenue. The problem is that this name is not allowed because it is not unique; you already have a Revenue field in the source data. To work around this limitation, you can name the field and add a space to the end of the name. Excel considers “Revenue ” (with a space) to be different from “Revenue” (with no space). Because this change is only cosmetic, the readers of your spreadsheet do not notice the space after the name.

Making report layout changes

Excel offers three report layout styles. The Excel team continues to offer the Compact layout as the default report layout. If you prefer a different layout, change it using the default settings for pivot tables.

If you consider three report layouts, and the ability to show subtotals at the top or bottom, plus choices for blank rows and Repeat All Item Labels, you have 16 different layout possibilities available.

Layout changes are controlled in the Layout group of the Design tab, as shown in Figure 3-8. This group offers four icons:

- **Subtotals**—Moves subtotals to the top or bottom of each group or turns them off.
- **Grand Totals**—Turns the grand totals on or off for rows and columns.
- **Report Layout**—Uses the Compact, Outline, or Tabular forms. Offers an option to repeat item labels.
- **Blank Rows**—Inserts or removes blank lines after each group.



Note You mathematicians in the audience might think that 3 layouts × 2 repeat options × 2 subtotal location options × 2 blank row options would be 24 layouts. However, choosing Repeat All Item Labels does not work with the Compact layout, thus eliminating 4 of the combinations. In addition, Subtotals At The Top Of Each Group does not work with the Tabular layout, eliminating another 4 combinations.

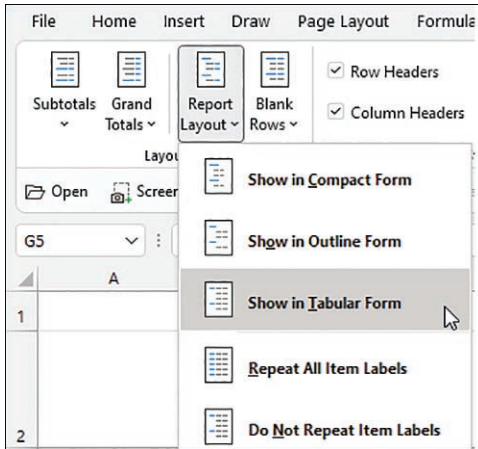


FIGURE 3-8 The Layout group on the Design tab offers different layouts and options for totals.

Using the Compact layout

By default, all new pivot tables use the Compact layout that you saw in Figure 3-6. In this layout, multiple fields in the row area are stacked in column A. Note in the figure that the Consultants sector and the Andrew Spain Consulting customer are both in column A.

The Compact form is suited for using the Expand and Collapse icons. If you select one of the Sector value cells such as Associations in A5 and then click the Collapse Field icon on the Analyze tab, Excel hides all the customer details and shows only the sectors, as shown in Figure 3-9.

	Midwest	Northeast	South	West	Grand Total
Associations	\$0	\$51,240	\$34,364	\$0	\$85,604
Consultants	\$89,033	\$0	\$926,970	\$115,132	\$1,131,135
Professional	\$0	\$0	\$437,695	\$39,250	\$476,945
Retail	\$84,740	\$0	\$704,359	\$31,021	\$820,120
Software	\$812,907	\$463,658	\$0	\$0	\$1,276,565
Training	\$754,744	\$1,609,714	\$498,937	\$54,048	\$2,917,443
Grand Total	\$1,741,424	\$2,124,612	\$2,602,325	\$239,451	\$6,707,812

FIGURE 3-9 Click the Collapse Field icon to hide levels of detail.

After a field is collapsed, you can show detail for individual items by using the plus icons in column A, or you can click Expand Field on the PivotTable Analyze tab to see the detail again.



Tip If you select a cell in the innermost row field and click Expand Field on the Options tab, Excel displays the Show Detail dialog box, as shown in Figure 3-10, to enable you to add a new innermost row field.

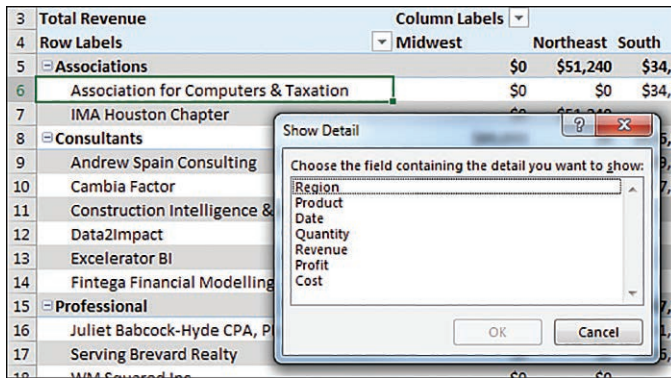


FIGURE 3-10 When you attempt to expand the innermost field, Excel offers to add a new innermost field.

Using the Outline layout

When you select Design, Layout, Report Layout, Show In Outline Form, Excel puts each row field in a separate column. The pivot table shown in Figure 3-11 is one column wider, with revenue values starting in C instead of B. This is a small price to pay for allowing each field to occupy its own column. Soon, you will find out how to convert a pivot table to values so you can further sort or filter. When you do this, you will want each field in its own column.

The Excel team added the Repeat All Item Labels option to the Report Layout tab starting in Excel 2010. This alleviated a lot of busy work because it takes just two clicks to fill in all the blank cells along the outer row fields. Choosing to repeat the item labels causes values to appear in cells A6:A7, A9:A14, as shown in Figure 3-11.

Figure 3-11 shows the same pivot table from before, now in Outline form and with labels repeated.



Caution This layout is suitable if you plan to copy the values from the pivot table to a new location for further analysis. Although the Compact layout offers a clever approach by squeezing multiple fields into one column, it is not ideal for reusing the data later.

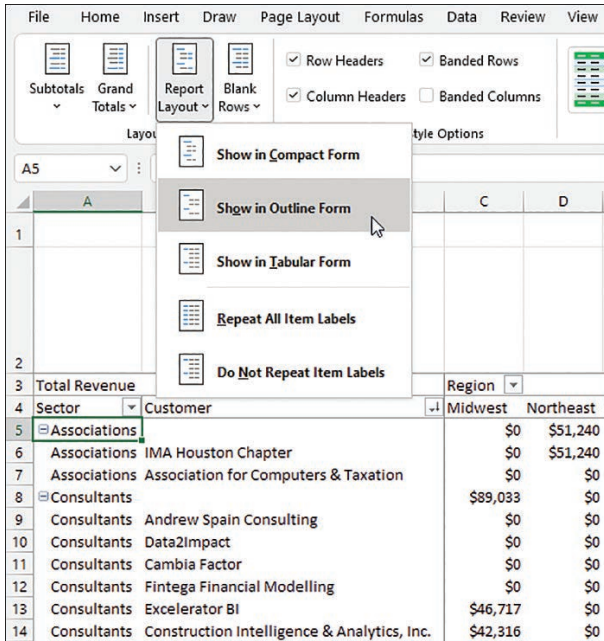


FIGURE 3-11 The Outline layout puts each row field in a separate column.

By default, both the Compact and Outline layouts put the subtotals at the top of each group. You can use the Subtotals drop-down menu on the Design tab to move the totals to the bottom of each group, as shown in Figure 3-12. In Outline view, this causes a not-really-useful heading row to appear at the top of each group. Cell A5 contains “Associations” without any additional data in the columns to the right. Consequently, the pivot table occupies 44 rows instead of 37 rows because each of the 7 sector categories has an extra header.

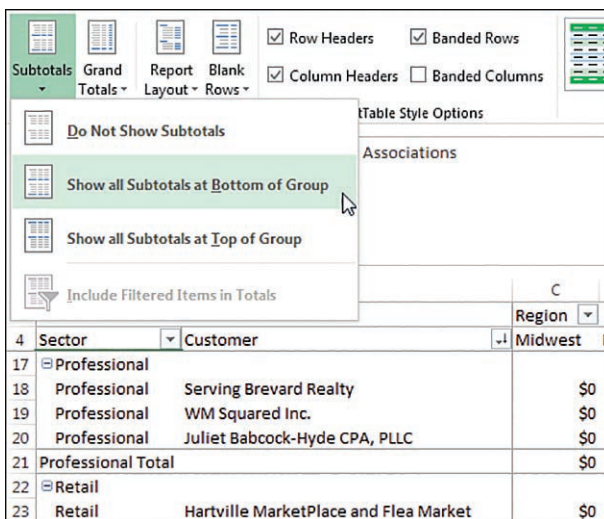


FIGURE 3-12 With subtotals at the bottom of each group, the pivot table occupies several more rows.

Using the traditional Tabular layout

Figure 3-13 shows the Tabular layout. This layout is similar to the one that has been used in pivot tables since their invention through Excel 2003. In this layout, the subtotals can never appear at the top of the group. The Repeat All Item Labels works with this layout, as shown in Figure 3-13.

	A	B	C	D	E
3	Revenue		Region		
4	Sector	Customer	Midwest	Northeast	South
5	Associations	IMA Houston Chapter	\$0	\$51,240	\$0
6	Associations	Association for Computers & Taxation	\$0	\$0	\$34,364
7	Associations Total		\$0	\$51,240	\$34,364
8	Consultants	Andrew Spain Consulting	\$0	\$0	\$869,454
9	Consultants	Data2Impact	\$0	\$0	\$0
10	Consultants	Cambia Factor	\$0	\$0	\$57,516
11	Consultants	Fintega Financial Modelling	\$0	\$0	\$0
12	Consultants	Excelerator BI	\$46,717	\$0	\$0
13	Consultants	Construction Intelligence & Analytics, Inc.	\$42,316	\$0	\$0
14	Consultants Total		\$89,033	\$0	\$926,970
15	Professional	Serving Brevard Realty	\$0	\$0	\$406,326
16	Professional	WM Squared Inc.	\$0	\$0	\$0
17	Professional	Juliet Babcock-Hyde CPA, PLLC	\$0	\$0	\$31,369
18	Professional Total		\$0	\$0	\$437,695
19	Retail	Hartville MarketPlace and Flea Market	\$0	\$0	\$704,359

FIGURE 3-13 The Tabular layout is similar to pivot tables in legacy versions of Excel.

The Tabular layout is the best layout if you expect to use the resulting summary data in a subsequent analysis. If you wanted to reuse the table in Figure 3-13, you would do additional “flattening” of the pivot table by choosing Subtotals, Do Not Show Subtotals and Grand Totals, Off For Rows And Columns.

Case study: Converting a pivot table to values

Say that you want to convert the pivot table shown in Figure 3-13 to be a regular data set that you can sort, filter, chart, or export to another system. You don’t need the Sectors totals in rows 7, 14, 18, and so on. You don’t need the Grand Total at the bottom. And, depending on your future needs, you might want to move the Region field from the Columns area to the Rows area. This would allow you to add Cost and Profit as new columns in the final report. Finally, you want to convert from a live pivot table to static values. To make these changes, follow these steps:

1. Select any cell in the pivot table.
2. From the Design tab, select Grand Totals, Off For Rows And Columns.
3. Select Design, Subtotals, Do Not Show Subtotals.
4. Drag the Region tile from the Columns area in the PivotTable Fields list. Drop this field between Sector and Customer in the Rows area.

5. Check Profit and Cost in the top of the PivotTable Fields list. Because both fields are numeric, they move to the Values area and appear in the pivot table as new columns. Rename both fields using the Current Field box on the PivotTable Analyze tab. The report is now a contiguous solid block of data, as shown in Figure 3-14.

	A	B	C	D	E	F
1						
2						
3	Sector	Region	Customer	Total Revenue	Total Profit	Total Cost
4	Associations	Northeast	IMA Houston Chapter	\$51,240	22824	28416
5	Associations	South	Association for Computers & Taxation	\$34,364	15576	18788
6	Consultants	Midwest	Construction Intelligence & Analytics, Inc.	\$42,316	18764	23552
7	Consultants	Midwest	Excelerator BI	\$46,717	19961	26756
8	Consultants	South	Andrew Spain Consulting	\$869,454	382170	487284
9	Consultants	South	Cambia Factor	\$57,516	26765	30751
10	Consultants	West	Data2Impact	\$59,881	25913	33968
11	Consultants	West	Fintega Financial Modelling	\$55,251	24632	30619
12	Professional	South	Juliet Babcock-Hyde CPA, PLLC	\$31,369	13730	17639
13	Professional	South	Serving Brevard Realty	\$406,326	178585	227741

FIGURE 3-14 The pivot table now contains a solid block of data.

6. Select one cell in the pivot table. Press Ctrl+* to select all the data in the pivot table.
7. Press Ctrl+C to copy the data from the pivot table.
8. Select a blank section of a worksheet.
9. Right-click. To the right of the words "Paste Special" is a greater-than sign that leads to a flyout with 14 ways to Paste Special. Choose Paste Values And Number Formatting, as shown in Figure 3-15. Excel pastes a static copy of the report to the worksheet.

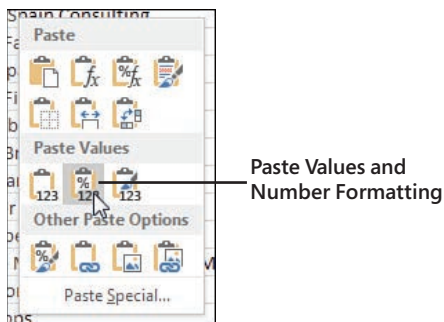


FIGURE 3-15 Use Paste Values And Number Formatting to create a static version of the data.

10. If you no longer need the original pivot table, select the entire pivot table and press the Delete key to clear the cells from the pivot table and free up the area of memory that was holding the pivot table cache. One way to select the entire pivot table is to use the Select drop-down menu on the PivotTable Analyze tab and choose Entire PivotTable.

The result is a solid block of summary data. These 27 rows are a summary of the 500+ rows in the original data set, but they also are suitable for exporting to other systems.

Controlling blank lines, grand totals, and other settings

Additional settings on the Design tab enable you to toggle various elements.

The Blank Rows drop-down menu offers the choice Insert Blank Line After Each Item. This setting applies only to pivot tables with two or more row fields. Blank rows are not added after each item in the inner row field. You see a blank row after each group of items in the outer row fields. As shown in Figure 3-16, the blank row after each sector makes the report easier to read. However, if you remove Sector from the report, you have only Customer in the row fields, and no blank rows appear (see Figure 3-17).

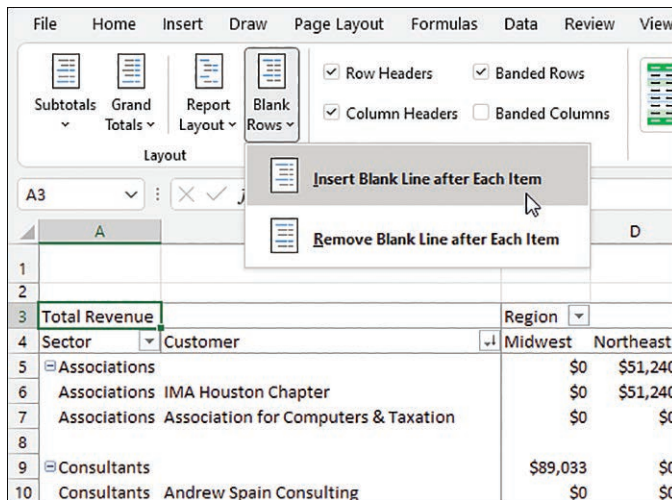


FIGURE 3-16 The Blank Rows setting makes the report easier to read.

	A	B	C	D
3	Total Revenue	Region		
4	Customer	Midwest	Northeast	South
5	Andrew Spain Consulting	\$0	\$0	\$869,454
6	Excel4Apps	\$750,163	\$0	\$0
7	Hartville MarketPlace and Flea Market	\$0	\$0	\$704,359
8	599CD.com	\$622,794	\$0	\$0
9	MySpreadsheetLab	\$0	\$613,514	\$0
10	CPASelfStudy.com	\$0	\$568,851	\$0
11	MyOnlineTrainingHub.com	\$0	\$0	\$498,937
12	LearnExcelBooks.com	\$0	\$427,349	\$0
13	Serving Brevard Realty	\$0	\$0	\$406,326

FIGURE 3-17 Blank rows will not appear when there is only one item in the row field.

Grand totals can appear at the bottom of each column and/or at the end of each row, or they can be turned off altogether. Settings for grand totals appear in the Grand Totals drop-down menu of the Layout group on the Design tab. The wording in this drop-down menu is a bit confusing, so Figure 3-18 shows what each option provides. The default is to show grand totals for rows and columns.

	A	B	C	D	E	F
1	Grand Totals On For Rows Only					
2	<i>Keeps the Grand Total column</i>					
3	Total Revenue Product					
4	Region	Doodads	Gadget	Gizmo	Widget	Grand Total
5	Midwest	\$6,036	\$544,772	\$652,651	\$537,965	\$1,741,424
6	Northeast	\$38,860	\$714,009	\$751,724	\$620,019	\$2,124,612
7	South	\$0	\$839,551	\$918,588	\$844,186	\$2,602,325
8	West	\$28,663	\$65,382	\$70,057	\$75,349	\$239,451
9						
10	Grand Totals On For Columns Only					
11	<i>Keeps the Grand Total row</i>					
12	Total Revenue Product					
13	Region	Doodads	Gadget	Gizmo	Widget	
14	Midwest	\$6,036	\$544,772	\$652,651	\$537,965	
15	Northeast	\$38,860	\$714,009	\$751,724	\$620,019	
16	South	\$0	\$839,551	\$918,588	\$844,186	
17	West	\$28,663	\$65,382	\$70,057	\$75,349	
18	Grand Total	\$73,559	\$2,163,714	\$2,393,020	\$2,077,519	
19						
20	Grand Totals Off For Rows and Columns					
21	Total Revenue Product					
22	Region	Doodads	Gadget	Gizmo	Widget	
23	Midwest	\$6,036	\$544,772	\$652,651	\$537,965	
24	Northeast	\$38,860	\$714,009	\$751,724	\$620,019	
25	South	\$0	\$839,551	\$918,588	\$844,186	
26	West	\$28,663	\$65,382	\$70,057	\$75,349	
27						

FIGURE 3-18 The wording is confusing, but you can toggle off the grand total column, row, or both.

If you want a grand total column but no grand total at the bottom, choose On For Rows Only, as shown at the top of Figure 3-18. To me, this seems backward. To keep the grand total column, you have to choose to turn on grand totals for rows only. I guess the rationale is that each cell in F5:F8 is a grand total of the row to the left of the cell. Hence, you are showing the grand totals for all the rows but not for the columns. Perhaps someday Microsoft will ship a version of Excel in English-Midwest where this setting would be called “Keep the Grand Total Column.” But for now, it remains confusing.

In a similar fashion, to show a grand total row but no grand total column, you open the Grand Totals menu and choose On For Columns Only. Again, in some twisted version of the English language, cell B18 is totaling the cells in the column above it.

The final choice, Off For Rows And Columns, is simple enough. Excel shows neither a grand total column nor a grand total row.



Tip You can abandon these confusing menu choices by using the right-click menu. If you right-click on any cell that has the words "Grand Total," you can choose Remove Grand Total.

Back in Excel 2003, pivot tables were shown in Tabular layout and logical headings such as Region and Product would appear in the pivot table, as shown in the top pivot table in Figure 3-19. When the Excel team switched to Compact form, they replaced those headings with Row Labels and Column Labels. These add nothing to the report. To toggle off those headings, look on the far-right side of the PivotTable Analyze tab for an icon called Field Headers and click it to remove Row Labels and Column Labels from your pivot tables in Compact form.

	A	B	C	D	E	F
1						
2	Tabular Form					
3	Revenue	Product				
4	Region	Doodads	Gadget	Gizmo	Widget	Grand Total
5	Midwest	\$6,036	\$544,772	\$652,651	\$537,965	\$1,741,424
6	Northeast	\$38,860	\$714,009	\$751,724	\$620,019	\$2,124,612
7	South	\$0	\$839,551	\$918,588	\$844,186	\$2,602,325
8	West	\$28,663	\$65,382	\$70,057	\$75,349	\$239,451
9						
10	Compact Form - "Region" becomes "Row Labels"					
11	Revenue	Column Labels				
12	Row Labels	Doodads	Gadget	Gizmo	Widget	Grand Total
13	Midwest	\$6,036	\$544,772	\$652,651	\$537,965	\$1,741,424
14	Northeast	\$38,860	\$714,009	\$751,724	\$620,019	\$2,124,612
15	South	\$0	\$839,551	\$918,588	\$844,186	\$2,602,325
16	West	\$28,663	\$65,382	\$70,057	\$75,349	\$239,451
17						
18	Compact Form - Toggle Off Field Headers					
19	Revenue					
20		Doodads	Gadget	Gizmo	Widget	Grand Total
21	Midwest	\$6,036	\$544,772	\$652,651	\$537,965	\$1,741,424
22	Northeast	\$38,860	\$714,009	\$751,724	\$620,019	\$2,124,612
23	South	\$0	\$839,551	\$918,588	\$844,186	\$2,602,325
24	West	\$28,663	\$65,382	\$70,057	\$75,349	\$239,451

FIGURE 3-19 The Compact form replaces useful headings with Row Labels. You can turn these off.



Caution When you arrange several pivot tables vertically, as in Figure 3-19, you'll notice that changes in one pivot table change the column widths for the entire column, often causing ##### to appear in the other pivot tables. By default, Excel changes the column width to AutoFit the pivot table but ignores anything else in the column. To turn off this default behavior, right-click each pivot table and choose PivotTable Options. In the first tab of the Options dialog box, the second-to-last check box is AutoFit Column Widths On Update. Clear this check box. This is another setting that you might want to adjust in Pivot Table Defaults. See Tip 5 in Chapter 14.

Customizing a pivot table's appearance with styles and themes

You can quickly apply color and formatting to a pivot table report by using the 85 built-in styles in the PivotTable Styles gallery on the Design tab. These 85 styles are further modified by the four check boxes to the left of the gallery. Throw in the 48 themes on the Page Layout tab, and you have 65,280 easy ways to format a pivot table. If none of those provide what you need, you can define a new style.

Start with the four check boxes in the PivotTable Style Options group of the Design tab of the ribbon. You can choose to apply special formatting to the row headers, column headers, banded rows, or banded columns. My favorite choice here is banded rows because it makes it easier for the reader's eye to follow a row across a wide report. You should choose from these settings first because the choices here will modify the thumbnails shown in the Styles gallery.

As mentioned earlier, the PivotTable Styles gallery on the Design tab offers 85 built-in styles. Grouped into 28 styles each of Light, Medium, and Dark, the gallery offers variations on the accent colors used in the current theme. In Figure 3-20, you can see which styles in the gallery truly support banded rows and which just offer a bottom border between rows.

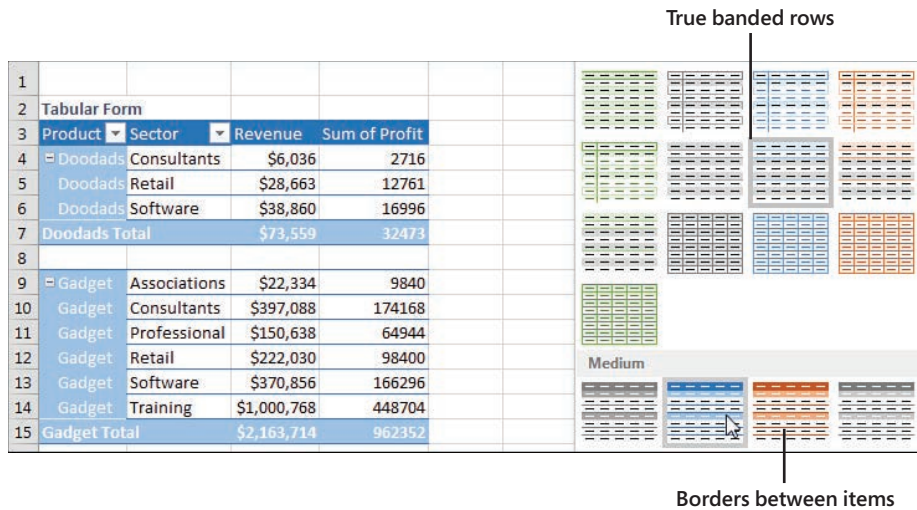


FIGURE 3-20 The styles are shown here with accents for row headers, column headers, and alternating colors in the columns.



Tip Note that you can modify the thumbnails for the 85 styles shown in the gallery by using the four check boxes in the PivotTable Style Options group.

The Live Preview feature in Excel works in the Styles gallery. As you hover your mouse cursor over style thumbnails, the worksheet shows a preview of the style.

Customizing a style

You can create your own pivot table styles, and the new styles are added to the gallery for the current workbook only. To use the custom style in another workbook, copy and temporarily paste the formatted pivot table to the other workbook. After the pivot table has been pasted, apply the custom style to an existing pivot table in your workbook and then delete the temporary pivot table.

Say that you want to create a pivot table style in which the banded colors are three rows high. Follow these steps to create the new style:

1. Find an existing style in the PivotTable Styles gallery that supports banded rows. Right-click the style in the gallery and select Duplicate. Excel displays the Modify PivotTable Quick Style dialog box.
2. Choose a new name for the style. Excel initially appends a 2 to the existing style name, which means you have a name such as PivotStyleDark3 2. Type a better name, such as **Greenbar**.
3. In the Table Element list, click First Row Stripe. A new section called Stripe Size appears in the dialog box.
4. Select 3 from the Stripe Size drop-down, as shown in Figure 3-21.
5. To change the stripe color, click the Format button. The Format Cells dialog box appears. Click the Fill tab and then choose a fill color. If you want to be truly authentic, choose More Colors, Custom and use Red=200, Green=225, and Blue=204 to simulate 1980s-era greenbar paper. Click OK to accept the color and return to the Modify PivotTable Quick Style dialog box.
6. In the Table Element List, click Second Row Stripe. Select 3 from the Stripe Size drop-down. Modify the format to use a lighter color, such as white.
7. If you plan on creating more pivot tables in this workbook, choose the Set As Default Pivot-Table Style For This Document check box in the lower left.
8. Optionally, edit the colors for Header Row and Grand Total Row.
9. Click OK to finish building the style. Strangely, Excel doesn't automatically apply this new style to the pivot table. After you put in a few minutes of work to tweak the style, the pivot table does not change.
10. Your new style should be the first thumbnail visible in the Styles gallery. Click that style to apply it to the pivot table.



Tip If you have not added more than seven custom styles, the thumbnail should be visible in the closed gallery, so you can choose it without reopening the gallery.

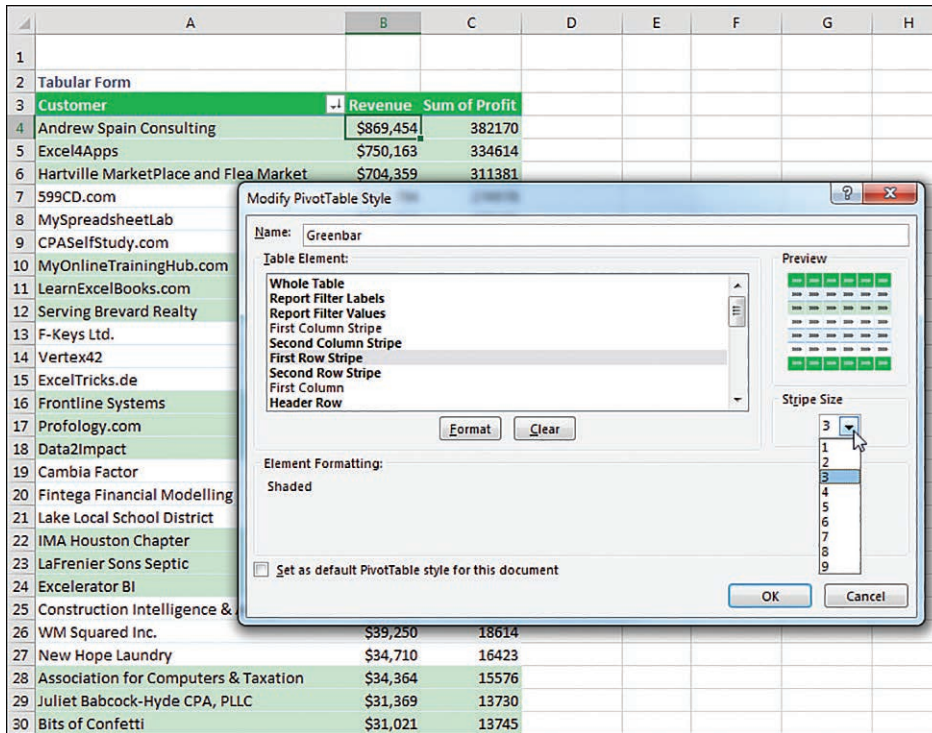


FIGURE 3-21 Customize the style in the Modify PivotTable Style dialog box.

Modifying styles with document themes

The formatting options for pivot tables in Excel are impressive. The 84 styles combined with 16 combinations of the Style options make for hundreds of possible format combinations.

In case you become tired of these combinations, you can visit the Themes drop-down menu on the Page Layout tab, where many built-in themes are available. Each theme has a new combination of accent colors, fonts, and shape effects.

To change a document theme, open the Themes drop-down menu on the Page Layout tab. Choose a new theme, and the colors used in the pivot table change to match the theme.



Caution Changing the theme affects the entire workbook. It changes the colors and fonts and affects all charts, shapes, tables, and pivot tables on all worksheets of the active workbook. If you have several other pivot tables in the workbook, changing the theme will apply new colors to all the pivot tables.



Tip Some of the themes use unusual fonts. You can apply the colors from a theme without changing the fonts in your document by using the Colors drop-down menu next to the Themes menu, as shown in Figure 3-22.

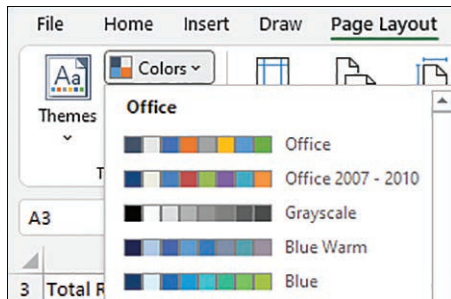


FIGURE 3-22 Choose new colors from the Colors menu.

Case Study: Excel Pivot Table Archaeology

At Microsoft, a great person named Howie Dickerman has been in charge of pivot tables for the last few years. Howie was an architect of Power Pivot and was always happy to engage the MVPs when we had some crazy pivot table idea. Occasionally, we would find a pivot table oddity and Howie would dig in to the code to try to figure out why. He called this Excel Archaeology. Howie retired in 2021 and his willingness to go deep into the Excel code base on archaeological expeditions will be missed.

This oddity would have been right up his alley. Excel MVP Wyn Hopkins from Access Analytic recently uncovered a feature in pivot tables that allows you to quickly apply a border to several sections inside the pivot table.

Say that you have a pivot table such as the one in Figure 3-23. Leave a blank row and column on each side of the pivot table, but then completely surround the pivot table with a border. The border shown in Figure 3-23 has a different style on each side to illustrate how each side of the border will be translated to the pivot table.

To transfer the outer border to the pivot table, right-click any cell in the pivot table and choose Refresh. The borders from outside the pivot table are applied to various sections inside the pivot table.

Total Revenue	Region				
Sector	Midwest	Northeast	South	West	Grand Total
Associations	\$0	\$51,240	\$34,364	\$0	\$85,604
Consultants	\$89,033	\$0	\$926,970	\$115,132	\$1,131,135
Professional	\$0	\$0	\$437,695	\$39,250	\$476,945
Retail	\$84,740	\$0	\$704,359	\$31,021	\$820,120
Software	\$812,907	\$463,658	\$0	\$0	\$1,276,565
Training	\$754,744	\$1,609,714	\$498,937	\$54,048	\$2,917,443
Grand Total	\$1,741,424	\$2,124,612	\$2,602,325	\$239,451	\$6,707,812

FIGURE 3-23 A relatively plain pivot table, with a border just outside the pivot table.

To transfer the outer border to the pivot table, right-click any cell in the pivot table and choose Refresh. The borders from outside the pivot table are applied to various sections inside the pivot table.

Total Revenue	Region				
Sector	Midwest	Northeast	South	West	Grand Total
Associations	\$0	\$51,240	\$34,364	\$0	\$85,604
Consultants	\$89,033	\$0	\$926,970	\$115,132	\$1,131,135
Professional	\$0	\$0	\$437,695	\$39,250	\$476,945
Retail	\$84,740	\$0	\$704,359	\$31,021	\$820,120
Software	\$812,907	\$463,658	\$0	\$0	\$1,276,565
Training	\$754,744	\$1,609,714	\$498,937	\$54,048	\$2,917,443
Grand Total	\$1,741,424	\$2,124,612	\$2,602,325	\$239,451	\$6,707,812

FIGURE 3-24 The border styles from the outer border are applied to the pivot table.

In a very specific pattern, the border styles used in the outer border are applied throughout the pivot table. The dashed border used above row 2 is applied above rows 3, 4 and above cell C11. The dotted border used below row 12 is applied in the pivot table below row 11. A similar pattern happens with the left border being applied to most vertical lines in the pivot table. The right border is applied to the right edge of the pivot table.

Why is this feature in Excel? It had to pre-date the Formatting Gallery. It must have been a way to build your own Pivot Table Styles before there were styles.

Changing summary calculations

When you create a pivot table report, by default Excel summarizes the data by either counting or summing the items. Instead of Sum or Count, you might want to choose functions such as Min, Max, and Count Numeric. In all, 11 options are available.

The Excel team fixed the Count Of Revenue bug

In early 2018, Microsoft fixed a bug that caused many pivot tables to provide a count of revenue instead of a sum. If a data column contains all numbers, Excel will default to Sum as the calculation. If a column contains text, the pivot table will default to Count. But up until 2018, a bug appeared if you had a mix of numbers and empty cells. An empty cell would cause your pivot table to Count instead of Sum.

One Excel customer wrote a letter to the Excel team describing this bug: “Why are you treating empty cells as text? Treat them like any other formula would treat them and consider them to be zero. A mix of numbers and zeroes should not cause a Count of that field.”

Without a single vote on Excel.UserVoice.com, someone on the Excel team patched the bug. If you have a mix of numbers and blank cells, you will no longer get a Count Of Revenue. This is a nice improvement.

Changing the calculation in a value field

The Value Field Settings dialog box offers 11 options on the Summarize Values As tab and 15 main options on the Show Values As tab. The options on the first tab are the basic Sum, Average, Count, Max, and Min options that are ubiquitous throughout Excel; the 15 options under Show Values As are interesting ones such as % of Total, Running Total, and Ranks.

There are several ways to open the Value Field Settings dialog box:

- If you have multiple fields in the Values area, double-click the heading for any value field.
- Choose any number in the Values area and click the Field Settings button in the PivotTable Analyze tab of the ribbon.
- In the PivotTable Fields list, open the drop-down menu for any item in the Values area. The last item will be Value Field Settings.
- If you right-click any number in the Values area, you have a choice for Value Field Settings, plus two additional flyout menus offering six of the eleven choices for Summarize Values By and most of the choices for Show Values As (see Figure 3-25).

The following examples show how to use the various calculation options. To contrast the settings, you can build a pivot table where you drag the Revenue field to the Values area nine separate times. Each one shows up as a new column in the pivot table. Over the next several examples, you will see the settings required for the calculations in each column.

To change the calculation for a field, select one Value cell for the field and click the Field Settings button on the PivotTable Analyze tab of the ribbon. The Value Field Settings dialog box is similar to the Field Settings dialog box, but it has two tabs. The first tab, Summarize Values By, contains Sum, Count, Average, Max, Min, Product, Count Numbers, StdDev, StdDevP, Var, and VarP. You can choose 1 of these 11 calculation options to change the data in the column. In Figure 3-26, columns B through D show various settings from the Summarize Values By tab.

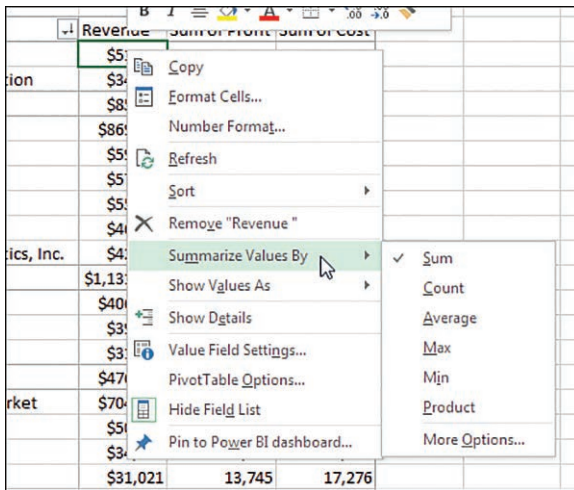


FIGURE 3-25 The right-click menu for any number in the Values area offers a flyout menu with the popular calculation options.

The following examples show how to use the various calculation options. To contrast the settings, you can build a pivot table where you drag the Revenue field to the Values area nine separate times. Each one shows up as a new column in the pivot table. Over the next several examples, you will see the settings required for the calculations in each column.

To change the calculation for a field, select one Value cell for the field and click the Field Settings button on the PivotTable Analyze tab of the ribbon. The Value Field Settings dialog box is similar to the Field Settings dialog box, but it has two tabs. The first tab, Summarize Values By, contains Sum, Count, Average, Max, Min, Product, Count Numbers, StdDev, StdDevP, Var, and VarP. You can choose 1 of these 11 calculation options to change the data in the column. In Figure 3-26, columns B through D show various settings from the Summarize Values By tab.

	A	B	C	D	E	F	G	H	I	J
2		Summarize Value By			Show Values As					
4	Rep	Total	Average	# of Orders	% of Total	% of Anne	Rank	RunTotal	% RunTot	ChgFromPrev
5	Anne Troy	\$1,372,957	\$11,836	116	20.47%	100.00%	2	1372957	20.47%	
6	Jade Miller	\$2,124,612	\$11,301	188	31.67%	154.75%	1	3497569	52.14%	54.75%
7	Jeffrey P. Coulson	\$796,239	\$10,760	74	11.87%	57.99%	4	4293808	64.01%	-62.52%
8	John Cockerill	\$42,316	\$10,579	4	0.63%	3.08%	10	4336124	64.64%	-94.69%
9	John Durran	\$200,201	\$12,513	16	2.98%	14.58%	7	4536325	67.63%	373.11%
10	Larry Vance	\$869,454	\$13,376	65	12.96%	63.33%	3	5405779	80.59%	334.29%
11	Michael Karpfen	\$530,306	\$12,052	44	7.91%	38.63%	5	5936085	88.50%	-39.01%
12	Mike Mann	\$184,425	\$15,369	12	2.75%	13.43%	8	6120510	91.24%	-65.22%
13	Richard Oldcorn	\$107,016	\$13,377	8	1.60%	7.79%	9	6227526	92.84%	-41.97%
14	Ryan Wilson	\$406,326	\$14,512	28	6.06%	29.59%	6	6633852	98.90%	279.69%
15	Sabine Hanschitz	\$34,710	\$8,678	4	0.52%	2.53%	12	6668562	99.41%	-91.46%
16	Todd A Lesko	\$39,250	\$9,813	4	0.59%	2.86%	11	6707812	100.00%	13.08%
17	Grand Total	\$6,707,812	\$11,914	563	100.00%					

Value Field Settings

Source Name: Revenue

Custom Name: Average

Summarize Values By: Show Values As

Summarize value field by

Choose the type of calculation that you want to use to summarize data from the selected field

- Sum
- Count
- Average
- Max
- Min
- Product

Number Format OK Cancel

FIGURE 3-26 Choose from the 11 summary calculations on this tab.

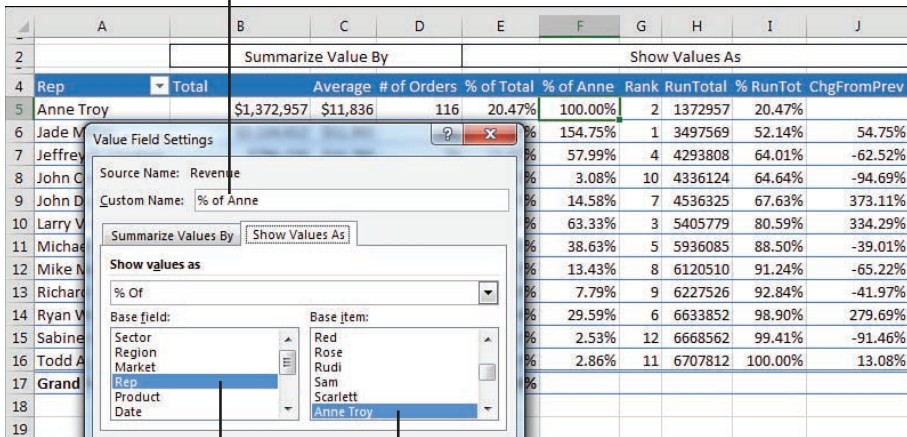
Column B is the default Sum calculation. It shows the total of all records for a given market. Column C shows the average order for each item by market. Column D shows a count of the records. You can change the heading to say # Of Orders or # Of Records or whatever is appropriate. Note that the count is the actual count of records, not the count of distinct items.



Note Counting distinct items has been difficult in pivot tables but is now easier using PowerPivot. See “Unlocking hidden features with the data model” in Chapter 10 for more details.

Far more interesting options appear on the Show Values As tab of the Value Field Settings dialog box, as shown in Figure 3-27. Fifteen options appear in the drop-down. Depending on the option you choose, you might need to specify either a base field or a base field and a base item. Columns E through J in Figures 3-26 and 3-27 show some of the calculations possible using Show Values As.

Rename field as appropriate



Base Field and Base Item are selectively enabled

FIGURE 3-27 Fifteen different ways to show that data is available on this tab.

Table 3-1 summarizes the Show Values As options.

TABLE 3-1 Calculations in Show Values As

Show Values As	Additional Required Information	Description
No Calculation	None	
% of Grand Total	None	Shows percentages so all the detail cells in the pivot table total 100%.
% of Column Total	None	Shows percentages that total up and down the pivot table to 100%.
% of Row Total	None	Shows percentages that total across the pivot table to 100%.
% of Parent Row Total	None	With multiple row fields, shows a percentage of the parent item's total row.
% of Parent Column Total	None	With multiple column fields, shows a percentage of the parent column's total.
Index	None	Calculates the relative importance of items. For an example, see Figure 3-31.
% of Parent Total	Base Field only	With multiple row and/or column fields, calculates a cell's percentage of the parent item's total.
Running Total In	Base Field only	Calculates a running total.
% Running Total In	Base Field only	Calculates a running total as a percentage of the total.
Rank Smallest to Largest	Base Field only	Provides a numeric rank, with 1 as the smallest item.
Rank Largest to Smallest	Base Field only	Provides a numeric rank, with 1 as the largest item.

Show Values As	Additional Required Information	Description
% of	Base Field and Base Item	Expresses the values for one item as a percentage of another item.
Difference From	Base Field and Base Item	Shows the difference of one item compared to another item or to the previous item.
% Difference From	Base Field and Base Item	Shows the percentage difference of one item compared to another item or to the previous item.

The capability to create custom calculations is another example of the unique flexibility of pivot table reports. With the Show Values As setting, you can change the calculation for a particular data field to be based on other cells in the Values area.

The following sections illustrate a number of Show Values As options.

Showing percentage of total

In Figure 3-26, column E shows % Of Total. Jade Miller, with \$2.1 million in revenue, represents 31.67% of the \$6.7 million total revenue. Column E uses % Of Column Total on the Show Values As tab. Two other similar options are % Of Row Total and % Of Grand Total. Choose one of these based on whether your text fields are going down the report, across the report, or both down and across.

Using % Of to compare one line to another line

The % Of option enables you to compare one item to another item. For example, in the current data set, Anne was the top sales rep in the previous year. Column F shows everyone's sales as a percentage of Anne's. Cell F7 in Figure 3-28 shows that Jeff's sales were almost 58% of Anne's sales.

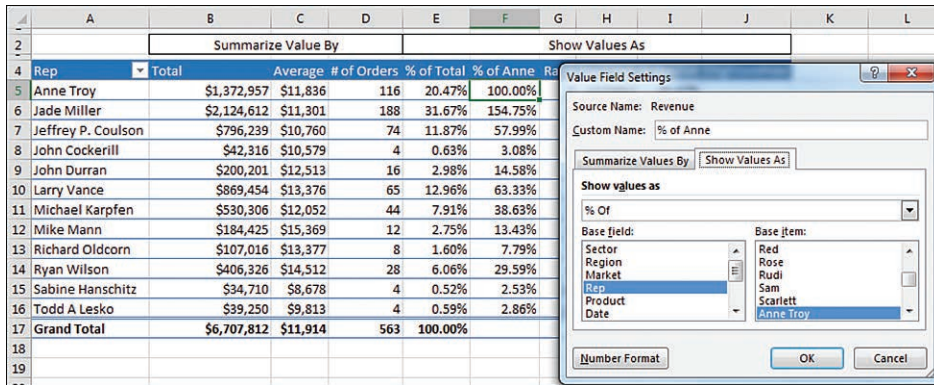


FIGURE 3-28 This report is created using the % Of option with Anne Troy as the Base Item.

To set up this calculation, choose Show Values As, % Of. For Base Field, choose Rep because this is the only field in the Rows area. For Base Item, choose Anne Troy. The result is shown in Figure 3-26.

Showing rank

Two ranking options are available. Column G in Figure 3-29 shows Rank Largest To Smallest. Jade Miller is ranked #1, and Sabine Hanschitz is #12. A similar option is Rank Smallest To Largest, which would be good for the pro golf tour.

Rep	Total	Average	# of Orders	Sum of Revenue	% of Anne	Rank
Anne Troy	\$1,372,957	\$11,836	116	20.47%	100.00%	2
Jade Miller	\$2,124,612	\$11,301	188	31.67%	154.75%	1
Jeffrey P. Coulson	\$796,239	\$10,760	74	11.87%	57.99%	4
John Cockerill	\$42,316	\$10,579	4	0.63%	3.08%	10
John Durran	\$200,201	\$12,513	16	2.98%	14.58%	7
Larry Vance	\$869,454	\$13,376	65	12.96%	63.33%	3
Michael Karpfen	\$530,306	\$12,052	44	7.91%	38.63%	5
Mike Mann	\$184,425	\$15,369	12	2.75%	13.43%	8
Richard Oldcorn	\$107,016	\$13,377	8	1.60%	7.79%	9
Ryan Wilson	\$406,326	\$14,512	28	6.06%	29.59%	6
Sabine Hanschitz	\$34,710	\$8,678	4	0.52%	2.53%	12
Todd A Lesko	\$39,250	\$9,813	4	0.59%	2.86%	11
Grand Total	\$6,707,812	\$11,914	563	100.00%		

FIGURE 3-29 The Rank options will rank ascending or descending.

To set up a rank, choose Value Field Settings, Show Values As, Rank Largest To Smallest. You are required to choose Base Field. In this example, because Rep is the only row field, it is the selection under Base Field.

These rank options show that pivot tables have a strange way of dealing with ties. I say *strange* because they do not match any of the methods already established by the Excel functions `=RANK()`, `=RANK.AVG()`, and `=RANK.EQ()`. For example, if the top two markets have a tie, they are both assigned a rank of 1, and the third market is assigned a rank of 2.

Tracking running total and percentage of running total

Running total calculations are common in reports where you have months running down the column or when you want to show that the top *N* customers make up *N%* of the revenue.

In Figure 3-30, cell I8 shows that the top four sales reps account for 76.97% of the total sales.



Note To produce this figure, you have to use the Sort feature, which is discussed in depth in Chapter 4, “Grouping, sorting, and filtering pivot data.” To create a similar analysis with the sample file, go to the drop-down menu in A4 and choose More Sort Options, Descending, By Total. Also note that the % Change From calculation shown in the next example is not compatible with sorting.

	A	B	C	D	E	F	G	H	I
2		Summarize Value By				Show Values As			
4	Rep	Total	Average # of Orders	% of Total	% of Anne	Rank	RunTotal	% RunTot	
5	Jade Miller	\$2,124,612					\$2,124,612	31.67%	
6	Anne Troy	\$3,497,569					\$3,497,569	52.14%	
7	Larry Vance	\$4,367,023					\$4,367,023	65.10%	
8	Jeffrey P. Coulson	\$5,163,262					\$5,163,262	76.97%	
9	Michael Karpfen	\$5,693,568					\$5,693,568	84.88%	
10	Ryan Wilson	\$6,099,894					\$6,099,894	90.94%	
11	John Durran	\$6,300,095					\$6,300,095	93.92%	
12	Mike Mann	\$6,484,520					\$6,484,520	96.67%	
13	Richard Oldcorn	\$6,591,536					\$6,591,536	98.27%	
14	John Cockerill	\$6,633,852					\$6,633,852	98.90%	
15	Todd A Lesko	\$6,673,102					\$6,673,102	99.48%	
16	Sabine Hanschitz	\$6,707,812					\$6,707,812	100.00%	
17	Grand Total								

FIGURE 3-30 Show running totals or a running percentage of total.

To specify Running Total In (as shown in Column H) or % Running Total In (Column I), select Field Settings, Show Values As, Running Total In. You have to specify a Base Field, which in this case is the Row Field: Rep.

Displaying a change from a previous field

Figure 3-31 shows the % Difference From setting. This calculation requires a Base Field and Base Item. You could show how each market compares to Anne Troy by specifying Anne Troy as the Base Item. This would be similar to Figure 3-26, except each market would be shown as a percentage of Anne Troy.

	A	B	C	D	E	F	G	H	I	J
2		Summarize Value By				Show Values As				
4	Rep	Total	Average # of Orders	% of Total	% of Anne	Rank	RunTotal	% RunTot	ChgFromPrev	
5	Anne Troy	\$1,372,957	\$11,8							%
6	Jade Miller	\$2,124,612	\$11,3						54.75%	%
7	Jeffrey P. Coulson	\$796,239	\$10,7						-62.52%	%
8	John Cockerill	\$42,316	\$10,5						-94.69%	%
9	John Durran	\$200,201	\$12,5						373.11%	%
10	Larry Vance	\$869,454	\$13,3						334.29%	%
11	Michael Karpfen	\$530,306	\$12,0						-39.01%	%
12	Mike Mann	\$184,425	\$15,3						-65.22%	%
13	Richard Oldcorn	\$107,016	\$13,3						-41.97%	%
14	Ryan Wilson	\$406,326	\$14,5						279.69%	%
15	Sabine Hanschitz	\$34,710	\$8,6						-91.46%	%
16	Todd A Lesko	\$39,250	\$9,8						13.08%	%
17	Grand Total	\$6,707,812	\$11,9							%

FIGURE 3-31 The % Difference From options enable you to compare each row to the previous or next row.

With date fields, it would make sense to use % Difference From and choose (previous) as the base item. Note that the first cell will not have a calculation because there is no previous date in the pivot table.

Tracking the percentage of a parent item

The legacy % Of Total settings always divides the current item by the grand total. In Figure 3-32, cell E4 says that Chicago is 2.75% of the total data set. A common question at the MrExcel.com message board is how to calculate Chicago's revenue as a percentage of the Midwest region total. This was possible but difficult in older versions of Excel. Starting in Excel 2010, though, Excel added the % Of Parent Row, % Of Parent Column, and % Of Parent Total options.

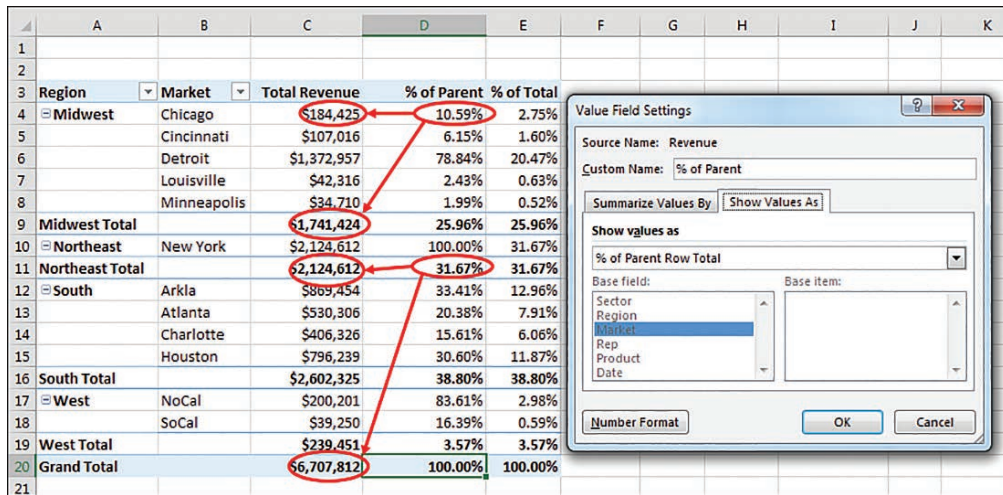


FIGURE 3-32 An option in Excel enables you to calculate a percentage of the parent row.

To set up this calculation in Excel, use Field Settings, Show Values As, % Of Parent Row Total. Cell D4 in Figure 3-32 shows that Chicago's \$184,425 is 10.59% of the Midwest total of \$1,741,424.

Although it makes sense, the calculation on the subtotal rows might seem confusing. D4:D8 shows the percentage of each market as compared to the Midwest total. The values in D9, D11, D16, and D19 compare the region total to the grand total. For example, the 31.67% in D11 says that the Northeast region's \$2.1 million is a little less than a third of the \$6.7 million grand total.

Tracking relative importance with the Index option

The final option of the 11 calculations is Index. It creates a somewhat obscure calculation. Microsoft claims that this calculation describes the relative importance of a cell within a column. In Figure 3-33, Georgia peaches have an index of 2.55, and California peaches have an index of 0.50. This shows that if the peach crop is wiped out next year, it will be more devastating to Georgia fruit production than to California fruit production.

	A	B	C	D	E	F	G	H	I
1	Sum of Sales: State							GA Peach	180
2	Crop	California	Georgia	Ohio	Grand Total			/ GA Total	210
3	Apple	100	10	30	140			A = Worth of Peaches to GA	0.86
4	Banana	200	10	1	211				
5	Kiwi	200	10	1	211			Peach Total	285
6	Peach	100	180	5	285			/ Total	847
7	Grand Total	600	210	37	847			B = Worth of Peaches	0.34
8									
9								Index is A/B	2.55
10	Index	State							
11	Crop	California	Georgia	Ohio	Grand Total			$= \frac{\text{GeorgiaPeach} \div \text{GeorgiaTotal}}{\text{PeachTotal} \div \text{Total}}$	
12	Apple	1.01	0.29	4.91	1.00				
13	Banana	1.34	0.19	0.11	1.00				
14	Kiwi	1.34	0.19	0.11	1.00				
15	Peach	0.50	2.55	0.40	1.00				
16	Grand Total	1.00	1.00	1.00	1.00				

FIGURE 3-33 Using the Index function, Excel shows that peach sales are more important in Georgia than in California.

Here is the exact calculation:

1. First, divide Georgia peaches by the Georgia total. This is $180/210$, or 0.857.
2. Next, divide total peach production (285) by total fruit production (847). This shows that peaches have an importance ratio of 0.336.
3. Now, divide the first ratio by the second ratio: $0.857/0.336$.

In Ohio, apples have an index of 4.91, so an apple blight would be bad for the Ohio fruit industry.

I have to admit that, even after writing about this calculation for 10 years, there are parts that I don't quite comprehend. What if a state like Hawaii relied on productions of lychees, but lychees were nearly immaterial to U.S. fruit production? If lychees were half of Hawaii's fruit production but 0.001 of U.S. fruit production, the Index calculation would skyrocket to 500.

Adding and removing subtotals

Subtotals are an essential feature of pivot table reporting. Sometimes you might want to suppress the display of subtotals, and other times you might want to show more than one subtotal per field.

Suppressing subtotals with many row fields

When you have many row fields in a report, subtotals can obscure your view. For example, in Figure 3-34, there is no need to show subtotals for each market because there is only one sales rep for each market.

3	Region	Market	Rep	Sum of Revenue
4	Midwest	Chicago	Mike Mann	184425
5		Chicago Total		184425
6		Cincinnati	Richard Oldcorn	107016
7		Cincinnati Total		107016
8		Detroit	Anne Troy	1372957
9		Detroit Total		1372957
10		Louisville	John Cockerill	42316
11		Louisville Total		42316
12		Minneapolis	Sabine Hanschitz	34710
13		Minneapolis Total		34710
14	Midwest Total			1741424
15	Northeast	New York	Jade Miller	2124612
16		New York Total		2124612
17	Northeast Total			2124612
18	South	Arkla	Larry Vance	869454
19		Arkla Total		869454

FIGURE 3-34 Sometimes you do not need subtotals at every level.

If you used the Subtotals drop-down menu on the Design tab, you would turn off all subtotals, including the Region subtotals and the Market subtotals. The Region subtotals are still providing good information, so you want to use the Subtotals setting in the Field Settings dialog box. Choose one cell in the Market column. On the PivotTable Analyze tab, choose Field Settings. Change the Subtotals setting from Automatic to None (see Figure 3-35).

1	A	B	C	D	E	F	G	H	I	J
1	The Subtotals Menu Removes All Subtotals					Use Field Settings to Control Each Column				
2										
3	Region	Market	Rep	Sum of Revenue	Region	Market	Rep	Sum of Revenue		
4	Midwest	Chicago	Mike Mann	184425	Midwest	Chicago	Mike Mann	184425		
5		Cincinnati	Richard Oldcorn	107016	Midwest	Cincinnati	Richard Oldcorn	107016		
6		Detroit	Anne Troy	1372957	Midwest	Detroit				
7		Louisville	John Cockerill	42316	Midwest	Louisville				
8		Minneapolis	Sabine Hanschitz	34710	Midwest	Minneapolis				
9	Northeast	New York	Jade Miller	2124612	Midwest Total					
10	South	Arkla	Larry Vance	869454	Northeast	New York				
11		Atlanta	Michael Karpfen	530306	Northeast Total					
12		Charlotte	Ryan Wilson	406326	South	Arkla				
13		Houston	Jeffrey P. Coulson	796239	South	Atlanta				
14	West	NoCal	John Durran	200201	South	Charlotte				
15		SoCal	Todd A Lesko	39250	South	Houston				
16	Grand Total			6707812	South Total					
17					West	NoCal				
18					West	SoCal				
19					West Total					
20					Grand Total					
21										
22										

Field Settings

Source Name: Market
Custom Name: Market

Subtotals & Filters Layout & Print

Subtotals

Automatic
 None
 Custom

Select one or more functions:

- Sum
- Count
- Average
- Max
- Min
- Product

Filter

Include new items in manual filter

FIGURE 3-35 Use the Subtotals setting in the Field list to turn off subtotals for one field.

To remove subtotals for the Market field, click the Market field in the bottom section of the PivotTable Fields list. Select Field Settings. In the Field Settings dialog box, select None under Subtotals, as shown in Figure 3-33. Alternatively, right-click a cell that contains a Market and remove the check mark from Subtotal Market.

Adding multiple subtotals for one field

You can add customized subtotals to a row or column label field. Select the Region field in the bottom of the PivotTable Fields list, and select Field Settings.

In the Field Settings dialog box for the Region field, select Custom and then select the types of subtotals you would like to see. The dialog box in Figure 3-36 shows five custom subtotals selected for the Region field. It is rare to see pivot tables use this setting. It is not perfect. Note that the count of 211 records in cell D25 automatically gets a currency format like the rest of the column, even though this is not a dollar figure. Also, the average of \$12,333 for South is an average of the detail records, not an average of the individual market totals.

	A	B	C	D	E	F	G	H
19	Northeast Min			\$1,741	Field Settings Source Name: Region Custom Name: Region Subtotals & Filters Layout & Print Subtotals <input type="radio"/> Automatic <input type="radio"/> Nong <input checked="" type="radio"/> Custom Select one or more functions: <input checked="" type="checkbox"/> Sum <input checked="" type="checkbox"/> Count <input checked="" type="checkbox"/> Average <input checked="" type="checkbox"/> Max <input checked="" type="checkbox"/> Min <input checked="" type="checkbox"/> Product Filter <input type="checkbox"/> Include new items in manual filter			
20	South	Arkla	Larry Vance	\$869,454				
21		Atlanta	Michael Karpfen	\$530,306				
22		Charlotte	Ryan Wilson	\$406,326				
23		Houston	Jeffrey P. Coulson	\$796,239				
24	South Sum			\$2,602,325				
25	South Count			\$211				
26	South Average			\$12,333				
27	South Max			\$25,350				
28	South Min			\$1,740				
29	West	NoCal	John Durran	\$200,201				
30		SoCal	Todd A Lesko	\$39,250				
31	West Sum			\$239,451				
32	West Count			\$20				
33	West Average			\$11,973				
34	West Max			\$21,730				
35	West Min			\$2,358				

FIGURE 3-36 By selecting the Custom option in the Subtotals section, you can specify multiple subtotals for one field.



Tip If you need to calculate the average of the four regions, you can do it with the DAX formula language and Power Pivot. See Chapter 10.

Formatting one cell is new in Microsoft 365

In the summer of 2018, a new trick appeared for Microsoft 365 customers. You can format a cell in a pivot table, and the formatting will follow that position.

For example, in Figure 3-37, a white font on dark fill has been applied to Revenue for Doodads sales to the Software sector.

	A	B	C	D	E	F	G
1							
2							
3	Revenue	Product					
4	Sector	Doodads	Gadget	Gizmo	Widget	Grand Total	
5	Associations	\$0	\$22,334	\$41,030	\$22,240	\$85,604	
6	Consultants	\$6,036	\$397,088	\$412,1			
7	Professional	\$0	\$150,638	\$190,9			
8	Retail	\$28,663	\$222,030	\$251,0			
9	Software	\$38,860	\$370,856	\$444,2			
10	Training	\$0	\$1,000,768	\$1,053,6			
11	Grand Total	\$73,559	\$2,163,714	\$2,393,0			

FIGURE 3-37 A new Format Cells option appears in the right-click context menu.

If you rearrange the pivot table, the dark formatting will follow the cell in the pivot table. While cell B9 was formatted in Figure 3-37, the formatting has moved to D5 in Figure 3-38.

Note that the formatting will persist if you remove the cell due to a filter. If you unselect Software from the Slicer and then reselect Software, the formatting will return.

However, if you remove Sector, Product, or Revenue from the pivot table, the individual cell formatting will be lost.

	A	B	C	D	E	F
3	Revenue	Sector				
4	Product	Professional	Retail	Software	Grand Total	
5	Doodads	\$0	\$28,663	\$38,860	\$67,523	
6	Gadget	\$150,638	\$222,030	\$370,856	\$743,524	
7	Gizmo	\$190,936	\$251,037	\$444,225	\$886,198	
8	Widget	\$135,371	\$318,390	\$422,624	\$876,385	
9	Grand Total	\$476,945	\$820,120	\$1,276,565	\$2,573,630	

FIGURE 3-38 Rearrange the pivot table and the formatting moves so that revenue for Doodads sales to the Software sector stays formatted.

In Figure 3-39, a Customer field has been added as the inner-row field. The dark formatting applied to Doodads sales of Software is now expanded to C5:C8 to encompass all four customers in this group. Note that in cell C9, the subtotal for Doodads sold to the Software sector is not formatted.

	A	B	C	D
2				
3	Revenue		Product	
4	Sector	Customer	Doodads	Gadget
5	Software	Excel4Apps	\$0	\$233,43
6	Software	F-Keys Ltd.	\$0	\$100,78
7	Software	Vertex42	\$38,860	\$22,14
8	Software	Frontline Systems	\$0	\$14,49
9	Software Total		\$38,860	\$370,83
10	Training	599CD.com	\$0	\$185,67

FIGURE 3-39 If you add an inner-row field, the formatting will expand to encompass all customers for Doodads in the Software sector.

Next steps

Note that the following pivot table customizations are covered in subsequent chapters:

- Sorting a pivot table is covered in Chapter 4, "Grouping, sorting, and filtering pivot data."
- Filtering records in a pivot table is covered in Chapter 4.
- Grouping daily dates up to months or years is covered in Chapter 4.
- Adding new calculated fields is covered in Chapter 5, "Performing calculations in pivot tables."
- Using data visualizations and conditional formatting in a pivot table is covered in Chapter 4.

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