

# A Step-by-Step Guide to Advanced Data Visualization

EXCEL 2016 / OFFICE 365



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## Acknowledgments

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I also owe a debt of gratitude to many in the data visualization communities who have either helped develop some of the visualization types shown below and best practices to visualizing data (not exclusively in Excel) including Alberto Cairo, Ann Emery, Cole Nussbaumer Knaflic, Andy Kirk, and Robert Kosara. There are many, many others, so please forgive me for not including all of them. I encourage you to read the books, blogs and other writings and materials from these and many others in the data visualization field.

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# Introduction

There is an increased recognition that effectively visualizing data is important to anyone who works with and analyzes data. To that end, there has been an explosion in data analysis and data visualization tools over the past few years. For many people, however, Microsoft Excel continues to the be the workhorse for their data visualization needs. If you are an Excel user, the default chart types in do not need to limit your data visualization capabilities; extending the tool to create other chart types is indeed possible.

In this step-by-step guide to data visualization in Excel, you will learn how to create nearly 20 new graphs in Excel 2016/Office 365 (O365). Each tutorial will lead you through the steps to create each chart type (instructions and images use the 2016 version of Excel on PCs, but are very similar to those on the Mac). Some basic, working knowledge of Excel, how to create basic graphs, adding different data series, and combining graph types will be useful. There are certainly different strategies to creating some of these graphs, but the approach I present here allow you to not only create those graphs, but also give you the techniques you can use elsewhere to create your own graphs. Along with this guide you will also receive an Excel file that you can use to recreate the graphs on your own or to use as templates for your own work.

Should you have questions or need clarifications, please contact me using the Contact form at PolicyViz.com (<u>https://policyviz.com/about/contact/</u>).

Thanks,

Jon Schwabish

# **Basic Data Visualization Principles**

This guide is not intended to be an introductory guide to best practices in data visualization. Instead, it is intended to show you how to extend the capabilities of Microsoft Excel so that you can create more and better visualizations. Yet, three basic principles seem especially useful to guide your creation of better, more effective visualizations.

### 1. Show the Data

People read will read the graphs in your report, article, or blog post to better understand your argument. The data are the most important part of the graph and should be presented in the clearest way possible. But that does not mean that *all* of the data must be shown—indeed, many graphs show too much.

### 2. Reduce the Clutter

Cart clutter, the use of unnecessary or distracting visual elements, tends to reduce effectiveness of the graph. Clutter comes in many forms: dark or heavy gridlines; unnecessary tick marks, labels, or text;

unnecessary icons or pictures; ornamental shading and gradients; and unnecessary dimensions. Too many graphs use textured or filled gradients when simple shades of a color can accomplish the same task.

## 3. Integrate the Text and the Graph

As a first, simple step, legends that define or explain a series on a graph are often placed far away from the content—off to the right or below the graph. Integrated legends—either right below the title or directly on the chart—are more accessible.

These three principles embody the idea that the graph creator should support the reader's acquisition of information quickly and easily. By stripping out unnecessary clutter and emphasizing the data, your graphs can more clearly and more effectively communicate information. However, default graph options in many graphing and statistical programs tend to add clutter and to separate text and graphs.

## **Chart Tools Quick Tour**

This guide will help you change many of those defaults in Excel 2016/O365, so a quick tour through the basic graph layout options seems appropriate. The Excel graphing engine is quite powerful and allows you to control a wide variety of formatting options for your

graphs. That being said, the goal of this step-by-step guide is to give you the tools and strategies for pushing past the standard graph types.

## **Design Tab**

Once you've created a graph and selected it, a Chart Tools tab will appear at the top of your ribbon consisting of two tabs: *Design and Format*. The Design tab contains options that allow you to apply different default 'Chart Layouts' and 'Chart Styles'. The options available under the 'Add Chart Element' button replaces the *Layout* tab on previous versions of Excel and allows you to modify the appearance of axes, titles, gridlines, and more.





Each of the options in the 'Add Chart Element' menu allows you to choose from a set of pre-populated options, or to open a menu with more options. The image at left shows the options available under the *Axes* button—here, I will usually select the "More Axis Options" to offer as many options as possible. For purposes of this guide, the 'Change Chart Type' button (second-to-last button on the right) and the 'Switch Row/Column' button (fourth-to-last button on the right) will be used regularly. The 'Change Chart Type' button will allow you to change the type of chart for all the data on the chart, or a selected series. One of the new features in Excel 2016/O365 is the series of dropdown menus in this menu that allows you to change the chart type for each series within a single menu. In previous versions of Excel, you would need to do this one series at a time.

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Switch Row/	Select	Change	Move							
Column	Data	Chart Type	Chart							
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Switch Row/Column Swap the data over the axis.										
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## Format Tab

The *Format* tab contains the standard outline and fill color options.

There is also a *Size* section of the menu from which you can select the size of your graph.

File Home Inse	ert Page Layout Formulas	s Data Review	View Add-ins	Design	Format	${ig Q}$ Tell me what you want to do	
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Series "Li	ne5"		
Series "Li	ne10"		
Series "Li	ne15"		
Series "Li	ne20"		
5			

In the very top-left section of the *Format* tab is the 'Chart Elements' drop-down menu. The list in this drop-down menu consists of everything in your chart including titles, axes, error bars, and every series. If you have a lot of objects on your chart, this drop-down menu will help you to easily find and select what you need.

#### Chart Elements Menu

One of the new features in Excel 2016/O365 is the 'Chart Elements' Menu' that appears just outside the top-right part of the chart when you select it. Appearing as a 'plus' symbol, the menu is identical to the 'Add Chart Elements' button in the *Design* tab.

Selecting the options will bring up a menu that will appear in a vertical banner along the right-edge of the window. From here, you can modify the appearance of different chart elements.



A couple of new features in Excel 2016 are worth mentioning. First, you can now select a specific data range to use as labels in your chart. This comes in quite handy when, for example, you want to add custom labels to a scatterplot. Instead of having to do the labeling manually, you can select the data labels series in the spreadsheet.



Second, Excel 2016 has a larger (and growing) charting library, accessed in the "Recommend Charts" area of the *Charts* tab. Among the new chart types is a Treemap, Histogram, Box & Whisker, and Waterfall chart. It should be noted, however, that not all of these chart types are available on the version of Excel 2016 available on the Mac.



# **Overlaid Gridlines**

The Overlaid Gridline chart is a column chart with gridlines on top of the columns. This type of chart allows viewers to absorb the column data as segments rather than single columns. Use the *OverlaidGridline tab* in the *Advanced Data Visualizations with Excel* 2016 *Hands-On.xlsx spreadsheet* to create the chart.



1. Begin by creating a column chart from columns A ("Group") and B ("Main Series").



2. Remove the title.



3. We're now going to add the four "Line" series to the chart. There are a few ways to do so. If you select the chart itself, you'll notice that the data are highlighted in the worksheet. You can simply select the little blue square at the bottom of the cells that are highlighted in blue and drag across. Alternatively, you can right-click on the chart and choose the "Select Data" option to add these series one at a time. We'll start by just adding the data in rows 2 through 6; the data in rows 7-11 will come later.



4. You will now have a clustered column chart, five series for each group. Select the **orange** series for "Line 5" on the graph. Under the "Design" tab under "Type" in the ribbon, select "Change Chart Type" (the third menu from the right). You can now use the dropdown menus to change the graph type for each series. Change the Chart Type for each "Line" series to "Line" and press "OK."





Each series except the "Main Series" now become lines.

5. If we were to simply change the lines to white, they would end in the middle of the bars of the A and E groups. We now move each of those four lines to the "secondary axis" so we can get them to stretch through the bars. To do so, first select a line, right-click, and select "Format Data Series" (alternatively, use the CTRL-1 keyboard shortcut). Go to the "Secondary Axis" option.



6. You'll notice that a new y-axis has appeared on the right side of the graph. When you're done moving all four series to the secondary axis, this new y-axis should go from o to 25 (if not, adjust the y-axes to be the same by selecting the axis and right-clicking or using the CTRL-1 keyboard shortcut).



7. There is also now a secondary x-axis, but we need to turn it on. To do so, select the "Axes" option in the "Chart Elements" menu by pressing the "plus" button that will appear when you select the chart. By hovering over the "Axes" menu, three of the boxes will

have checkmarks next to them ("Primary Horizontal", "Primary Vertical", and "Secondary Vertical"). Turn on the "Secondary Horizontal" axis by selecting the checkbox.



 Change the colors of the lines to white using the "Format" tab option. And notice that the lines still end in the middle of the bars for the A and E groups.



9. We fix that by changing how the data points line up with the tick marks. In a default line graph in Excel, the data markers line up *between* the tick marks; notice how the line begins in the middle of the A bar, between the y-axis and the tick mark between the A and B groups. By placing the data markers *on* the tick marks, we can extend the lines through the bars.

To do so, we'll format the *secondary x-axis* (by rightclicking and navigating to the "Axis position" options under "Axis Options" in the "Format axis" menu (using the CTRL-1 shortcut or using the menu from the ribbon). Here, change the "Position Axis" marker from "Between tick marks" to "On tick marks". Notice how the lines now shift out slightly.



10. Add your vertical primary axis line (Excel 2016 leaves it off as default), select the axis and add the line under the "Format Axis" menu. Doing so, will show some overlap between the "gridlines" and the axis line. We can do a couple more things to line this up just the way we want it.



11. We want to extend the data series for each "Line" series through row 11. One way to do this is to right-click on the

graph, select the "Select Data" option, and edit each of the 4 "Line" series to extend the data series.

		В	C	D	E	F	G	H	1	J	K	L	
	Group	<b>Main Series</b>	Line5	Line10	Line15	Line20	А	В		С	D		Е
2	Α	10	5	10	15	20	25						- 25
	В	12	5	10	15	20							
ł	С	16	5	10	15	20	20						20
i	D	19	5	10	15	20	15						15
;	Е	23	5	10	15	20	15						15
,			5	10	15	20	10						10
;			5	10	15	20	10						10
)			5	10	15	20	5		_				5
0			5	10	Edit	Series		?	×				
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2					-00	enalgonulines:5	092.90911			С	D	Е	

Alternatively, you can select the line on the chart and you'll notice that your data are selected in the spreadsheet.

You can then drag the selection box to extend the data series.

	A	В	С	D	E	F	G	H	I	J	K	L
1	Group	Main Series	Line5	Line10	Line15	Line20	A	B C	D	E		
2	А	10	5	10	15	20	25					25
3	В	12	5	10	15	20						
4	С	16	5	10	15	20	20					20
5	D	19	5	10	15	20	15			-		15
6	Е	23	5	10	15	20						15
7			5	10	15	20	10					
8			5	10	15	20	10					10
9			5	10	15	20	5 <b>%</b> ]	<u>.</u> 9		b <b>2</b> b	ee	• • • • 5
10			5	10	15	20						
11			5	10	15	20	0					0
12								A	В	С	D	E



This won't fix the overlap issue, but you'll notice that the group labels are shifted over to the left. This is because we now have ten values tagged to this secondary horizontal axis. 12. We need to now change where the data markers line up with the tick marks. Once again, format the secondary x-axis and change the "Position Axis" back to "Between tick marks".

You'll notice how the lines shift in slightly so that they don't overlap the vertical axes.



13. We also want to turn off the secondary horizontal axis. But don't delete it! You need to turn off the tick marks and labels



(accomplished in the middle of this same menu) and set the "Line Color" to "No line".



Overlaid Gridlines 3

14. Repeat the process in Step 13 for the secondary vertical axis, remove the gridlines and style the rest as you see fit.



# Final Version with Styling

# **Overlaid Gridlines**



# Overlaid Gridlines with a Formula

In this version of the Overlaid Gridlines chart, I create a stacked column chart. Each section of the chart is given a white outline so that it *appears* like there are gridlines. There are fewer steps in this approach, but it's a bit more difficult to get the data set-up. The worksheet contains a rather complicated formula that makes this approach a bit more flexible: the "Breaker" cell allows you to modify where the "gridlines" appear. Use the *OverlaidGridlines\_Formula tab* in the *Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet* to create the chart.



## 1. Create a stacked column chart from cells C16:M20.

These are the cells that contain the formula.

	Α	В	С	D	E	F	G		Η	Ι	J		Κ		L
1	Group	<b>Main Series</b>	Line5	Line10	Line15	Line20									
2	Α	10	5	10	15	20									
3	В	12	5	10	15	20									
4	С	16	5	10	15	20									
5	D	19	5	10	15	20									
6	Е	23	5	10	15	20									
7			5	10	0										]
8			5	10	20			C	nart 11	tie					
9			5	10	30 -										
10			5	10	25 -										1
11			5	10	20 -										
12					15 -										
13					0									9	
14	Breaker:	5			10 -										
15	Group	Main Series	1	2	5 -				_					9	10
16	A	10	5	5	0									0	0
17	В	12	5	5		1 2	3	4	5	6 7	8	9	10	0	0
18	С	16	5	5			Series1	Series2	Series3	B Series4	Series5			0	0
19	D	19	5	5	5	4		0	0	(	0	0		0	0
20	E	23	5	5	5	5		3	0	(	0	0		0	0

2. Notice how the default version of the chart plots the columns; we want to plot the rows. To do so, select the chart and the "Switch Row/Column" button in the "Design" tab of the ribbon.

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Add Elen	Chart Quick ent - Layout	Change Colors - Chart Styles									Switch Row/ Select Column Data Type Location	
Cha	art 1 👻	: × 🗸	f <sub>x</sub>									Switch Row/Column
	А	В	С	D	Е	F	G	Н	Ι	J	K	Swap the data over the axis.
1	Group	Main Series	Line5	Line10	Line15	Line20						Data being charted on the X axis will move to the Y axis and vice
2	A	10	5	10	15	20						versa.
3	В	12	5	10	15	20						
4	С	16	5	10	15	20						
5	D	19	5	10	15	20						
6	E	23	5	10	15	20						
7			5	10	ĭ			Chart Tit	tle			+
8			5	10	30 -							
9			5	10	25							
10			5	10								- <b>Y</b>
11			3	10	20 -		_					
12					015							0
14	Breaker <sup>.</sup>	5			10 -							
15	Group	Main Series	1	2	5 -							9 10
16	A	10	5	5	0 -							0 0
17	В	12	5	5	Ŭ	1 2	3 4	4 5	6 7	8 9	10	0 0
18	С	16	5	5		I	Series1 Series1	eries2 Series3	Series4	Series5		0 0
3. Now it's just a matter of styling. Change the fill of each shape under the "Shape Fill" dropdown in the "Format" menu to the same color. Similarly, change the color of the "Shape Outline" to white and increase the thickness to your desired weight. Of course, delete the existing (default) gridlines, legend, etc.



4. Repeat for all 5 series.



### Final Version with Styling

## Overlaid Gridlines with a Formula



## Overlaid Gridlines with a Scatterplot

In this version of the Overlaid Gridlines graph, we'll combine a column chart and a scatterplot. We'll then add horizontal error bars to the scatterplot points to mimic the gridlines. Use the

OverlaidGridlines\_Scatterplot tab in the Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet to create the chart.



 Create a column chart with the "Main Series" data. Delete the existing gridlines and chart title. Then, right-click on the chart and choose "Select Data" in the menu.



2. In the next menu, under "Legend Entries (Series)" select "Add".

Select Data Source		?	$\times$
Chart <u>d</u> ata range: =OverlaidGridlines_Scatterplot!\$A\$	1:\$B\$6		1
Legend Entries Geries)	n Row/Column Horizontal ( <u>C</u> ategory) Axis Labels		
Add Edit X Remove -	Edi <u>t</u>		
Main Series	A .		
	В		
	C C		
	D D		
	E		
Hidden and Empty Cells	OK	Ca	ancel

3. We are going to add the scatterplot series, so after choosing "Add", insert the reference to the "Scatter" name in the "Series name:" box (cell A8) and (what will become) the y-series

(B10:B14) in the "Series values:" box. You'll end up with a paired column chart.



4. Select the **orange** ("Scatter") series and under the "Design" tab in the ribbon, select "Change Chart Type".

In the resulting menu, change the chart type for the "Scatter" series to a scatterplot chart type.



5. We have only assigned y-values to the scatterplot series, so we now need to give it the x-values. Right-click on the chart and

choose "Select Data" again. Select "Edit" for the "Scatter" series and insert the cell reference for the x-values (A10:A14).



6. We now have the scatterplot overlaid with the column chart. We now need to add the horizontal error bars. To do so, select the "Error Bars" option that appears in the "Chart Elements" menu that appears when you select the chart. Now, select the "More Options" and menu item and in the resulting "Add Error Bars" menu that appears, select the "Scatter" series and select "OK".



7. You may notice that Excel will, by default, add both vertical and horizontal error bars. The default pane is for styling the Vertical Error Bars. We don't need these, so you can press delete.



8. What we want to do is to style the horizontal error bars. Select those error bars (again, by right-clicking or using CTRL-1) and you'll be brought to the Horizontal Error Bars formatting pane.



9. Some changes to make here: Under "Direction" select "Both" and under "End Style" select "No Cap". At the bottom, under "Error Amount", select the "Custom" menu and hit the "Specify value" button. Here, you'll be prompted for a Positive and Negative Error Value. We'll insert a reference to cell A17 for both values here. Why 2.4 for the error bar value? The error bars refer to the *position* along the x-axis. We want the lines to extend from the scatterplot point just beyond the A bar, so that results in two "positions" plus a bit more.



In the "Line Color" tab, you can change the line color to a white solid line and in the "Line Style" tab, change the line width to 1.5 pt.



11. Right-click (or CTRL-1) to format the scatterplot points and under "Format Data Series", select the "Marker" Options" tab and then select "None" for "Marker Type". This will hide the marker, and all you are left with is the column chart with overlaid gridlines.



#### Final Version with Styling



# **Overlaid Gridlines with a Scatterplot**

### **Vertical Line**

This tutorial shows you how to add a vertical line to a line chart. This could be used to mark an event, a policy change, or some other annotation. This approach is superior to drawing a line or shape on the graph because it is a part of the graph and can be moved to other

programs (e.g. PowerPoint) and is linked to data for easier updating and replication. Use the *VerticalLine tab* in the *Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet* to create the chart.



 Start by making the line graph using cells A1:B13. You'll notice you get two lines. Excel assumes that you want to <u>plot</u> the values in column A and not use them as xaxis <u>labels</u>.



2. If you select data and remove the "Year" series and remake the chart to use A2:A13 as Horizontal Axis labels,



you'll get a graph of the Participation series with the Year labeled along the axis.



3. We'll add the vertical line by adding a scatterplot chart to the line chart and then dropping a vertical error bar from that point. We start by adding the scatterplot point. Right-click on the chart and choose the "Select Data" option. (You'll notice I've deleted the title, legend, and gridlines here.)



4. From there, select "Add" and input the "Series name" (cell A15) and the y value of 50 into the "Series values" (cell B17) into the box.

	A	D	C	/		J		E		Г		G		п	
	Year	Participation													
2	2000	17.2													
	2001	17.3													
	2002	19.1	60.0				Edit Se	ries					2	×	
i	2003	21.3					Luit Se	iies					•	~	
,	2004	23.9	50.0				Series <u>n</u> –Vortic	ame:	\$15			↑ _ s	cottor		
1	2005	25.7	40.0				Sorios v	aluas	4915			<u> </u>	Catter		
;	2006	26.7	10.0			Ì	=Vertic	alLine!\$E	3\$17			<b>1</b> = 5	0		
	2007	26.5	30.0							٦					
0	2008	28.4						_		l	OK		Ca	ancel	
1	2009	33.5	20.0	_											
2	2010	40.3	10.0												
3	2011	44.7	10.0												
4			0.0												
5	Scatter			2000	2001	2002	2003	2004	2005	2006	2007	2008 2	2009	2010	2011
6	Х	2													
7	у	50													
6 7	x y	2 50													

5. You'll notice that two things occurred. First, the y-axis moved from a maximum of 50 to a maximum of 60. Excel will not allow you to put a data series at the maximum of the chart, and we just added a y-value of 50 to the chart. Second, a data marker didn't appear. This is because we have just added a line to the chart, but a line needs two points, so nothing appears on the chart. To select our newly-added point to the chart and convert it to the scatterplot, use the dropdown menu in the "Format" tab. The "Scatter" series will appear in that dropdown.



6. The "Scatter" series is now selected, so while it is selected, we will change it to a scatterplot by choosing the "Change Chart Type" button in the "Design" tab on the ribbon.

In that menu, select the "Scatter" option in the dropdown menu next to the "Scatter" series and press "OK".



7. We've now changed the point to a scatterplot, but need to feed it an x-value.
To do so, right-click on the chart and choose "Select Data." Select the "Scatter" series, click "Edit", and input the x-value (cell B16) into the "Series X Values" box.

	А	В	С		D		E		F	(	G	H	[	
1	Year	Participation												
2	2000	17.2												
3	2001	17.3												
4	2002	19.1	60.0			Edit Se	ries				ſ	X		
5	2003	21.3				Series <u>n</u>	ame:				1			
6	2004	23.9	50.0	٠		=Vertica	alLine!\$/	4\$15		Ţ	= Sca	tter		
7	2005	25.7	40.0		ſ	=Vertic	values:	3\$16		Ť	= 2		-	
8	2006	26.7	40.0			Series <u>Y</u>	values:	5910		_	] - 2			
9	2007	26.5	30.0		[	=Vertica	alLine!\$	8\$17		Ť	= 50			
10	2008	28.4	-						Г	ОК		Cancel		
11	2009	33.5	20.0											
12	2010	40.3	10.0											
13	2011	44.7	10.0											
14			0.0											
15	Scatter		200	2001	2002	2003	2004	2005	2006 2	2007 20	08 20	09 2010	201	1
16	Х	2												
17	у	50												

A3	Ψ	X 🗸	fx Year						
	А	В	С	D	E	F	G	Н	
1	Year	Participation							
2	2000	17.2							
3	2001	17.3					2		
4	2002	19.1	60.0		dit Series		ſ	×	
5	2003	21.3	50.0	S	Series <u>n</u> ame:				•
6	2004	23.9			=VerticalLine!\$A\$	15	<b>T</b> = Scat	tter	
7	2005	25.7	40.0	Î	=VerticalLine!\$A\$	3	<b>1</b> = 200	1	
8	2006	26.7	30.0	-	Series <u>Y</u> values:			_	
9	2007	26.5	20.0	[	=VerticalLine!\$B\$	17	<b>1</b> = 50		
10	2008	28.4	10.0				ОК	Cancel	
11	2009	33.5	10.0	L					
12	2010	40.3	0.0						
13	2011	44.7	Ō						
14			0 9						
15	Scatter								
16	Х	2							
17	у	50							

The scatterplot now appears on the chart at the y-value of 50 and an x-value of 2—note that this is the 2<sup>nd</sup> position, not the year 2001. If, instead of 50, cell B16 was set to 2001, Excel would interpret this as the 2,001<sup>st</sup> position on the horizontal axis as illustrated here. Leave the x value at cell B16 on your chart.

8. Time to add the vertical error bar. Select the "Error Bars" menu option in the "Chart Elements" menu that appears when you select the chart. In the "Add Error Bars" menu, select the "Scatter" series and press "OK". (You can skip this additional menu if you select the "Scatter" series first and then select the "Error Bars" option in the "Chart Elements" menu.) In either case, select the "More Error Bars Options" in the "Error Bars" menu.

	А	В	С	D	E	F	G	Н	I	J	K	L	N	1 1	N
1	Year	Participation		60.0			0			Ĭ <b>+</b> <	Chart Element	s			
2	2000	17.2									Axes				
3	2001	17.3		50.0	•					a real	Axis Titles     Chart Title				
4	2002	19.1		40.0							Data Labe	ls			
5	2003	21.3		40.0							🗌 Data Table	e _			_
6	2004	23.9		30.0							Error Bars		Standa	rd Error	
7	2005	25.7	Ĭ							Ĭ	Gridlines		Percent	age	
8	2006	26.7		20.0									Standa	rd Deviation	
9	2007	26.5		10.0							Up/Down	Bars	More C	ptions	
10	2008	28.4		10.0								L			
11	2009	33.5		0.0									ŀ	Add Error B ?	×
12	2010	40.3		2000	2001 2002 2	2003 2004 2	005 2006 200	7 2008 2009	2010 2011					Add Error Bars based	d on Series:
13	2011	44.7					0			0				Participation Scatter	
14															
15	Scatter														
16	Х	2												ОК	Cancel
17	v	50													

9. Excel will add both horizontal and vertical error bars. Notice that you'll first be brought to the Vertical Error Bars formatting menu. From here, make a few changes: Change the "Direction" to "Minus", the "End Style" to "No Cap", and select the "Percentage" option in the "Error Amount" menu and type 100 into the box. Notice the vertical error bar will drop to the xaxis.



10. Notice that you're also left with a horizontal error bar, which we don't need, so select it and delete. To hide the scatterplot marker, select it and select format (right-click or CTRL-1). In the "Marker Options" tab, select the option for "None".



Finally, adjust the maximum of the y-axis to 50
by formatting the y-axis (again, right-click or CTRL-1) and changing the "Maximum" value to 50.



- 12. As an aside, you can easily add annotation to this line by taking the following steps.
  - a. First, instead of naming the series "Scatter", give it the name of the annotation you want; for example, "2001 Policy Passed".

	А	В	С	D	E	F	G	Н	Ι	
1	Year	Participation								
2	2000	17.2		50						
3	2001	17.3		45					/	
4	2002	19.1		40						
5	2003	21.3		35						
6	2004	23.9		30						
7	2005	25.7		25						
8	2006	26.7		20						
9	2007	26.5		15						
10	2008	28.4		10						
11	2009	33.5		5						
12	2010	40.3		0						
13	2011	44.7		2000 2	2001 2002 2	2003 2004 20	05 2006 200	7 2008 2009	2010 2011	
14										
15	2001 Poli	cy Passed	-							
16	X	2								
17	y	50								

b. Second, select the marker for that series and right-click to add data labels.



Fil	e Home	Insert Pa	ge Layout	Forn	nulas	Data	n Re	eview	Vie	w A	dd-ins	Power I	Pivot	Design	n For	mat	Ç
Serie Char Horiz Plot	<mark>s "Scatter"</mark> t Area zontal (Category Area	/) Axis	Cha Cha Sha	nge pe -	Abc		Abc	Ab		Abc	Ab	c Ab	<b>。</b> (	Abc	<ul> <li>▲ ▲ Sh</li> <li>▼ ▲ Sh</li> <li>▼ ▲ Sh</li> <li>▼ ▲ Sh</li> </ul>	nape Fill nape Out nape Effe	- :  34
Verti	cal (Value) Axis	In	sert Shapes								Shape S	tyles					
Serie	s "Participation"		f <sub>x</sub>	=SER	IES(Ver	ticalL	ine!\$A	\\$15,V	ertica	ILine!\$	\$B\$16,V	/erticalLin	e!\$B\$	17,2)			ļ
Serie	s "Scatter" s "Scatter" Y Frr	or Bars B		C	]	D		Е		F		G		H	Ι		
1	Year ]	Participat	ion														
2	2000	1	7.2	50		Գ				0						<b> +</b>	
3	2001	1	7.3	45													]
4	2002	1	9.1	40													
5	2003	2	1.3	35												Y	
6	2004	2	3.9	30													
7	2005	2	5.7	25													
8	2006	2	6.7	20												Ĭ	
9	2007	2	6.5	15	_												
10	2008	2	8.4	10													
11	2009	3	3.5	5													
12	2010	4	0.3	0 -	2000	2001	2002	2002	200.4	2005	2005	2007 200	0 0.00	0 0010	2011		
13	2011	4	4.7		2000 2	2001	2002	2003	2004	2005	2006	2007 200	8 200	9 2010	2011		

Alternatively, you can use the drop-down menu in the top-left of the *Format* tab to directly select the data marker.

- c. Third, select the data label and right-click to format. In the menu, check the box for "Series Name" and uncheck the box for "Y value". Format the label as you see fit.
- d. You can also accomplish the same goal by adding a Data Label to the point. In the Data Label formatting menu (which you can get to by selecting the Data Label and using the CTRL+1 keyboard shortcut), selecting the "Value from Cells" option. The new menu will allow you to select a cell for the label. (Note: this custom Data Labels option is not available in the Mac OS.)



### Final Version with Styling.

Vertical Line



## Block Shading (annual-annual)

This chart type is typically used to mark some period of time behind a line or column chart, for example, a forecast period or to mark recessions. When the frequencies of the data match up—in this case annual and annual—the chart is made quickly and easily. Use the BlockShading\_Annual tab in the Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet to create the chart.



1. First, notice that if you leave the "Year" label in cell A1 and insert a line chart with cells A1:C13, Excel will plot the "Year" series.

	Α	В	С	D		E		I	7		G		Η		Ι		J
1	Year	Participation	Dummy							~							0
2	2000	17.2	0	1					Cl		Titlo						+
3	2001	17 3	0	2500					CI	lait I	nic						
4	2002	Plot Ar 17.1	ea 0	2300													and the second s
5	2003	21.3	0	2000	_											_	
6	2004	23.9	50	1500													
7	2005	25.7	50	1500													
8	2006	26.7	50	1000													-
9	2007	26.5	50														
10	2008	28.4	0	500													
11	2009	33.5	0	0	_												_
12	2010	40.3	0		1	2	3	4	5	6	7	8	9	10	11	12	
13	2011	44.7	0				_	■Year	_	Particip	ation	<u> </u>	Dummy	7			
14				0						_0_							_0
Deleting the "Year" in cell A1 and then inserting a line chart with cells A1:C13 generates the line chart we'll start with.

	Α	В	С	D	E	F	G	Н	Ι	J
1		Participation	Dummy	-						-
2	2000	17.2	0	0		Ch	-0			+
3	2001	17.3	0	60.0		CL				
4	2002	19.1	0	00.0 -						
5	2003	21.3	0	50.0				٦		
6	2004	23.9	50	40.0						
7	2005	25.7	50	30.0						
8	2006	26.7	50							
9	2007	26.5	50	20.0						
10	2008	28.4	0	10.0						-
11	2009	33.5	0	0.0						_
12	2010	40.3	0		2000 2001 2002	2003 2004	2005 2006	2007 2008 2	009 2010 20	1
13	2011	44.7	0			-Particip	pation <u> </u>	Dummy		
14				0			0			_0

3. Select the "Dummy" (orange line) series, and under "Change Chart Type" in the "Design" tab on the ribbon, change the chart type for that series to a clustered column chart using the dropdown menu.



4. Select the "Dummy" (**orange** bars) series and right-click to format. In the "Series Options" tab, change the "Gap Width" to o%.



5. Format the y-axis (by right-clicking or CTRL-1) and change the maximum y-value to 50 (to match the "Dummy" series).



6. Style as you like by deleting the legend, changing the color of the bars, and the number and appearance of the gridlines.



### Final Version with Styling

## Block Shading (annual - annual)



# Block Shading (monthly-annual)

This version of the block shading chart is more complicated than the one where the data frequencies line up. In this case—where the one series is annual and the shading is monthly (e.g., recessions)—

building the chart requires using the secondary axes. Use the *BlockShading\_Monthly tab* in the *Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet* to create the chart.



 We start in the same way as the previous chart except with the "Year" label in cell A deleted. Create a line chart using the data in cells A1:B13.

	Α	В	C D	E	F	G	Н	I	J		K	
1		Participation	Year	Month	<b>Recession Dummy</b>							
2	2000	17.2	2000	1								
3	2001	17.3	2000	2								
4	2002	19.1	2000	3								
5	2003	21.3	2000	4								
6	2004	23.9	2000	5	0		-				0	
7	2005	25.7	2000	6			Participa	tion				+
8	2006	26.7	2000	7	50.0		1 articipa	1011				Ţ
9	2007	26.5	2000	8	45.0							all a start
10	2008	28.4	2000	9	40.0					/		Y
11	2009	33.5	2000	10	35.0				/		L	
12	2010	40.3	2000	11	30.0							
13	2011	44.7	2000	12	25.0						— Y	
14			2001	1	20.0						— L	
15			2001	2	10.0							
16			2001	3	5.0							
17			2001	4	0.0						[_	
18			2001	5	2000 2001 2	002 2003	2004 2005	2006 2007	2008 2009	2010	2011	
19			2001	6	1		0				0	
20			2001	7	1							
21			2001	8	1							
22			2001	9	1							
23			2001	10	1							

2. Then delete the title (and legend).



3. Right-click on the chart and choose "Select Data".



4. We will add the "Recession Dummy" series by selecting "Add" in the resulting menu. Then, reference cell F1 for the "Series Name" and that series (cells F2:F145) for the "Series values". This will slide the **blue** series far over to the left because Excel now views this as a line chart with 144 spaces (corresponding to the number of observations in the "Recession Dummy" series).

D	E	F	G	Н	Ι	J	K
Year	Month	<b>Recession Dummy</b>	7				
2000	1						
2000	2						
2000	F	ı dit Series	:	7 X			
2000							
2000	Se	eries <u>n</u> ame: PlockShading Monthly(\$E\$1	♠ = Porce	ssion Dumm			
2000	-	pries values:	- Kete				
2000	=	BlockShading_Monthly!\$F\$2:\$F\$1	145 🛨 = , , ,	, , ,			
2000				Concel			
2000			ОК	Cancel			
2000	10	30.0					
2000	11	25.0					
2000	12	20.0					
2001	1	15.0					
2001	2	10.0					
2001	3	5.0					
2001	4	0.0					
2001	5	COORDEREMENT					
2001	6	1					
0001	-		1				

5. Select the **orange** ("Recession Dummy") series, right-click and move that series to the "Secondary Axis" by selecting the option in the "Series Options" tab.



6. Again, select the **orange** ("Recession Dummy") series, and under "Change Chart Type" in the "Design" tab on the ribbon, change the chart type for that series to a clustered column chart.



7. With a column chart now created—and tagged to the secondary axis—we need to "turn on" the secondary horizontal axis. To do so, select the chart, and under the "Axis" dropdown

menu in the "Chart Elements" menu, select the checkbox next to "Secondary Horizontal."

	В	С	D	Е	F	G	Н	I	J	K	L	Μ	N	Ο	P	Eormatu
1	Participation		Year	Month	Recession Dummy	p			0	10101	1010	° _ /	Chart Element	ts		Chart Option
2	17.2		2000	1		50.0 7 6 7	10 21 31 31 30 30	51 51 51 50 50 50 50 50 50 50 50 50 50 50 50 50	71 76 81 81 81 80 81 91	900110	13 13 13		Axes	<	Primar	ry Horizontal
3	17.3		2000	2		45.0							Axis Titles	s 🗾	🗹 Primar	ry Vertical
4	19.1		2000	3		40.0						1	Chart Title	2	Secon	dary Horizontal
5	21.3		2000	4		35.0				/		0.8	Data Labe	els	More	dary Vertical
6	23.9		2000	5		30.0							Error Bars	e		
7	25.7		2000	6	(	25.0						0.6 0	Gridlines			AILTEAL
8	26.7		2000	7		20.0						0.4	Legend			
9	26.5		2000	8		15.0						0.4	Trendline	Barc		
10	28.4		2000	9		10.0						0.2		Dais		
11	33.5		2000	10		5.0										
12	40.3		2000	11		0.0 2000	2001 2002 2	2003 2004 20	05 2006 2007	2008 2009	2010 2011	0				
13	44.7		2000	12	(	<b>b</b>			0			0				
14			2001	1												
15			2001	2												
16			2001	3	1											
17			2001	4	1											

8. The **orange** column chart will seemingly flip to the secondary axis, and the **blue** line will stretch out as it did in the first step.



9. We want the bars to stretch along the entire vertical axis. So, format the secondary vertical axis (select it and right-click or CTRL-1), and under the "Axis Options" menu, change the "Minimum" value to 1 and the "Maximum" value to 2 (note that this works because the "Recession Dummy" series is set to 1; you can use a different number if you want, but these minimum/maximum values would then also change).



Format the column chart (by selecting and right-clicking or CTRL-1), and under the "Series Options" tab, change the "Gap Width" to o%.



11. In that same menu, you can change the colors of the bars using the "Fill" section.





▶ Number

Block Shading (monthly-annual)



12. Turn off the secondary horizontal and vertical axes by setting the "Line color" to "No line" and "Tick Marks" and "Labels" to

"None" in the "Axis Options" section of the "Format Axis" menu.

### Final Version with Styling

# Block Shading (monthly - annual)



## **Broken Stacked Bars**

Stacked bar or column charts have the disadvantage that it can be difficult to compare series that do not lie on the same vertical axis. This tutorial shows how to break up a stacked bar chart so that each series sits on its own vertical axis.

The data are set up in a particular way. You'll notice that I have the raw data sitting in the top table in rows 1-6. I've made a new data

table below in rows 9-15. Interspersed between the data are "Dummy" data series; each one is equal to 65 minus (denoted in the formula using an absolute reference) the neighboring cell. 65 is used only because it is larger than the largest data value of 56; 70, 80, even 57 would also work. Use the *BrokenStackedBars tab* in the *Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet* to create the chart.



Create a stacked bar chart using the data in columns A9:I15.
 (Notice that I deleted the "Group" name in cell A9 before doing so; otherwise, Excel will plot the group numbers as a data

series.) Notice how the chart is grouping the series by columns instead of by rows.

	А	В	С	D	E	F	G	Н	I		J		K	L	Μ	
1	Group	Under 25	25 to 44	45 to 64	65 to 74	Total										
2	1	37	25	26	12	100										
3	2	56	19	13	12	100										
4	3	34	26	30	10	100										
5	4	15	43	30	12	100		0				0				
6	5	18	52	24	6	100					(	Chart T	itle			
7																
8	65							Dur	nmy4							
									4-74							
9		Under 25	Dummy1	25 to 44	Dummy2	45 to 64	Dummy3	65 t	to 74							
9 10	1	<b>Under 25</b> 37	<b>Dummy1</b> 28	<b>25 to 44</b> 25	<b>Dummy2</b> 40	<b>45 to 64</b> 26	<b>Dummy3</b> 39	65 t	to 74					-		
9 10 11	1 2	<b>Under 25</b> 37 56	<b>Dummy1</b> 28 9	<b>25 to 44</b> 25 19	<b>Dummy2</b> 40 46	<b>45 to 64</b> 26 13	<b>Dummy3</b> 39 52	65 t 0ur 45	to 74 nmy3 to 64 nmy2					-		¢
9 10 11 12	1 2 3	<b>Under 25</b> 37 56 34	<b>Dummy1</b> 28 9 31	<b>25 to 44</b> 25 19 26	<b>Dummy2</b> 40 46 39	<b>45 to 64</b> 26 13 30	<b>Dummy3</b> 39 52 35	65 t Dur 45 Dur 25	to 74				•	-		¢
9 10 11 12 13	1 2 3 4	<b>Under 25</b> 37 56 34 15	Dummy1 28 9 31 50	<b>25 to 44</b> 25 19 26 43	<b>Dummy2</b> 40 46 39 22	<b>45 to 64</b> 26 13 30 30	Dummy3 39 52 35 35	65 t Dur 45 Dur 25 Dur	to 74 mmy3 to 64 mmy2 to 44 mmy1					-		¢
9 10 11 12 13 14	1 2 3 4 5	<b>Under 25</b> 37 56 34 15 18	Dummy1 28 9 31 50 47	<b>25 to 44</b> 25 19 26 43 52	Dummy2 40 46 39 22 13	<b>45 to 64</b> 26 13 30 30 24	Dummy3 39 52 35 35 41	65 t Dur 45 Dur 25 Dur Und	to 74 mmy3 to 64 mmy2 to 44 mmy1 ler 25 mmy1					-		¢
9 10 11 12 13 14 15	1 2 3 4 5 6	<b>Under 25</b> 37 56 34 15 18 13	Dummy1 28 9 31 50 47 52	<b>25 to 44</b> 25 19 26 43 52 41	Dummy2 40 46 39 22 13 24	<b>45 to 64</b> 26 13 30 30 24 33	Dummy3 39 52 35 35 41 32	65 t Dur 45 Dur 25 Dur Unc	to 74 mmy3 to 64 mmy2 to 44 mmy1 der 25 0	50	100	150	200	250	300	350
<ul> <li>9</li> <li>10</li> <li>11</li> <li>12</li> <li>13</li> <li>14</li> <li>15</li> <li>16</li> </ul>	1 2 3 4 5 6	<b>Under 25</b> 37 56 34 15 18 13	Dummy1 28 9 31 50 47 52	<b>25 to 44</b> 25 19 26 43 52 41	Dummy2 40 46 39 22 13 24	45 to 64 26 13 30 30 24 33	Dummy3 39 52 35 35 41 32	65 t Dur 45 Dur 25 Dur Unc	to 74 mmy3 to 64 mmy2 to 44 mmy1 der 25 0	50	100	150	200	250	300	¢ 350

2. To switch this, select the "Switch Row/Column" button in the "Design" tab on the ribbon.

The chart is now grouped by rows instead of columns.

File	Home	nsert Page Lay	out Formulas	Data Revie	w View A	dd-ins Power P	ivot Design	Format	Q	${\mathbb Q}$ Tell me what you want to do
Add Ch Elemen Char	art Quick Ch t - Layout - Co t Layouts	hange			Chart S	Styles	CherTills			Image: Constraint of the second se
Chart	1 -	$\times \checkmark f$	Êx -							Swap the data over the axis
	А	В	С	D	Е	F	G	Н		I M
1	Group	Under 25	25 to 44	45 to 64	65 to 74	Total				Data being charted on the X axis will move to the Y axis and vice
2	1	37	25	26	12	100				versa.
3	2	56	19	13	12	100				
4	3	34	26	30	10	100				
5	4	15	43	30	12	100		9		0
6	5	18	52	24	6	100				Chart Title
7									6	
8	65	Under 25	D1	25 to 11	D	AE to CA	D	(= +	5	
9	1	Under 25		25 to 44	Dummy2	45 to 64	Dummy3	651	,	
10	1	56	28	23 10	40	20	52			
12	2	34	31	26	30	30	32	0	2	
12	4	15	50	43	22	30	35		2	
14	5	18	47	52	13	24	41		1	
15	6	13	52	41	24	33	32		0	0 50 100 150 200 250 300
16										■ Under 25 ■ Dummy1 ■ 25 to 44 ■ Dummy2
17										■ 45 to 64 ■ Dummy3 ■ 65 to 74 ■ Dummy4

3. We've switched the plot, but Excel puts the 6<sup>th</sup> group at the top of the chart and the 1<sup>st</sup> group at the bottom. We'd like to have the order of the graph mimic the order of the data in the spreadsheet. To do so, format the y-axis (select the axis and right-click or hit CTRL-1) and in that menu, make two changes: In the "Axis Options" tab, check the box next to "Categories in reverse order" *and* change the "Horizontal axis crosses:" option to "At maximum category". The first change flips the order of the data, but it also moves the x-axis to the top of the chart; that's why the second step is needed.



4. We now hide the "Dummy" series by changing their fill to "No Fill" using the "Format" menu.

Format $Q$ Tell me what	you want to do			
Shape Fill Automatic Theme Colors	AA	A Text Fill - A Text Outlin A Text Effect	ne - Grin Seri ts - Grin Seri	ng Forward 👻 🖡 nd Backward 👻 🛱 ection Pane 🛛 🖄
	WordArt Styles		5	Arrange
	J	K	L	М
Recent Colors				
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Gradient			8	
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5			K	
6 <b>0</b> 50	100	150 200	25	
	Under 25 Dumm 45 to 64 Dumm	y1 ∎ 25 to 44 Dt y3 ■ 65 to 74 Dt	ummy2 ummy4	

5. We now need to change the spacing of the vertical gridlines to match the vertical alignment of the data bars. Select the horizontal axis and right-click or CTRL-1 to format. Change the axis to span from o (in the "Minimum" section) to 260 (in the "Maximum" section), and change the "Major Unit" to 65 to match the variable used to construct the spacing.





If you don't want that final gridline on the chart, you can cheat a bit and change the minimum value to 0 and the maximum value of the horizontal axis to 259.9.

6. You can delete the legend if you like. You can also delete just the four "Dummy" series labels in the legend by separately selecting and deleting each one. You can also delete the x-axis because the markers don't make much sense at this point.



#### **Final Version with Styling**

## **Broken Stacked Bars**



# Vertical Bullet

A bullet chart contains 5 data series: an observed (actual) value; a target value; and three (or more) ranges (e.g., poor, good, and excellent). This tutorial shows how to create a vertical bullet chart



using a stacked bar chart and secondary axes. Use the *Vertical\_Bullet tab* in the *Advanced Data Visualizations with Excel* 2016 Hands-On.xlsx spreadsheet to create the chart.

1. Create a stacked column chart using the data for Region A in column B.



2. We want these series to be stacked, so you need to use the "Switch Row/Column" button in the "Design" tab.



3. We'll move the Value and Target series to the secondary axis by selecting each, right-clicking (or CTRL-1), and selecting the "Format Data Series" option at the bottom of the menu.

	А	В	С		D	Е	I				
1		Region A	Regi	on B	Region C	<b>Region D</b>					
2	Poor	25%		50%	10%						
3	Good	40%		25%	35%	80%					
4	Excellent	35%		25%	30%	10%					
5	Value	75%		65%	60%	55%					
6	Target	70%		75%	80%	60%					
7	300%	T	(	0			° +				
8			A								
9	250% ——	9			Series "Target"		and a				
10				i Outiii	le						
11	200%			Delete							
12	150%		<b>\$</b>	Perset to Match Style							
13				Change	o M <u>a</u> teri Style		9				
14	100%			Change	e Series Chart Type						
15				Select	Data						
16	50%			3-D <u>R</u> o	itation						
17				Add D	ata La <u>b</u> els	•					
18	8 Add T <u>r</u> endline										
19	<u>}</u>			<u>F</u> ormat	Data Series		0				

4. In the format menu, select "Secondary Axis" in the "Series Options" menu.



After you move the first series to the secondary 5. axis, you won't be able to select the other series. To select the next series, use the dropdown menu in the far top-left section of the "Format" tab, then click Format Selection.

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6. Once both series are moved to the secondary axis, format the series to change the "Gap Width" to 400% (you'll only need to do this for one of the series).


7. We'll now change the Target series to a scatterplot to create the marker. Select the Target series and then select the "Change Chart Type" menu in the "Design" tab. Use the dropdown menu to change the chart type for the Target series to "Scatter".



8. Now that it's a scatterplot, you can format as you like. Select the scatterplot point, format by right-clicking, and under "Marker Options" of the format menu, select the dash under the "Built-in" menu. You can also increase the size.



- 9. Alternatively, if you don't like the look of the scatterplot marker, you can change the marker to a circle and add a horizontal error bar to the point. To do so, select the point, and add an error bar using the "Error Bars" option in the "Chart Elements" menu. Delete the vertical error bar and format the horizontal error bar:
  - a. Change the "Direction" to "Both";
  - b. Change the "End Style" to "No Cap";
  - c. Change the "Fixed value" to "0.2"



You can also change the appearance of the horizontal error bar:

- e. In the "Line Style" menu, change the width (I've used 2 pt here)
- f. In the "Line Color" menu, change the color (I've used **pink** here).



10. Be sure to set both y-axes to the same range with a minimum and maximum of o% and 100%, respectively.



 Recolor and format the different series as needed. To extend the series to include all four Regions, simply select the chart and drag the blue data box to the right.



### Final Version with Styling

Vertical Bullet



## Horizontal Bullet

The horizontal bullet chart presents the same data as in the vertical version, but this approach is slightly different (you could use the same approach for the vertical version, though it's more difficult to apply the vertical version to the horizontal bars). The somewhat

tricky version of this approach is that you need to be careful with the data and where the Target sits in the different ranges. Use the *Horizontal\_Bullet tab* in the *Advanced Data Visualizations with Excel* 2016 Hands-On.xlsx spreadsheet to create the chart.



 Begin by creating a stacked bar chart using cells A1:B7. Notice how the Target\* series differs when it sits within the "Good" range instead of the "Excellent" range.

	А	В	С	D	Е		
1		Region A	Region B	Region C	Region D		
2	Poor	25%	50%	35%	10%		
3	Good	40%	25%	35%	50%		
4	Excellent-Low	5%	0%	10%	0.5%		
5	Target*	0.5%	0.5%	0.5%	30%		
6	Excellent-High	30%	25%	20%	/ 10%		
7	Value	75%	65%	60%	55%		
8							
9	Target	70%	75%	80%	60%		
10							
11	Region A						
12	Value						
13							
14	Excellent-High						
15	Target*						
16					0		
17	Excellent-Low						
18	Good						
19	-						
20	Poor						
21	0%	10% 20% 30	% 40% 50%	60% 70%	80%		
22	D		0		0		

2. If you select the first option in the "Insert Chart" menu, you'll notice that you get a Clustered Bar Chart instead of a Stacked Bar Chart. To change, select the "Switch Row/Column" button in the "Design" tab of the ribbon. You can also select this chart option directly in the Insert Chart menu by selecting the option to the right.



3. Move the Value (**gold**) series to the secondary axis by selecting and formatting (either by rightclicking or CTRL-1). Move the series to the "Secondary Axis" under the "Series Options" tab and change the "Gap Width" to 400%.



4. Fix both sets of horizontal axes to go from o%-100%.



5. Delete the secondary horizontal axis, legend, and gridlines. Format the different series to the desired colors. Notice that the "Excellent" series is broken into two groups—to the left and right of the "Target" series—so be careful to give those two series the same color.



6. You can now select the chart and drag the blue data box to extend the chart to cover all four Regions.

	А	В	С	D	E
1		Region A	<b>Region B</b>	<b>Region</b> C	Region D
2	Poor	25%	50%	35%	10%
3	Good	40%	25%	35%	50%
4	Excellent-Low	5%	0%	10%	0.5%
5	Target*	0.5%	0.5%	0.5%	30%
6	Excellent-High	30%	25%	20%	10%
7	Value	75%	65%	60%	55%
8					
9	Target	70%	75%	80%	60%
10	p		0		o
11					<b>T</b>
12	Region D				
13	-				
14	Region C		_		
15					
16	þ				0
17	Region B				
18	-				
19	Pagion A			_	
20	Kegioli A				
21	0% 10%	20% 30% 40%	60% 60%	70% 80% 90%	100%
22	h	2010 2010 107	-0		

7. Notice how this approach generates a large red box for the Target\* series in Region D. You need to do some manual work here to recolor the that segment. Select that segment (not the entire series) and color as needed. Color the Excellent-Low segment as your target color.



#### Final Version with Styling

### Horizontal Bullet



## Dot Plot

The dot plot is a nice alternative to a paired or stacked column/bar chart where you want to compare values for different categories. Use

the *DotPlot tab* in the *Advanced Data Visualizations with Excel* 2016 *Hands-On.xlsx spreadsheet* to create the chart.



1. Creating a Dot Plot in Excel 2016 consists of a series of scatterplots. To start, create a scatterplot from cells B1:C11. The data are set up in such a way to keep the three data series (Bottom, Middle, High) next to each other, but this also means we need to switch how Excel plots the x- and y-series. So, after having inserted the scatterplot, right-click on the chart, choose "Select Data", select the "Bottom" series and then the "Edit" button. Here, switch the data—the "Height" series (B2:B11) should go in the "Series Y values:" box and the "Series X values:" box.



2. Add the "Middle" and "High" series by rightclicking on the chart and choosing the "Select Data" option. Select the "Add" option and fill in the menu options—for the "Middle" series, fill in the "Series name:" box with cell D1; the "Series X values:" with cells D2:D11; and the "Series Y values:" with cells B2:B11. Repeat for the "High" series. (If you haven't noticed, the "Height" series is used for all three series here because it doesn't (and shouldn't) change.)



3. We are going to use Error Bars to add the horizontal lines that connect the points. To do so, select the **orange** "Middle" series in the chart, and then the "More Options" in the "Error Bars" dropdown menu in the "Chart Elements" menu that appears when you select the chart.



4. You'll notice that the first set of error bars you are prompted to format are the vertical error bars. We don't need these error bars, so you can select and delete them.



5. Then, select and format the *horizontal error bars* (by selecting and then right-clicking or CTRL-1). In the menu, choose "No Cap" in the "End Style" section of the menu. Then, select the button for "Custom" for the "Error Amount". For the "Positive Error Value", insert the reference for the "PosError" series in cells F2:F11. For the "Negative Error Value", insert the reference for the "NegError" series in cells G2:G11.



6. We now move to setting up the labels so that they sit next to the **blue** points (the "Bottom" series). To do so, we can use the "Value From Cells" feature in the Data Labels options menu (not available in versions prior to Excel 2016). Select the "Bottom" series, right-click and select the "Add Data Labels" option in the menu.



7. Format the data labels by selecting them and right-clicking or using the CTRL+1 keyboard shortcut. In the "Label Options" menu, check the box next to the "Value From Cells" option. In the pop-up box, select the state names from cells A2:A11. Uncheck the box next to the "Y Value" label and in the "Label Position" section of the menu below, select the option next to "Left" to move the labels over.



8. If you'd rather have the labels further away from the data and right-aligned, you can add a new scatterplot series with the y-values equal to the "Height" series and the x-values equal to a constant (in this example, the number 18 works). Then, again, add the data labels using the "Value from Cells" option and place them to the left of the points. Now hide the markers by right-clicking and changing the "Marker Option" to "None".

	A	В	С	D	E
1	State	Label	Height	Bottom	Middle
2	Rhode Island	18	19	45	65
3	DC	18	17	30	50
4	Maryland	18	15	20	45
5	Pennsylvania	18	13	25	50
6	Virginia	18	11	30	48
7	Connecticut	18	9	25	37
8	Delaware	18	7	30	40
9	New Jersey	18	5	22	31
10	West Virginia	18	3	21	35
11	New York	18	1	24	33
12	<b>0</b>		0		
13	20 Rhode Isla	und ]•	•	•	
14			•		
15	16 Maryla	nd 🖢 🗣	•	•	
16	14 Pennsylvar		•	•	
17	12 Virgi	nia 🕘 🔶 🛶	•	•	
18	0 <sup>10</sup> Connecti	cut 🕘 🔸		•	0
19	8 Delaw		• •		
20	6 New Jers	sey 🔍 🗣 🔸	•		
21	4 West Virgi		•		
22	2 New Yo	srk •	•		
23	0 0 10	20 20	40 50 /	50 70 0	

9. Complete the formatting by changing the shapes and colors of the points and deleting gridlines and y-axis, as desired.



10. If you want to add arrows to the error bars—as shown in the *DotPlot\_Arrows tab* in the *Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet*—you can add another "Middle" series. From the first "Middle" series, add a horizontal error bar that goes to the left (Minus); from the new "Middle" series, add a horizontal error bar that goes to the right (Plus). Use Left Arrow for the custom negative error values and Right Arrow values for the custom positive error values. In the "Line Style" tab of the "Format Error Bars" menu, select the "Arrow settings" as you see fit.



#### Final Version with Styling

Dot Plot



# Slope

The slope chart uses lines to enable comparisons of different categories. It is most effective when comparing multiple series with only 1-3 data points.

Use the *Slope tab* in the *Advanced Data Visualizations with Excel* 2016 *Hands-On.xlsx spreadsheet* to create the chart.



1. Start by creating a line chart using the data provided in cells A1:C6.



Excel will create a line chart along the columns here, but we want to flip that. Select the chart and then select the "Switch Row/Column" button in the "Design" tab on the ribbon.



3. It's now a matter of styling and adding the data labels. To get the lines to fill up the entire chart space, first delete the legend. Then, format the x-axis (select and right-click or CTRL-1): In the "Format Axis" menu, select the "On tick marks" button at the bottom under the "Axis position" section of the menu. This lines up the data markers with the tick marks and thus takes up the whole chart space. You can also turn off the tick marks by selecting "None" in the "Major type" dropdown menu under "Tick Marks", and turn off the line in the "Line Color" tab. Press "Close" and you can then delete the vertical axis and horizontal gridlines.



4. Now to add the data markers. Begin by selecting the **pink** line, right-click, and select "Add Data Labels" in the menu.



5. This will add a data label to either end of the line. Notice how they are both aligned to the right of the point and consist of the value of the point. This is fine for the point on the right, but for the point on the left, we want the data marker to be to the left of the point and to include the state name.



6. Select the data labels—this will select both—so select the left label again so that only that label is selected.



7. Right-click and select the "Format Data Label" option in the menu. Here, you can check the box next to "Series Name" (in addition to the "Value" box that is already selected), and select the "Left" option under the "Label Position" section of the menu. You can also change the separator from a comma to a (space) if you want. Repeat for the remaining lines.


8. The advantage of making these selections through the menu is that the labels will all be aligned together. With text boxes, you would need to do that alignment manually. You can now select the plot area and resize it so that the labels fit on the chart. Style chart as desired.



## Final Version with Styling

Slope



## **Vertical Bar-Scatter**

In this chart, we combine a column chart and a scatterplot for comparing values. Use the *Bar-Scatter\_Vertical tab* in the *Advanced* 



*Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet* to create the chart

1. Create a clustered column chart using the poverty rate data in A2-C11.

	A B C C														
1	Poverty in the N	ortheast US													
2	State	<b>Poverty Rate</b>	Supplemental Poverty Rate												
3	New York	0.159	0.181												
4	New Jersey	0.095	0.155												
5	Massachusetts	0.109	0.138												
6	Rhode Island	0.132	0.136												
7	Pennsylvania	0.112	0.126												
8	Connecticut	0.086	0.125												
9	Maine	0.116	0.112												
10	New Hampshire	New Hampshire         0.079         0.103													
11	Vermont 0.096 0.101														
12		0		9											
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14	0.2			and a											
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25		- Supp	Siementai r Overty Kate												

2. Select the Poverty Rate series (the **blue** bars) and change the chart type to a "Line with Markers" by using the dropdown menu in the "Change Chart Type" menu in the "Design" tab of the ribbon.

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2	State	Poverty Rate Suppl	🖄 Line	Custom Combination	E Bar	
3	New York	0.159	O Pie	Cha	art Titl 🗀 🖂	
4	New Jersey	0.095	Bar	0.2		
5	Massachusetts	0.109	Area	0.18	Line	
6	Rhode Island	0.132	X Y (Scatter)	0.12		
7	Pennsylvania	0.112	Stock	0.08		
8	Connecticut	0.086	Badar	0.02		Line with Markers
9	Maine	0.116	Treeman	Valt Jerest weeds toland	Annual A	
10	New Hampshire	0.079	Sunburst	Her Her Massacr Phylos Penn	° ° 1	
11	Vermont	0.096	Histogram	Poverty Rate	Suppleme Area	
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14	0.18		Combo	Poverty Rate	Clustered Column	
16	0.14			Supplemental Poverty Rate	Clustered Column	
17	0.12	<b>Y</b>				
18	0.08					
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23	WHEEP'	the terr Co	4004 F			
24 25	-	Supplemental Poverty Rate	Poverty Rate			



This will give you a marked line on top of the column chart.

3. To get rid of the line, format the Poverty Rate series by selecting and right-clicking (or CTRL-1). In the format menu, change the "Line Color" to "No line". That will make the line disappear, but the markers will remain.



4. Style the chart elements as you like.



#### Final Version with Styling

### Vertical Bar - Scatter



# Horizontal Bar-Scatter

In this chart, we combine a bar chart and a scatterplot for comparing values. Use the *Bar-Scatter\_Horizontal tab* in the *Advanced Data* 

*Visualizations with Excel 2016 Hands-On.xlsx spreadsheet* to create the chart.



1. Create a bar chart using the poverty rate data in A2-C11.

	А	В	С	D
1	Poverty in the <b>N</b>	Northeast US		
2	State	Poverty Rate	<b>Supplemental Poverty Rate</b>	Y-series
3	New York	0.159	0.181	17
4	New Jersey	0.095	0.155	15
5	Massachusetts	0.109	0.138	13
6	Rhode Island	0.132	0.136	11
7	Pennsylvania	0.112	0.126	9
8	Connecticut	0.086	0.125	7
9	Maine	0.116	0.112	5
10	New Hampshire	0.079	0.103	3
11	Vermont	0.096	0.101	1
12	9		0	
13		Cha	urt Title	axis
14	Vermont			
15	New Hampshire			
16	Maine			ľ
17	Connecticut			
18	Pennsylvania			<b>0</b>
19	Massachusetts			
20	New Jersev			
22	New York			
23	0	0.02 0.04 0.06	0.08 0.1 0.12 0.14 0.16 0.18 0.	2
24		Supplemental Pove	erty Rate ■Poverty Rate	
25			0	

2. Notice that the order of the data in the chart differ from those in the spreadsheet. We want those to be the same, especially for this chart. Format the y-axis: In the "Format Axis" menu (use the CTRL+1 keyboard shortcut), check the box next to "Categories in reverse order" *and* change the "Horizontal axis crosses:" option to "At maximum category".



3. We are now going to change the poverty rate (blue) series to a scatterplot. Select the blue series and select the scatterplot option in the dropdown menu in the "Change Chart Type" menu found under the "Design" tab on the ribbon.

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	ОК	Cancel



When you change the series to a scatterplot, the graph is going to look very weird. This is because Excel is filling it its own values for the x- and y-series.

- 4. We need to now go in and assign them to the right position. So, right-click on the chart and choose "Select Data." Select the Poverty Rate series and select the "Edit" button. Assign the correct series to the x- and y-positions: the x series is the Poverty Rate (cells B3:B1), and the y series is the "Y-series" data shown in Column D (D2:D11).
- The Y-series is created in such a way that the points are aligned with the center of the bars. This approach works because, by default, Excel won't let you plot data at the maximum of the vertical axis, so it will round up from the maximum value. We take advantage of this by using odd numbers and thus getting the data markers to line up with the bars.

A	В	С	D	E
Poverty in the N	Northeast US			
State	<b>Poverty Rate</b>	Supplemental Poverty Rate	<b>Y</b> -series	
New York	0.159	0.181	17	
New Jersey	0.095	0.155	15	
Massachusetts	0.109	0.138	13	
Rhode Island	0.132	0.136	11	
Pennsvlvania	0 112	0.126	9	
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	Supplemental Pover	y Rate • Poverty Rate		
	A Poverty in the N State New York New Jersey Massachusetts Rhode Island Pennsvlvania New York New Jersey Massachusetts Rhode Island Pennsylvania Connecticut Maine New Hampshire Vermont 0	ABPoverty in the Northeast USStatePoverty RateNew York0.159New Jersey0.095Massachusetts0.109Rhode Island0.132Pennsvlvania0.112ICharNew YorkCharNew YorkImage: ComecticutNew YorkImage: ComecticutNew YorkImage: ComecticutNew YorkImage: ComecticutNew YorkImage: ComecticutNew HampshireImage: Comecticut <th>A       B       C         Poverty in the Northeast US       State       Poverty Rate       Supplemental Poverty Rate         New York       0.159       0.181         New Jersey       0.095       0.155         Massachusetts       0.109       0.138         Rhode Island       0.132       0.136         Pennsvlvania       0 112       0 126         Khode Island       0.132       0.136         Pennsvlvania       0 112       0 126         Khode Island       0 112       0 126         Khode Island       0 112       0 126         Khode Island       0 112       Edit Series         Series name:       ='Bar-Scatter_Horizontal'!SB         Series X values:       ='Bar-Scatter_Horizontal'!SB         Series Y values:       ='Bar-Scatter_Horizontal'!SD         New Hampshire       0 0.02 0.04 0.06 0.08 0.1 0.12       0.14 0.10 0.18 0.2         Supplemental Poverty Rate       •Poverty Rate</th> <th>A       B       C       D         Poverty in the Northeast US       State       Poverty Rate       Supplemental Poverty Rate       Y-series         New York       0.159       0.181       17         New Jersey       0.095       0.155       15         Massachusetts       0.109       0.138       13         Rhode Island       0.132       0.136       11         Pennsvlvania       0.112       0.126       9         Chart Title       7       5         New York       6       5       5         New York       6       6       6         New York       7       5       5         New York       6       7       5         New York       7       5       5         New York       7       6       5         New York</th>	A       B       C         Poverty in the Northeast US       State       Poverty Rate       Supplemental Poverty Rate         New York       0.159       0.181         New Jersey       0.095       0.155         Massachusetts       0.109       0.138         Rhode Island       0.132       0.136         Pennsvlvania       0 112       0 126         Khode Island       0.132       0.136         Pennsvlvania       0 112       0 126         Khode Island       0 112       0 126         Khode Island       0 112       0 126         Khode Island       0 112       Edit Series         Series name:       ='Bar-Scatter_Horizontal'!SB         Series X values:       ='Bar-Scatter_Horizontal'!SB         Series Y values:       ='Bar-Scatter_Horizontal'!SD         New Hampshire       0 0.02 0.04 0.06 0.08 0.1 0.12       0.14 0.10 0.18 0.2         Supplemental Poverty Rate       •Poverty Rate	A       B       C       D         Poverty in the Northeast US       State       Poverty Rate       Supplemental Poverty Rate       Y-series         New York       0.159       0.181       17         New Jersey       0.095       0.155       15         Massachusetts       0.109       0.138       13         Rhode Island       0.132       0.136       11         Pennsvlvania       0.112       0.126       9         Chart Title       7       5         New York       6       5       5         New York       6       6       6         New York       7       5       5         New York       6       7       5         New York       7       5       5         New York       7       6       5         New York

5. With the data now in the correct order, you can delete the y-axis, legend, and format the two series as desired.



#### Final Version with Styling

## Horizontal Bar - Scatter



# Lollipop

A lollipop chart is basically a bar chart except that the end of the bar is replaced with a dot (the candy) and the bar itself is replaced with a line (the stick, if you will). The lollipop graph reduces a lot of the ink on the page and I think helps the reader focus just on the end where the data are encoded. Use the *Lollipop tab* in the *Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet* to create the chart.



1. Create a bar chart with the Spending data using cells A1:B6. You'll notice that Excel sorts the data with Category E at the top of the chart. Personally, I want my data to be visualized in the same order as it appears in the spreadsheet. So, the first step is to re-sort the data so that Category A appears at the top of the chart.

1       Spending         2       Category A       20         3       Category B       27         4       Category C       34         5       Category D       41         6       Category E       49         7       Spending         9       Category E       49         10       Category E       49         11       Category B       7         8       Spending       7         9       Category E       7         10       Category D       7         11       Category D       7         12       Category C       7         13       Category B       7         14       Category B       7         16       Category A       7         18       0       10       20       30       40       50       60		А	В	С	D	E
2       Category A       20         3       Category B       27         4       Category C       34         5       Category D       41         6       Category E       49         7       Spending         9       Category D         10       Category D         11       Category D         12       Category C         13       Category C         14       Category B         16       Category A         17       0         18       0       10       20       30       40       50       60	1		Spending			
3       Category B       27         4       Category C       34         5       Category D       41         6       Category E       49         7       Spending         9       Category D         10       Category E         11       Category D         12       Category C         13       Category C         14       Category A         15       Category A         16       Category A         17       0         10       20       30       40       50       60	2	Category A	20			
4       Category C       34         5       Category D       41         6       Category E       49         7       Spending         9       Category E         10       Category D         12       Category C         13       Category C         14       Category A         15       Category A         16       Category A         17       0         10       20       30       40       50       60	3	Category B	27			
5       Category D       41         6       Category E       49         7       Spending         9       Category E         10       Category D         11       Category D         12       Category C         13       Category C         14       Category A         15       Category A         16       Category A         17       0       10       20       30       40       50       60	4	Category C	34			
6     Category E     49       7     Spending       9     Category E       10     Category D       11     Category D       12     Category C       13     Category B       14     Category B       15     Category A       16     Category A       17     0       18     0	5	Category D	41			
7       Spending         9       Category E         10       Category D         11       Category D         12       Category C         13       Category C         14       Category B         16       Category A         17       0         18       0	6	Category E	49			
8       9       Category E         10       11       Category D         11       Category D         12       13         13       Category C         14       Category B         16       Category A         17       18       0       10       20       30       40       50       60	7		Sr			+
9       Category E         10       11         11       Category D         12       13         13       Category C         14       15         15       Category A         16       Category A         17       10         18       0       10       20       30       40       50       60	8		51	Chung		
10       11       Category D         11       Category D         12       13         13       Category C         14       15         15       Category A         16       Category A         17       0         18       0	9	Category F				and a
11       Category D         12       13         13       Category C         14       Category B         15       Category A         16       Category A         17       0       10       20       30       40       50       60	10					
12       13       Category C         13       Category C         14       Category B         15       Category A         16       Category A         17       0         18       0	11	Category D				
13       Category C         14       Category B         15       Category B         16       Category A         17       Category A         18       0       10       20       30       40       50       60	12					
14       Category B         15       Category B         16       Category A         17       Category A         18       0       10       20       30       40       50       60	13	Category C				0
15       Category B         16       Category A         17       Category A         18       0       10       20       30       40       50       60	14					
16         Category A            17         0         10         20         30         40         50         60	15	Category B				
17     18     0     10     20     30     40     50     60	16	Category				
<b>18</b> 0 10 20 30 40 50 60	17					
	18	0	10 20	30	40 50	60

2. To do so, format the y-axis by selecting it and right-clicking or using the CTRL-1 shortcut. In the "Format Axis" menu, check the box next to "Categories in reverse order" *and* change the "Horizontal axis crosses:" option to "At maximum category". The first change flips the order of the data, but it also moves the x-axis to the top of the chart; that's why the second step is needed.



3. To change this to the lollipop, we'll use error bars. Select the bars in the chart, and select the "More Options" option in the "Error Bars" section of the "Chart Elements" menu available when you select the chart.



4. Excel will automatically add horizontal error bars to the chart. In the "Horizontal Error Bar" menu, change the "Direction" to "Minus", and the "End Style" to "No Cap". We also want to select the "Percentage" option in the "Error Amount" area of the menu, and place a 100 in the box. This will create a horizontal error bar that goes to the left all the way to the y-axis, regardless of the data.



5. In the "Line" menu (the first option in this menu) change the "Begin Arrow type" to the circle and increase its size (if you like) in the "Begin Arrow size" menu just below. (You can also change the color in the "Line Color" menu.) (Note: Excel 2016 reversed how 'begin' and 'end' were defined, so if you've made this graph in an earlier version of Excel and opened it in Excel 2016, you'll notice that the circle is in the wrong position.)



6. Change the fill on the **blue** bars to "No Fill" by selecting the bars and selecting "No Fill" in the "Shape Fill" dropdown located in the "Format" menu on the ribbon.



### Final Version with Styling

# Lollipop



# Sparklines

Sparklines are a simple chart type that show small versions (or "small multiples") of graphs. Beginning with Excel 2010, Sparklines became a default option, available in the "Insert" tab of the ribbon.

Use the *Sparklines tab* in the *Advanced Data Visualizations with Excel* 2016 Hands-On.xlsx spreadsheet to create the chart.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Company 1	710	4	505	264	353	721	715	249	944	124	503 \
Company 2	358	978	415	300	446	305	910	126	769	841	106
Company 3	988	124	84	283	309	534	490	973	588	517	982
Company 4	701	329	733	981	641	94	416	937	526	357	253
Company 5	228	878	210	382	118	214	829	391	752	178	790 ////
Company 6	919	712	143	455	709	185	291	315	775	917	153
Company 7	954	196	932	108	224	997	264	228	200	411	421 1
Company 8	679	935	378	97	901	563	348	496	841	490	587
Company 9	535	430	96	935	805	356	687	598	547	472	80 • • • • • • • • • • • • • • • • • • •
Company 10	310	747	268	611	421	112	768	695	505	279	969 ////
Company 11	846	489	845	959	5	19	77	494	973	625	572
Company 12	677	369	626	628	226	305	863	157	389	289	802
Company 13	768	672	698	817	635	773	915	282	93	398	435
Company 14	388	951	453	106	838	778	717	556	621	39	381 .
Company 15	973	557	774	371	807	887	370	948	643	76	159

1. Select where you would like to place your Sparklines (though this could be done later too).

	А	В	С	D	E	F	G	Η	Ι	J	Κ	L	М
1		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
2	Company 1	710	670	630	590	550	510	470	430	390	350	310	
3	Company 2	358	358	359	361	362	364	366	367	369	369	370	
4	Company 3	988	993	996	999	1002	1009	1003	1002	998	995	992	
5	Company 4	701	601	501	401	301	351	401	451	501	357	253	
6	Company 5	228	229	229	229	230	230	231	232	232	233	233	
7	Company 6	919	310	305	107	44	36	29	11	6	3	3	
8	Company 7	954	940	932	508	400	996	264	228	200	411	421	
9	Company 8	679	935	378	97	901	563	348	496	841	490	587	
10	Company 9	535	430	96	935	805	756	687	598	547	472	80	
11	Company 10	310	263	233	192	255	193	24	63	218	268	290	
12	Company 11	846	886	926	966	400	700	750	800	850	900	950	
13	Company 12	250	500	700	880	960	850	725	550	300	400	600	
14	Company 13	768	778	760	817	700	773	793	813	833	800	750	
15	Company 14	388	951	453	106	838	778	717	556	621	39	381	
16	Company 15	973	557	774	371	807	887	370	948	643	76	159	
17													

2. Select the "Line" option in the "Sparklines" menu in the "Insert" tab on the ribbon.

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3	Company 2	358	358	359	361	362	364	366	367	369	369	370										
4	Company 3	988	993	996	999	1002	1009	1003	1002	998	995	992										
5	Company 4	701	601	501	401	301	351	401	451	501	357	253										
6	Company 5	228	229	229	229	230	230	231	232	232	233	233										
7	Company 6	919	310	305	107	44	36	29	11	6	3	3										
8	Company 7	954	940	932	508	400	996	264	228	200	411	421										
9	Company 8	679	935	378	97	901	563	348	496	841	490	587										
10	Company 9	535	430	96	935	805	756	687	598	547	472	80										
11	Company 10	310	263	233	192	255	193	24	63	218	268	290										
12	Company 11	846	886	926	966	400	700	750	800	850	900	950										
13	Company 12	250	500	700	880	960	850	725	550	300	400	600										
14	Company 13	768	778	760	817	700	773	793	813	833	800	750										
15	Company 14	388	951	453	106	838	778	717	556	621	39	381										
16 17	Company 15	973	557	774	371	807	887	370	<mark>9</mark> 48	643	76	159										

3. Select your data for the "Data Range:".

	A	В	С	D	E	F	G	Η	Ι	J	Κ	L	Μ	
1		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
2	Company 1	710	670	630	590	550	510	470	430	390	350	310		
3	Company 2	358	358	359	361	362	364	366	367	369	369	370		
4	Company 3	988	993	996	999	1002	1009	Create	Sparklin	es			? >	<
5	Company 4	701	601	501	401	301	351	Choose	the data t	that you v	vant			
6	Company 5	228	229	229	229	230	230	<u>D</u> ata R	ange: E	32:L16				Ť
7	Company 6	919	310	305	107	44	36	Choose	where yo	u want th	e sparklir	nes to be	placed	
8	Company 7	954	940	932	508	400	99 <del>6</del>	<u>L</u> ocatio	on Range	\$M\$2	\$M\$16			Ť
9	Company 8	679	935	378	97	901	563					ОК	Cancel	
10	Company 9	535	430	96	935	805	756	687	598	547	472	80		
11	Company 10	310	263	233	192	255	193	24	63	218	268	290		
12	Company 11	846	886	926	966	400	700	750	800	850	900	950		
13	Company 12	250	500	700	880	960	850	725	550	300	400	600		
14	Company 13	768	778	760	817	700	773	793	813	833	800	750		
15	Company 14	388	951	453	106	838	778	717	556	621	39	381		
16	Company 15	973	557	774	371	807	887	370	948	643	76	159		
17														

4. Hit OK and the Sparklines fill in.

	A	В	С	D	E	F	G	Η	Ι	J	K	L	М
1		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
2	Company 1	710	670	630	590	550	510	470	430	390	350	310	
3	Company 2	358	358	359	361	362	364	366	367	369	369	370	
4	Company 3	988	993	996	999	1002	1009	1003	1002	998	995	992	$\overline{}$
5	Company 4	701	601	501	401	301	351	401	451	501	357	253	$\searrow \checkmark$
6	Company 5	228	229	229	229	230	230	231	232	232	233	233	
7	Company 6	919	310	305	107	44	36	29	11	6	3	3	$\$
8	Company 7	954	940	932	508	400	996	264	228	200	411	421	$\sim$
9	Company 8	679	935	378	97	901	563	348	496	841	490	587	$\sim \sim$
10	Company 9	535	430	96	935	805	756	687	598	547	472	80	
11	Company 10	310	263	233	192	255	193	24	63	218	268	290	$\sim \sim$
12	Company 11	846	886	926	966	400	700	750	800	850	900	950	
13	Company 12	250	500	700	880	960	850	725	550	300	400	600	$\frown$
14	Company 13	768	778	760	817	700	773	793	813	833	800	750	$\sim$
15	Company 14	388	951	453	106	838	778	717	556	621	39	381	$\swarrow \checkmark \checkmark$
16	Company 15	973	557	774	371	807	887	370	948	643	76	159	$\sim\sim$
1.7													

5. Using the Sparkline Tools, you can format the color of the Sparklines (in the "Sparkline Color" drop down), add markers (in the "Show" tab), or even change the chart type to columns (in the "Type" tab).

6	<b>ൗ</b> ∂ -			Advance	d Data	Visualiza	ations w	ith Exce	2016 H	lands-O	n.xlsx -	Excel		Sparkline Too	ols			
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1		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010						
2	Company 1	710	670	630	590	550	510	470	430	390	350	310		<u> </u>				
3	Company 2	358	358	359	361	362	364	366	367	369	369	370		·				
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# Final Version with Styling

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Company 1	710	4	505	264	353	721	715	249	944	124	503 \
Company 2	358	978	415	300	446	305	910	126	769	841	106
Company 3	988	124	84	283	309	534	490	973	588	517	982
Company 4	701	329	733	981	641	94	416	937	526	357	253
Company 5	228	878	210	382	118	214	829	391	752	178	790 ////
Company 6	919	712	143	455	709	185	291	315	775	917	153
Company 7	954	196	932	108	224	997	264	228	200	411	421 1
Company 8	679	935	378	97	901	563	348	496	841	490	587
Company 9	535	430	96	935	805	356	687	598	547	472	80
Company 10	310	747	268	611	421	112	768	695	505	279	969 ////
Company 11	846	489	845	959	5	19	77	494	973	625	572 - 572
Company 12	677	369	626	628	226	305	863	157	389	289	802 ///
Company 13	768	672	698	817	635	773	915	282	93	398	435
Company 14	388	951	453	106	838	778	717	556	621	39	381
Company 15	973	557	774	371	807	887	370	948	643	76	159

# Gantt

The Gantt chart consists of horizontal lines or bars and is typically used as a schedule-tracking device to show the duration of different values or actions. It's easy to create a Gantt chart in Excel by simply highlighting cells in the spreadsheet, but Glenna Shaw shared a way to create a different style of Gantt chart using a line chart with markers. This Gantt chart has a slightly different look than the typical approach. Use the *Gantt* tab in the *Advanced Data Visualizations with Excel 2016 Hands-On.xlsx* spreadsheet to create the chart.



 The basic Gantt chart using filled-in spreadsheet cells is shown here. We are going to add data to those cells to plot them in a graph. Use the =ROW() formula to place the value of each row in the highlighted cell. You could also manually type in some values, but the ROW formula is a bit faster and easier to update.

SUN	x - 1	~	<i>fx</i> =	ROW() 🚽	-			
	А	В	С	D	Е	F	G	Η
1		Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17
2	Research Topic	2	=ROW()	+				
3	Write Outline		3	3				
4	Gather Resources	4	4	4				
5	<b>Design Presentation</b>			5	5	5		
6	Rehearse					6	6	6
7	Deliver							7
8								

2. Insert a Line with Markers chart using the data in cells A2:H8.



3. You'll notice that the order of the lines in the graph don't match the order of the data in the spreadsheet. As we've done before, format the yaxis so the order of the chart matches the order of the data by right-clicking the axis (or using the CTRL+1 keyboard shortcut) and check the box next to "Values in reverse order". Adjust the axis minimum to the lowest row number - 1 and maximum to the highest row number + 1 to use the full plot area of the chart.


4. We can delete some of the unnecessary chart elements such as the y-axis, horizontal gridlines, and legend.



5. We can add vertical gridlines by selecting the xaxis (now at the top of the chart), and selecting the Gridlines option in the Chart Elements menu that appears when you select the plus button to the right of the chart.



6. We are now going to add the labels to the chart. If you select the first (top) series, you'll notice that both points are selected. If you click again, only the first (left) point is highlighted; rightclick and select Add Data Label.



7. Click on the data label twice and right-click (or CTRL+1) and make two changes: select only the "Series Name" option under Label Options, and select the "Left" option in the bottom Label Position menu.



8. This first label doesn't look like it moved over to the left, but if you select the plot space (not the whole chart, just the space inside) you can shift it to the right and the label is now lined up to the left of the point. Now repeat the process for the other series.



9. One advantage of Excel 2016 is that you can adjust the size of the data label boxes. You may find, for example, that the "Design Presentation" label is wrapped on two lines. If you want this label to be on just one line, you can select the box and select it again—this will bring up empty circles around the box; selecting those will enable you to adjust the size of the text box.



10. You can also change the color of the labels to match the colors of your lines.



#### Final Version with Styling

### Gantt



### Heatmap

Heatmaps are typically used to show high-frequency data in a compact format. You might think of them as a table, but instead of showing the actual numbers, the heatmap shows colors.

25112.8

City	Cat1	Cat2	Cat3	Cat4	Cat5	Cat6	Cat/
San Francisco, CA							
Chicago, IL							
Jacksonville, FL							
San Jose, CA							
Austin, TX							
Fort Worth, TX							
San Antonio, TX							
Boston, MA							
Charlotte, NC						_	
Memphis, TN-MS-AR							
Seattle, WA							
Denver, CO							
New York, NY							
Nashville, TN							
Dallas, TX							
Houston, TX							
Indianapolis, IN						_	
Philadephia, PA							
Los Angeles, CA							
Washington, DC							
El Paso, TX							
Buffalo, NY							
Detroit, MI							
Columbus, OH							
Phoenix, AZ							
Baltimore, MD							
San Diego, CA							

This visualization is relatively easy to create using Excel's Conditional Formatting menu and then a little trick to hide the numbers. Use the *Heatmap tab* in the *Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet* to create the chart.

 The basic data for this example consists of 7 variables for 28 cities, laid out in a simple grid. We want to show frequency for each category.

Gridlines are turned off for this worksheet.

	А	В	С	D	Е	F	G	Н
1	City	Cat1	Cat2	Cat3	Cat4	Cat5	Cató	Cat7
2	New York, NY	20.61	5.02	15.59	2.15	44.94	1.27	27.08
3	Los Angeles, CA	19.52	5.28	14.24	2.30	39.81	1.98	25.73
4	Chicago, IL	46.61	11.35	35.27	4.05	108.88	2.83	61.98
5	Houston, TX	20.15	5.16	15.00	2.26	42.68	1.64	26.65
6	Philadephia, PA	20.40	4.30	16.10	2.05	41.30	1.55	26.16
7	Phoenix, AZ	14.03	3.51	10.52	0.98	21.18	2.09	17.98
8	San Antonio, TX	27.30	7.81	19.48	1.19	81.87	1.94	34.91
9	San Diego, CA	7.22	1.95	5.27	0.88	18.50	1.01	9.11
10	Dallas, TX	20.13	4.70	15.43	1.70	42.58	2.64	26.72
11	San Jose, CA	39.10	10.30	28.80	3.78	84.51	2.23	53.41
12	Jacksonville, FL	44.01	10.89	33.13	3.43	93.92	4.00	55.34
13	Indianapolis, IN	22.55	5.97	16.58	1.99	34.63	1.39	30.33
14	San Francisco, CA	46.26	11.33	34.92	6.10	141.40	3.87	59.49
15	Austin, TX	28.59	8.17	20.42	3.39	106.44	1.49	38.04
16	Columbus, OH	15.65	3.61	12.04	1.60	35.26	1.61	20.17
17	Fort Worth, TX	36.88	8.92	27.96	3.44	69.41	2.11	46.87
18	Charlotte, NC	29.41	7.49	21.92	1.99	44.38	2.88	36.23
19	Detroit, MI	18.57	4.25	14.33	0.94	32.97	1.76	24.23
20	El Paso, TX	17.86	4.34	13.52	2.17	36.00	1.82	23.00
21	Memphis, TN-MS-AR	26.36	6.70	19.66	2.50	51.44	1.74	35.38
22	Baltimore, MD	11.36	2.84	8.52	0.89	15.35	0.85	14.56
23	Boston, MA	28.55	7.03	21.52	3.29	74.57	1.89	35.13
24	Seattle, WA	24.15	5.85	18.30	2.41	58.04	1.68	32.90
25	Washington, DC	13.94	3.99	9.95	1.43	50.62	0.98	18.23
26	Nashville, TN	19.83	5.02	14.81	1.40	46.20	2.10	25.40
27	Denver, CO	17.99	5.35	12.64	2.53	74.49	1.05	22.54
28	Buffalo, NY	17.70	4.41	13.29	2.27	35.16	1.68	24.09

- 2. To add color to the cells using Conditional Formatting, select the first category (cells B2:B28) and open the "Color Scales" option in the Conditional Formatting dropdown found in the "Home" tab. Select the "More Rules..." option.
- If you wanted to show frequency for the entire table instead of by category, you could select your data and choose one of Excel's predefined color scale options.

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	A	В	С	D	E	F	G	Η	K L M	
1	City	Cat1	Cat2	Cat3	Cat4	Cat5	Cat6	Cat7		
2	New York, NY	20.61	5.02	15.59	2.15	44.94	1.27	27.08	Data Bars	
3	Los Angeles, CA	19.52	5.28	14.24	2.30	39.81	1.98	25.73		
4	Chicago, IL	46.61	11.35	35.27	4.05	108.88	2.83	61.00	🖌 🧧 Color <u>S</u> cales 🔹 📑 📑	
5	Houston, TX	20.15	5.16	15.00	2.26	42.68	1.64	20.65		
6	Philadephia, PA	20.40	4.30	16.10	2.05	41.30	1.55	26.16	Icon Sets	
7	Phoenix, AZ	14.03	3.51	10.52	0.98	21.18	2.09	17.98		
8	San Antonio, TX	27.30	7.81	19.48	1.19	81.87	1.94	34.91	New Rule	
9	San Diego, CA	7.22	1.95	5.27	0.88	18.50	1.01	9.11	Clear Rules More Rules	
10	Dallas, TX	20.13	4.70	15.43	1.70	42.58	2.64	26.72	Le Celar Adres	
11	San Jose, CA	39.10	10.30	28.80	3.78	84.51	2.23	53.41	Manage Rules	es
12	Jacksonville, FL	44.01	10.89	33.13	3.43	93.92	4.00	55.34		
13	Indianapolis, IN	22.55	5.97	16.58	1.99	34.63	1.39	30.33		
14	San Francisco, CA	46.26	11.33	34.92	6.10	141.40	3.87	59.49		
15	Austin, TX	28.59	8.17	20.42	3.39	106.44	1.49	38.04		
16	Columbus, OH	15.65	3.61	12.04	1.60	35.26	1.61	20.17		
17	Fort Worth, TX	36.88	8.92	27.96	3.44	69.41	2.11	46.87		
18	Charlotte, NC	29.41	7.49	21.92	1.99	44.38	2.88	36.23		
19	Detroit, MI	18.57	4.25	14.33	0.94	32.97	1.76	24.23		
20	El Paso, TX	17.86	4.34	13.52	2.17	36.00	1.82	23.00		
21	Memphis, TN-MS-AR	26.36	6.70	19.66	2.50	51.44	1.74	35.38		
22	Baltimore, MD	11.36	2.84	8.52	0.89	15.35	0.85	14.56		
23	Boston, MA	28.55	7.03	21.52	3.29	74.57	1.89	35.13		
24	Seattle, WA	24.15	5.85	18.30	2.41	58.04	1.68	32.90		
25	Washington, DC	13.94	3.99	9.95	1.43	50.62	0.98	18.23		
26	Nashville, TN	19.83	5.02	14.81	1.40	46.20	2.10	25.40		
27	Denver, CO	17.99	5.35	12.64	2.53	74.49	1.05	22.54		
28	Buffalo, NY	17.70	4.41	13.29	2.27	35.16	1.68	24.09		

3. In the resulting menu, you can select the colors you would like to use. It is customary to use lighter colors for smaller values, and darker colors for larger values. Select the colors in the "Color:" dropdown menu. Click OK.

	А	В	G	Н							
1	City	Cat1									
2	New York, NY	20.61	New FO	rmatting Rule				?	~		
3	Los Angeles, CA	19.52	Select a	Rule Type:							
4	Chicago, IL	46.61									
5	Houston, TX	20.15	- Form								
6	Philadephia, PA	20.40	Eorr								
7	Phoenix, AZ	14.03	E Form	at only top of bo	at are above or l	nelow average					
8	San Antonio, TX	27.30	Form	nat only unique o	r duplicate value	s					
9	San Diego, CA	7.22	► Use	a formula to dete	rmine which cell	s to format					
10	Dallas, TX	20.13									
11	San Jose, CA	39.10	Edit the	Rule Description:							
12	Jacksonville, FL	44.01	Format	t all cells based	on their values:						
13	Indianapolis, IN	22.55	F <u>o</u> rmat	Style: 2-Color	Scale						
14	San Francisco, CA	46.26		Minimum			Maxin				
15	Austin, TX	28.59		I anna at Malva			Viaxin	at Malua			
16	Columbus, OH	15.65	Tybe:	Lowest value	~		Highe				
17	Fort Worth, TX	36.88	<u>V</u> alue:	(Lowest value)	Î		(High	(Highest value)			
18	Charlotte, NC	29.41	Color:		~						
19	Detroit, MI	18.57	Provio	Theme Colo	rs						
20	El Paso, TX	17.86	Flevier								
21	Memphis, TN-MS-AR	26.36					ОК	Can	icel		
22	Baltimore, MD	11.36									
23	Boston, MA	28.55	7.03		Blue-Gray, Aco	cent 1, Lighter 8	80% 1.89	35.13	3		
24	Seattle, WA	24.15	5.85			58.04	1.68	32.90	)		
25	Washington, DC	13.94	3.99	Standard Co	olors	50.62	0.98	18.23	3		
26	Nashville, TN	19.83	5.02			46.20	2.10	25.40	)		
27	Denver, CO	17.99	5.35	Recent Colo	rs	74.49	1.05	22.54	4		
28	Buffalo, NY	17.70	4.41			35.16	1.68	24.09	)		
29				More Co	olors						
30						_					

	А	В	С	D	Е	F	G	H
1	City	Cat1	Cat2	Cat3	Cat4	Cat5	Cató	Cat7
2	New York, NY	20.61	5.02	15.59	2.15	44.94	1.27	27.08
3	Los Angeles, CA	19.52	5.28	14.24	2.30	39.81	1.98	25.73
4	Chicago, IL	46.61	11.35	35.27	4.05	108.88	2.83	61.98
5	Houston, TX	20.15	5.16	15.00	2.26	42.68	1.64	26.65
6	Philadephia, PA	20.40	4.30	16.10	2.05	41.30	1.55	26.16
7	Phoenix, AZ	14.03	3.51	10.52	0.98	21.18	2.09	17.98
8	San Antonio, TX	27.30	7.81	19.48	1.19	81.87	1.94	34.91
9	San Diego, CA	7.22	1.95	5.27	0.88	18.50	1.01	9.11
10	Dallas, TX	20.13	4.70	15.43	1.70	42.58	2.64	26.72
11	San Jose, CA	39.10	10.30	28.80	3.78	84.51	2.23	53.41
12	Jacksonville, FL	44.01	10.89	33.13	3.43	93.92	4.00	55.34
13	Indianapolis, IN	22.55	5.97	16.58	1.99	34.63	1.39	30.33
14	San Francisco, CA	46.26	11.33	34.92	6.10	141.40	3.87	59.49
15	Austin, TX	28.59	8.17	20.42	3.39	106.44	1.49	38.04
16	Columbus, OH	15.65	3.61	12.04	1.60	35.26	1.61	20.17
17	Fort Worth, TX	36.88	8.92	27.96	3.44	69.41	2.11	46.87
18	Charlotte, NC	29.41	7.49	21.92	1.99	44.38	2.88	36.23
19	Detroit, MI	18.57	4.25	14.33	0.94	32.97	1.76	24.23
20	El Paso, TX	17.86	4.34	13.52	2.17	36.00	1.82	23.00
21	Memphis, TN-MS-AR	26.36	6.70	19.66	2.50	51.44	1.74	35.38
22	Baltimore, MD	11.36	2.84	8.52	0.89	15.35	0.85	14.56
23	Boston, MA	28.55	7.03	21.52	3.29	74.57	1.89	35.13
24	Seattle, WA	24.15	5.85	18.30	2.41	58.04	1.68	32.90
25	Washington, DC	13.94	3.99	9.95	1.43	50.62	0.98	18.23
26	Nashville, TN	19.83	5.02	14.81	1.40	46.20	2.10	25.40
27	Denver, CO	17.99	5.35	12.64	2.53	74.49	1.05	22.54
28	Buffalo, NY	17.70	4.41	13.29	2.27	35.16	1.68	24.09

The column will now be shaded with the colors selected.

4. Repeat the process separately for the remaining columns.

	А	В	С	D	Е	F	G	Н
1	City	Cat1	Cat2	Cat3	Cat4	Cat5	Cató	Cat7
2	New York, NY	20.61	5.02	15.59	2.15	44.94	1.27	27.08
3	Los Angeles, CA	19.52	5.28	14.24	2.30	39.81	1.98	25.73
4	Chicago, IL	46.61	11.35	35.27	4.05	108.88	2.83	61.98
5	Houston, TX	20.15	5.16	15.00	2.26	42.68	1.64	26.65
6	Philadephia, PA	20.40	4.30	16.10	2.05	41.30	1.55	26.16
7	Phoenix, AZ	14.03	3.51	10.52	0.98	21.18	2.09	17.98
8	San Antonio, TX	27.30	7.81	19.48	1.19	81.87	1.94	34.91
9	San Diego, CA	7.22	1.95	5.27	0.88	18.50	1.01	9.11
10	Dallas, TX	20.13	4.70	15.43	1.70	42.58	2.64	26.72
11	San Jose, CA	39.10	10.30	28.80	3.78	84.51	2.23	53.41
12	Jacksonville, FL	44.01	10.89	33.13	3.43	93.92	4.00	55.34
13	Indianapolis, IN	22.55	5.97	16.58	1.99	34.63	1.39	30.33
14	San Francisco, CA	46.26	11.33	34.92	6.10	141.40	3.87	59.49
15	Austin, TX	28.59	8.17	20.42	3.39	106.44	1.49	38.04
16	Columbus, OH	15.65	3.61	12.04	1.60	35.26	1.61	20.17
17	Fort Worth, TX	36.88	8.92	27.96	3.44	69.41	2.11	46.87
18	Charlotte, NC	29.41	7.49	21.92	1.99	44.38	2.88	36.23
19	Detroit, MI	18.57	4.25	14.33	0.94	32.97	1.76	24.23
20	El Paso, TX	17.86	4.34	13.52	2.17	36.00	1.82	23.00
21	Memphis, TN-MS-AR	26.36	6.70	19.66	2.50	51.44	1.74	35.38
22	Baltimore, MD	11.36	2.84	8.52	0.89	15.35	0.85	14.56
23	Boston, MA	28.55	7.03	21.52	3.29	74.57	1.89	35.13
24	Seattle, WA	24.15	5.85	18.30	2.41	58.04	1.68	32.90
25	Washington, DC	13.94	3.99	9.95	1.43	50.62	0.98	18.23
26	Nashville, TN	19.83 5.02 14		14.81	1.40	46.20	2.10	25.40
27	Denver, CO	17.99 5.35 12.64 2.53				74.49	1.05	22.54
28	Buffalo, NY	17.70	4.41	13.29	2.27	35.16	1.68	24.09

5. The last task is to hide the numbers. You can't delete them because the shading would then disappear, and you can't turn them to white (to match the background) because they would then show through the colors. Instead, it's a small formatting trick. Highlight the 7 columns of data and rightclick (or use the CTRL-1 keyboard shortcut) to select "Format Cells".

Fi	le Home Insert	Page Layout	Formulas	Data Revie	ew View	X	Cut	О т	" <del>m</del> e v	vhat yo
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	Α	В	С	D	E		Insert			
1	City	Cat1	Cat2	Cat3	Cat4		Delete		ať	7
2	New York, NY	20.61	5.02	15.59	2.15		<u>Class Castanta</u>		.03	8
3	Los Angeles, CA	19.52	5.28	14.24	2.30		Clear Contents		.73	3
4	Chicago, IL	46.61	11.35	35.27	4.05	1	Quick Analysis		.98	
5	Houston, TX	20.15	5.16	15.00	2.26		Filt <u>e</u> r		, .6:	5
6	Philadephia, PA	20.40	4.30	16.10	2.05		Sort		.10	5
7	Phoenix, AZ	14.03	3.51	10.52	0.98		3 <u>0</u> 11		.98	3
8	San Antonio, TX	27.30	7.81	19.48	1.19	τ	Insert Commen	t	.9	
9	San Diego, CA	7.22	1.95	5.27	0.88	:=	Format Cells		.1	
10	Dallas, TX	20.13	4.70	15.43	1		Pick From Dron	down List	.72	2
11	San Jose, CA	39.10	10.30	28.80	3.78			-down List	.4	
12	Jacksonville, FL	44.01	10.89	33.13	3.43		Define Name		.34	-
13	Indianapolis, IN	22.55	5.97	16.58	1.99		L <u>i</u> nk		.3.	3
14	San Francisco, CA	46.26	11.33	34.92	6.10		Additional Cell	Actions	- 49	
15	Austin, TX	28.59	8.17	20.42	3.39	_	Additiona <u>i</u> Cell	Actions	.04	1
16	Columbus, OH	15.65	3.61	12.04	1.60		35.26	1.61	20.1	
1/	Fort Worth, TX	36.88	8.92	27.96	3.44	Tim	es Ne - 11 -	A`A`\$ ▪	% \$	$\leftrightarrow$
18	Charlotte, NC	29.41	7.49	21.92	1.99	В	$I \equiv \Delta \cdot A$	▼ .00	.00 ┥	5
19	Detroit, MI	18.57	4.25	14.33	0.94	-	26.00	1.00		
20	El Paso, TX	17.86	4.34	13.52	2.17		36.00	1.82	23.00	
21	Memphis, TN-MS-AR	26.36	6.70	19.66	2.50		51.44	1.74	35.3	5
22	Baltimore, MD	11.36	2.84	8.52	0.89		15.35	0.85	14.50	2
23	Boston, MA	28.55	7.03	21.52	3.29		74.57	1.89	35.1	5
24	Seattle, WA	24.15	5.85	18.30	2.41		58.04	1.68	32.9	
25	Washington, DC	13.94	3.99	9.95	1.43		50.62	0.98	18.2	5
26	Nashville, TN	19.83	5.02	14.81	1.40		46.20	2.10	25.40	)
2/	Denver, CO	17.99	5.35	12.64	2.53		74.49	1.05	22.54	ł
28	Buttalo, NY	17.70	4.41	13.29	2.27		35.16	1.68	24.09	1

6. Select the "Custom" option at the bottom of the "Category:" menu. Type 3 semicolons (;;;) in the "Type:" box.

	Clippoard			N.	A	uanment		Num		
B2	• : ×	√ fx	Format Cells							? ×
	A	В	Number	Alignment	Font	Border	Fill	Protection		
1	City	Cat1	<u>C</u> ategory:							
2	New York, NY	20.61	General		^ S	ample				
3	Los Angeles, CA	19.52	Currency							
4	Chicago, IL	46.61	Accounting		Typ	e:				
5	Houston, TX	20.15	Date		;;;					
6	Philadephia, PA	20.40	Percentage		G	eneral				^
7	Phoenix, AZ	14.03	Fraction		0					
8	San Antonio, TX	27.30	Scientific		0.	00 ##0				
9	San Diego, CA	7.22	Special		#,	##0.00				
10	Dallas, TX	20.13	Custom		#,	##0_);(#,##0)				
11	San Jose, CA	39.10			#,	##0_);[Red](#,#= ##0_00_):(# ##0	#0) 00)			
12	Jacksonville, FL	44.01			#,	##0.00_);[Red](#	#,##0.00)			
13	Indianapolis, IN	22.55			\$#	;##0_);(\$#,##0)	# # 00			
14	San Francisco, CA	46.26			24	;,##0_);[Red](\$#	,##0)			
15	Austin, TX	28.59			$\sim$				D	elete
16	Columbus, OH	15.65								
17	Fort Worth, TX	36.88	Type the nur	nber format (	code, usin <u>c</u>	one of the exis	sting codes as a	a starting point.		
18	Charlotte, NC	29.41								
19	Detroit, MI	18.57								
20	El Paso, TX	17.86								
21	Memphis, TN-MS-AR	26.36								
22	Baltimore, MD	11.36						OK		Cancel
23	Boston, MA	28.55	7.03	21	.52	3.29	74.57	1.89	35.13	
24	Seattle, WA	24.15	5.85	18	.30	2.41	58.04	1.68	32.90	
25	Washington, DC	13.94	3.99	9 9	.95	1.43	50.62	0.98	18.23	
26	Nashville, TN	19.83	5.02	2 14	.81	1.40	46.20	2.10	25.40	
27	Denver, CO	17.99	5.35	12	.64	2.53	74.49	1.05	22.54	
28	Buffalo, NY	17.70	4.41	. 13	.29	2.27	35.16	1.68	24.09	
20										

Press OK. This number format hides the 7. numbers; they are still in the cells and can be used and manipulated, and the colors remain. City

- To make your heat map even easier to understand,
  - Average the category numbers by city and sort largest to smallest, or
  - Sort by city name, or
  - Sort by state.



## Final Version with Styling

City	Cat1	Cat2	Cat3	Cat4	Cat5	Cat6	Cat7
San Francisco, CA							
Chicago, IL							
Jacksonville, FL							
San Jose, CA							
Austin, TX						_	
Fort Worth, TX							
San Antonio, TX							
Boston, MA							
Charlotte, NC							
Memphis, TN-MS-AR							
Seattle, WA							
Denver, CO							
New York, NY							
Nashville, TN							
Dallas, TX							
Houston, TX							
Indianapolis, IN							
Philadephia, PA							
Los Angeles, CA							
Washington, DC							
El Paso, TX							
Buffalo, NY							
Detroit, MI							
Columbus, OH							
Phoenix, AZ							
Baltimore, MD							
San Diego, CA							

# **Diverging Bars**

Diverging bar charts are great for showing the differences of negative and positive values, such as Strongly Agree to Strongly Disagree. Because they align around a central (neutral) value, it can be clearer to show these categories diverging from a single midpoint. Use the *DivergingBars tab* in the *Advanced Data Visualizations with Excel* 2016 Hands-On.xlsx spreadsheet to create the chart.



1. Create a stacked bar chart using cells A1:G4. You'll notice that Excel creates the chart along the columns, but we want to plot the data along the rows. (You can also select the second option on the right when you initially insert the chart.)



2. To switch this, select the "Switch Row/Column" button in the "Design" tab of the ribbon.



3. The "Dummy" series are just used as fillers, so set the "Fill" on those series to "No Fill" using the "Shape Fill" menu in the "Format" tab of the ribbon.



4. Add data labels to each series by right-clicking and selecting the "Add Data Labels..." option from the menu.



5. Change the range of the x-axis (again, by rightclicking or CTRL-1) to .5 for minimum and 2 for maximum to use more of the space. You can also delete the x-axis because the x-axis labels are essentially meaningless.



6. Move the Legend to the top of the chart. Remove the "Dummy" series labels by individually selecting and deleting them.



7. Finally, recolor the series as you wish, with different color palettes for either side.



If you wish to place the "Group" labels closer to the chart, you can label the first "Dummy" series; right-click (or CTRL-1) on that series, and change the "Label Contains" option to "Category Name" and place the "Label Position" at the "Inside End". Then delete the vertical axis.



You can also add a vertical bar at the midpoint by adding a scatterplot to the chart. Right-click on the chart and choose "Select Data" from the menu. Add the new series ("Vertical" in row 23) and change to a scatterplot (see some of the other tutorials on how to do so). This new scatterplot will be pegged to the "Secondary Axis", so you just need to modify the secondary horizontal and vertical axes to place the point in the correct position. Once positioned, add a vertical error bar (see some of the other tutorials on how to do so).



#### Final Version with Styling

**Diverging Bars** 



## **Tile Grid Map**

In a Tile Grid Map, the map areas are given a uniform size and shape—usually a square—and are arranged to approximate their real-world position. They can be constructed fairly easily in Excel after some upfront time with cell formatting and formula building. Use the *TileGrid tab* in the *Advanced Data Visualizations with Excel* 

2016 Hands-On.xlsx spreadsheet to create the chart. I have included a final, formatted version of the Tile Grid Map in the *FinalTileGrid tab* of the file so that you don't need to do some of the tedious retyping.



	A B	C	D	E	F	G	Η	Ι	J	K	L
1	Title	e of t	he M	ap G	oes H	lere					
2 3		Grou	p one		Group	o two					
4	AK										ME
5						WI				VT	NH
6	WA	ID	MT	ND	MN	IL	MI		NY	MA	
7	OR	NV	WY	SD	IA	IN	ОН	PA	NJ	СТ	RI
8	CA	UT	со	NE	МО	KY	WV	VA	MD	DE	
9		AZ	NM	KS	AR	ΤN	NC	SC	DC		
10				OK	LA	MS	AL	GA			
11	н			ΤХ					FL		

The map is set up by typing the abbreviation of each state name in the appropriate cell. I've already done this part for you. 1. Change to the Page Layout by selecting the "Page Layout" button in the "View" tab of the ribbon. This sets the row and column

measurements to inches. Size the cells into squares (I set the row and column widths to 0.5 inches). Either grab the columns (and then rows) and change the width with your mouse, or right-click on the columns (and then rows) and select the "Column Width..." (or "Row Height...") option. Change back to Normal view or continue to work in Page Layout if preferred.



In the Excel file, the map is located in the left side of the worksheet and the data table is located to the right in columns O and P. To the right of the data table is another cell that calculates the median value of the series (using the MEDIAN formula); this measure splits the data into the two groups.

One group is greater than the median and the other group is less than or equal to the median. For each state in the map, the cell needs to point to the appropriate point in the data column. For example, the state cell for Alaska in the map (cell B<sub>4</sub>) will need to point to cell P<sub>2</sub> (e.g., '=P<sub>2</sub>').

C31	$C31$ $\checkmark$ $Jx$																	
A	В	С	D	E	F	G	Н	Ι	J	K	L M	N	Ο	Р	Q	R	S	Т
1	Titl	e of	the N	Лар	Goe	s He	ere						Alabama	4,833,722				
2 3		Grou	p one		Grou	p two							Alaska Arizona	735,132 6,626,624		Median	4,395,295	
4	AK										ME		Arkansas	2,959,373				
5						WI				VT	NH		California	38,332,521				
6	WA	ID	MT	ND	MN	IL	MI		NY	MA			Colorado	5,268,367				
7	OR	NV	WY	SD	IA	IN	ОН	PA	NJ	СТ	RI		Connecticut	3,596,080				
8	CA	UT	со	NE	МО	KY	WV	VA	MD	DE			Delaware	925,749				
9		AZ	NM	KS	AR	ΤN	NC	SC	DC				District of Columbia	646,449				
10				OK	LA	MS	AL	GA					Florida	19,552,860				
11	н			ΤХ					FL				Georgia	9,992,167				

2. To get the state abbreviations in the cell and not the data value from the formula, apply a Custom Number Format for each state. You need to do this one state at a time. For example, select Alaska, and right-click (or CTRL-1). In the "Format Cells" menu, go to the "Custom" option and type in "AK". This custom label hides the number and replaces it with the "AK" abbreviation. Repeat for every state.



3. For each state in the map, the cell needs to point to the appropriate cell in the data column on the right. Select the state cell for Alaska, in the formula bar type = and then click on cell P2 in the data table to map it to Alaska's value. Hit enter. Map all the states to their respective values in the data column.



4. Excel's Conditional Formatting menu is used to set the colors in the map based on the number of groups you want to show (above the median, fill the cell with a **dark blue**; below the median, fill it with **light blue**). To apply it here, select the entire map and select the "New Rule" option in the Conditional Formatting menu.


5. We first add the formula for the blank cells. Select the second option in the "New Formatting Rule" menu, choose Blanks in the Format only cells with: drop down, and format those cells (using the "Format" button) to fill with a white color.



- 6. We next add the formatting for the data values. Add two more conditional formatting rules as follows:
  - a. Format only cells that contain cell values less than or equal to \$\$\$2 with orange fill and black text
  - b. Format only cells that contain cell values greater than \$\$\$2 with blue fill and white text
  - You can choose different fill and text colors. I've used shades of blue as my example colors.

New Formatting Rule		? ×		
<u>S</u> elect a Rule Type:				
Format all cells based on their values				
► Format only cells that contain				
- Format only top or bottom ranked values				
- Format only values that are above or bel	ow average			
Format only unique or duplicate values	-			
- Use a formula to determine which cells to	oformat			
Edit the Rule Description:				
Format only cells with:				
	to v toto			
Cell value ess than or equal	=\$\$\$2			
Preview: AaBbCcYyZz	<u>F</u> ormat			
	ОК	Cancel		
	New Formatting Rule			? ×
	Select a Rule Type:			
	Format all cells based on their values			
	Format only cells that contain			
	Format only top or bottom ranked value	Jes		
	Format only values that are above or b	elow average		
	► Format only unique or duplicate values			
	Use a formula to determine which cells	to format		
	Edit the Rule Description:			
	Format only cells with:			
	Cell Value v greater than	✓ =\$	S\$2	Î
	Preview: AaBbCcYyZz	<u>E</u> c	ormat	
			ОК	Cancel
L				

7. The order of these formulas *does* matter. You want the white (blank) formula to appear first; you can do so by selecting the map cells, selecting Manage Rules from the Conditional Formatting menu, selecting that rule and using the up arrow in the formula bar.

iat you want to do				
	Normal			
Conditional Format as	Norma			
Highlight Cells	Rules 🕨			
C Top/Bottom R	iles 🕨			
<u>D</u> ata Bars	۶.			
Color <u>S</u> cales	۶.			
Icon Sets	Þ			
i 🧮 New Rule				
Elear Rules	Conditional Formatting Rule	es Manager		? ×
Manage <u>R</u> ules	Show formatting rules for: Cu	rrent Selection		
	📄 <u>N</u> ew Rule 📝 <u>E</u> dit	Rule X Delete Rule	▲ <b>▼</b>	
	Rule (applied in order shown)	Format	Applies to	Stop If True
	Cell Value > \$S\$2	AaBbCcYyZz	=\$B\$4:\$L\$11	1 🗆
	Cell Value <= \$S\$2	AaBbCcYyZz	=\$B\$4:\$L\$11	<b>1</b>
	Cell contains a blank val	AaBbCcYyZz	=\$B\$4:\$L\$11	<b>1</b>
	1			
			ОК	Close Apply

You can change the cutoff value from the median to something else by changing the formula in that cell.



8. Finish by formatting the title and legend as desired.



# **Final Version with Styling**



# Marimekko

The Marimekko chart encodes two variables: one along the height of the vertical axis and another along the width of the columns. The basic approach of this chart is to create a column chart with 100 columns, repeating values as necessary. We'll group the data to make it easier to color each series separately instead of having to select and recolor each of the 100 columns. This will require working with a number of formulas, but it will be more flexible in the end. Use the *Marimekko tab* in the *Advanced Data Visualizations with Excel 2016 Hands-On.xlsx spreadsheet* to create the chart.



Item#	% Purchased	% of Total
Item 1	45%	10%
Item 2	38%	18%
Item 3	32%	10%
Item 4	27%	5%
Item 5	22%	7%
Item 6	18%	25%
Item 7	14%	5%
Item 8	10%	5%
Item 9	8%	5%
Item 10	4%	10%

The data for this example consists of 10 items and for each item we have the percent purchased (% *Purchased*). We also have the share of the total sold for each item (% of Total), which sums to 100%. For the Marimekko chart, we'll put % *Purchased* along the vertical axis and % of Total on the horizontal axis.

The data are found in columns B and C; the rest of the worksheet is constructed to build the graph, and much of it repeats so that we can use the VLOOKUP formula. This version of the Marimekko uses rounded data values; if your data have decimals, simply multiply everything by 10 or 100 and use 1,000 or 10,000 columns in the chart.

# Setting up the Data

### COLUMN 1 [E]

Create a new column for the % of *Total* variable, but change it from a percentage to an integer. You could copy and paste the original data and change the format of the new cells (select the cells and right-click or use the CTRL-1 keyboard shortcut), or use a formula  $[E_5=C_5*100]$  so that the data can be easily updated.

### COLUMN 2 [F]

Create a *Count* variable that denotes the cumulative count of each item. We'll start with the number 1, which is hard-coded in cell F<sub>3</sub>. A simple formula [F6=F5+E5, F7=F6+E6, ...] sets the number of cells for each value. Thus, the first *Item* will ultimately be represented by the 1<sup>st</sup> through 10<sup>th</sup> columns; the second *Item* starts with the 11<sup>th</sup> column; and so on.

#### COLUMN 3 [G]

Repeat the % *Purchased* series; again, the formula  $[G_5=B_5]$  will make it easier to update if the data change.

			L	1	G
<b>finitions Summary</b> up OKUPs r Chart			Convert % of Total from % to Number	Create Count variable (cumulative # obs)	Repeat % Purchased variable
			1	2	3
% Purchased %	of Total		% of Total	Count	% Purchased
45%	10%		10	1	45%
38%	18%	ſ	-C5*100 18	11	=B5 38%
32%	10%	<u> </u>	10	-55+55 29	32%
27%	5%		5	39	27%
22%	7%		7	44	22%
18%	25%		25	51	18%
14%	5%		5	76	14%
10%	5%		5	81	10%
8%	5%		5	86	8%
4%	10%		10	91	4%

# COLUMN 4 [I]

Repeat the *Count* variable [I<sub>5</sub>=F<sub>5</sub>]. (Note: Column H is left blank to simply separate the groups of data.)

# Column 5 [J]

Simple *Item* # here, counting up from 1 to 10.

## Column 6 [L]

Repeat the *Item* # series [L<sub>5</sub>=J<sub>5</sub>]. (Note: Column K is left blank to simply separate the groups of data.)

# Column 7 [M]

Repeat the % *Purchased* variable [M5=G5]

F	G	Η	I	J	Κ	L	Μ
Create Count variable (cumulative # obs)	Repeat % Purchased variable		Repeat Count variable	Counter for Item Number (just pulling out label)		Repeat Item Number variable	Repeat % Purchased variable
2	3		4	5		6	7
Count	% Durahasad		Count	Itom#		Itom#	% Durchasad
Count	70 Furchased		Count	1		110-11#	70 Furchased
1	45%			1			45%
11	38%		=F5 11	2		=J5 4	=G5 38%
29	32%		29	3		3	32%
39	27%		39	4		4	27%
44	22%		44	5		5	22%
51	18%		51	6		6	18%
76	14%		76	7		7	14%
81	10%		81	8		8	10%
86	8%		86	9		9	8%
91	4%		91	10		10	4%

#### Column 8 [O]

You can think of starting to build the chart by setting up this column first. This *Counter* simply counts from 1 to 100. Don't type this manually—type a "1" in cell O4 and then the formula  $[O_5=O_4+1]$  in the cell just below and drag it down to row 103.

# [Column 9 [P]

We'll use a VLOOKUP formula to bring over the data for the chart. In cell P4, we put =VLOOKUP(O4,\$I\$5:\$J\$14,2,1) and drag it down to row 103.

#### [Column 10 [Q]

In cell Q4, we put =VLOOKUP(O4,\$F\$5:\$G\$14,2,1) and drag it down to row 103.

I	J	Κ	L	Μ	Ν	O	P	Q
Repeat Count variable	Counter for Item Number (just pulling out label)		Repeat Item Number variable	Repeat % Purchased variable		Counter: 1 to 100	VLOOKUP: Use column 4 and 5 to create labels	VLOOKUP: Use column 2 and 3 to stretch out the % Purchased variable
4	5		6	7		8	9	10
						Counter	Item #	% Purchased
Count	Item#		Item#	% Purchase	=04	I+1 1	1	45%
1	1		1	45%		2	1	45%
11	2		2	38%		3		45%
29	3		3	32%	=\	/LOOKUP(04,\$I\$	5:\$J\$14,2,1)	45%
39	4		4	27%	-	5	1	45%
44	5		5	22%		=VL	.00KUP(04,\$F\$	5:\$G\$14,2,1) 🔓
51	6		6	18%			1	45%
76	7		7	14%		8	1	45%
81	8		8	10%		9	1	45%
86	9		9	8%		10	1	45%
91	10		10	4%		11	2	38%
						12	2	38%
						13	2	38%
						14	2	38%
						15	2	38%
						16	2	38%
						17	2	38%
						18	2	38%
						19	2	38%
						20	2	3.8%

### How the Formula Works

=VLOOKUP(O4,

\$F\$5:\$G\$14,

2,

1)

#### =VLOOKUP(O4,

This is the thing we look up. We are going to match each entry in this *Counter* series to another look-up table to pull out corresponding values.

#### \$F\$5:\$G\$14

We're going to query the data we created earlier that consists of the *Count* and *Item* # data in columns I and J. VLOOKUP matches the first argument in the VLOOKUP formula to the first column in the I-J table, which is why we needed to order things the way we did in the first set of steps. (The dollar signs (\$) act as the absolute references so that we can copy and paste this formula without changing the cell references.)

#### 2

This corresponds to the column number we want to extract, so this refers to the *Item* # data in column J.

This is the "*range\_lookup*" value and tells Excel we want an "approximate match" of the value in cell O<sub>3</sub> instead of an "exact match." It's good practice to specify this argument whenever you use VLOOKUP. This is the key part of the formula for this exercise. What the approximate match does, is only fill in those cells for which the lookup value (in column I) does not exceed the lookup reference (the *Counter* series). Thus, you'll notice how the values in column P equal the first item number for the first 10 entries and then, starting on the 11<sup>th</sup> entry, starts with the second item number.

In sum, this VLOOKUP queries the *Counter* series and pulls out the *Item* # from Column J to denote each series that will populate the chart.

## COLUMNS 11-20 [R-AA]

We're going to create 10 different data series (one for each *Item*) so that we can add them all to one chart and then color each by simply grabbing the entire group. The numbers at the top of the series (in Row 2) are important here and correspond to each *Item Number*. This

formula is a little complicated, but once it's inserted into the first column, we can just drag it horizontally and vertically.

## So, in cell Q<sub>3</sub>, we have =IF(\$P4=R\$3,VLOOKUP(\$P4,\$L\$5:\$M\$14,2,1),o)

О	Р	Q	R	S	Т	U	V	W	Х	Y	Ζ	AA
Counter: 1 to 100	VLOOKUP: Use column 4 and 5 to create labels	VLOOKUP: Use column 2 and 3 to stretch out the % Purchased variable	VLOOKUP: Use c Row 3 labels corre	olumn 6 and 7 to f sponds to each Ite	ill in the different m number	series						
8	9	10	11	12	13	14	15	16	17	18	19	20
Counter	Item #	% Purchased	1	2	3	4	5	6	7	8	9	10
1	1	45%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2	1	45%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%
				0%	0%	0%	0%	0%	0%	0%	0%	0%
=IF	(\$P4=R\$3,VLOO	KUP(\$P4,\$L\$5:\$I	M\$14,2,1),0)	0%	0%	0%	0%	0%	0%	0%	0%	0%
5	1	45%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	1	45%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%
7	1	45%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%
8	1	45%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%
9	1	45%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10	1	45%	45%	0%	0%	0%	0%	0%	0%	0%	0%	0%
11	2	38%	0%	38%	0%	0%	0%	0%	0%	0%	0%	0%
12	2	38%	0%	38%	0%	0%	0%	0%	0%	0%	0%	0%
13	2	38%	0%	38%	0%	0%	0%	0%	0%	0%	0%	0%
14	2	38%	0%	38%	0%	0%	0%	0%	0%	0%	0%	0%

### Let's Break It Down Again

=IF(\$P4=R\$3,

#### VLOOKUP(\$P4,\$L\$5:\$M\$14,2,1),

0)

#### =IF(\$P4=R\$3,

To start, the *IF* statement evaluates the first argument, here \$P<sub>4</sub>=R\$3. We're simply comparing the *Item Number* entered in the second row to how many times each series will repeat in Column P. Notice the strategic use of the absolute/relative reference "\$" symbol; we use the references so the cell specifications don't move when we drag the formula across the worksheet.

#### VLOOKUP(\$P4,\$L\$5:\$M\$14,2,1),

If the first argument is *True*, the second argument is evaluated and placed in the cell. That argument uses another VLOOKUP: Here, the first argument (\$P<sub>3</sub>) looks up the *Item* # from column P in the last set of data placed in columns L and M, specified in the second argument by [\$L\$5:\$M\$14]. The third argument in the VLOOKUP (the number 2) looks in the second column (column M). The final piece of the VLOOKUP (the number 1) specifies an approximate match. The VLOOKUP formula pulls out the *% Purchased* variable, which is the thing we're going to plot.

## 0)

If the first argument is *False*, the formula places a o in the cell, as specified by the "o" at the end of the *IF* statement. As an example, for the first Item [Column P], the first 10 rows fill with 45% and the remainder fills with 0%; for the second Item, the first 10 rows are set to 0%, the next 18 rows are 38%, and the remaining 72 rows are 0%.

Dragging this formula across and down will give you blocks of numbers that repeat the *% Purchased* values corresponding to their shares of the total.

#### You could also use the formula

=IF(\$P4=R\$3,VLOOKUP(R\$3,\$P\$4:\$Q\$103,2,1),0) which uses the data we set up in Columns 9 and 10 instead of Columns 6 and 7. Both formulas will return the same values.

### [Column 21 [AB]

In this example, we'll place x-axis labels at every 10% increment. To do so, we'll create a custom x-axis series to add to the chart. Here's the formula:  $=IF(INT(O_5/10)*10=O_5,O_5/100,"")$ . This formula uses the INT function to round the number down to the nearest integer. If we divide the *Counter* series (in column O) by 10 and round down to the nearest integer [INT(O\_5/10)] and then multiply by 10, we get whole numbers. If those whole numbers equal increments of ten (which works because we divided by 10 in the INT formula), we set the cell value to that percentage; if not, the formula returns return an empty cell, denoted by the "" in the IF statement. If you enter this formula in cell AB4 and drag it down the column, you'll only see "10%", "20%", "30%", etc. show up in the cells.

W	Х	X Y		AA	AB
					Formula off
16	17	18	19	20	21
6	7	8	9	10	X axis Labels
0%	0%	0%	0%	0%	1
0%	0%	0%			5
0%	0%	0%	=IF(INT(05/1	0)*10=05,05/10	0,)
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	10%
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	
0%	0%	0%	0%	0%	20%
0%	0%	0%	0%	0%	

# Create the Chart

 We now create a column chart using the data in columns R4-AA103. To close the gaps between the columns, right-click on the series and change the *Gap Width* to 0% and the *Series Overlap* to 100%.



2. You can now easily change the color of each series (i.e., each *Item*) by selecting it on the chart and using the "Fill" options in the "Format" menu.



3. To add the x-axis labels to the chart, right-click on your chart and choose *Select Data* and select Column AB4:AB103 as the *Horizontal (Category) Axis Labels*.



4. Now go back to the chart and format the x-axis by right-clicking (or CTRL-1). Change the *Interval between tick marks* from 1 to 10. You'll also need to select the *Specify interval unit* option in the *Interval between labels* menu, and Excel should fill in the 1 for you. Format chart as desired.



# Final Version with Styling

# Marimekko



# **Data Visualization Books**

If you wish to learn more about data visualization, there exists a large and growing set of books that will help you dive deeper into best practices and strategies to effectively create and present your data. More books, blogs, and other resources can be found at <u>PolicyViz.com</u>.

Alberto Cairo. Cairo is a journalism professor, so his books primarily focus on data visualizations geared towards a wide audience. His first two books on data visualization, <u>The Functional Art</u> and <u>The Truthful</u> <u>Art</u>, cover fundamental overviews of data, some statistics, and data visualization.

Jorge Camões. All of the visuals in <u>Data at Work</u> are built in Excel (though it is not a step-by-step guide) and covers covers a wide range of data visualization principles and strategies.

Stephen Few. Few's <u>Show Me the Numbers</u> and <u>Now You See It: Simple</u> <u>Visualization Techniques for Quantitative Analysis</u> demonstrate how to present data effectively and strategically.

Andy Kirk. Kirk's *Data Visualisation: A Handbook for Data Driven Design* is one of the few books that offers a system to conceptualize and develop data visualizations. Cole Nussbaumer Knaflic. Knaflic's <u>Storytelling with Data</u> (she has a blog of the same name) is a great introductory treatment to data visualization, and how to pair text with graphs to lead your reader or user to a conclusion.

Naomi Robbins. A succinct guide to creating effective graphs, Robbins' <u>Creating More Effective Graphs</u> gives you the basic knowledge and techniques required to choose and create appropriate graphs for a broad range of applications.

Jonathan Schwabish. Designed for presenters of scholarly or dataintensive content, <u>Better Presentations: A Guide for Scholars</u>, <u>Researchers, and Wonks</u> details essential strategies for developing clear, sophisticated, and visually captivating presentations.

Edward Tufte. Author of four books, Tufte's books are sometimes viewed as classics in the field of data visualization. His <u>The Visual</u> <u>Display of Quantitative Information</u> is especially relevant to introductory data visualization with different examples and techniques.

Dona Wong. Wong dedicates individual pages in her book, <u>*The Wall</u></u> <u>Street Journal Guide to Information Graphics</u>, to specific graph types, and how and why to choose the best chart to fit the data.</u>*