



# Data Visualization

Dr. Ken Kwong-Kay Wong

Boston, MA  
Mar 2, 2023







# Data Visualization

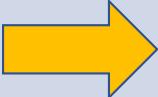
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# Course Schedule (Day 4)

Class	Topics
Thurs, Mar 2, 2023:	
4	 <b>Different Types of Visual in Business Communications</b> <ul style="list-style-type: none"><li>1. Comparison<ul style="list-style-type: none"><li>a. Column Chart</li><li>b. Bar Chart</li><li>c. Bullet Chart</li><li>d. Lollipop Chart</li><li>e. Line Chart</li><li>f. Step Chart</li><li>g. Highlight Table</li><li>h. Heatmaps</li></ul></li><li>2. Composition<ul style="list-style-type: none"><li>a. Pie Chart</li><li>b. Donut Chart</li><li>c. Treemap</li><li>d. Packed Bubble Chart</li><li>e. Area Chart</li><li>f. Cumulative Sum with Waterfall Chart</li></ul></li><li>3. Relationship<ul style="list-style-type: none"><li>a. Scatterplot</li></ul></li><li>4. Distribution<ul style="list-style-type: none"><li>a. Box-and-whisker Plot</li><li>b. Likert Scale Chart</li></ul></li></ul>



# Course Schedule (Day 5)

Class	Topics
<b>Fri, Mar 3, 2023:</b>	
5	<b>Ethical Considerations in Data Visualization</b> <ol style="list-style-type: none"><li>1. Ethics in Data Visualization<ol style="list-style-type: none"><li>a. Unethical Data Visualization</li><li>b. The Misleading Data Dashboard</li><li>c. 10 Data Visualization Mistakes to Avoid</li><li>d. A Code of Ethics for Data Visualization Professionals</li></ol></li><li>2. Sharing and Publishing Data<ol style="list-style-type: none"><li>a. E-mailing Tableau Workbook file</li><li>b. Publishing to Tableau Server</li><li>c. Publishing to Tableau Online<ul style="list-style-type: none"><li>- Using the “Ask Data” Function</li></ul></li><li>d. Publishing to Tableau Public</li><li>e. Publishing to Web Sites and Blogs via HTML Embedding</li><li>f. Using Tableau Reader and Tableau Mobile App</li></ol></li></ol>

# Course Schedule (Day 6)

Class	Topics
<b>Mon, Mar 6, 2023:</b>	
6	<b>Calculated Field, Parameters, and Quick Table</b> <ul style="list-style-type: none"><li>1. Create Calculated Field Using Text Operators:<ul style="list-style-type: none"><li>a. SPLIT</li><li>b. LEFT and RIGHT</li><li>c. LOWER and UPPER</li><li>d. REPLACE</li><li>e. DATEADD</li><li>f. DATEDIFF</li><li>g. DATEPART</li><li>h. DATEPARSE</li><li>i. CASE</li><li>j. IF-THEN-ELSE / Group Creation</li><li>k. IIF</li><li>l. IFNULL</li></ul></li><li>2. Create Parameters<ul style="list-style-type: none"><li>a. What If Analysis</li><li>b. Text Fields Search</li></ul></li><li>3. Quick Table<ul style="list-style-type: none"><li>a. Running Total</li><li>b. Cohort Analysis</li></ul></li><li>4. The Analytics Pane<ul style="list-style-type: none"><li>a. Constant, Average, and Reference Line</li><li>b. Trend Line</li></ul></li><li>5. Advanced Visualization Techniques<ul style="list-style-type: none"><li>a. Timelines</li><li>b. Gantt Chart</li><li>c. Bar-in-bar Chart</li><li>d. Radar Chart</li><li>e. Interactive View: Top 5 Clients</li></ul></li></ul>



# Course Schedule (Day 7)

Class	Topics
<b>Tues, Mar 7, 2023:</b>	
7	<b>Elevating Your Tableau Knowledge</b> <ol style="list-style-type: none"><li>1. What's next after QTM-6032?<ol style="list-style-type: none"><li>a. The Tableau Community</li><li>b. The Tableau Conference</li><li>c. The Iron Viz competition</li><li>d. Blogs about DataViz</li><li>e. Tableau Zen Master</li></ol></li><li>2. Fun Stuff – Arts</li><li>3. Team Presentation</li></ol>

**Class 4:**

# **Different Types of Visual in Business Communications**

Mar 2, 2023

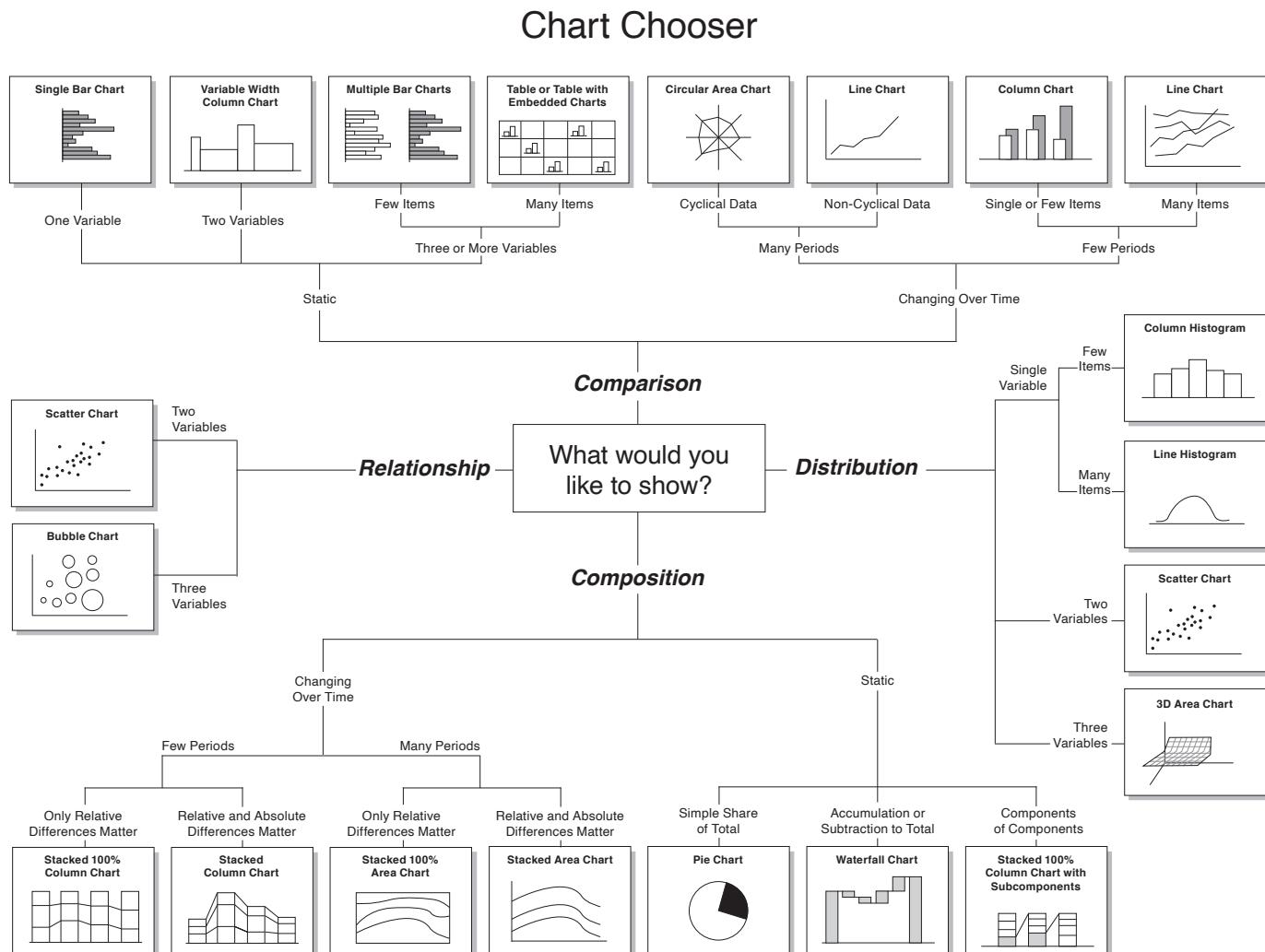


# Recap: Which Chart to Use?

- Each visualization type is intended to represent different types of data in specific ways to best represent its insight.
- A clear goal:
  - Convey a message
  - Answer questions
  - Provoke new questions and discussions



# Recap: Which Chart to Use?



# 1. Comparison

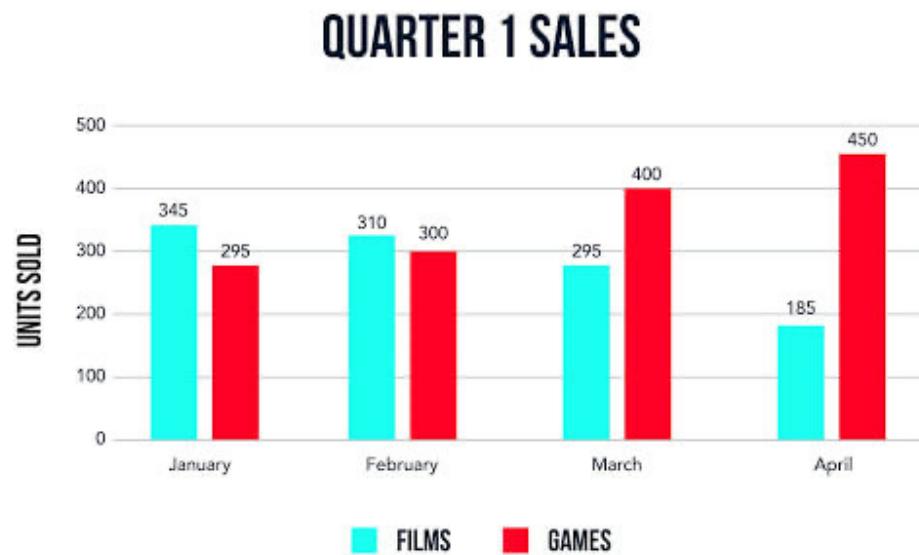


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## 1a. Column Chart



## 1a. Column Chart



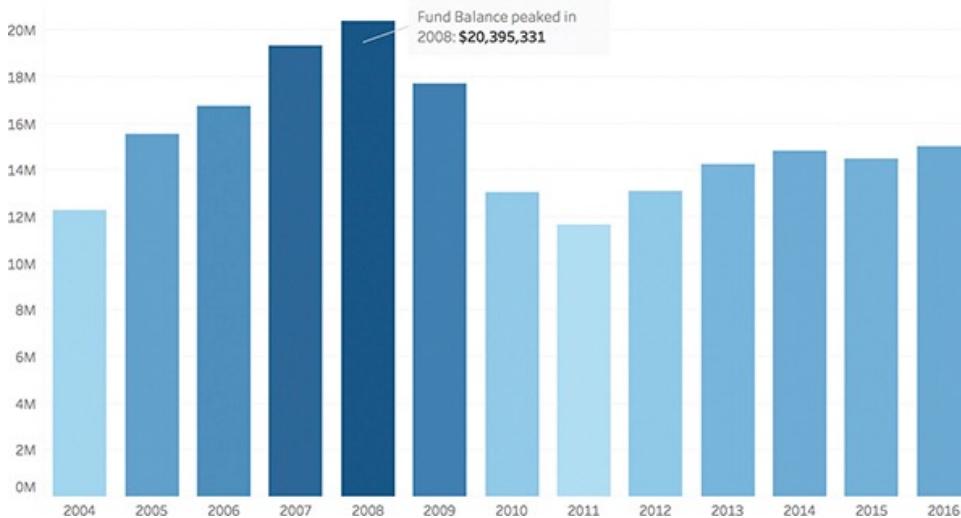
Column chart: graph that displays information as **vertical bars**



# 1a. Column Chart

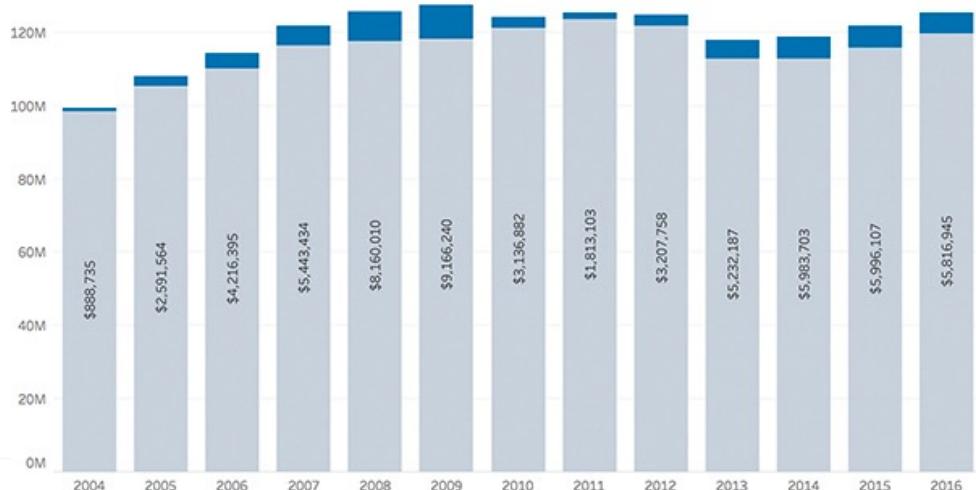
Sussex County Year End Fund Balance Record

Fund Balance as of 12/31



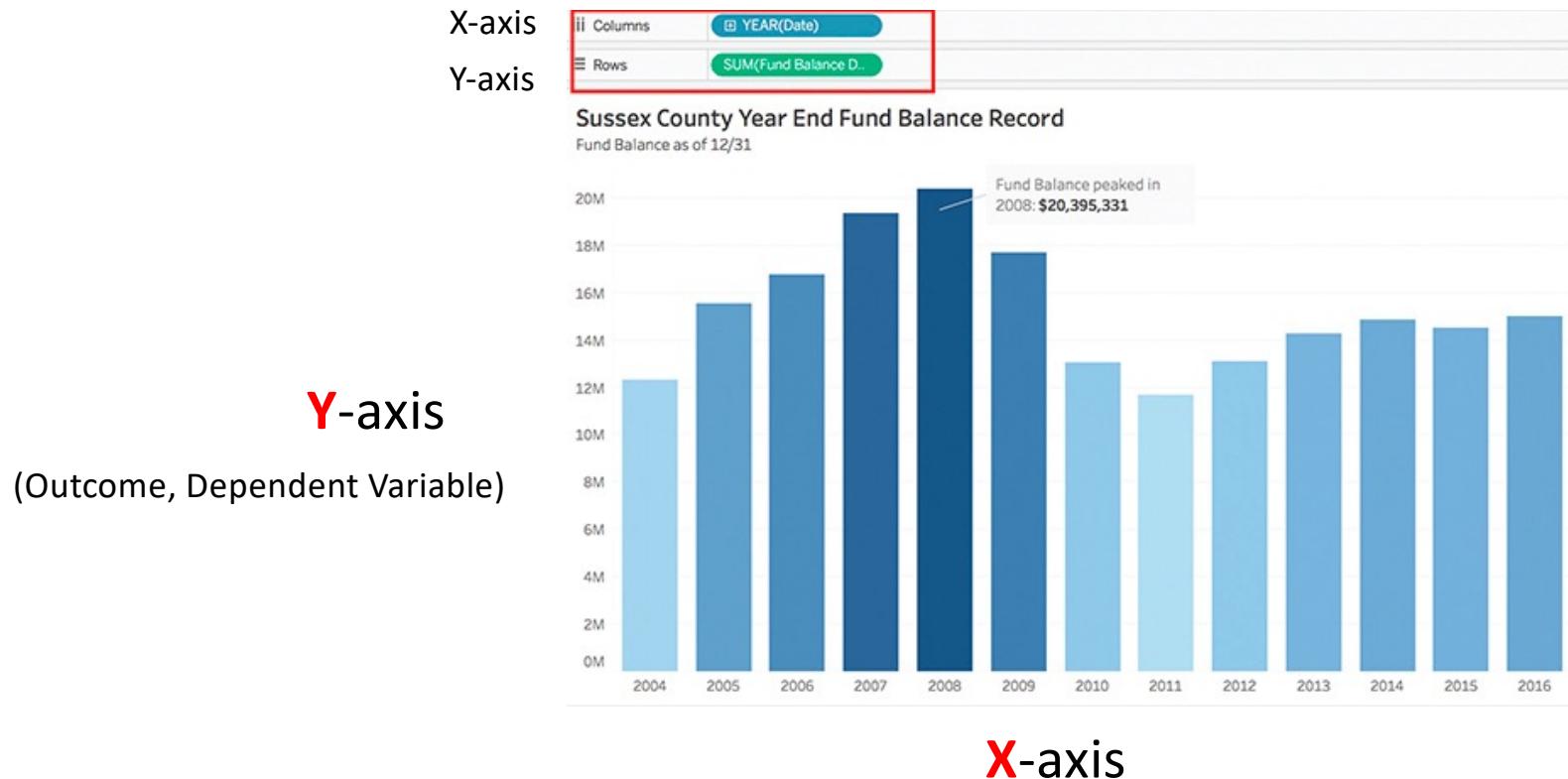
Sussex County Fund Balance Portion of Revenue

\$ listed equals total fund balance utilized as revenue; blue caps represented portion of fund balance utilized





# 1a. Column Chart – in Tableau



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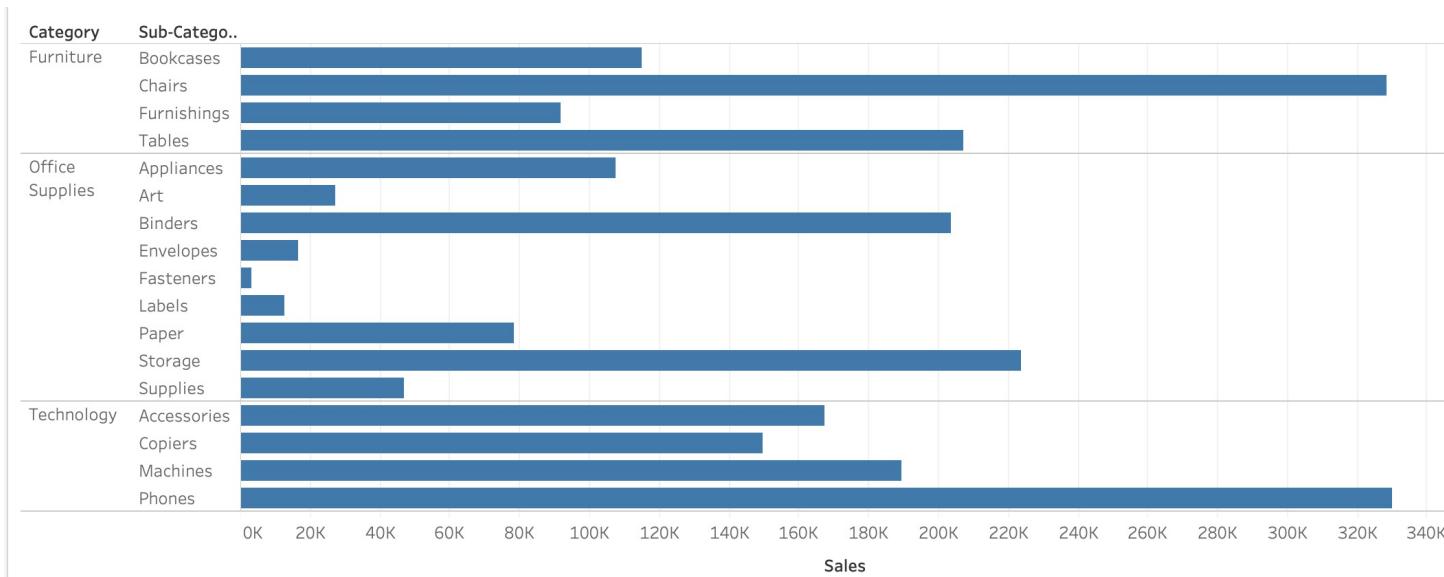


## 1b. Bar Chart



# 1b. Bar Chart

Let's say we want to create this ultimately:



Bar chart: graph that displays information as **horizontal** bars



## 1b. Bar Chart – Hierarchies

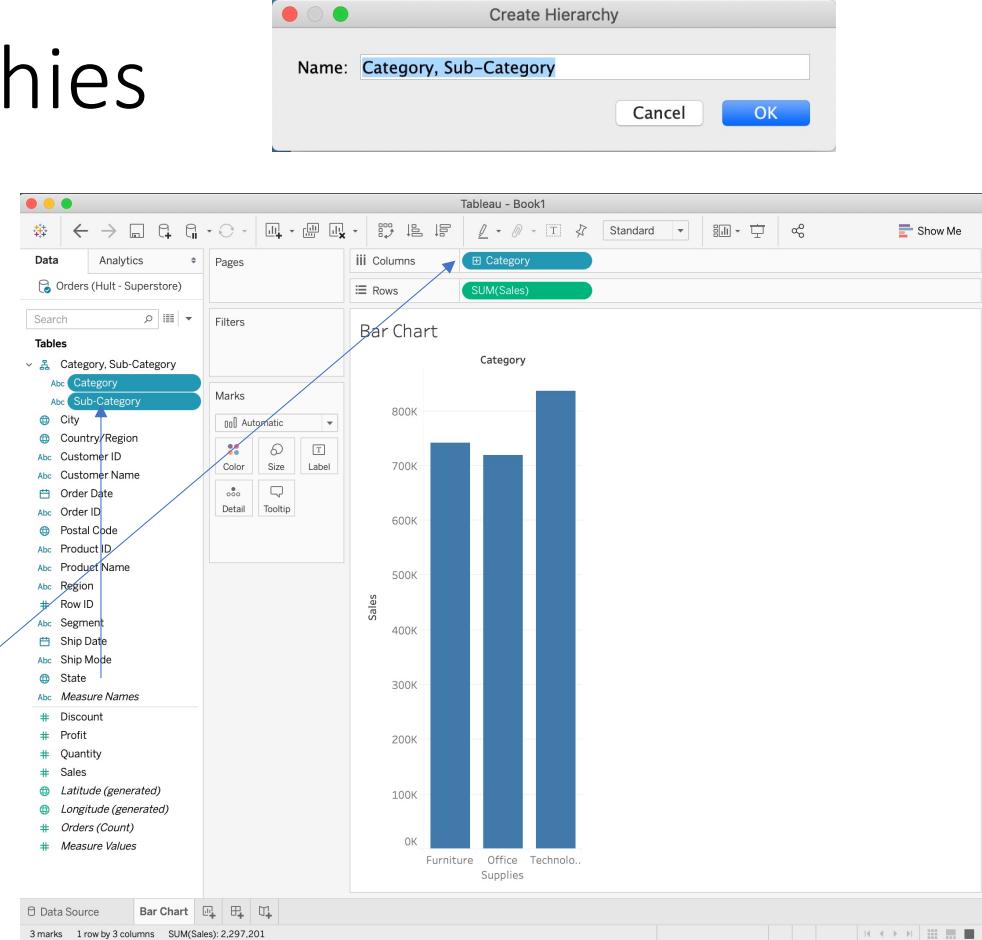
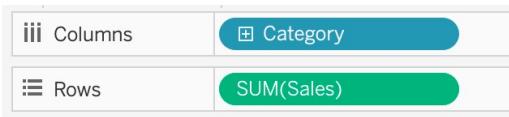
- Strategy: build a column chart first, and then “flip” it to make a bar chart
- Hult – Superstore.xls
- Orders > Canvas
- Sheet 1, call it “Bar Chart”
- Category > Columns
- Sales > Rows





# 1b. Bar Chart – Hierarchies

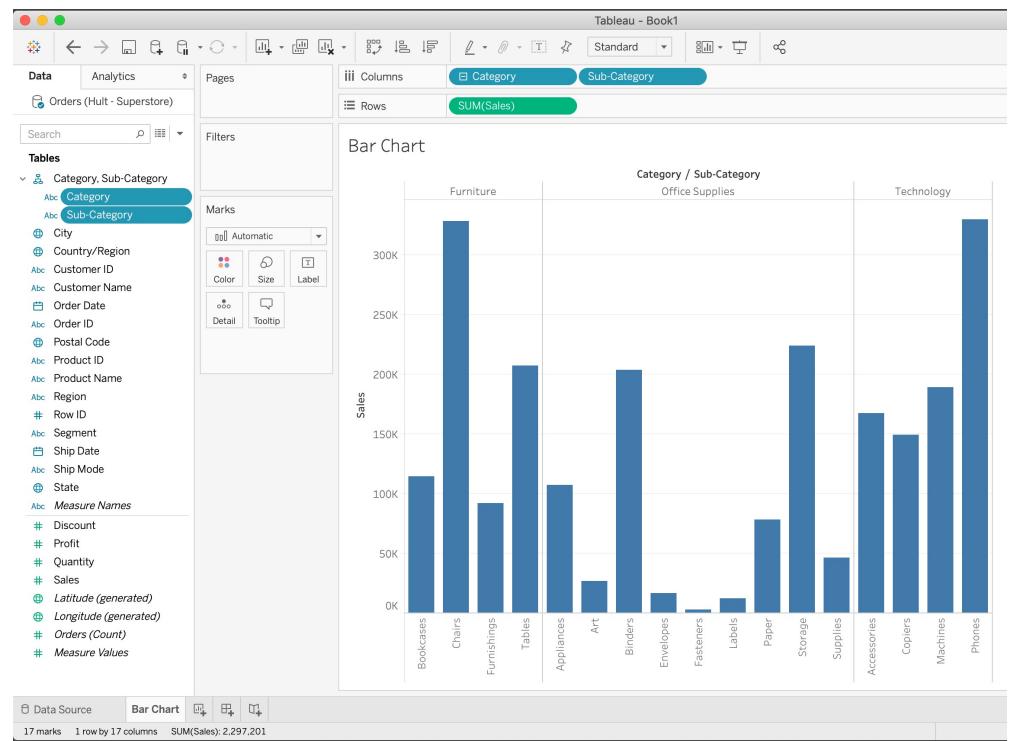
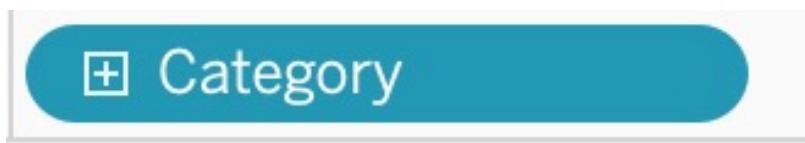
- Now, let's learn how to show more details in the bar graph by using hierarchy.
- Drag “Sub-Category” on top of “Category” up in the Data pane (not Canvas!), OK
  - You'll see that in Columns, the “Category” pill becomes “+ Category”





# 1b. Bar Chart – Hierarchies

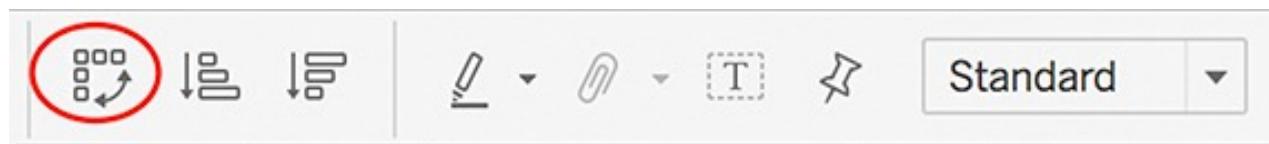
- Click the **+ sign** in front of Category, the graphs will be updated with details about the sub-category
- Click the **- sign** and it will shrink back to just the 3 major categories





## 1b. Bar Chart: Making it from a Column Chart

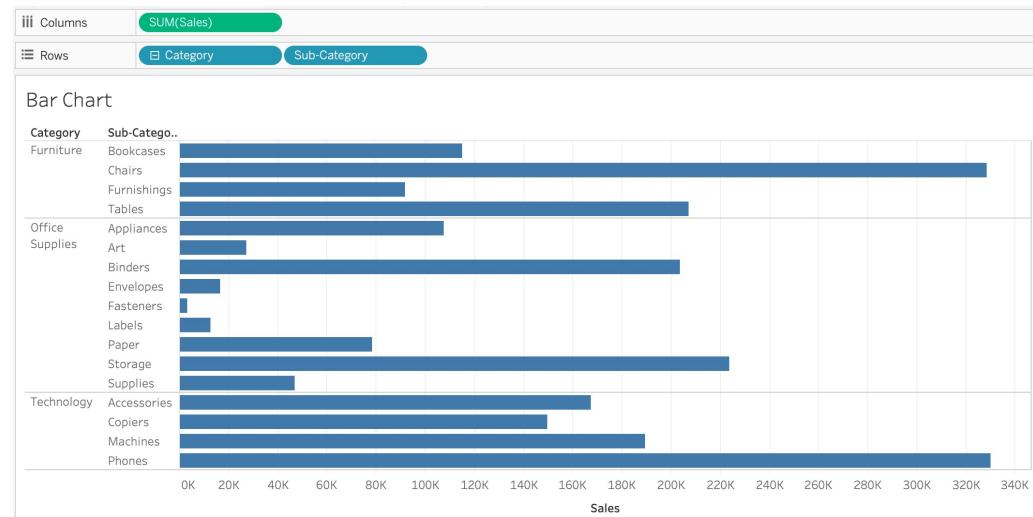
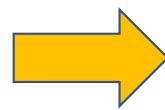
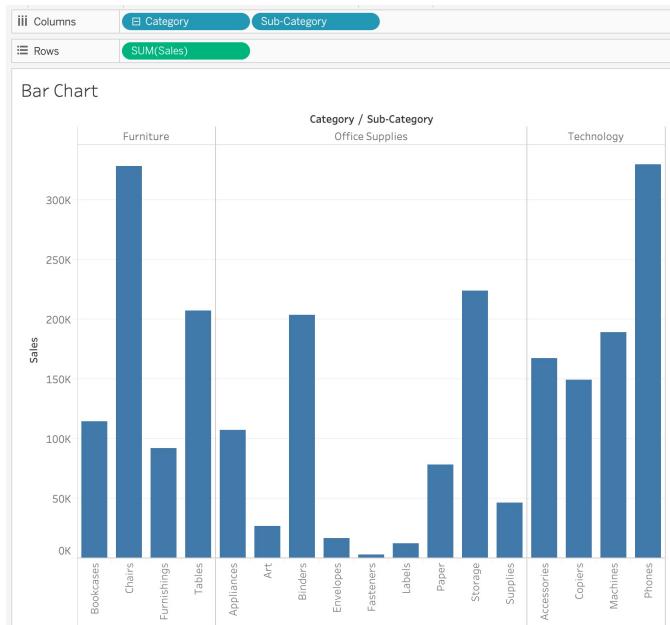
- We are not done yet, it's showing a column chart and not a bar chart.
- We want to make it display in a horizontal manner, so press this icon in the tool bar at the top





# 1b. Bar Chart: Making it from a Column Chart

- Done!





## 1c. Bullet Chart



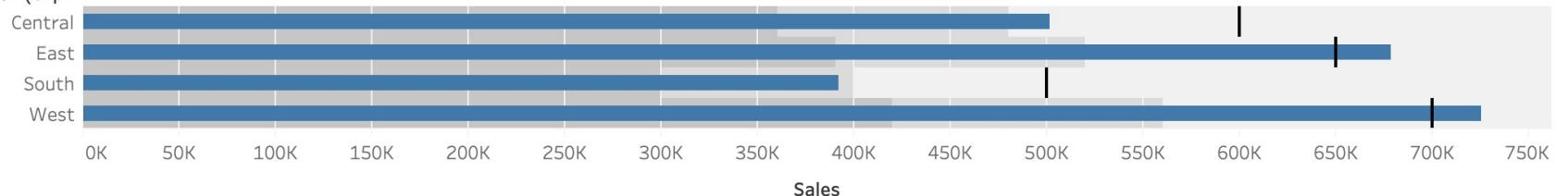
## 1c. Bullet Charts

Bullet chart is a bar chart that shows the values for both measures (e.g., Target vs. Actual sales) side-by-side.

**Let's say we want to create this ultimately:**

Bullet Chart

Region (Clip..





## 1c. Bullet Charts

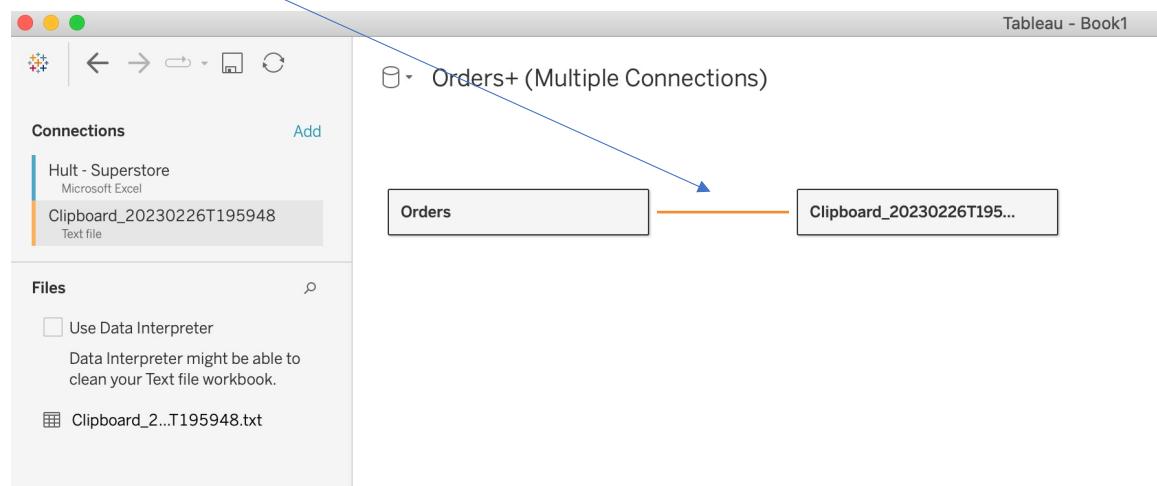
	A	B	C
1	Region	Target	
2	Central	600000	
3	East	650000	
4	South	500000	
5	West	700000	
6			

- Let's look at the spreadsheet “Hult – Sales Target.xlsx” in Excel
- Select all 10 cells in Excel, copy
- In Tableau Desktop, go to the “Hult – Superstore.xlsx” workbook, Data Source tab, drag “Orders” to Canvas.
- Paste (Control-V on Windows; Command-V on Mac)
  - Yes, just paste it anywhere on the screen, and wait for 5-10 seconds.



## 1c. Bullet Charts - Blend

- Tableau automatically sets up a relationship between the two via a **blend**, as indicated by the little chain-link icon next to the Region field of the Superstore data set.
- That means you can work with fields from both data sources in one view.

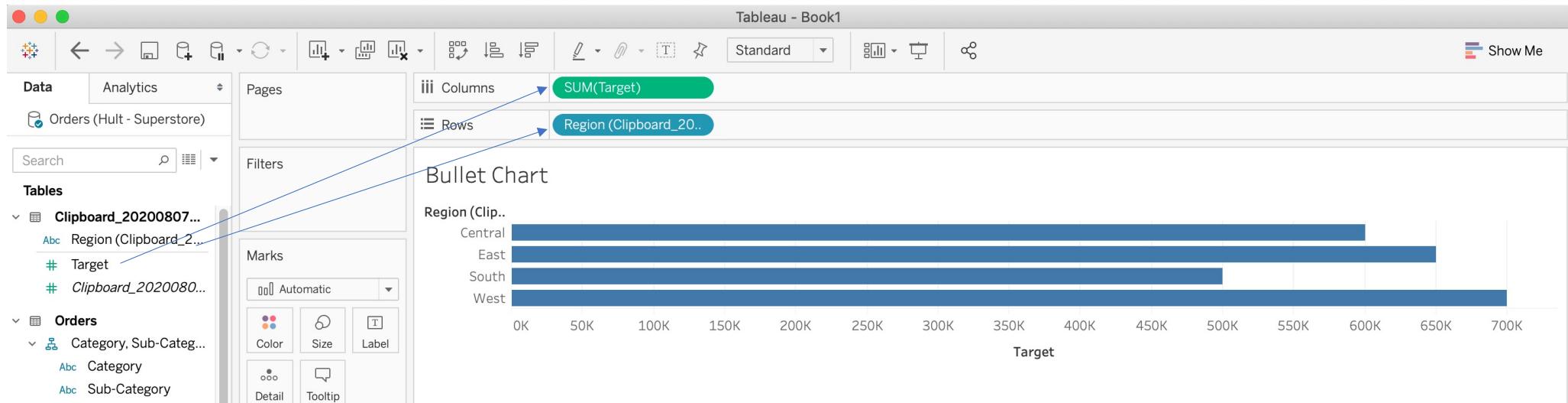


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# 1c. Bullet Charts

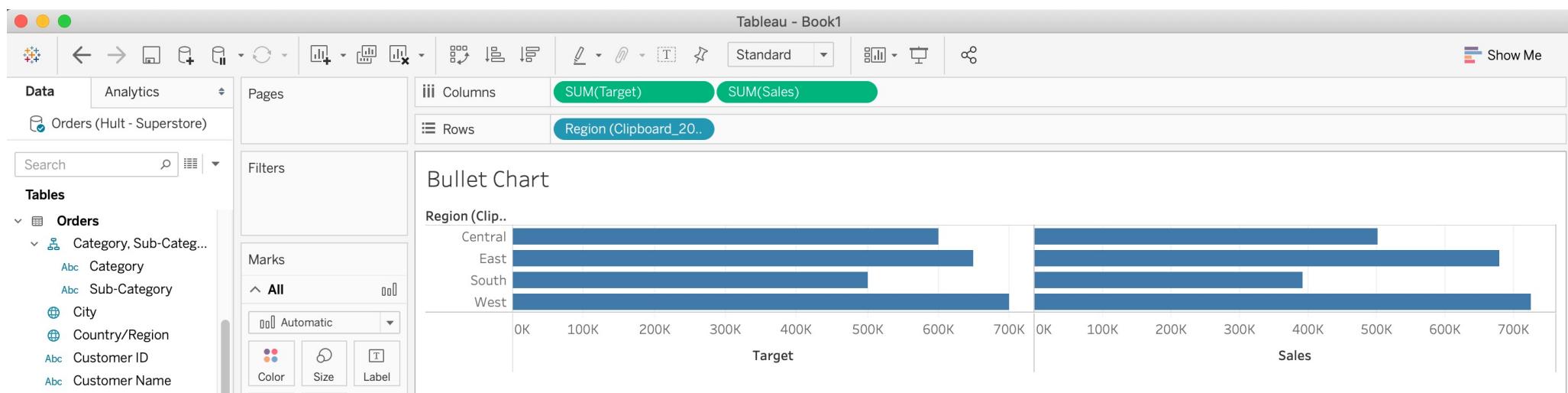
- New sheet, call it “**Bullet Chart**”; scroll up in the Data pane. Look at the top section where it says “**Clipboard\_2020....**”.
- **Target** > Columns
- **Region (Clipboard 202..)** > Rows





# 1c. Bullet Charts

- Sales > Columns, put it on the right-hand side of SUM(Target)





## 1c. Bullet Charts

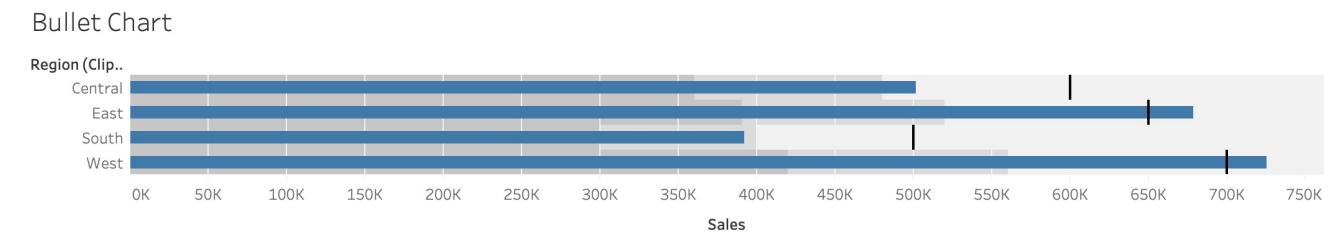
- Now, let's merge the 2 graphs. Go to the **Show Me** card in the upper-right hand corner, change chart type to Bullet chart [8<sup>th</sup> row, 2<sup>nd</sup> icon]

For **bullet graphs** try

0 or more **Dimensions**

2 **Measures**

Right-click the continuous axis

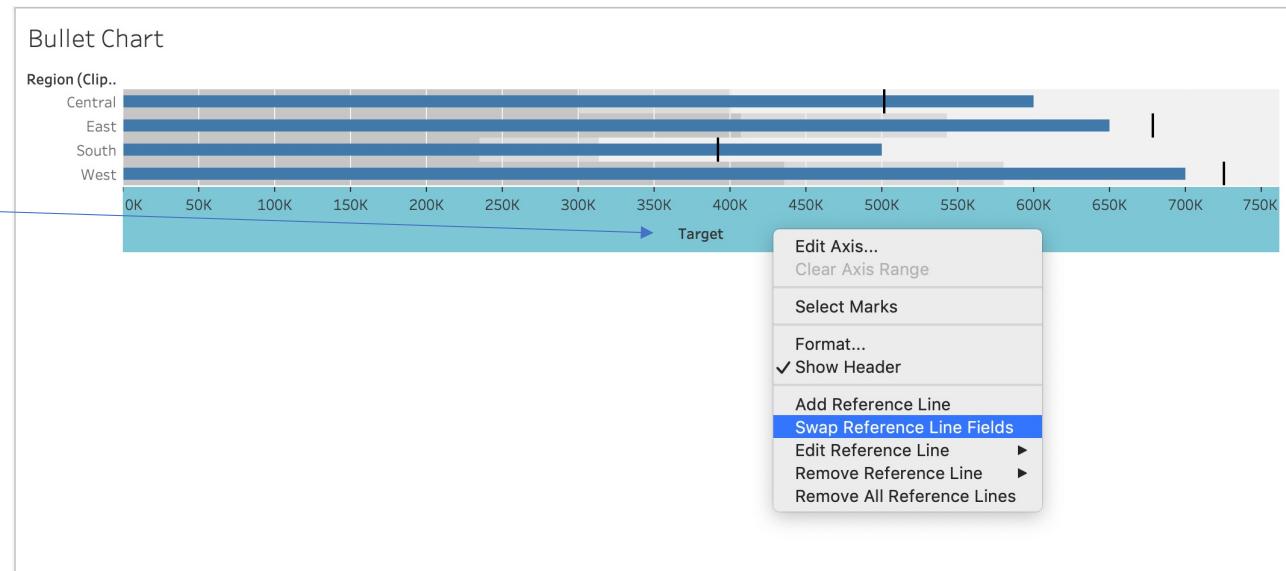


Done!



# 1c. Bullet Charts

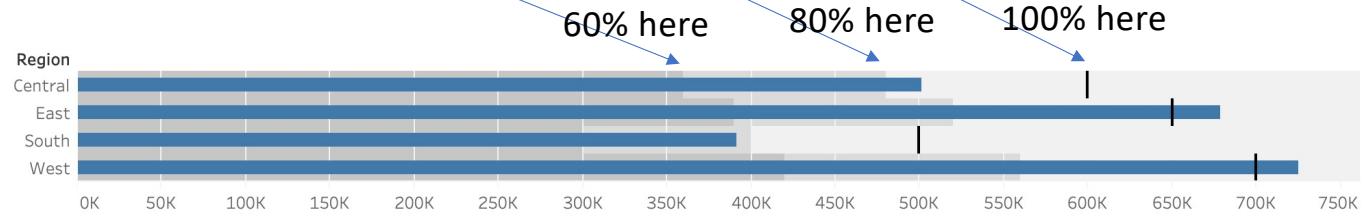
- We don't have to perform this step but in case Tableau mixed up your 2 measures showing **Target** instead of **Sales** on the X-axis, you can just right-click on the x-axis and select "Swap Reference Line Fields" to fix it.





## 1c. Bullet Charts

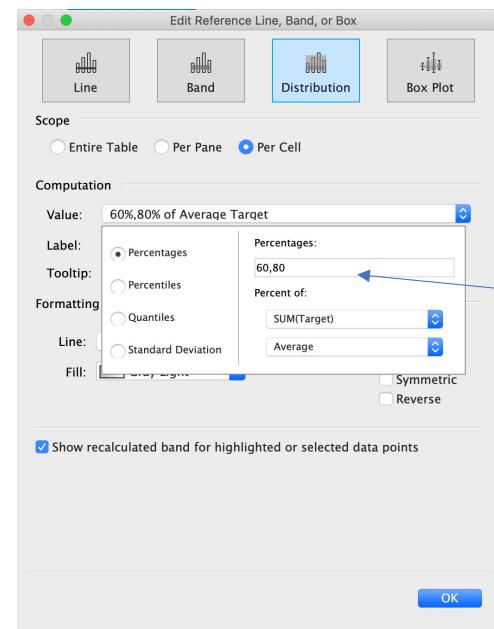
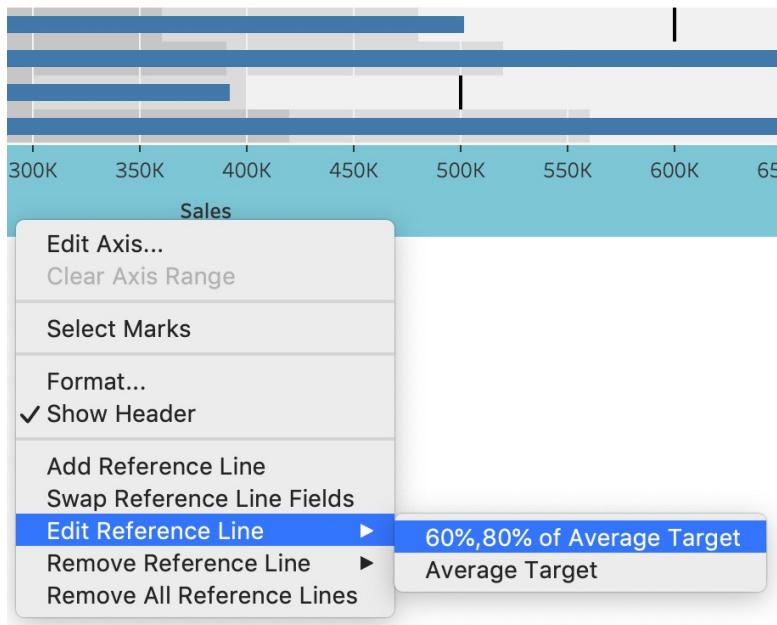
- The light grey represents 80% of target
- The darker grey represents 60% of target





# 1c. Bullet Charts

To change these 60, 80 threshold, just right-click the horizontal X-axis and select “Edit Reference line” > “60%, 80% of Average Target”

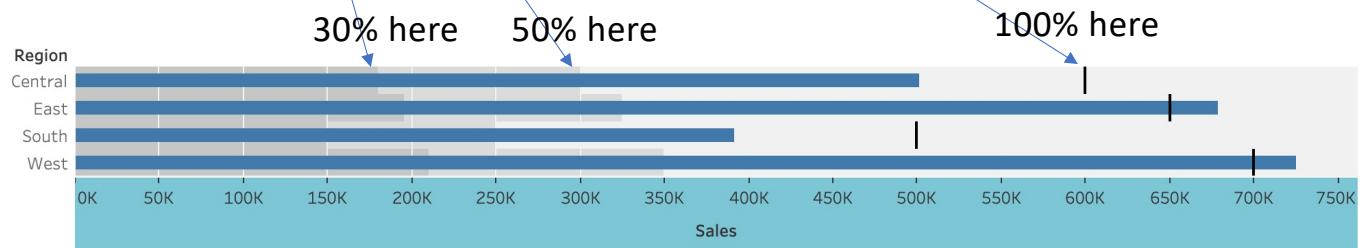


Click the “Value” pull down menu  
Change it from 60,80 to 30,50



## 1c. Bullet Charts

- The light grey represents 50% of target
- The darker grey represents 30% of target





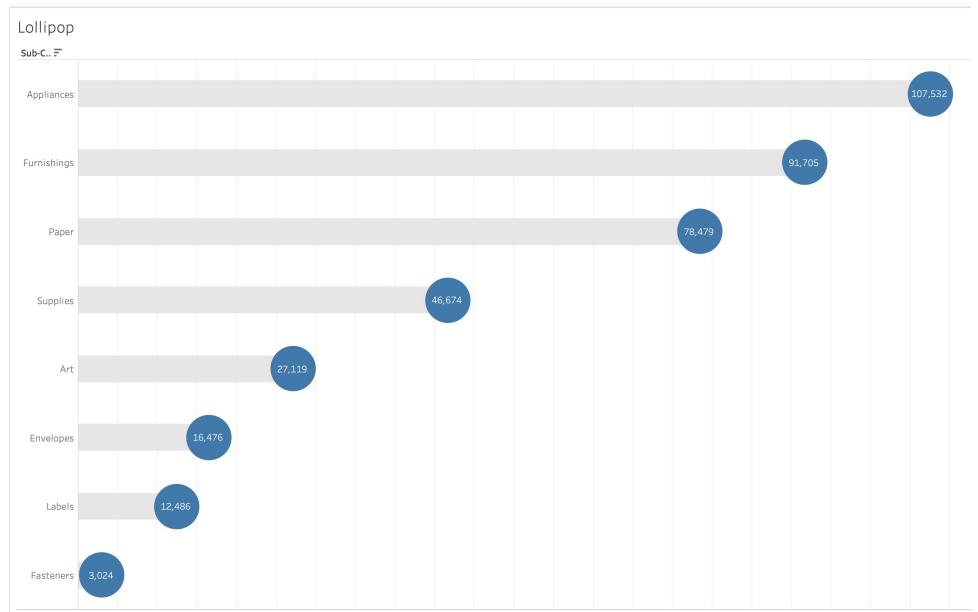
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## 1d. Lollipop Chart



# 1d. Lollipop Charts

- Lollipop chart is a hybrid chart that combines a traditional **bar chart** and a Cleveland **dot plot**.
- It's a fun way to spice up a bar chart to give it more visual appeal without reducing its analytical integrity.





## 1d. Lollipop Charts

- A lollipop chart is **great for comparing multiple measures**
- It typically contains **categorical variables on the y-axis** measured against a second **(continuous) variable on the x-axis**, although these can be plotted on the y axis.
- With either orientation, the emphasis is on the **circle**, as it is a visual cue to draw the audience's attention to the specific value in each category.
  - The line (or bar) itself is meant to be a minimalistic approach to tie each category to its relative point without drawing too much attention to the line itself.



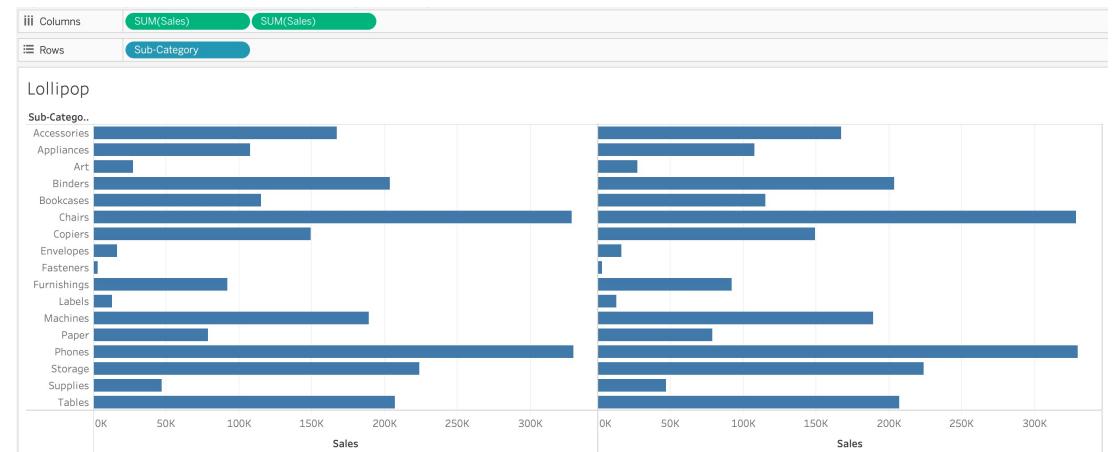
## 1d. Lollipop Charts

- File > New
- **Hult – Superstore.xlsx**
- New sheet, call it “**Lollipop chart**”
- **Sales** > Rows
- **Sub-category** > Columns
- Flip it sideways



# 1d. Lollipop Charts

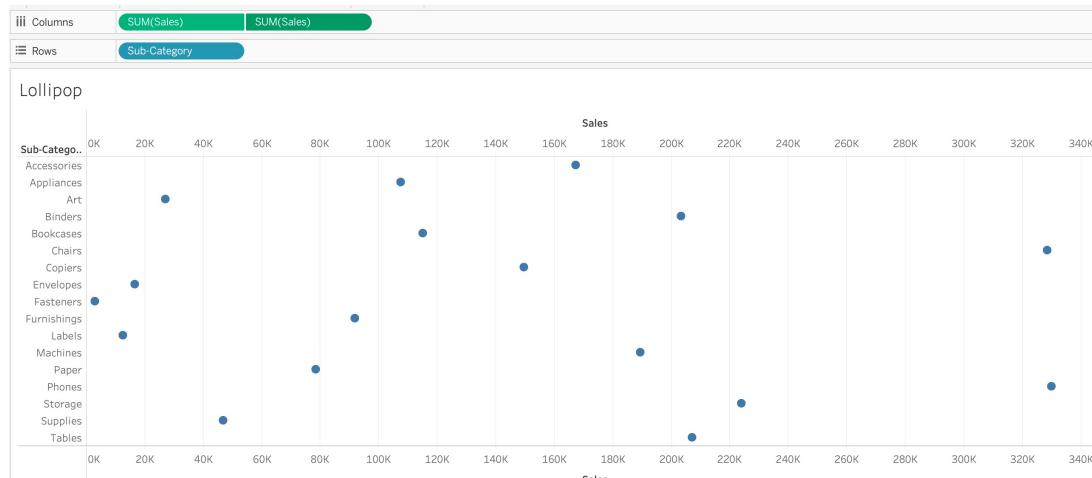
- Duplicate the chart by pressing **COMMAND** key and then dragging “**SUM(Sales)**” to the right in Columns.
  - CTRL key for PC
  - *Alternatively, just drag “Sales” to Columns and put it on the right-hand side of the existing “SUM(Sales)”*





# 1d. Lollipop Charts

- Put both charts together by going to the second “**SUM(Sales)**” pill and selecting **Dual Axis**
  - Tableau will turn the bar chart into circles

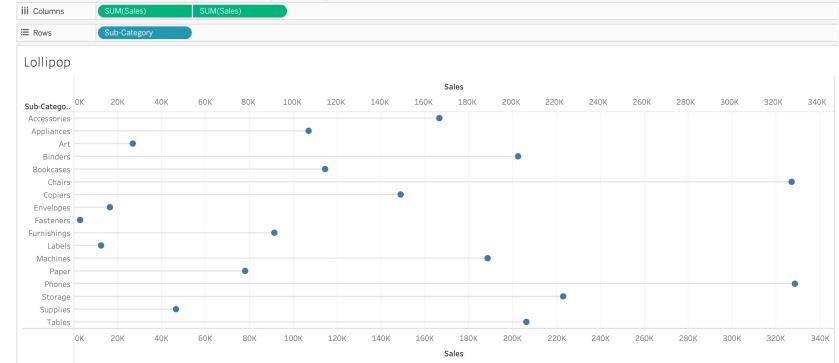




# 1d. Lollipop Charts

Now, let's work on the horizontal bar

- In the Marks card, select the first page of “**SUM(Sales)**”
- Change it from “**Automatic**” to “**Bar**”, as we’re going to create the bar chart.
- **Size icon**: reduce the size, make it thin
- **Color icon**: make it light grey color





# 1d. Lollipop Charts

Then, we'll work on the Lollipop circle

- In the Marks card, select the second page of “**SUM(Sales)**”
- **Size** icon: increase the size
- Finally, sort the data (descending) [icon at the top]



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## 1d. Lollipop Charts

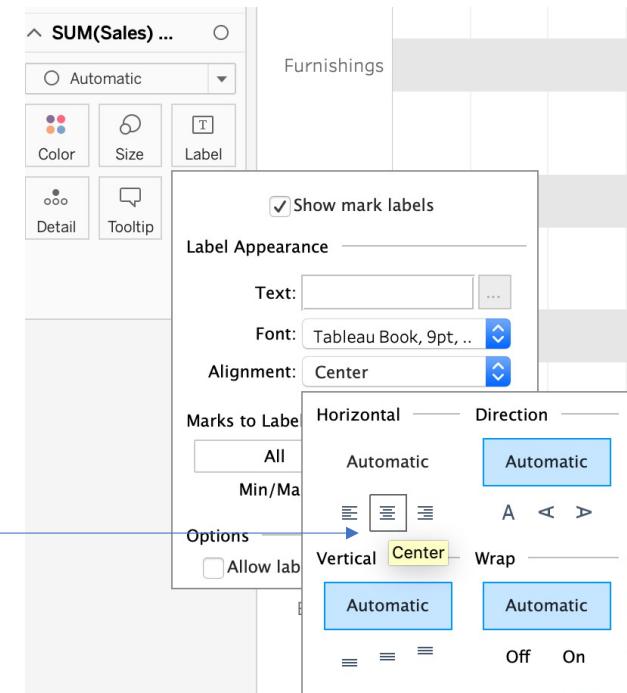
Fine tuning suggestions:

- Entire View
- Make sure your axes line up correctly. Right-click the second measure axis (e.g., sales) and choose Synchronize Axis to make the axes equal.
- Right-click the axis again and uncheck Show Header.
- Tidy up the visual by sorting bars
- Exclude any data that might not be pertinent to your story. [e.g., exclude Fasteners]
- Continue removing headers and axis titles as well as adjusting titles as appropriate until you are happy with the visualization.



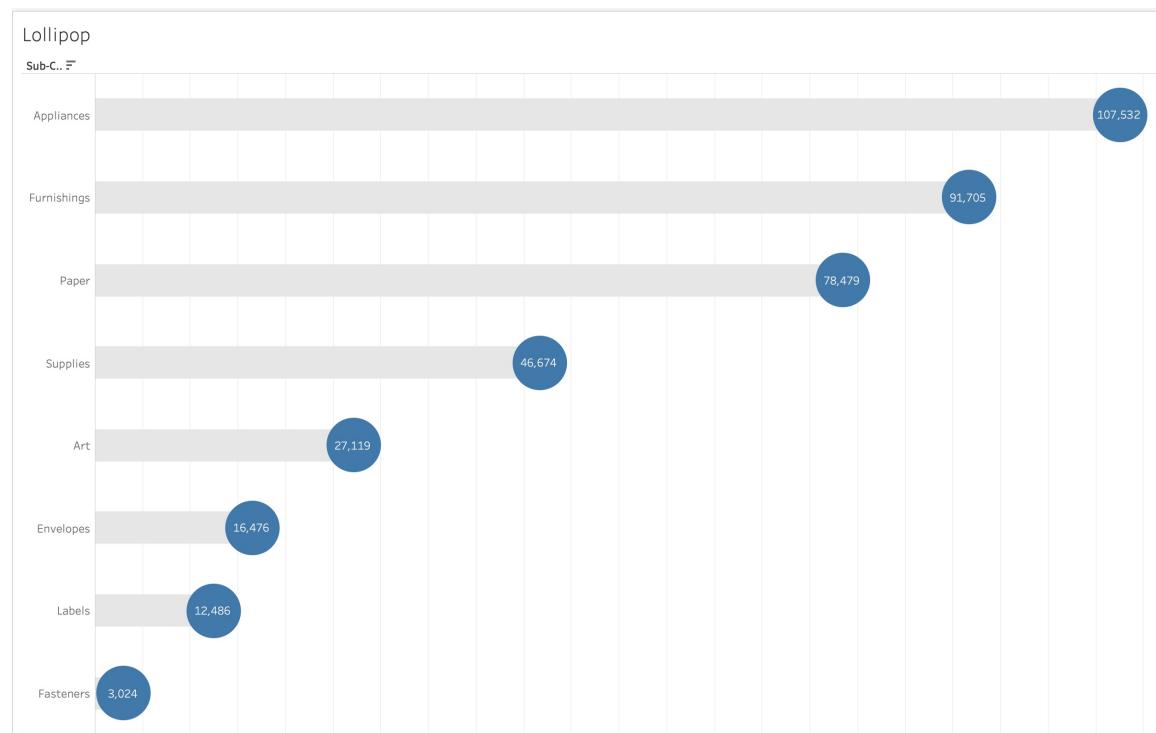
# 1d. Lollipop Charts

- You might elect to remove the bottom axis header and use the circles to encode their value.
- Show numbers in the circle by going to the 2nd page of “SUM(Sales)”, **Label, Show mark labels**
- Alignment: Horizontal > Centre





# 1d. Lollipop Charts

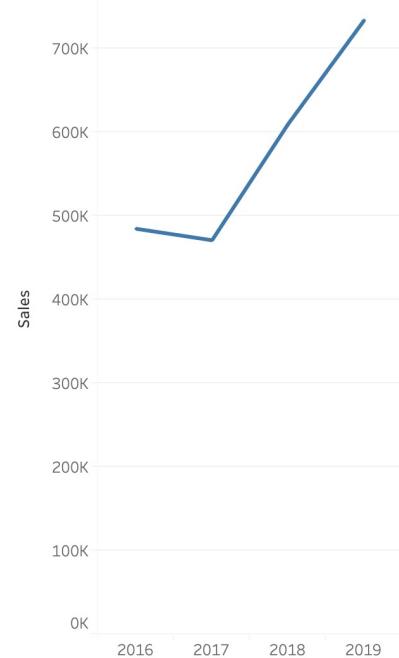




## 1e. Line Chart



## 1e. Line Chart



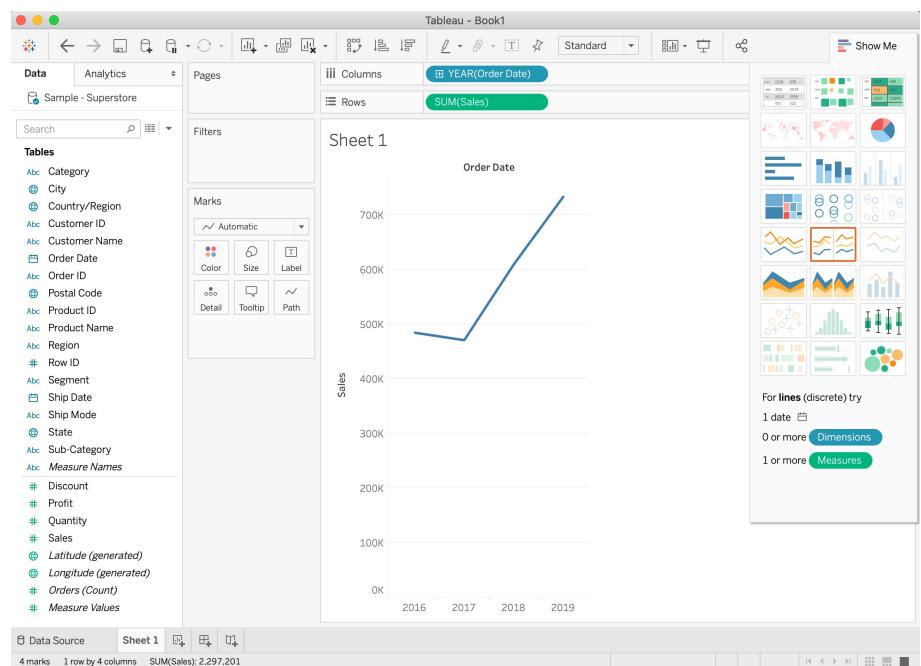
Line chart: graph that displays information as a series of data points connected by straight lines.

Changes over time are often best visualized with a line chart



# 1e. Line Chart

- Hult – Superstore.xlsx
- New sheet, call it “Line Chart”
- Sales > Rows
- Order Date > Columns
- Done! However, the line graph looks way too simple, so we can try something else, like a step chart.





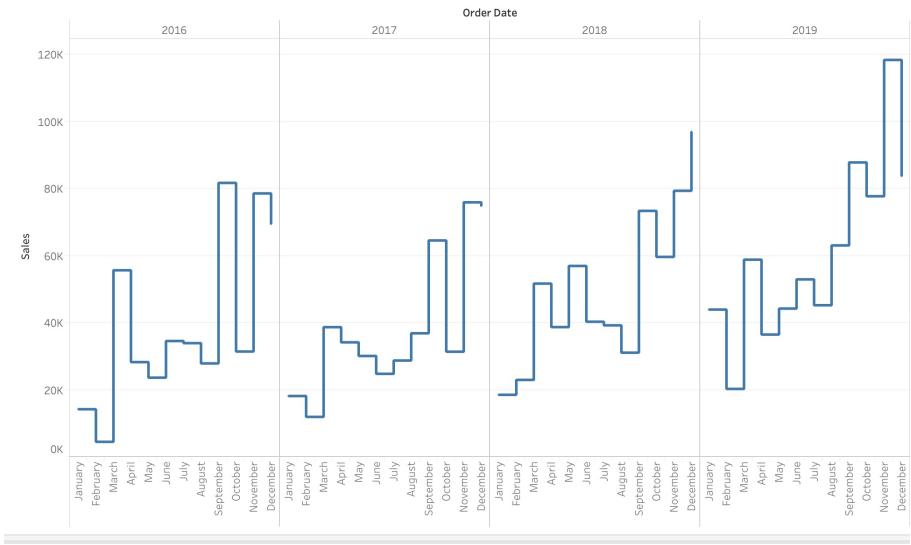
## 1f. Step Chart



## 1f. Step Charts

- How about we use the Line Chart to build a **Step Chart** that looks more sophisticated?
  - This way, we can see the details of sales change over time.

Let's say we want to create this ultimately:



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## 1f. Step Charts

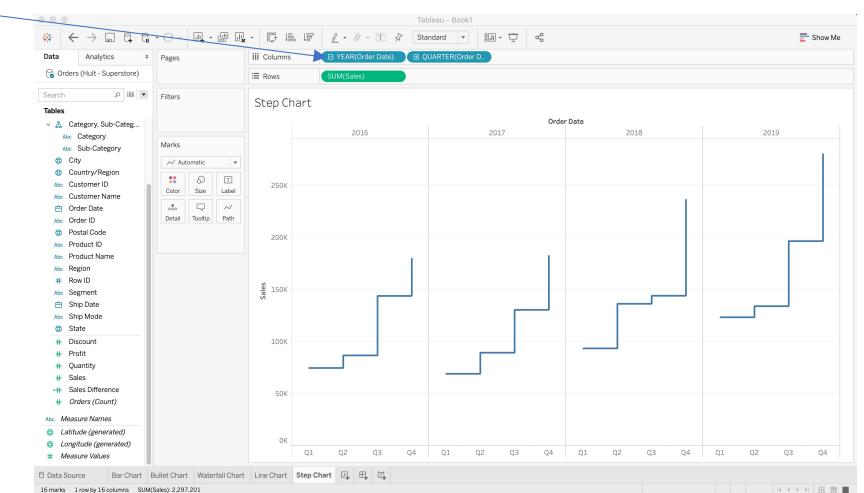
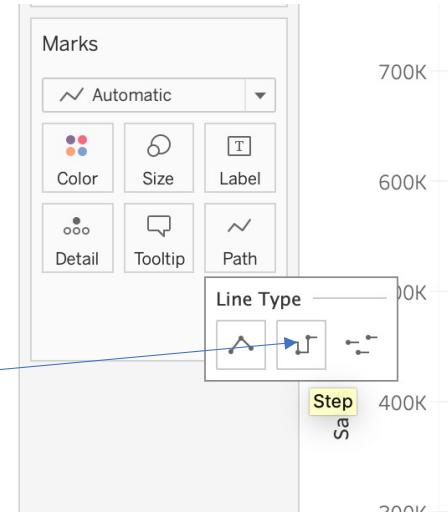
- First, **duplicate** the Line Chart sheet and call the new one “Step Chart”
  - Line Chart tab, right click, select Duplicate
  - Line Chart (2) tab, right click, rename it to **Step Chart**
- To show the details of sales, we need hierarchies.
  - Luckily, dates are automatically treated as hierarchies by Tableau
- See, there’s a “+” sign in front of “Year (Order Date)”

The screenshot shows the Tableau Data pane. On the left, there is a button labeled "iii Columns". To its right, a list of columns is displayed, with the first column, "YEAR(Order Date)", highlighted by a blue selection bar. The rest of the columns are listed in a standard black font.



# 1f. Step Charts

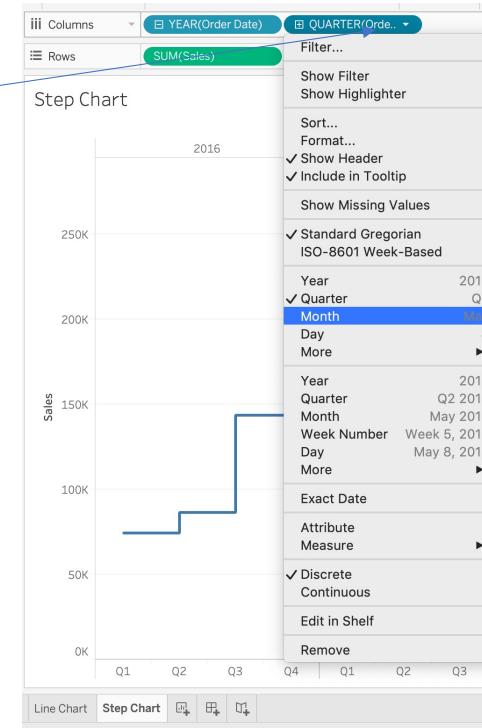
- Go to the Marks card, click the “Path” button
- Select the line type “Step” Line.
- Then, click “+” sign in front of “Year (Order Date)”
  - “+ QUARTER (Order Date)” pill will appear.





# 1f. Step Charts

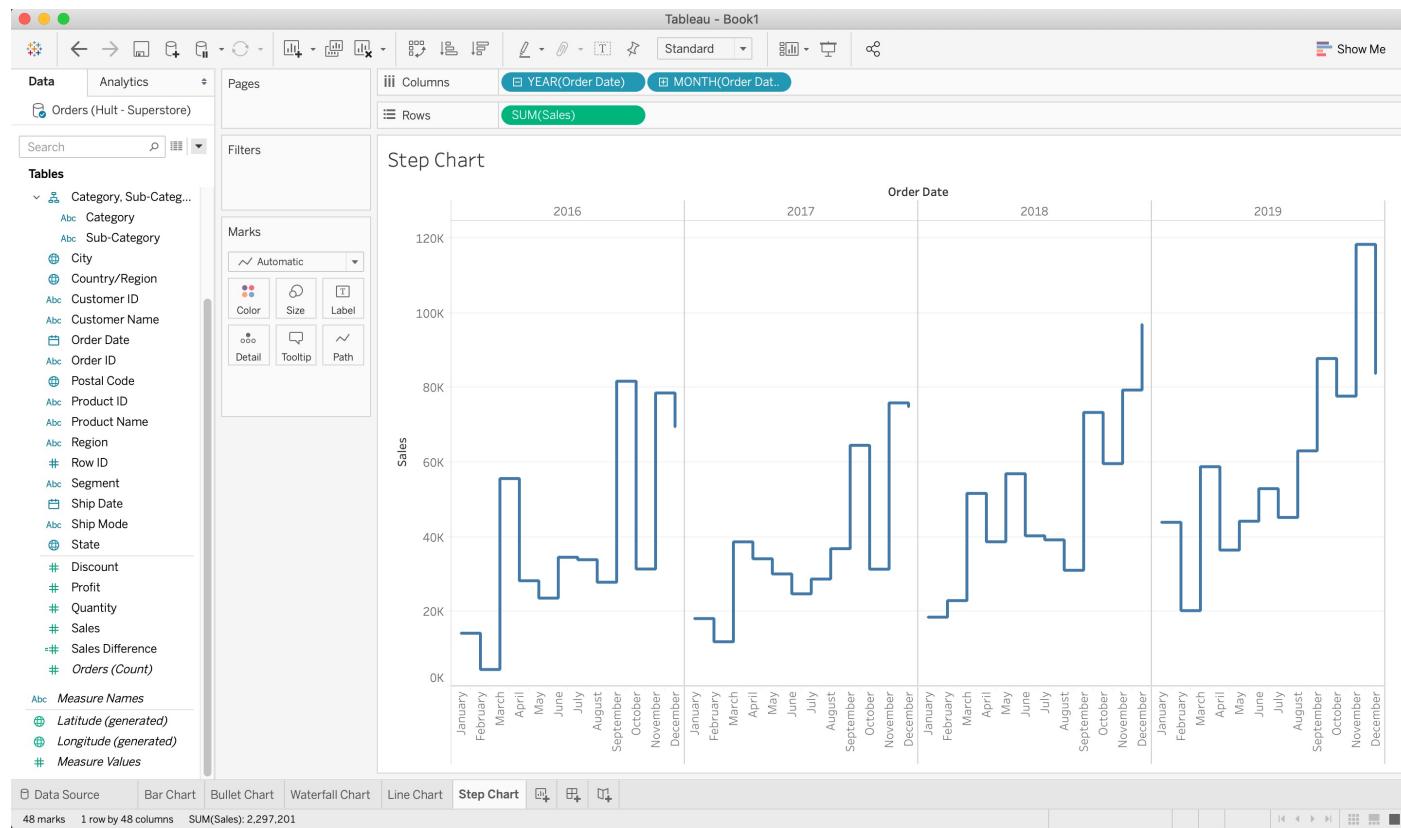
- Click the down arrow on the right-hand side of “+ QUARTER (Order Date)” pill, and select the **first “Month”** in the context menu
- You can keep pressing the “+” sign to drill down the data, and drag it away from the screen if you want to remove it.



*Remember: Continuous date creates a timeline in certain kind of graphs. Switch between the 2 to see the difference, if any. Also, if your data is collected over irregular intervals, use continuous is better.*



# 1f. Step Charts



Done!



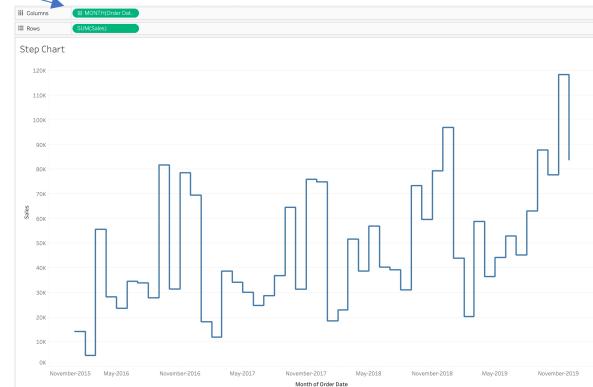
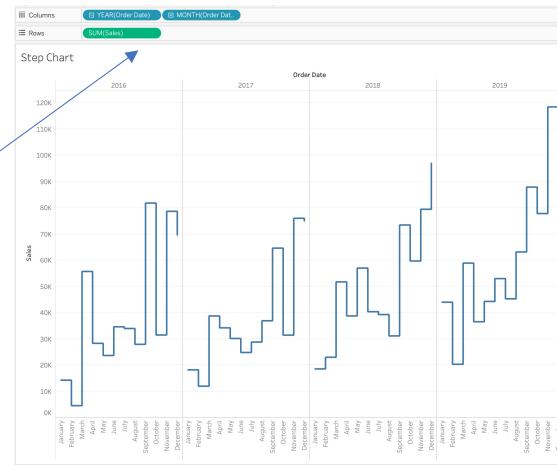
# 1f. From discrete to continuous

There are many ways to do the same thing in Tableau.  
We've just done a timeline by using 2 pills in the Columns shelf: Year(Order Date) and MONTH(Order Date).

We can do the same by just using one pill as well:

1. Remove the “YEAR(Order Date)”
2. Now, go to the “MONTH(Order Date)” pill and then select the 2<sup>nd</sup> Month, making it Continuous to build a timeline.

Discrete is “Blue” color  
Continuous is “Green” color





## 1g. Highlight Tables



# 1g. Highlight Tables

Let's say we want to create this ultimately:

X-axis (Column)

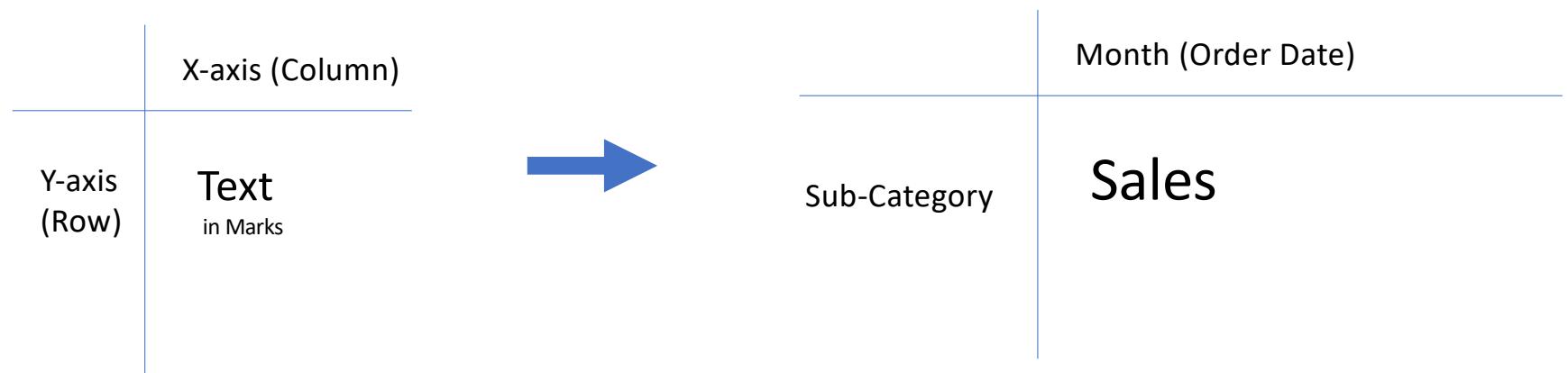
Y-axis  
(Row)

Sub-Catego..	Order Date											
	January	February	March	April	May	June	July	August	Septemb..	October	November	December
Accessories	5,478	5,369	8,767	7,952	9,613	8,908	17,126	12,376	24,900	12,927	25,957	28,007
Appliances	3,176	4,933	6,734	6,042	7,526	7,479	3,823	13,062	10,193	9,152	18,970	16,443
Art	914	1,118	1,302	2,407	2,231	2,218	2,066	1,690	3,660	1,923	3,954	3,636
Binders	12,214	4,237	13,889	13,365	9,159	13,287	8,557	20,430	37,344	18,077	20,858	31,997
Bookcases	5,352	1,650	7,352	4,720	6,290	9,148	8,589	5,622	23,373	8,247	23,561	10,977
Chairs	11,285	7,583	21,344	18,527	25,894	21,523	23,016	18,340	51,577	24,170	47,760	57,429
Copiers	3,960		25,590	3,880	18,400	900	9,780	5,730	10,320	37,020	15,150	18,800
Envelopes	750	669	1,657	945	1,096	514	1,200	701	2,177	1,403	2,907	2,458
Fasteners	88	159	150	258	109	116	182	243	406	326	550	438
Furnishings	3,980	2,316	5,159	7,538	6,893	5,923	7,609	4,034	11,805	5,447	16,783	14,218
Labels	207	300	940	430	863	1,207	1,692	876	1,496	1,248	1,850	1,376
Machines	7,215	8,990	35,052	18,190	11,268	12,183	4,065	6,262	26,386	10,613	33,807	15,210
Paper	2,264	2,813	6,286	3,964	6,213	6,722	4,180	6,523	10,690	4,997	12,578	11,250
Phones	13,469	8,984	28,443	17,609	24,362	26,314	23,883	27,658	37,775	26,472	56,221	38,817
Storage	9,218	6,125	14,793	15,806	14,670	18,606	12,491	17,743	29,487	17,240	37,023	30,643
Supplies	4,403	289	10,637	6,216	1,154	1,267	8,816	866	6,436	838	1,350	4,402
Tables	10,952	4,218	16,913	9,913	9,288	16,405	10,163	16,889	19,626	20,223	33,182	39,193



## 1g. Highlight Tables

- The idea is to create a cross table

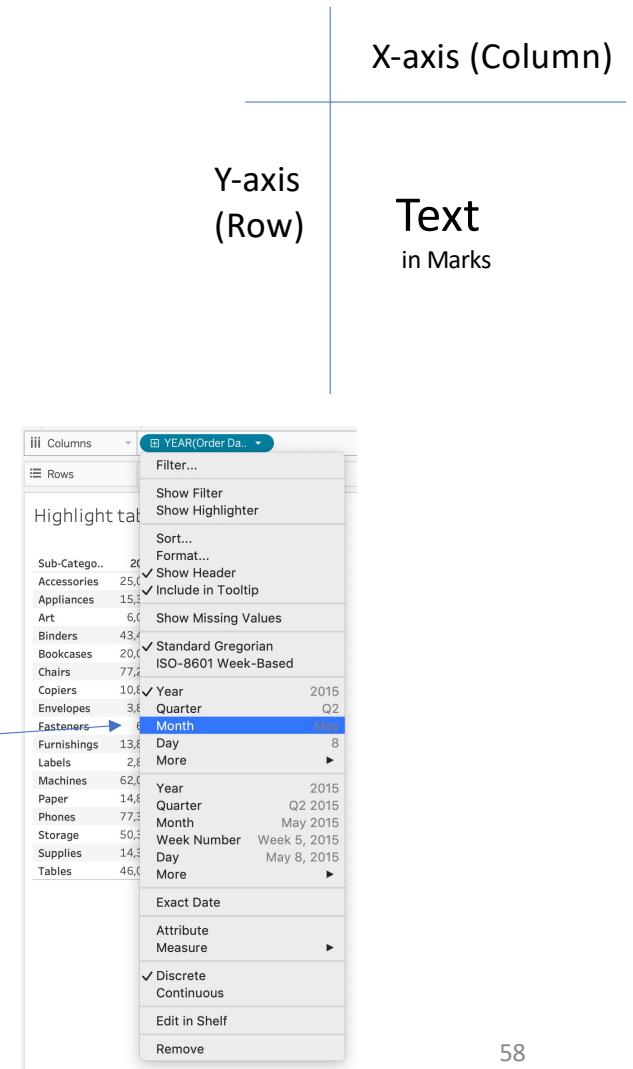




## 1g. Highlight Tables

**2 Steps: Create a cross table, then add color**

- New sheet, call it “**Highlight Table**”
- Drag “**Sales**” to the “**Text**” icon on the Marks card
- **Sub-Category** > Rows
- **Order Date** > Columns
- In the “**YEAR(Order Date)**” pill, open the context menu, select the first **Month**.



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# 1g. Highlight Tables

Tableau - Book1

Data Analytics Orders (Hult - Superstore)

Search

Tables

- Abc Region (Clipboard\_2...)
- # Target
- # Clipboard\_2020080...
- Orders
- Category, Sub-Categ...
- Abc Category
- Abc Sub-Category
- City
- Country/Region
- Customer ID
- Customer Name
- Order Date
- Order ID
- Postal Code
- Product ID
- Product Name
- Region
- # Row ID
- Segment
- Ship Date
- Ship Mode
- State
- # Discount
- # Profit
- # Quantity
- # Sales
- # Sales Difference
- # Orders (Count)

Pages

iii Columns MONTH(Order Dat...

Rows Sub-Category

Marks

Automatic

Color Size Text

Detail Tooltip

SUM(Sales)

Highlight Table

Order Date

Sub-Catego..	January	February	March	April	May	June	July	August	Septem..	October	Novem..	Decemb..
Accessories	5,478	5,369	8,767	7,952	9,613	8,908	17,126	12,376	24,900	12,927	25,957	28,007
Appliances	3,176	4,933	6,734	6,042	7,526	7,479	3,823	13,062	10,193	9,152	18,970	16,443
Art	914	1,118	1,302	2,407	2,231	2,218	2,066	1,690	3,660	1,923	3,954	3,636
Binders	12,214	4,237	13,889	13,365	9,159	13,287	8,557	20,430	37,344	18,077	20,858	31,997
Bookcases	5,352	1,650	7,352	4,720	6,290	9,148	8,589	5,622	23,373	8,247	23,561	10,977
Chairs	11,285	7,583	21,344	18,527	25,894	21,523	23,016	18,340	51,577	24,170	47,760	57,429
Copiers	3,960	25,590	3,880	18,400	900	9,780	5,730	10,320	37,020	15,150	18,800	
Envelopes	750	669	1,657	945	1,096	514	1,200	701	2,177	1,403	2,907	2,458
Fasteners	88	159	150	258	109	116	182	243	406	326	550	438
Furnishings	3,980	2,316	5,159	7,538	6,893	5,923	7,609	4,034	11,805	5,447	16,783	14,218
Labels	207	300	940	430	863	1,207	1,692	876	1,496	1,248	1,850	1,376
Machines	7,215	8,990	35,052	18,190	11,268	12,183	4,065	6,262	26,386	10,613	33,807	15,210
Paper	2,264	2,813	6,286	3,964	6,213	6,722	4,180	6,523	10,690	4,997	12,578	11,250
Phones	13,469	8,984	28,443	17,609	24,362	26,314	23,883	27,658	37,775	26,472	56,221	38,817
Storage	9,218	6,125	14,793	15,806	14,670	18,606	12,491	17,743	29,487	17,240	37,023	30,643
Supplies	4,403	289	10,637	6,216	1,154	1,267	8,816	866	6,436	838	1,350	4,402
Tables	10,952	4,218	16,913	9,913	9,288	16,405	10,163	16,889	19,626	20,223	33,182	39,193

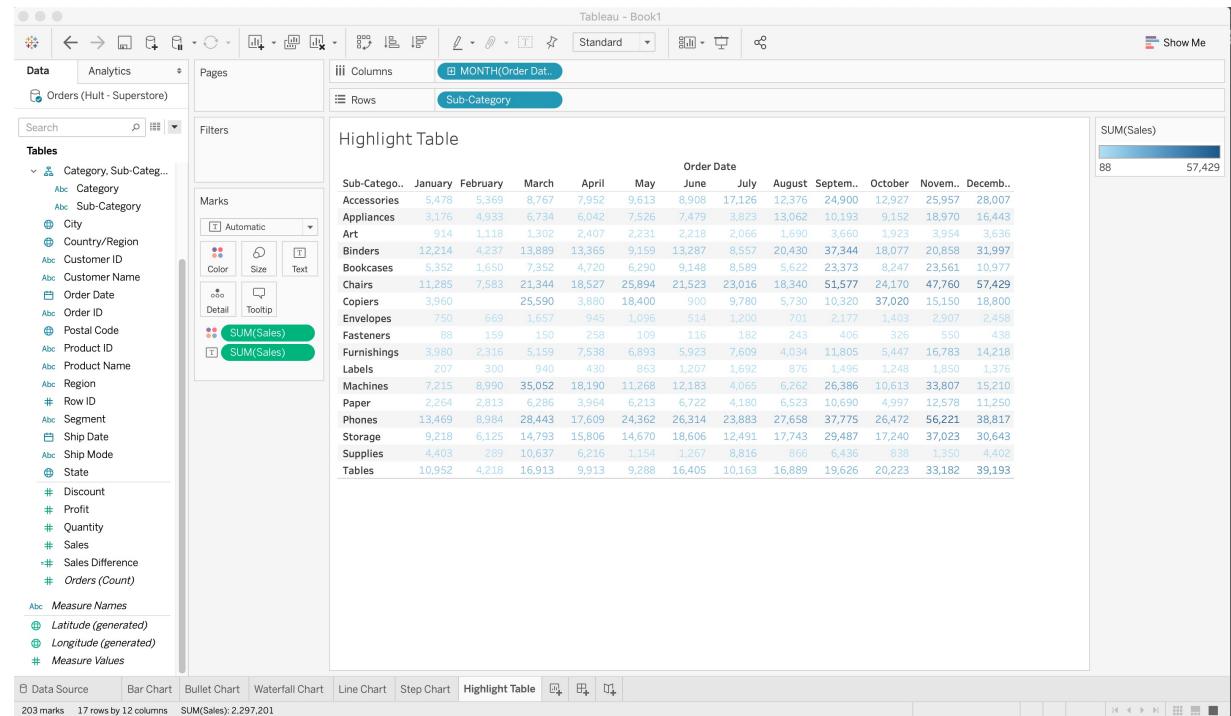
Data Source Bar Chart Bullet Chart Waterfall Chart Line Chart Step Chart Highlight Table

203 marks 17 rows by 12 columns SUM(Sales): 2,297,201



# 1g. Highlight Tables

- Now, step 2 to add color
- Drag “Sales” to color on the Marks card.
  - Darker color means higher revenue.
- Instead of changing the text color, you can choose to change the background color





# 1g. Highlight Tables

- Go to Marks, pull down menu, change from “Automatic” to “Square”

Sub-Catego..	Order Date											
	January	February	March	April	May	June	July	August	Septemb..	October	November	December
Accessories	5,478	5,369	8,767	7,952	9,613	8,908	17,126	12,376	24,900	12,927	25,957	28,007
Appliances	3,176	4,933	6,734	6,042	7,526	7,479	3,823	13,062	10,193	9,152	18,970	16,443
Art	914	1,118	1,302	2,407	2,231	2,218	2,066	1,690	3,660	1,923	3,954	3,636
Binders	12,214	4,237	13,889	13,365	9,159	13,287	8,557	20,430	37,344	18,077	20,858	31,997
Bookcases	5,352	1,650	7,352	4,720	6,290	9,148	8,589	5,622	23,373	8,247	23,561	10,977
Chairs	11,285	7,583	21,344	18,527	25,894	21,523	23,016	18,340	51,577	24,170	47,760	57,429
Copiers	3,960		25,590	3,880	18,400	900	9,780	5,730	10,320	37,020	15,150	18,800
Envelopes	750	669	1,657	945	1,096	514	1,200	701	2,177	1,403	2,907	2,458
Fasteners	88	159	150	258	109	116	182	243	406	326	550	438
Furnishings	3,980	2,316	5,159	7,538	6,893	5,923	7,609	4,034	11,805	5,447	16,783	14,218
Labels	207	300	940	430	863	1,207	1,692	876	1,496	1,248	1,850	1,376
Machines	7,215	8,990	35,052	18,190	11,268	12,183	4,065	6,262	26,386	10,613	33,807	15,210
Paper	2,264	2,813	6,286	3,964	6,213	6,722	4,180	6,523	10,690	4,997	12,578	11,250
Phones	13,469	8,984	28,443	17,609	24,362	26,314	23,883	27,658	37,775	26,472	56,221	38,817
Storage	9,218	6,125	14,793	15,806	14,670	18,606	12,491	17,743	29,487	17,240	37,023	30,643
Supplies	4,403	289	10,637	6,216	1,154	1,267	8,816	866	6,436	838	1,350	4,402
Tables	10,952	4,218	16,913	9,913	9,288	16,405	10,163	16,889	19,626	20,223	33,182	39,193

The screenshot shows the Tableau interface with the 'Marks' shelf open. The 'Automatic' option is currently selected. The 'Square' option is highlighted with a gray background. Other options like 'Bar', 'Line', 'Area', 'Circle', 'Shape', 'Text', 'Map', 'Pie', 'Gantt Bar', 'Polygon', and 'Density' are also listed.

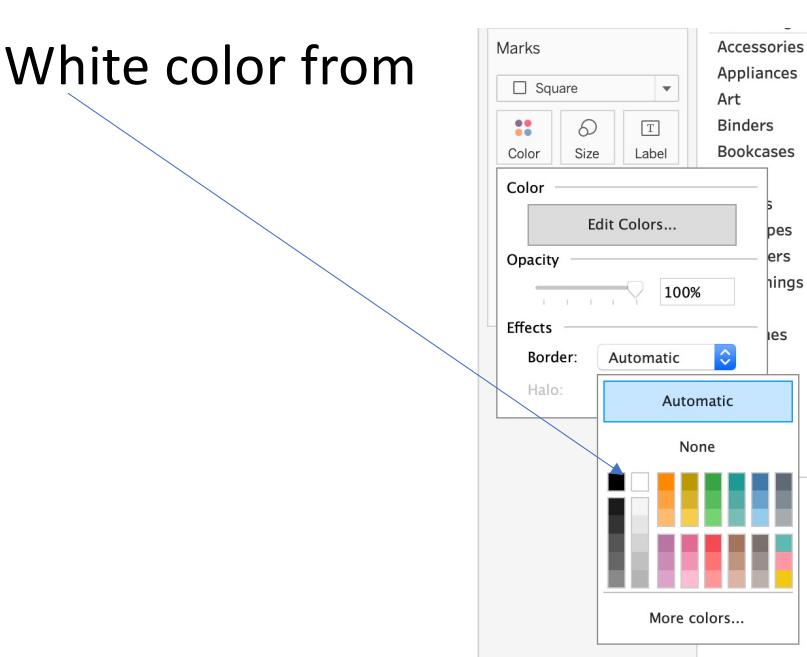
Sub-Catego..	January
Accessories	5,478
Appliances	3,176
Art	914
Binders	12,214
Bookcases	5,352
Chairs	11,285
Copiers	3,960
Envelopes	750
Fasteners	88
Furnishings	3,980
Labels	207
Machines	7,215
Paper	2,264
Phones	13,469
Storage	9,218
Supplies	4,403
Tables	10,952

But the colorful cells are touching each other. How about we add a white border for each cell?



## 1g. Highlight Tables

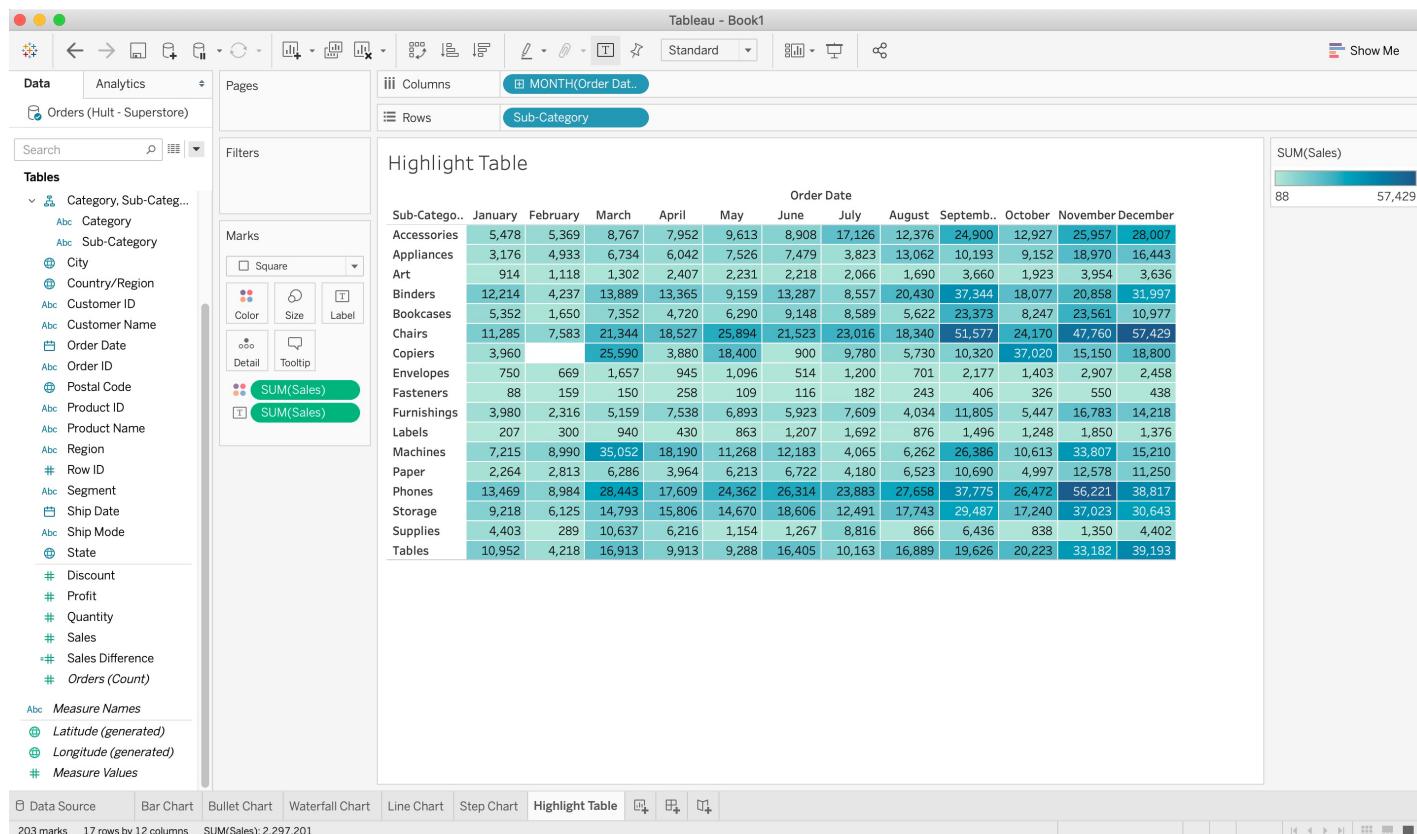
- In Marks, click “Color”, select White color from the Border pull-down menu.





# 1g. Highlight Tables

- Done!





## 1h. Heatmap



# 1h. Heatmap

- In the last session, we looked at creating a heatmap on a geographic map.
- Today, we can make a table that also looks like a Heatmap (kind of!)
- Here, we don't care about the actual numbers

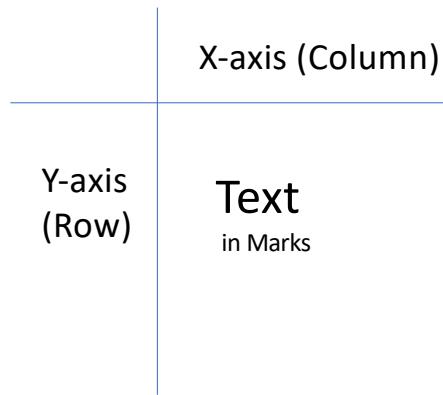
Let's say we want to create this ultimately:

Sub-Catego..	January	February	March	April	May	June	July	August	September	October	November	December
Accessories	●	●	●	●	●	●	●	●	●	●	●	●
Appliances	●	●	●	●	●	●	●	●	●	●	●	●
Art	●	●	●	●	●	●	●	●	●	●	●	●
Binders	●	●	●	●	●	●	●	●	●	●	●	●
Bookcases	●	●	●	●	●	●	●	●	●	●	●	●
Chairs	●	●	●	●	●	●	●	●	●	●	●	●
Copiers	●	●	●	●	●	●	●	●	●	●	●	●
Envelopes	●	●	●	●	●	●	●	●	●	●	●	●
Fasteners	●	●	●	●	●	●	●	●	●	●	●	●
Furnishings	●	●	●	●	●	●	●	●	●	●	●	●
Labels	●	●	●	●	●	●	●	●	●	●	●	●
Machines	●	●	●	●	●	●	●	●	●	●	●	●
Paper	●	●	●	●	●	●	●	●	●	●	●	●
Phones	●	●	●	●	●	●	●	●	●	●	●	●
Storage	●	●	●	●	●	●	●	●	●	●	●	●
Supplies	●	●	●	●	●	●	●	●	●	●	●	●
Tables	●	●	●	●	●	●	●	●	●	●	●	●



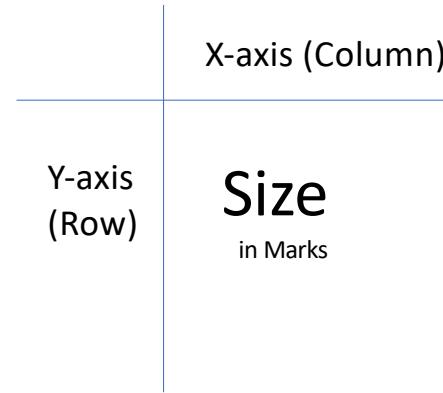
## 1h. Difference between a highlight table and a heatmap

### Highlight table:



- Color and text
- Square

### Heatmap:

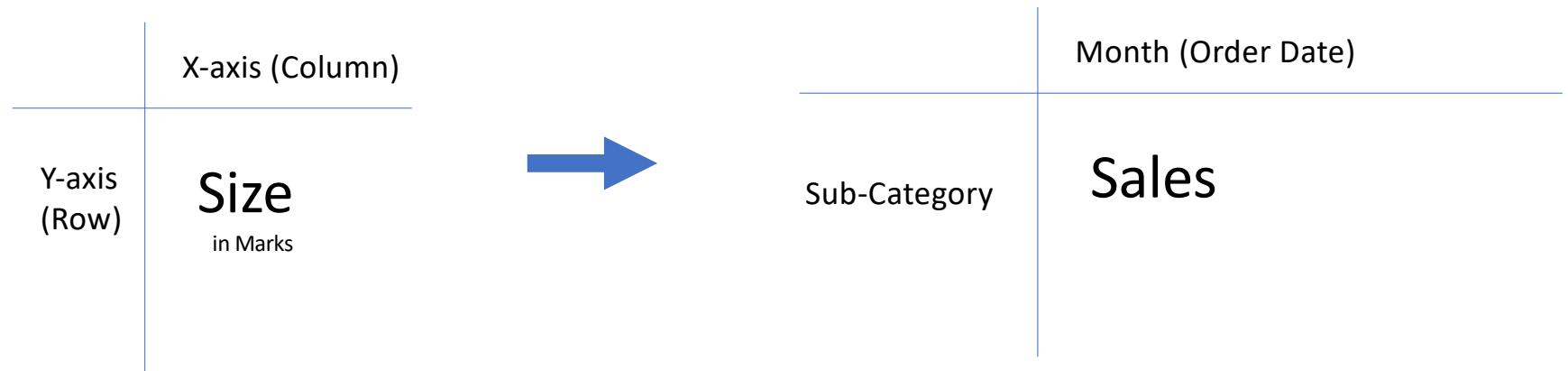


- Color and Size
- Circle



# 1h. Heatmap

- Create a cross table





# 1h. Heatmap

- Hult– Superstore.xls

**2 Steps: Create a cross table, then add color**

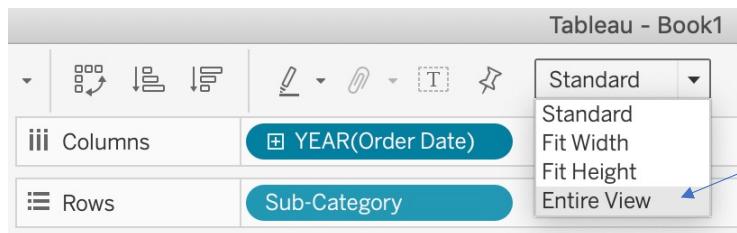
- New sheet, call it “Heatmap”
- Drag “Sales” to the “Size” field on the Marks card
- Sub-Category > Rows
- Order Date > Columns
- In the Marks card, change “Automatic” to “Circle”
- In the “YEAR(Order Date)” pill, open the context menu, select the first Month.

The screenshot shows the context menu for the 'YEAR(Order Da...)' pill in the Marks card. The 'Month' option under the 'Year' section is highlighted with a blue arrow pointing from the text above. The menu includes options like 'Filter...', 'Show Filter', 'Show Highlighter', 'Sort...', 'Format...', 'Show Header' (checked), 'Include in Tooltip' (checked), 'Show Missing Values', 'Standard Gregorian ISO-8601 Week-Based' (checked), 'Year' (2015), 'Quarter' (Q2), 'Month' (May) which is selected, 'Day' (8), 'More', 'Year' (2015), 'Quarter' (Q2 2015), 'Month' (May 2015), 'Week Number' (Week 5, 2015), 'Day' (May 8, 2015), and 'More'.



# 1h. Heatmap

- At the top, change “Standard” to “Entire View” in the pull-down menu



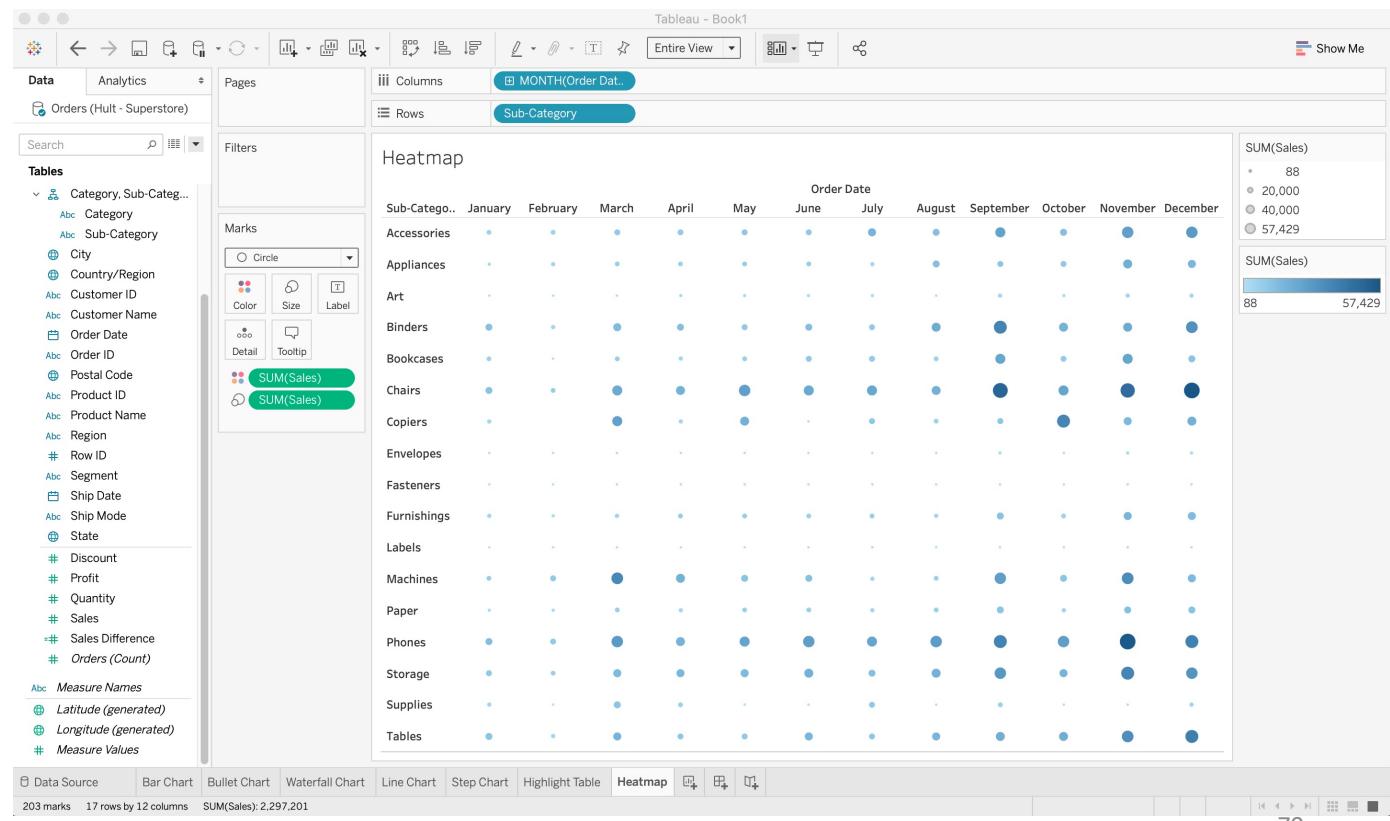
Heatmap

- To make the circles colorful, drag “Sales” to the “Color” icon on the Marks card.



# 1h. Heatmap

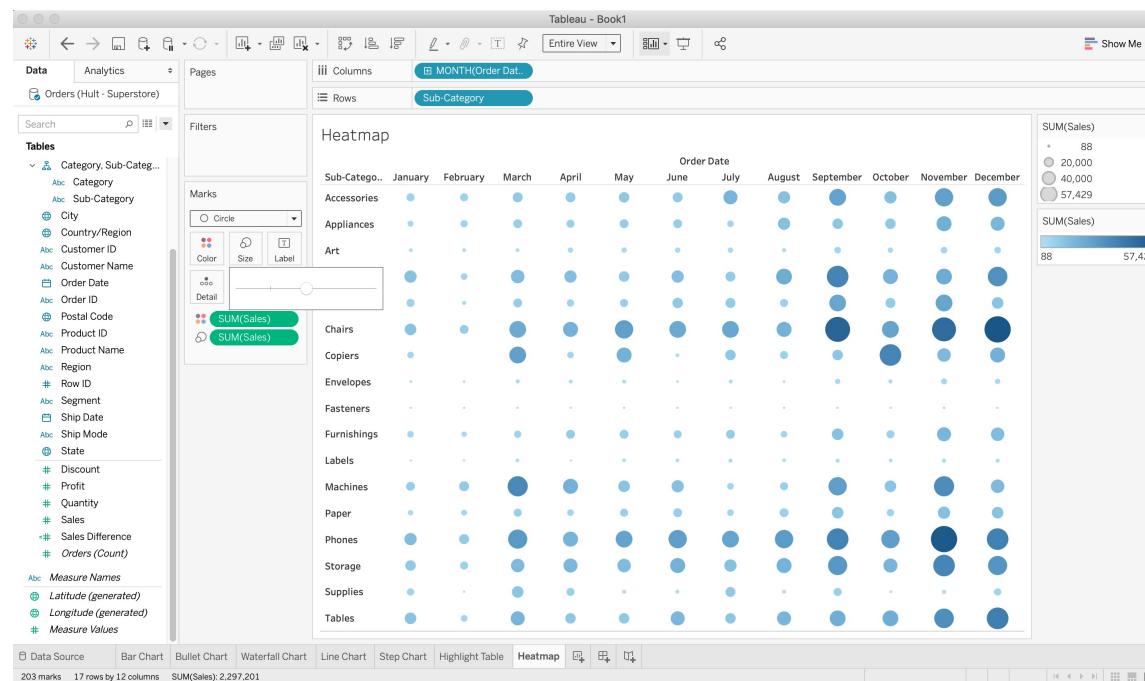
But the circles are too small!





# 1h. Heatmap

- To make the circles bigger, click the “Size” icon on the Marks card and then move the slider to the right.



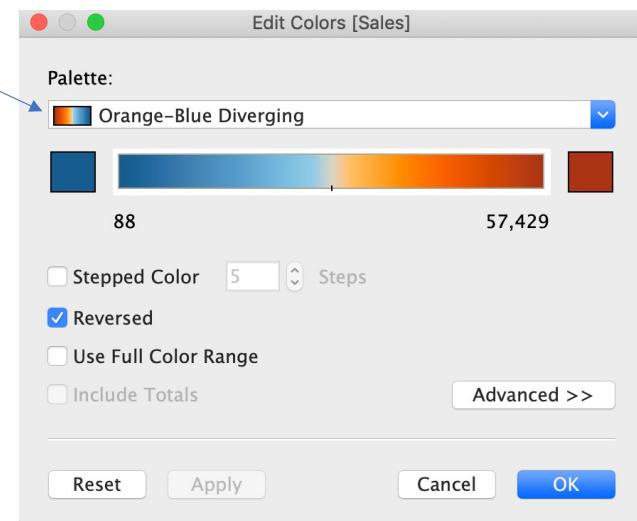
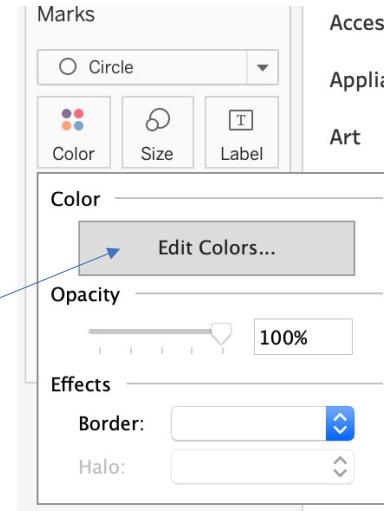
71



# 1h. Heatmap

**Finally, let's fine-tune the color.**

- It's all blue, how about we add more colors?
- Instead of the classic **red-green**, we should use **orange-blue** palette.
  - This is because about 9% of men and 0.8% of women suffer from red-green color blindness.
- Go to the Marks card, click the “**Color**” icon, “**Edit Colors...**”, and select “**Orange-Blue Diverging**” in the pull-down menu
- Since we want to show low-value in blue and high-value in orange, check “**Reversed**” to flip the color.
- **Apply, OK.**

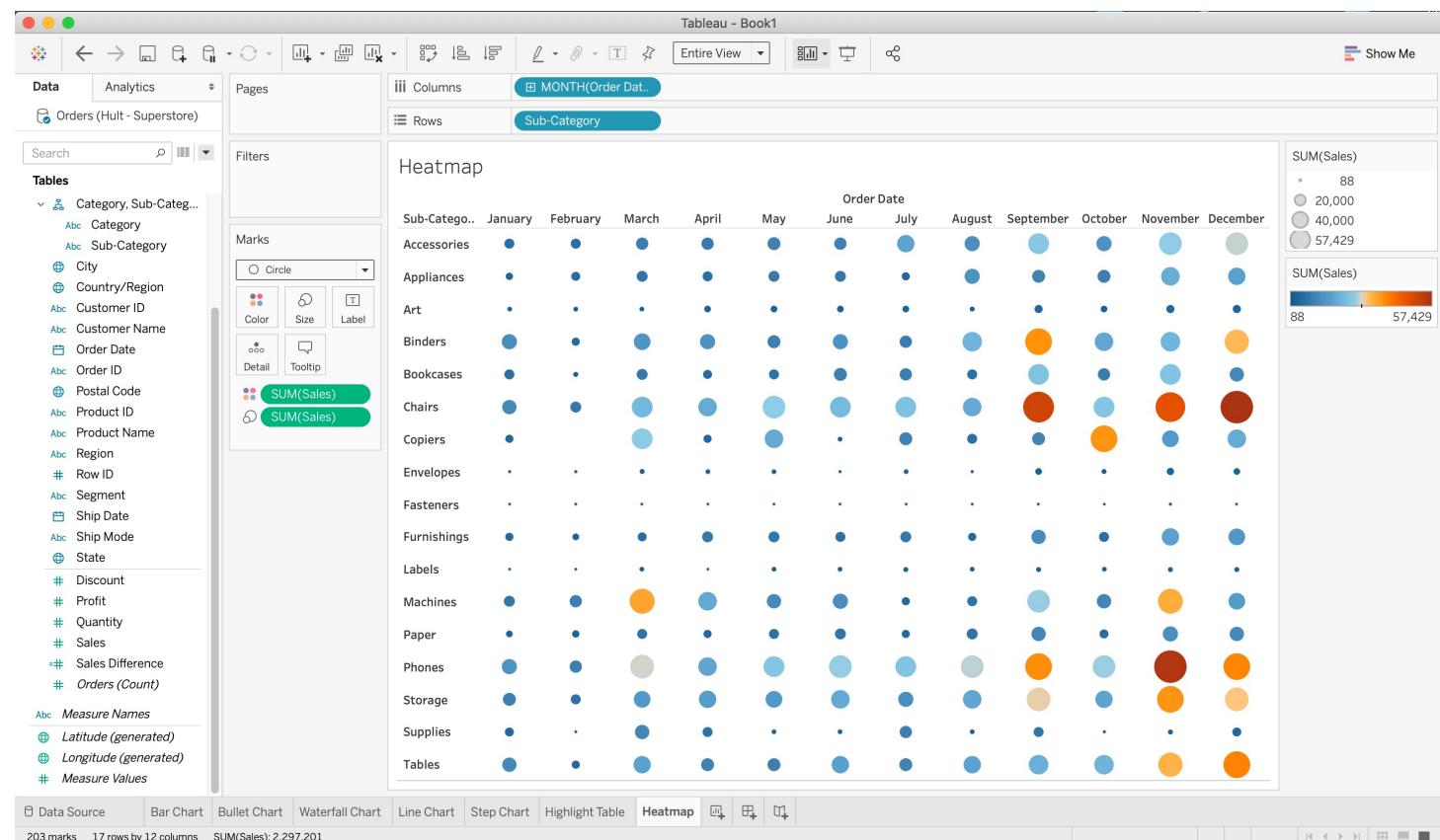


72



# 1h. Heatmap

- Done!



## 2. Composition



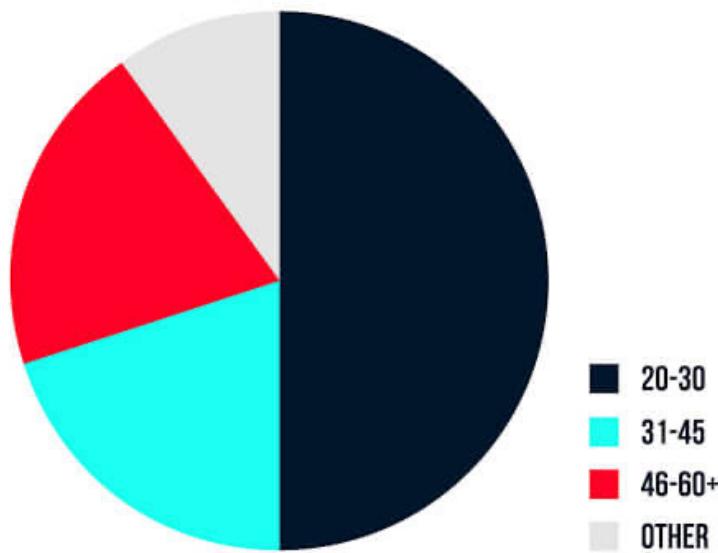
HULT  
INTERNATIONAL  
BUSINESS SCHOOL

## 2a. Pie Chart



## 2a. Pie Chart

**CUSTOMER AGE DEMOGRAPHIC**



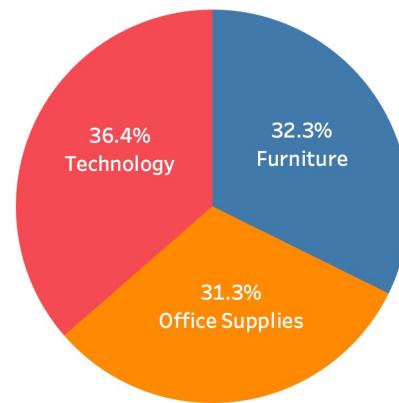
Pie chart: graph that displays information as a circle divided into slices to illustrate proportion.

76



## 2a. Pie Chart

Let's say we want to create this ultimately:

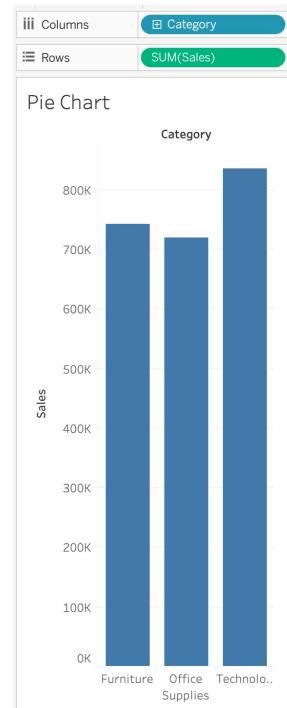




## 2a. Pie Chart

To build a pie chart, create a **bar chart** first and then use the **Show Me** card to select the pie chart option.

- Hult – Superstore.xls
- New sheet, call it “**Pie chart**”
- Sales > Rows
- Category > Columns





## 2a. Pie Chart

- Then use the **Show Me** card to select the **Pie Chart** option [2<sup>nd</sup> row, 3<sup>rd</sup> icon].
  - Alternatively, you can also create a pie chart directly in the Marks card. [Drag Category to Color in the marks card; automatic to pie]

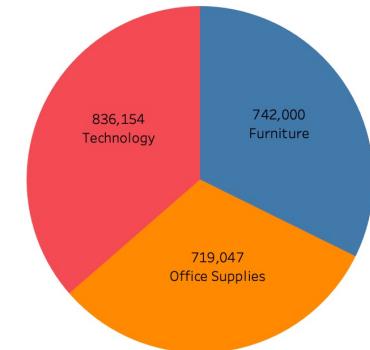
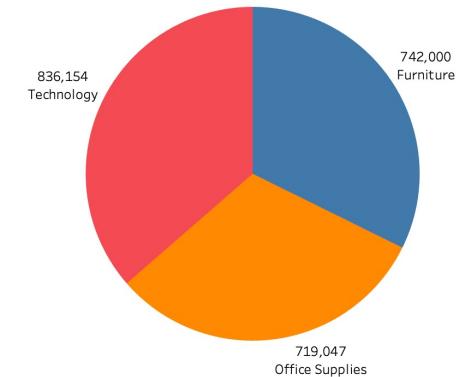
The screenshot shows the Tableau interface with the following elements:

- Top Bar:** Includes standard icons for zoom, refresh, and a dropdown menu labeled "Standard".
- Show Me Card:** Located on the right side of the interface. It displays various visualization options in a grid. The "Pie" option is highlighted with an orange border.
- Marks Card:** Located on the far right. It shows the configuration for the pie chart:
  - Color: Topping (selected)
  - Size: SUM(Percent)
  - Label: SUM(Percent)
  - Detail: (empty)
  - Tooltip: (empty)
  - Angle: (empty)
- View Area:** Shows a pie chart with three segments colored red, blue, and orange. The background of the view area shows a world map.
- Left Panel:** Shows the "Columns" and "Rows" sections, both currently empty.



## 2a. Pie Chart

- Go to the top to change “Standard” view to “**Entire View**” to make the chart bigger. If it’s still not big enough, you can go to “Size” in the Marks card to adjust further.
- To add text information for each pie:
  - **Sales > Label** in the Marks card
  - **Category > Label** in the Marks card
- To move the text onto the pie itself:
  - Double click the text, and then **drag it in!**

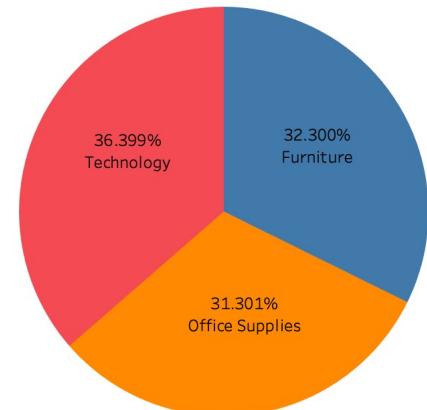
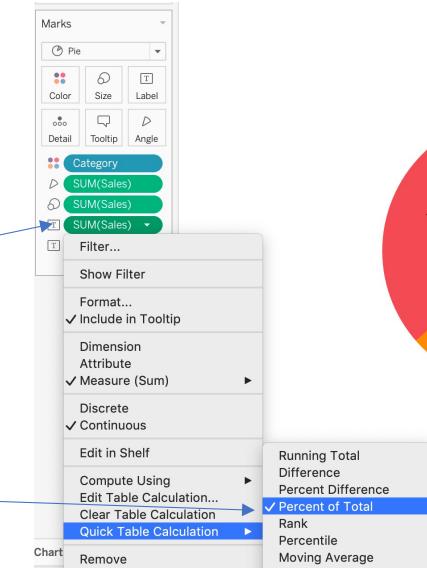


80



## 2a. Pie Chart

- To change the number into percentage:
  - In the Marks card, right-click on Label pill of **SUM(Sales)**
  - Quick Table Calculation > Percent of Total
  - But....there are too many decimal places!

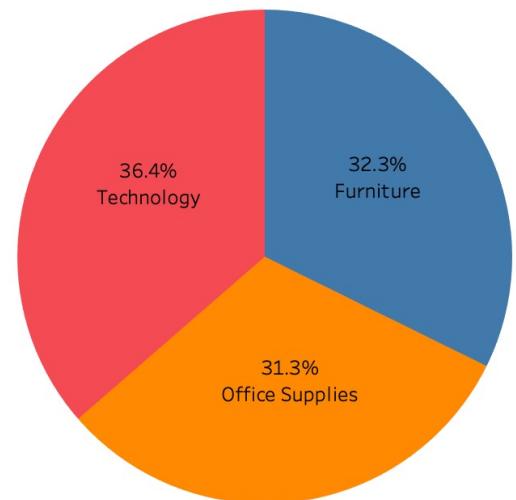




## 2a. Pie Chart

- To reduce the % decimal place
  - In the Marks card, right-click on again on the label pill of **SUM(Sales)**
  - **Format...**
  - Default: Numbers: **Percentage**: change it to 1 decimal place

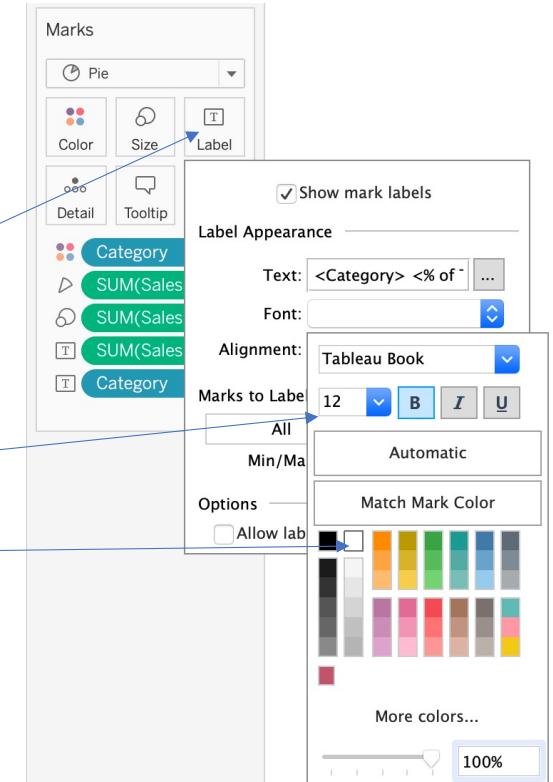
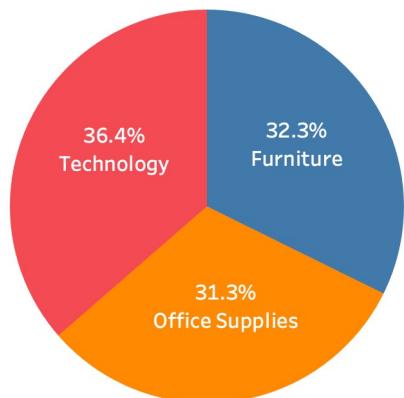
The screenshot shows the 'Format' dialog box for a pie chart. The 'Marks' card is selected. Under the 'Numbers' section, the 'Type' dropdown is set to 'Percentage'. A sub-menu is open, showing various number formats: Automatic, Number (Standard), Number (Custom), Currency (Standard), Currency (Custom), Scientific, Percentage, and Custom. The 'Percentage' option is highlighted. The 'Decimal places' input field shows '1'.





## 2a. Pie Chart

- Now, let's fine tune it by making the text white and bigger:
  - In the Marks card, click the "Label" icon
  - Font: Change font size to 12, **bold** the text, and make the color white





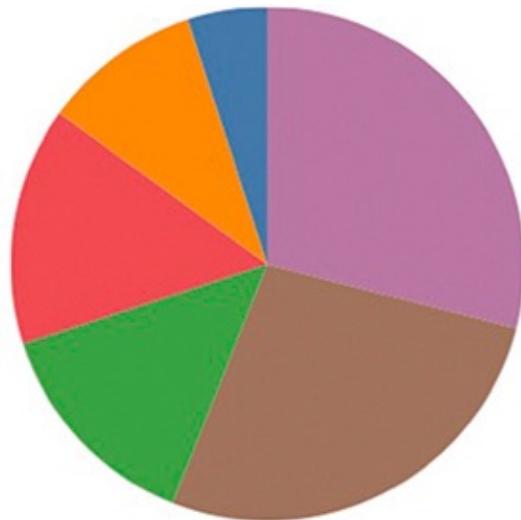
## 2b. Donut Chart



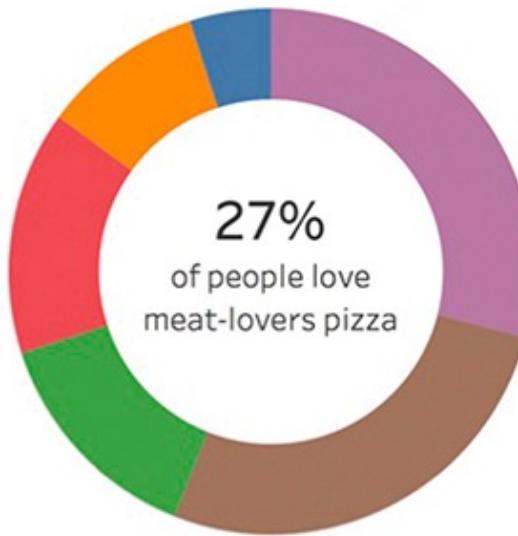
## 2b. Donut Chart

To avoid a bad pie chart, focus on comparing 6 or less values.

Use distinct color separation for maximum readability.



Pie Chart



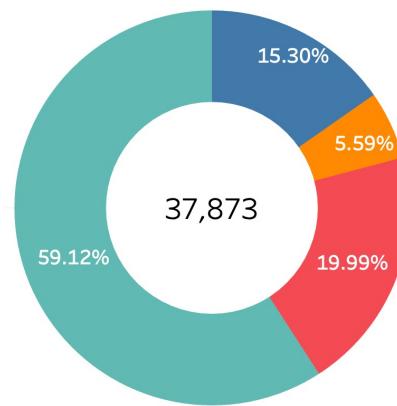
Donut Chart

Donut charts can help clarify your data story by including a key takeaway in the center white space



## 2b. Donut Chart

Let's say we want to create this ultimately:





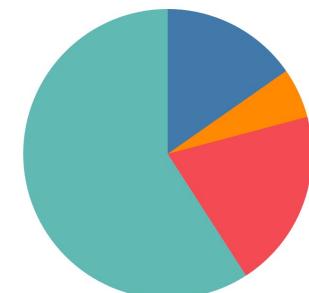
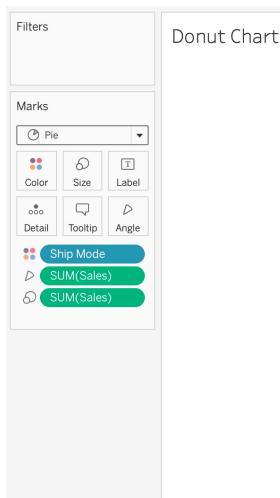
## 2b. Donut Chart

**Now, let's learn to create a Donut Chart**

1. New sheet, call it “**Donut chart**”
2. Drag “**Ship Mode**” to **Canvas**
3. Drag “**Sales**” to the “**ABC**” in the table
4. “**Show Me**” card > Pie chart
5. Make it bigger by changing the view from “**Standard**” to “**Entire View**” at the top.

Donut Chart

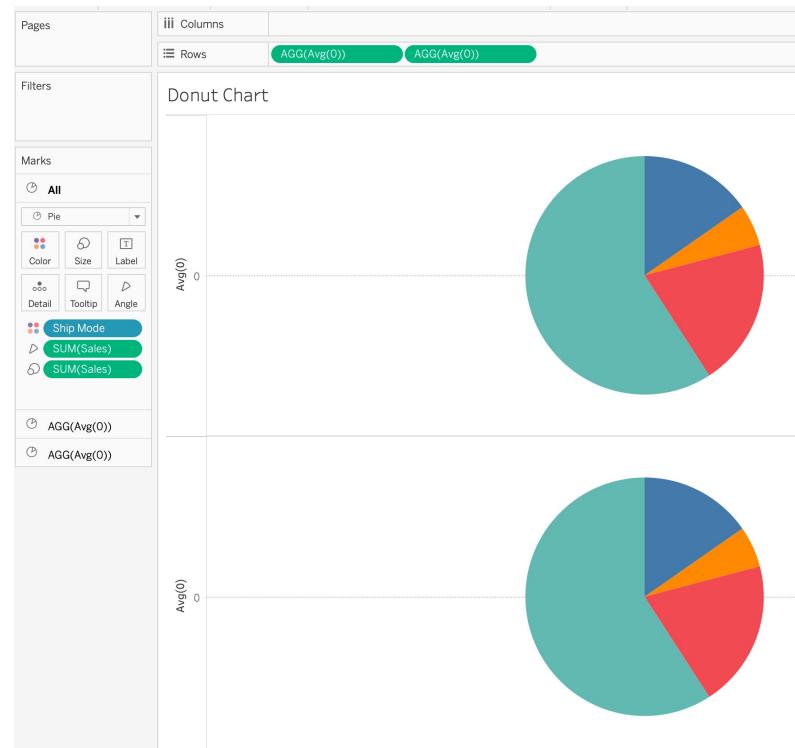
Ship Mode	
First Class	351,428
Same Day	128,363
Second Class	459,194
Standard Class	1,358,216





## 2b. Donut Chart

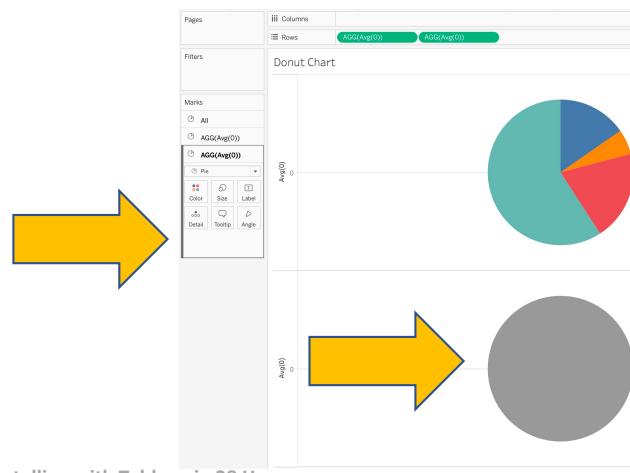
6. Now, double click the Rows to enter “**Avg(0)**” and press **Return** to create a placeholder pill.
7. On the right-hand side of this pill, double click the Rows again to enter the second “**Avg(0)**” and press **Return**
  - Note: it's zero and not an O
8. Go to the Size icon in the Marks card to enlarge the 2 pie charts





## 2b. Donut Charts

9. In the Marks card, select the **second “AGG(Avg(0))” page located at the bottom.**  
We’re going to modify the 2<sup>nd</sup> pie chart.
10. Remove all 3 pills



The Marks card shows the following configurations:

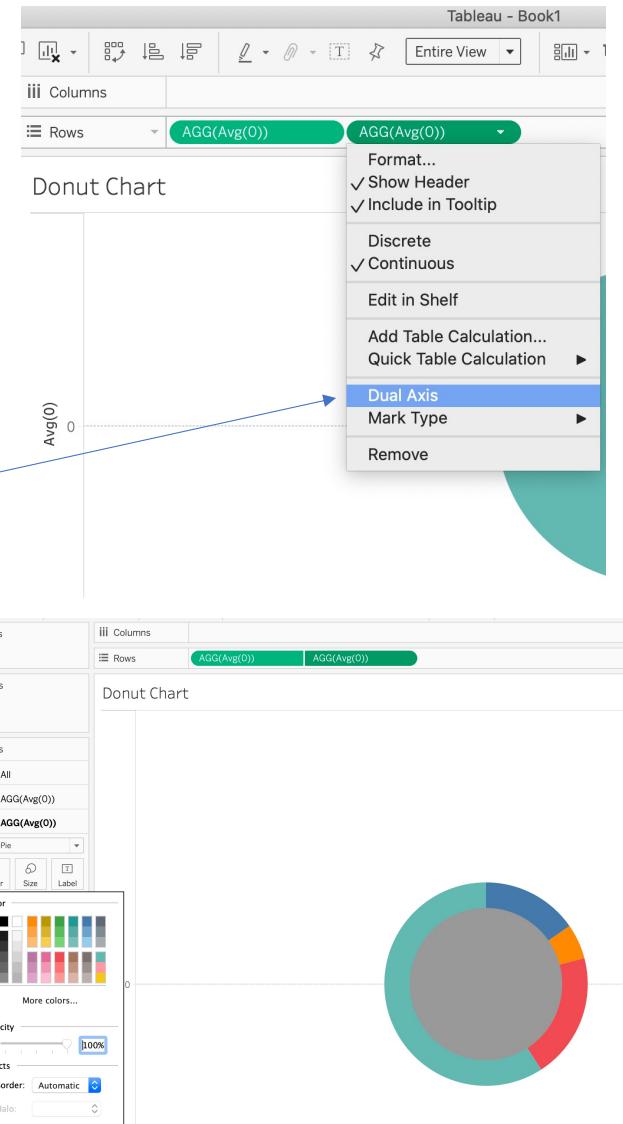
- Pie** (selected)
- Color**: AGG(Avg(0))
- Size**: AGG(Avg(0))
- Label**: AGG(Avg(0))
- Detail**: AGG(Avg(0))
- Tooltip**: AGG(Avg(0))
- Angle**: AGG(Avg(0))

Below these, there are two green buttons labeled **Ship Mode** and **SUM(Sales)**, and two collapsed sections labeled **MIN(Quantity)** and **MIN(Quantit...)**.



## 2b. Donut Charts

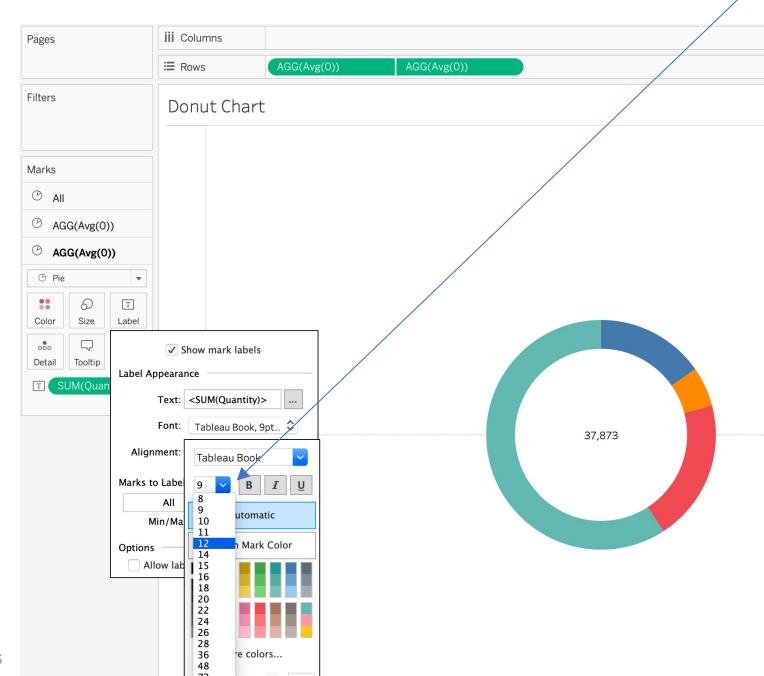
11. Click the “Size” icon to decrease the size of the 2<sup>nd</sup> pie chart by about 20%
12. Go to the 2<sup>nd</sup> “AGG(Avg(0))” pill’s context menu at the top, select “Dual Axis” to combine the 2 pie charts.
13. Go to the “Color” icon in the Marks card to change the color from grey to white, so that the middle of the Donut Chart is white.





## 2b. Donut Charts

14. Drag “Quantity” to “Label” icon in the Marks card.
15. To increase the size of text (e.g., 37,873), go to the “Label” icon in the **“AGG(Avg(0))”page** of the Marks card, Font, and change the font size there.



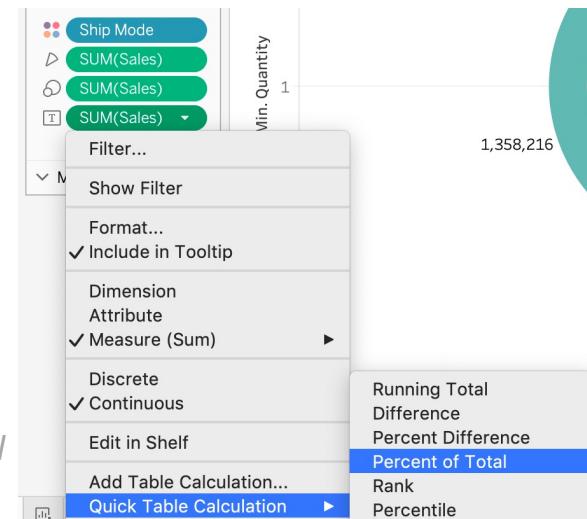
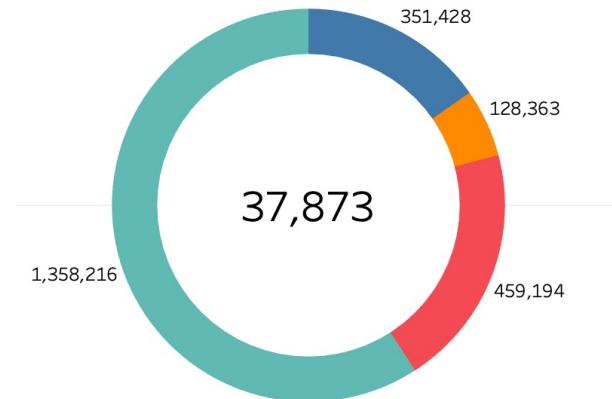
91



## 2b. Donut Charts

16. Let's add some numbers to the outer arc.
17. Go to first “**AGG(Avg(0))**” page in the Marks card, then drag “**Sales**” to the “**Label**” icon.
18. It's showing the numbers. You can turn them into percentages.
19. Go to the Label pill of “**SUM(Sales)**”, context menu, **Quick Table Calculation > Percent of Total**.

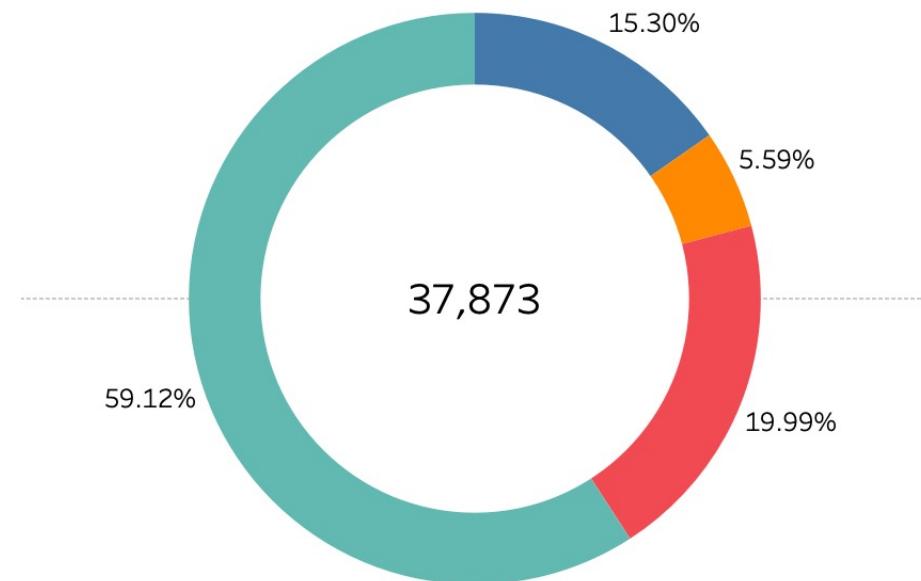
*If required, reduce the % decimal place by going to the Marks card, right-click on again on the label pill of SUM(Sales), Format..., Default: Numbers: Percentage: change it to 1 decimal place*





## 2b. Donut Charts

Done!





## 2c. Treemap

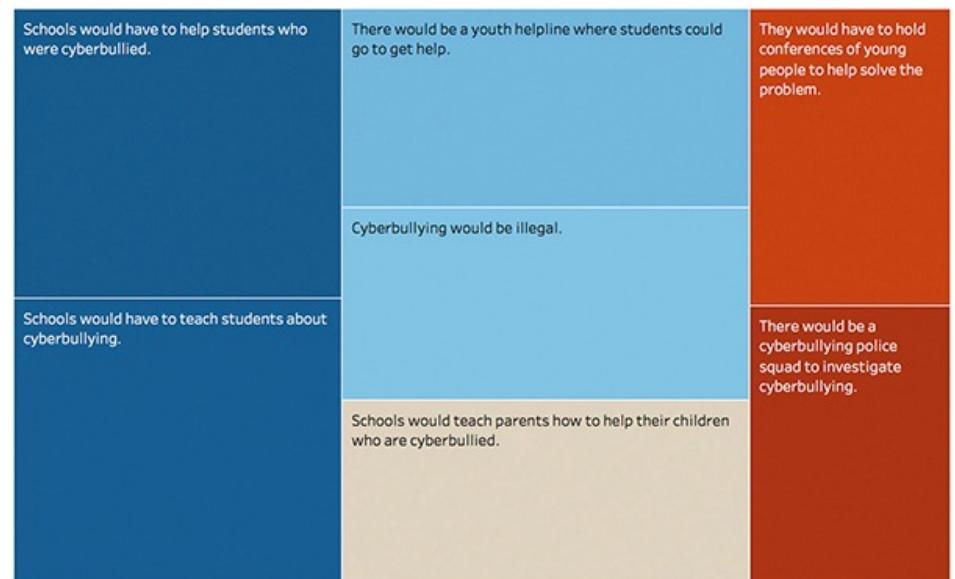


## 2c. Treemap

- Treemap uses a series of rectangles of various sizes to show relative proportions.
- Best for analyzing a parts-to-whole relationship.
- It is ideal for legibly showing hundreds (or perhaps even thousands) of items simultaneously within a single visualization.

### How Would Students Fight Back?

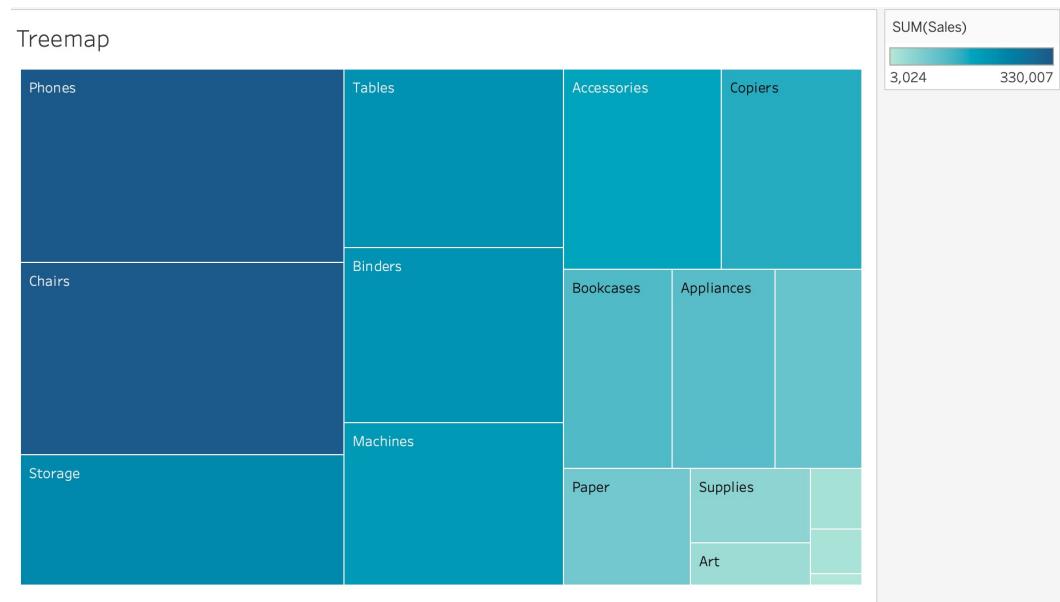
Students recognize that schools have a responsibility to educate and support students who experience cyberbullying.





## 2c. Treemap

Let's say we want to create this ultimately:

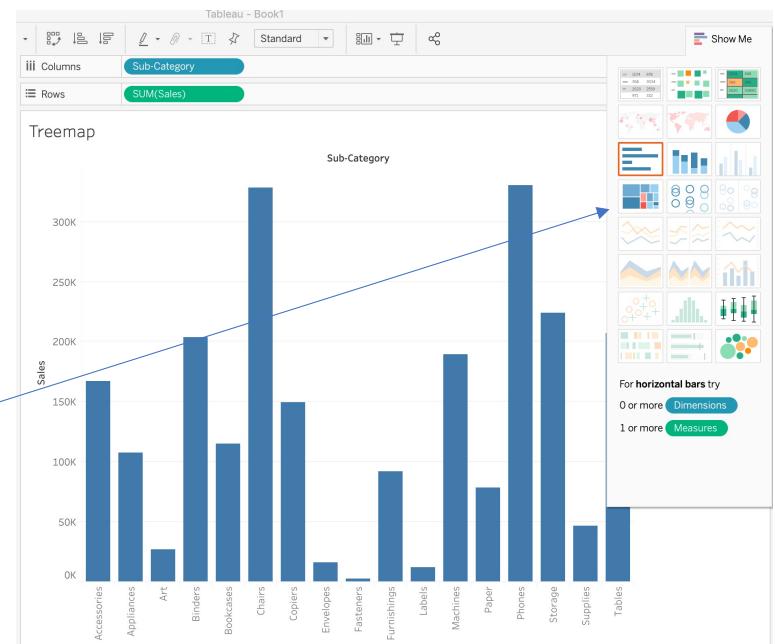


Tree map: graph that displays information as a diagram of hierarchical data in the form of nested rectangles whose sizes reflect variables' quantitative values.



## 2c. Treemap

- Hult – Superstore.xls
- New sheet, call it “Treemap”
- Sales > Rows
- Sub-category > Columns
- A bar chart is created. Now, use the Show Me card to build a treemap [4th row, first icon]





## 2c. Treemap

Done!



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## 2c. Treemap

- The greater the sum of unique responses for each category, the darker and larger its box (this is further clarified by the color legend at right).
- Size and Color are crucial elements in treemaps.
- You can modify a treemap by adjusting how color is utilized.



HULT  
INTERNATIONAL  
BUSINESS SCHOOL

## 2d. Packed Bubble Chart



## 2d. Packed Bubble Chart

- The bubble chart is a variation of the scatter plot that replaces data points with a cluster of circles (bubbles)
- This method **shows relational values** without regard to axes
- It is used to display three dimensions of data: two through the bubble's location and another through size.

Let's say we want to create this ultimately:





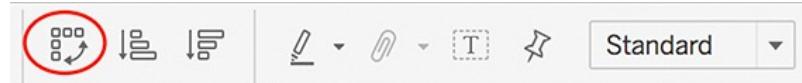
## 2d. Packed Bubble Chart

- These charts allow for the **comparison of entities** in terms of their relative positions with respect to each numeric axis and size.
- The sizes of the bubbles provide details about the data, and **colors** can be used as an additional encoding cue to **answer many questions** about the data at once.



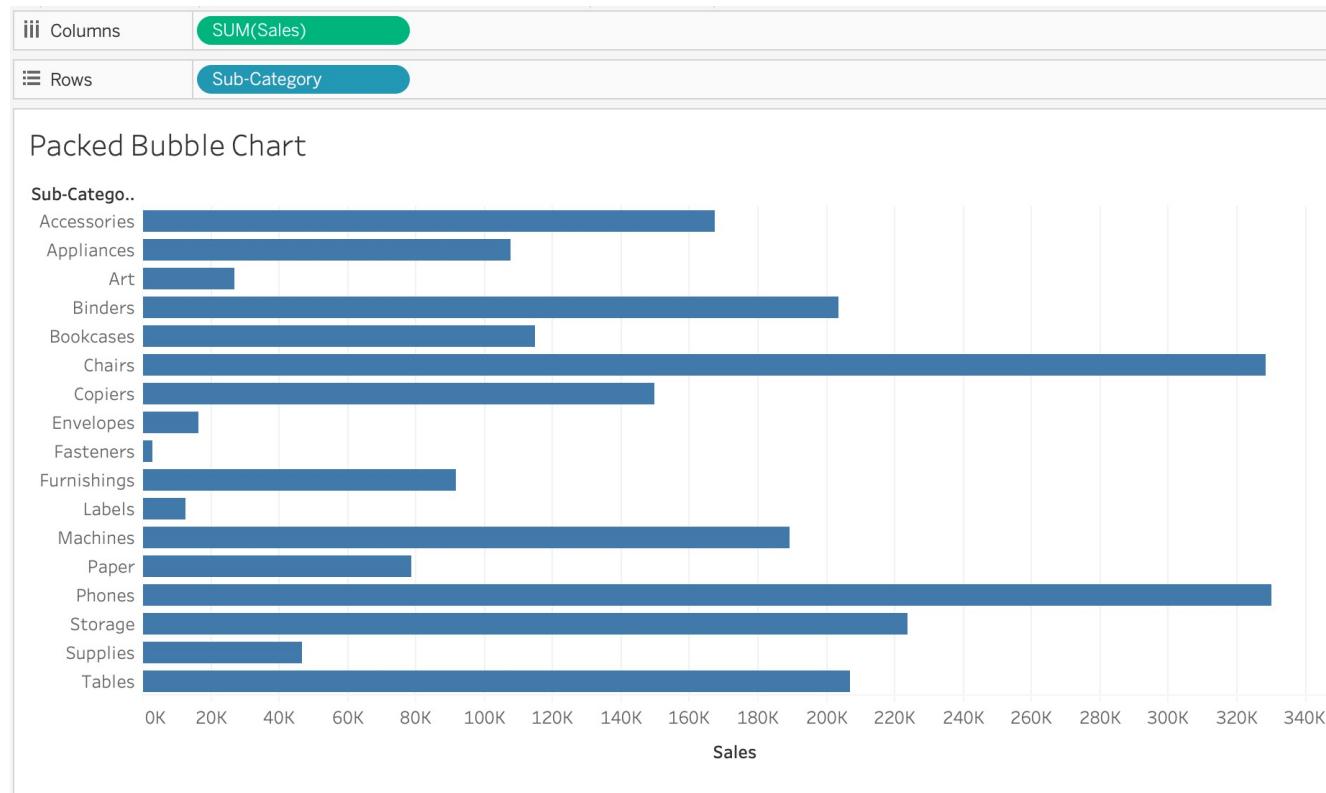
## 2d. Packed Bubble Chart

- Strategy: first build a **bar chart** and then make it a bubble chart
- **Hult– Superstore.xls**
- New sheet, call it “**Packed Bubble Chart**”
- **Sub-Category > Columns**
- **Sales > Rows**
- Flip it sideways





## 2d. Packed Bubble Chart



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## 2d. Packed Bubble Chart

- Use the “Show Me” card to select the Packed Bubble chart [8<sup>th</sup> row, 3<sup>rd</sup> icon]



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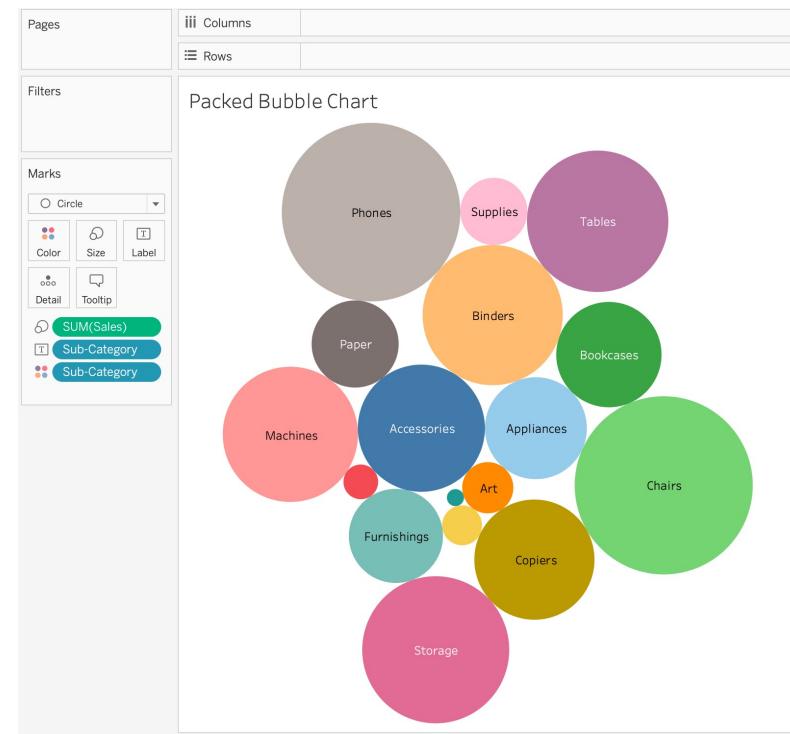


## 2d. Packed Bubble Chart

In this example, the size of the bubble represents the amount of sales whereas the color of the bubble represents the sub-category.

To change color of a category, go to the Color icon in the Marks card, Edit Color..., and adjust accordingly.

Done!

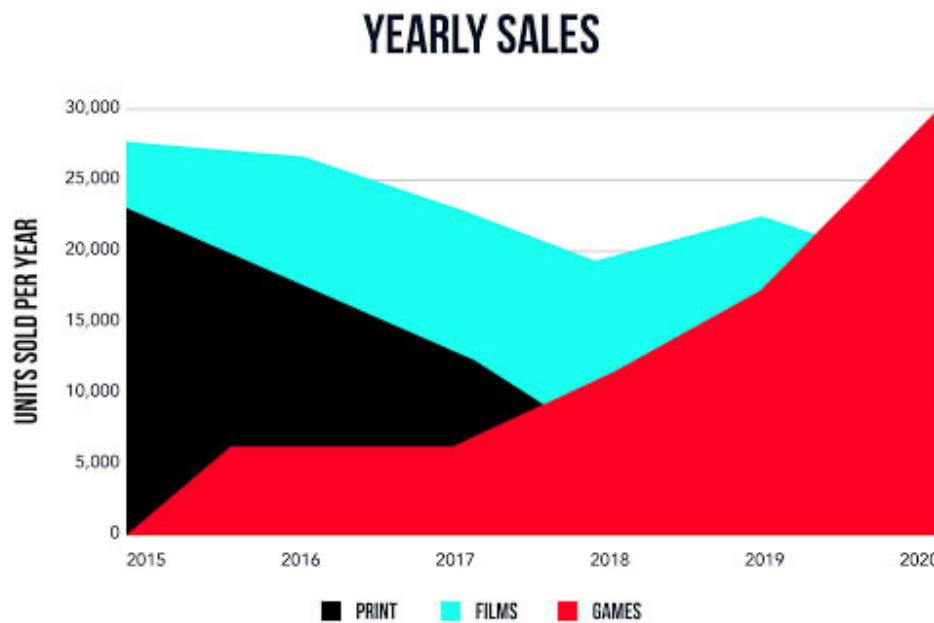




## 2e. Area Chart



## 2e. Area Chart

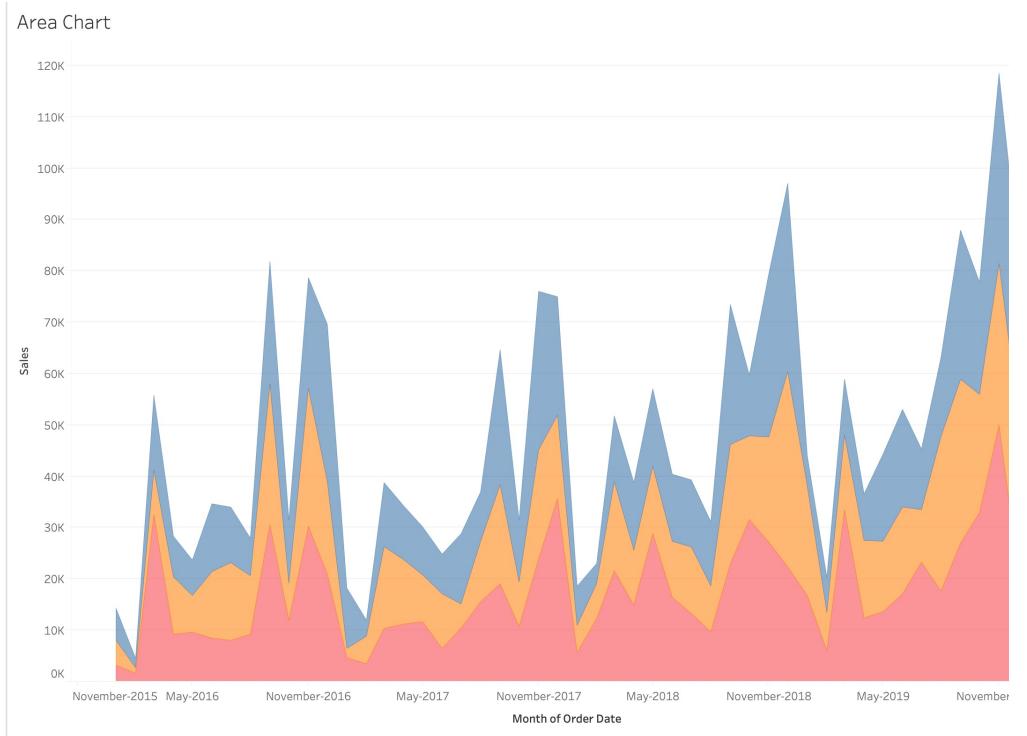


Area chart: graph that displays information as a line chart for which distinct areas between the lines and the axes are emphasized with colors, textures, or hatchings.



## 2e. Area Chart

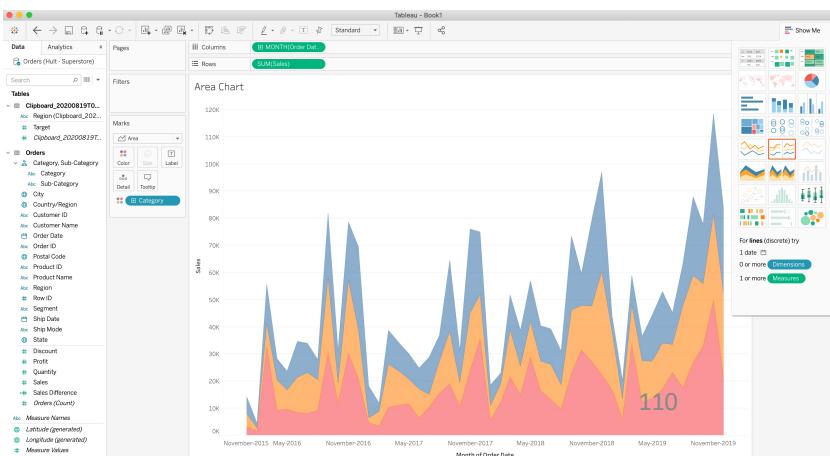
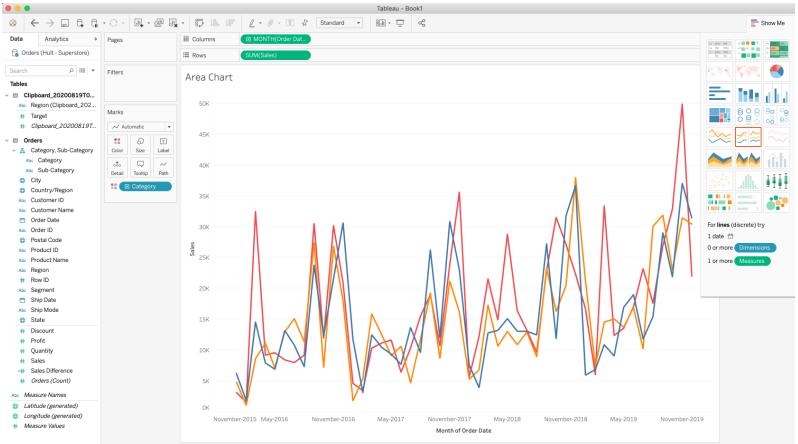
Let's say we want to create this ultimately:





## 2e. Area Chart

- Hult – Superstore.xls
- New sheet, call it “Area Chart”
- Sales > Rows
- Order Date > Columns
  - Change it from YEAR to the 2<sup>nd</sup> month (continuous)
- Drag “Category” to the “Color” icon in the Marks card
- A line chart is created. Now, use the Show Me card to build an Area Chart [6th row, first icon]





## 2f. Cumulative Sum with Waterfall Chart



## 2f. Cumulative Sums with Waterfall charts

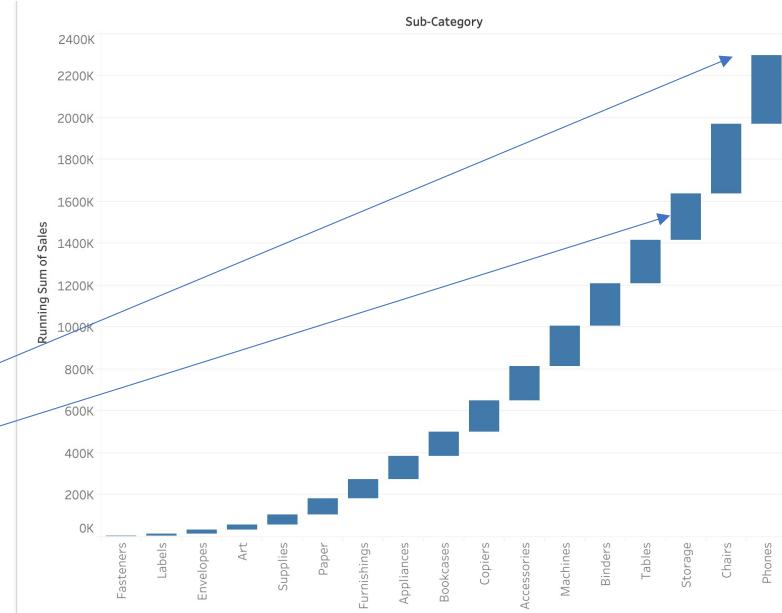
- Waterfall charts effectively show the **cumulative sum** of a series of positive and negative values.
- The chart shows the starting value, the end value, and the **incremental steps** of the series.

**Usage:** Look at new sales per category, or...

Total number of new enrollment  
(New enrollment per program)

*Use it when changes over time is not the focus*

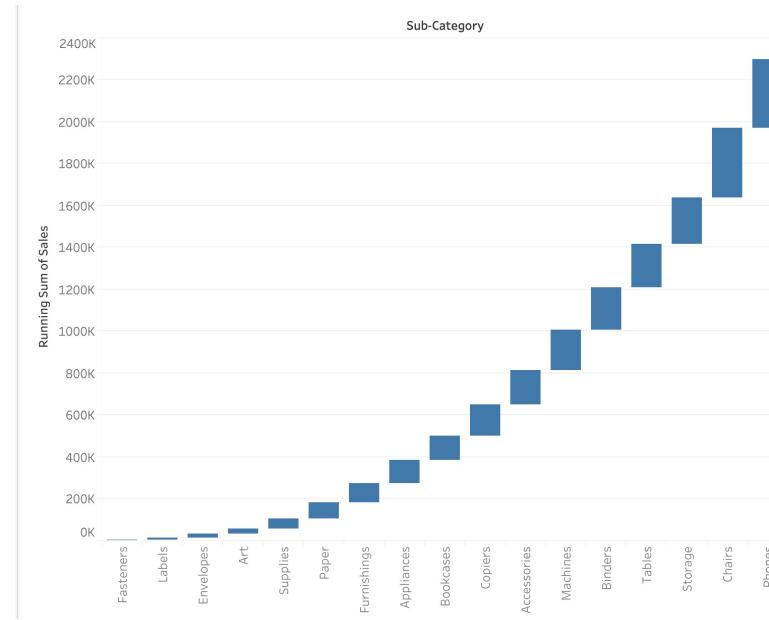
Let's say we want to create this ultimately:





## 2f. Cumulative Sums with Waterfall charts

- That is, we want to build a waterfall chart that shows the **contributions of each subcategory** to the grand total of sales.



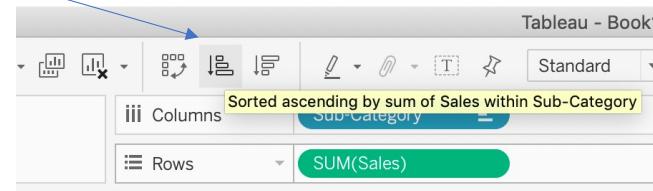
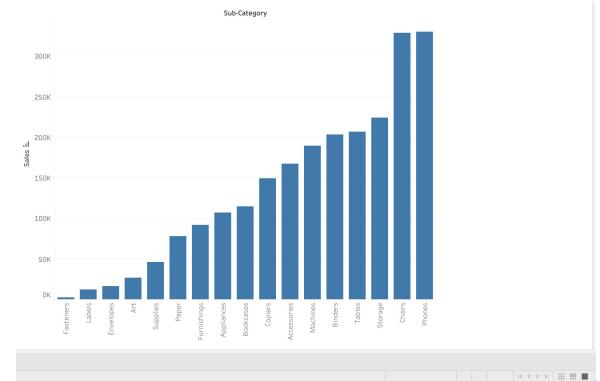


## 2f. Cumulative Sums with Waterfall charts

- Hult - Superstore.xlsx.

**Step 1: Let's create a sorted “bar chart”**

- New sheet, call it “Waterfall Chart”
- Sales > Rows
- Sub-category > Columns
- Press the “Sort ascending” button at the top



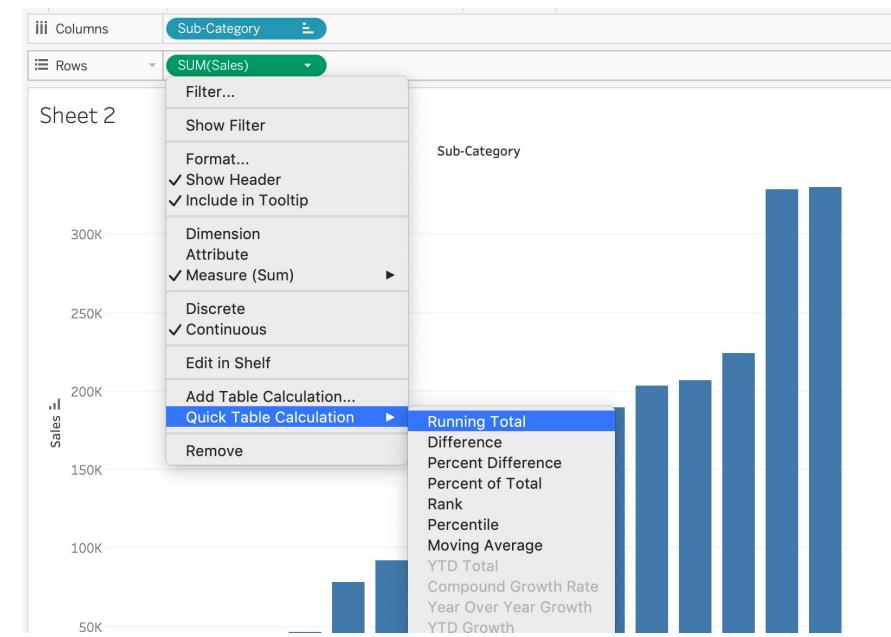
114



## 2f. Cumulative Sums with Waterfall charts

### Step 2: Let's create a Cumulative Sum and Gantt Bars

- In Rows, right click the “**SUM(Sales)**” pill
- Quick Table Calculation > **Running Total**

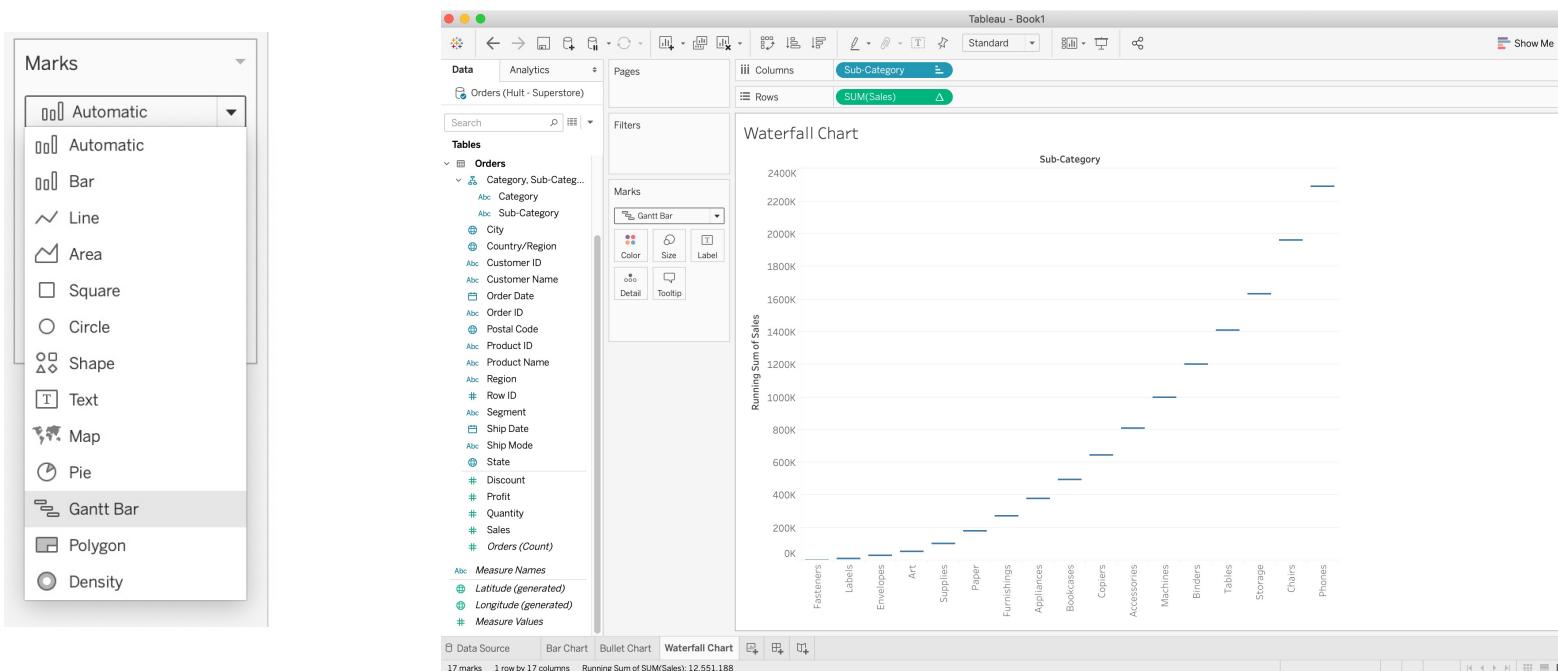


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## 2f. Cumulative Sums with Waterfall charts

- In the Marks Card, pull down menu, change from “Automatic” to “Gantt Bar”



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## 2f. Cumulative Sums with Waterfall charts

### Step 3: Calculate the step size (incremental sales)

- Calculate the step size between the cumulative sums.
- Create a new calculated field by opening the menu in the data pane, and choose the “**Create Calculated Field...**” option.
- Call it “**Sales Difference**”, type the formula “**-[Sales]**”, Apply, OK.  
[Nothing happens]

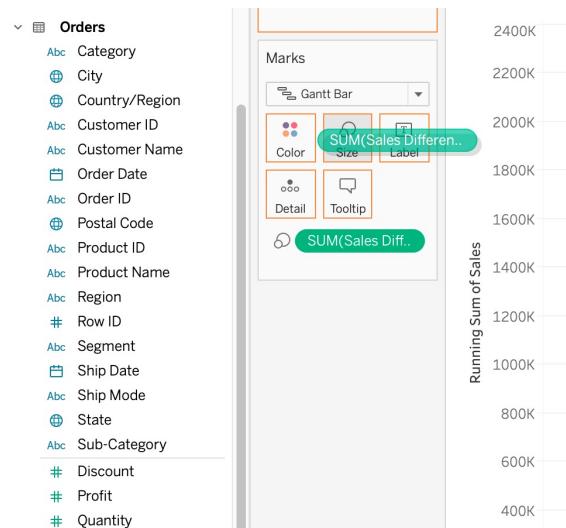
The screenshot shows the Tableau Data pane on the left and a floating dialog box on the right. The Data pane has a context menu open with the 'Create Calculated Field...' option highlighted. The dialog box is titled 'Sales Difference' and contains the formula '-[Sales]'. Below the formula, a message says 'The calculation is valid.' At the bottom right of the dialog are 'Apply' and 'OK' buttons.

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## 2f. Cumulative Sums with Waterfall charts

- This allows you to deduct the sales of each category from the cumulative sum, creating the “step size” that we want.
- Drag the newly created “**Sales Difference**” to the **Size** button on the Marks card.



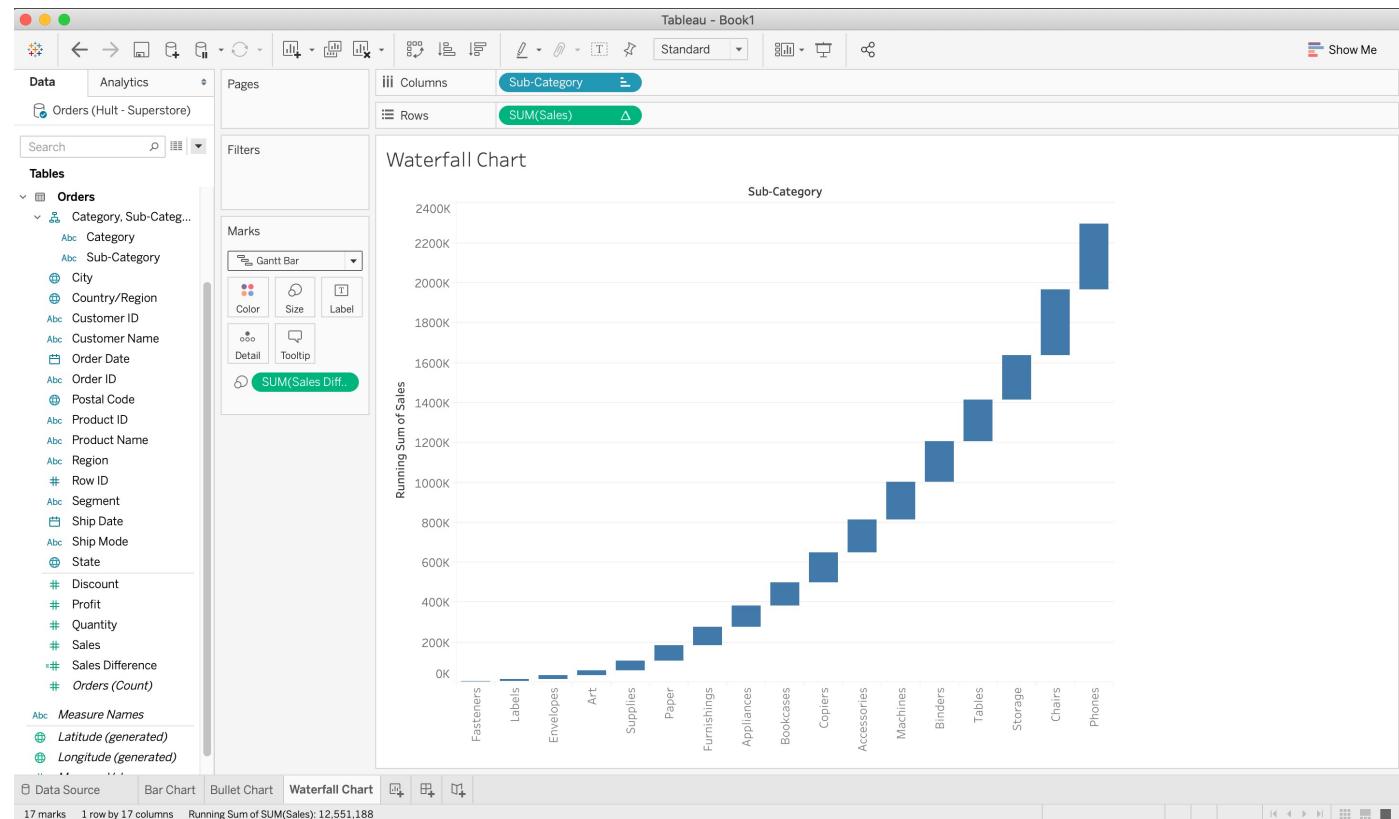
118



## 2f. Cumulative Sums with Waterfall charts

Done!

Here's a waterfall chart that shows the **contributions of each subcategory** to the grand total of sales.

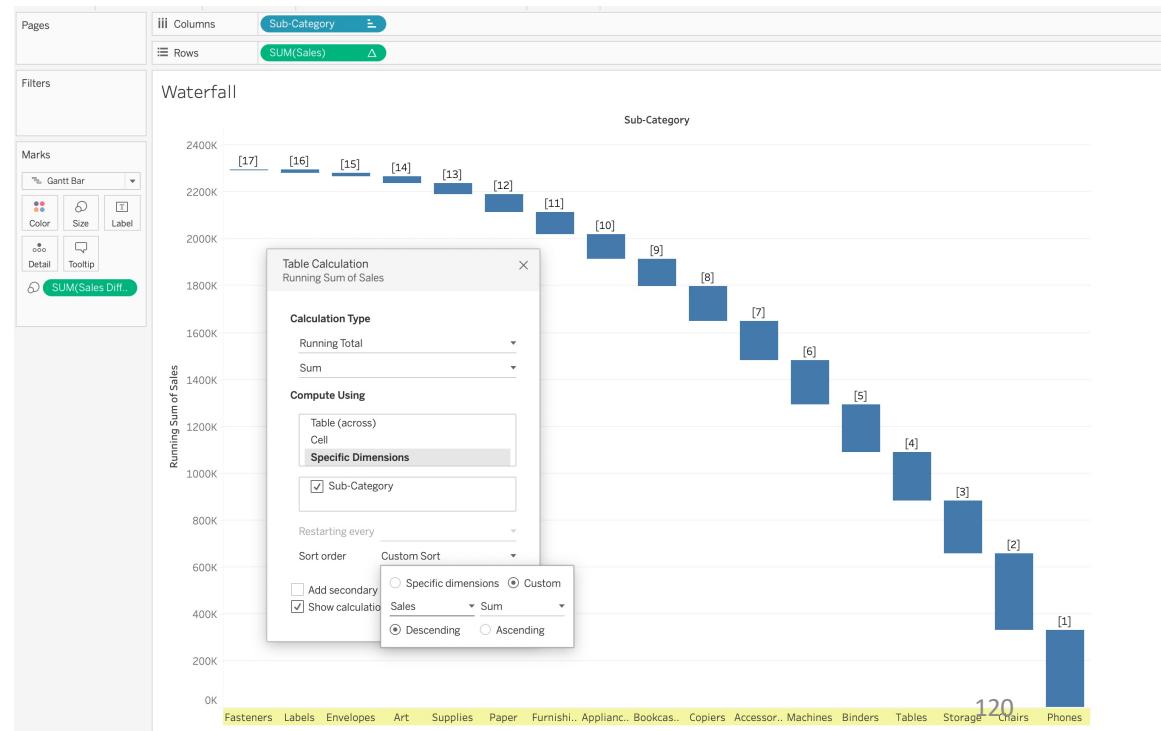




## 2f. Cumulative Sums with Waterfall charts

Alternatively, you can create another version:

- Right click on “SUM(Sales)”
- Select “Edit Table Calculation...”
- Specific Dimensions
- Sort order: Custom Sort
- Sales ; Sum
- Descending



# 3. Relationship



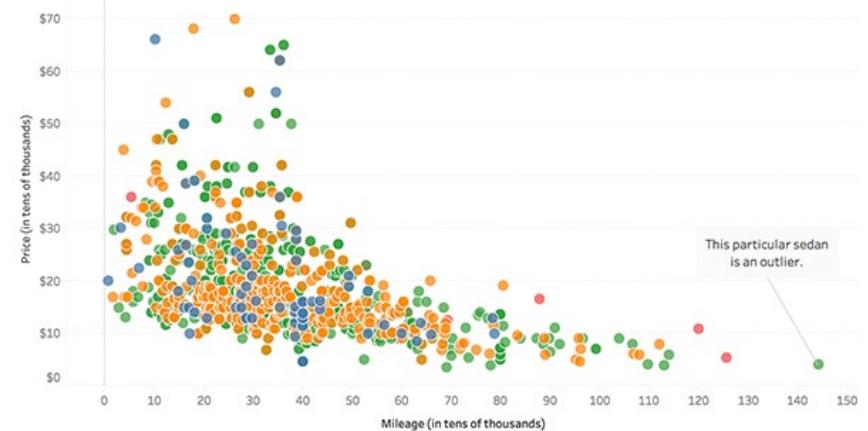
## 3a. Scatterplot



## 3a. Scatter Plot

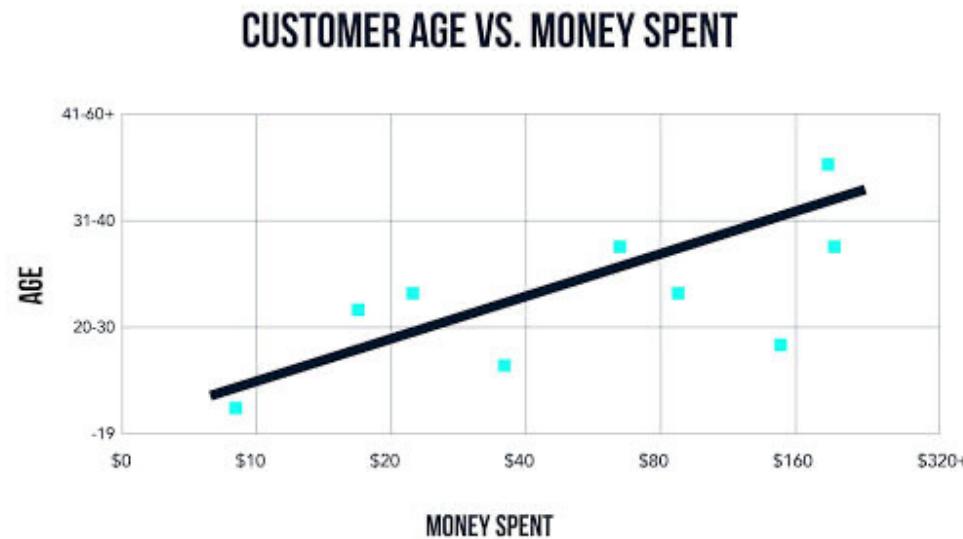
- Scatter plots are an effective way to visualize numerical variables to compare measures and quickly identify:
  - Patterns
  - Trends
  - Concentrations (clusters)
  - Outliers
- Best used to investigate relationships between variables.
- Scatter plots are particularly useful when exploring statistical relationships such as linear regression.

What Effect Does Mileage of a Used Car Have On Price?  
A regression scatterplot of used coupes, SUVs, sedans, and trucks.





## 3a. Scatter Plot

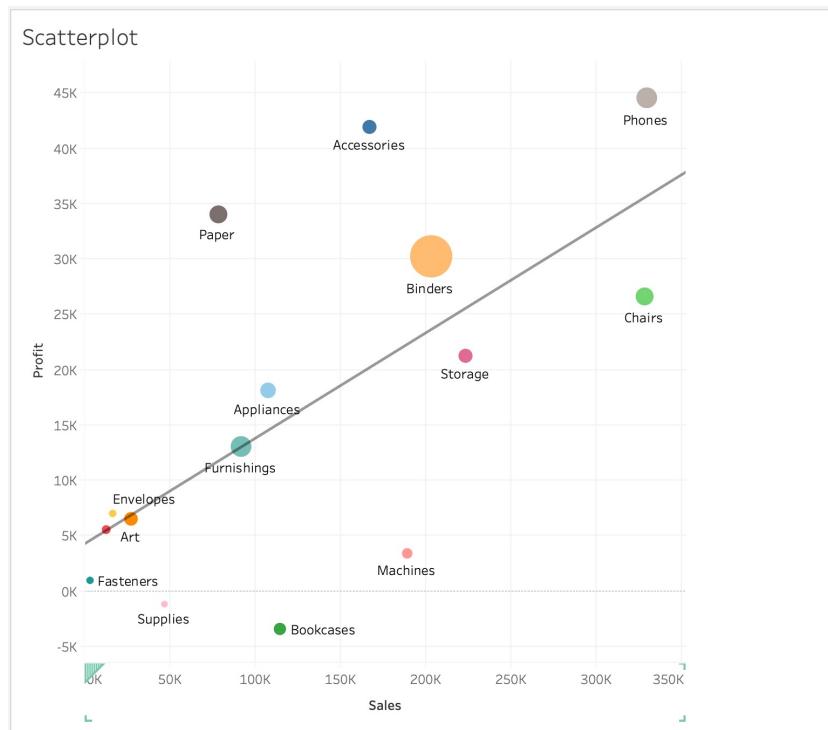


Scatter plot: graph that displays information as dots representing the correlation between two variables



## 3a. Scatter Plot

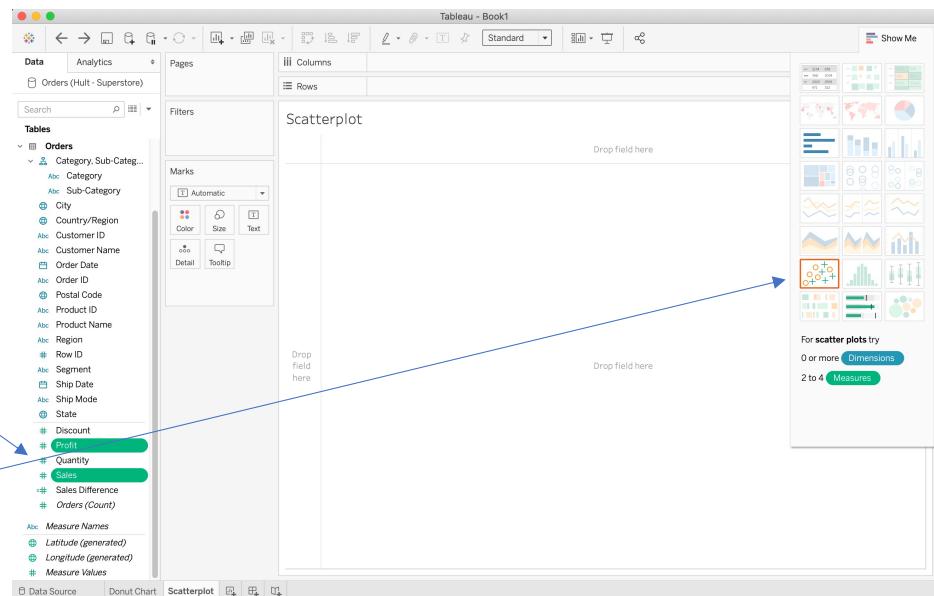
Let's say we want to create this ultimately:





## 3a. Scatter Plot

- Hult – Superstore.xls
- New sheet, call it “Scatter Plot”
- Let’s say we want to understand the relationship between “Sales” and “Profit” in the sub-categories
- Highlight “Sales” and “Profit”
  - Profit, Command key on Mac (Control key on PC), Sales
- Show Me card > Scatterplot [7<sup>th</sup> row, 1<sup>st</sup> icon]



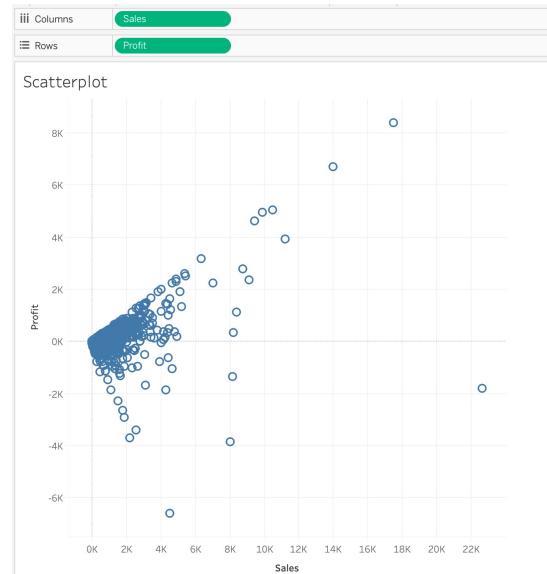
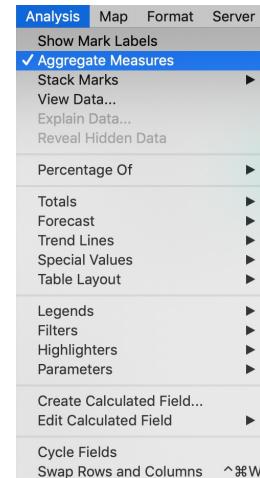
iii Columns	SUM(Sales)
Rows	SUM(Profit)

126



## 3a. Scatter Plot

- You only see one dot in this Cartesian chart.
- To view the actual data points, go to the “**Analysis**” menu at the top, and deselect “**Aggregate Measures**”
- A simple scatter plot is now generated.



127



## 3a. Scatter Plot

- You can add depth and visual richness to a scatterplot by: **Bringing over dimensions** and using them to add color or additional shapes onto the scatter plot.



## 3a. Scatter Plot

- Now, say we don't care about the individual transaction and want to analysis the **discount** applied to each product **sub-category**
- First, select "**Aggregate Measures**" back in the Analysis menu

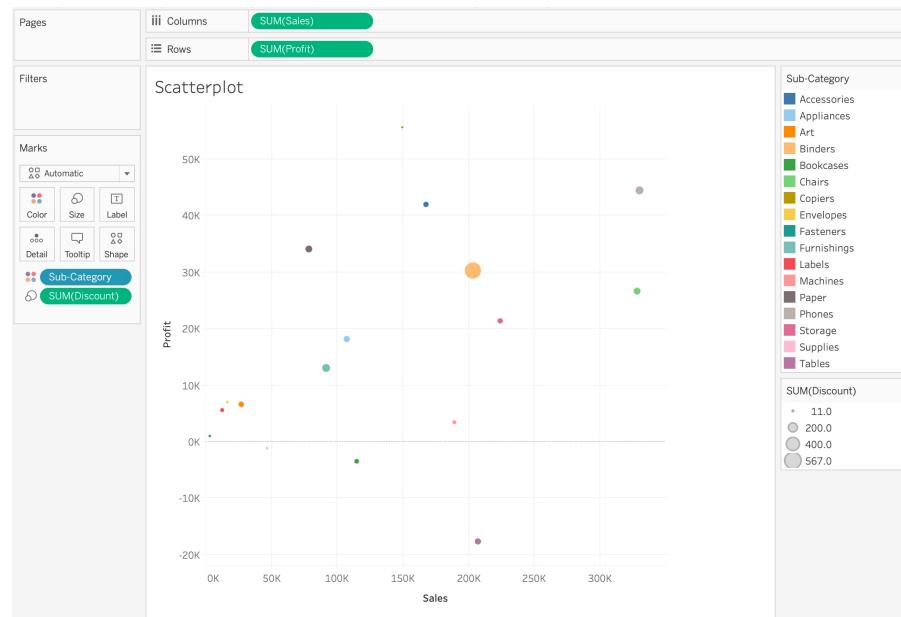


129



## 3a. Scatter Plot

- Drag “Sub-category” to the “Color” icon in the Marks card
- Drag “Discount” to the “Size” icon in the Marks card
- Click “Shape” in the pull-down menu to select a solid circle

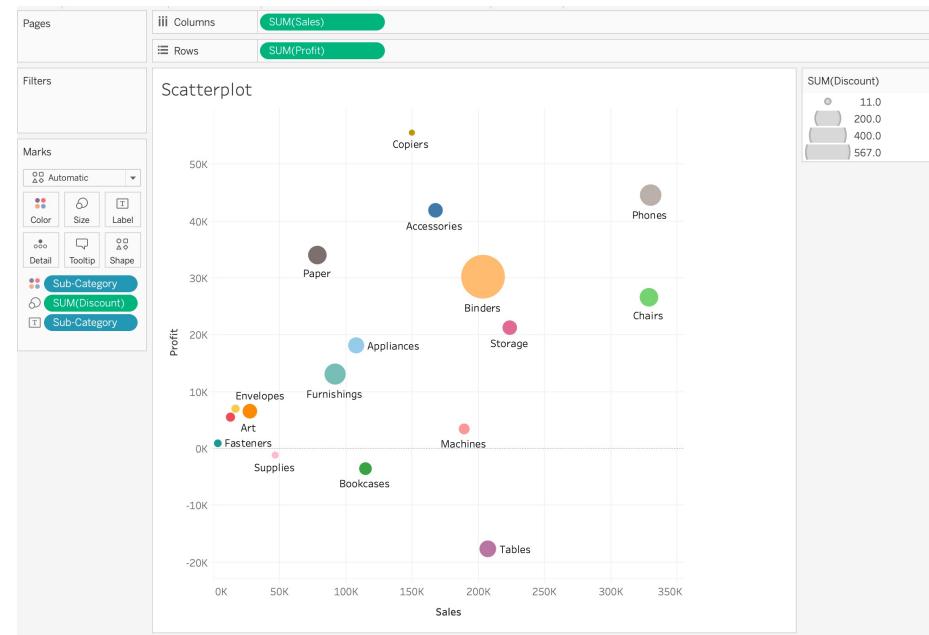


130



## 3a. Scatter Plot

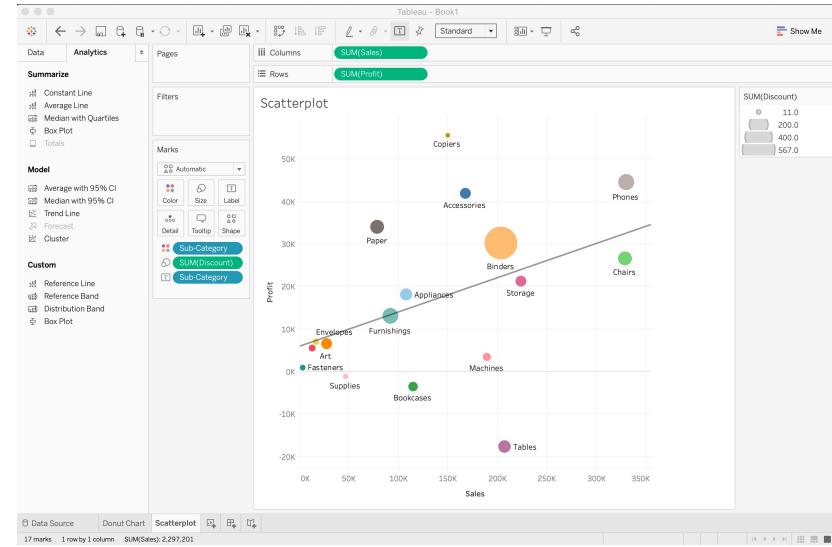
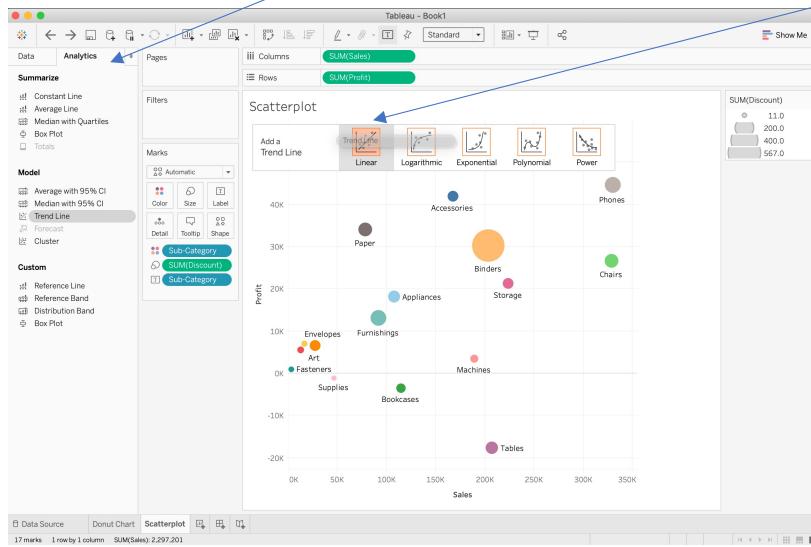
- You can also show the sub-category directly in the scatterplot, rather than in the legend on the right-hand side.
- Drag “Sub-Category” to the “Label” icon in the Marks card.
- Fine tune it by adjusting circle size in the “Size” icon in the Marks card.





# 3a. Scatter Plot – Trend Line

- To add a trend line, go to the **Analytics** pane
- Drag “**Trend Line**” to the canvas and put it on top of the “**Linear**” box.

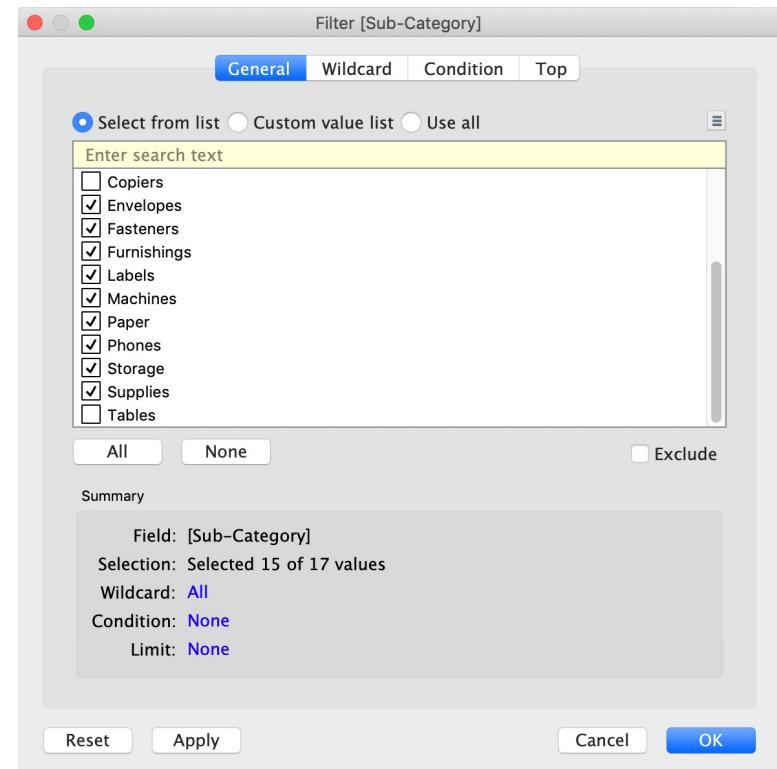


132



## 3a. Scatter Plot - Filters

- Incorporating filters can reduce noise and help limit investigation to the factors that matter most to your analysis.
- E.g., let's say you don't really care about the “Copiers” and “Tables” sub-categories
  - Data pane
  - You can filter them out by dragging “Sub-Category” to the “Filters” card and deselect “Copiers” and “Tables”.  
Apply, OK.

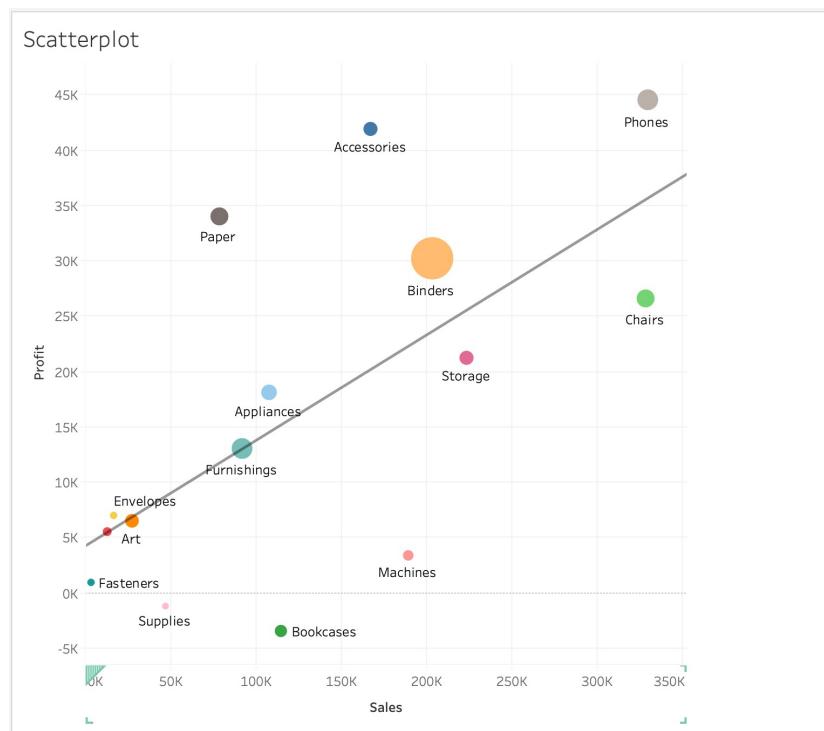


133



## 3a. Scatter Plot

Done!



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# 4. Distribution



## 4a. Box-and-whisker Plot



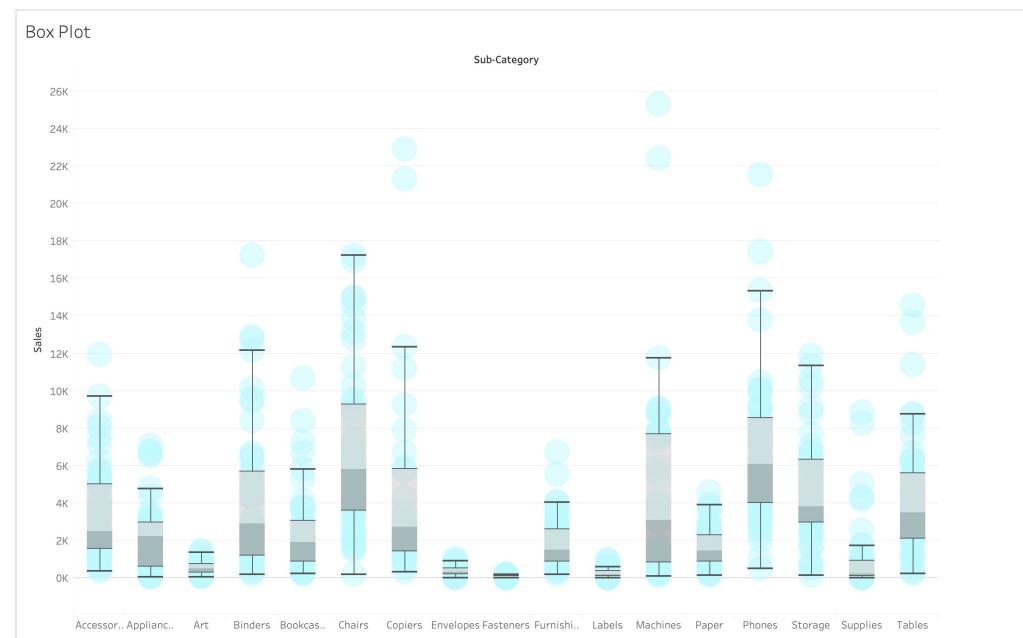
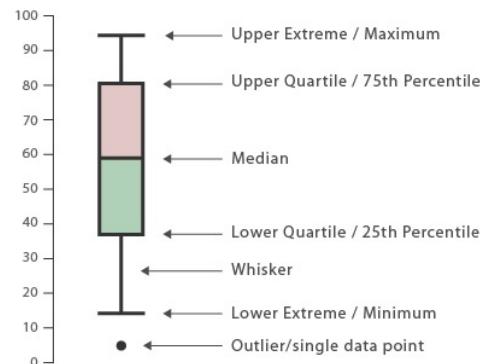
## 4a. Box-and-whisker Plot (a.k.a. Box Plot)

Let's say we want to create this ultimately:

**Median ( $Q_2$  / 50th percentile)** : the middle value of the dataset.

**First quartile ( $Q_1$  / 25th percentile)** : also known as the *lower quartile*  $q_n(0.25)$ , is the median of the lower half of the dataset.

**Third quartile ( $Q_3$  / 75th percentile)** : also known as the *upper quartile*  $q_n(0.75)$ , is the median of the upper half of the dataset



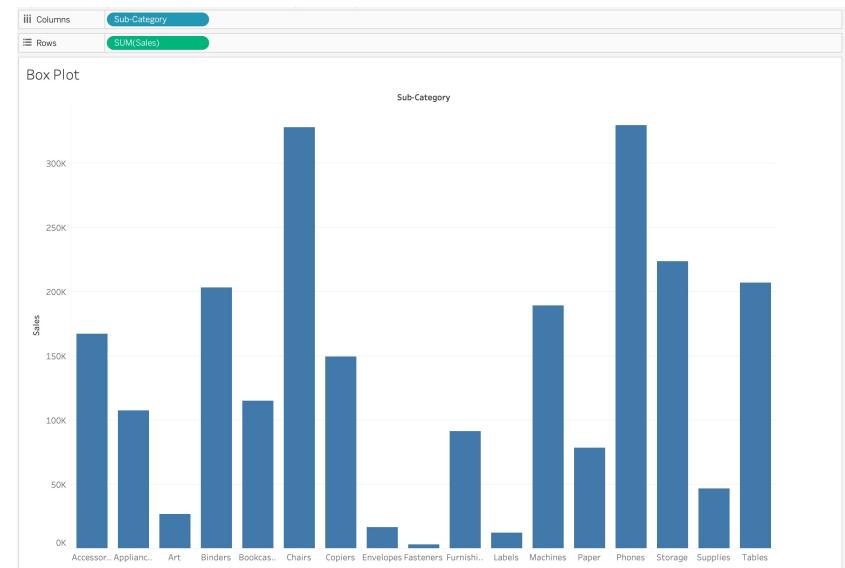
**Box-and-whisker plot:** graph that displays information as a rectangle depicting quartiles with lines extending vertically to indicate variability outside the upper and lower quartiles.

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## 4a. Box-and-whisker Plot

- Hult – Superstore.xlsx
- New sheet, call it “Box Plot”
- Sub-Category > Columns
- Sales > Rows

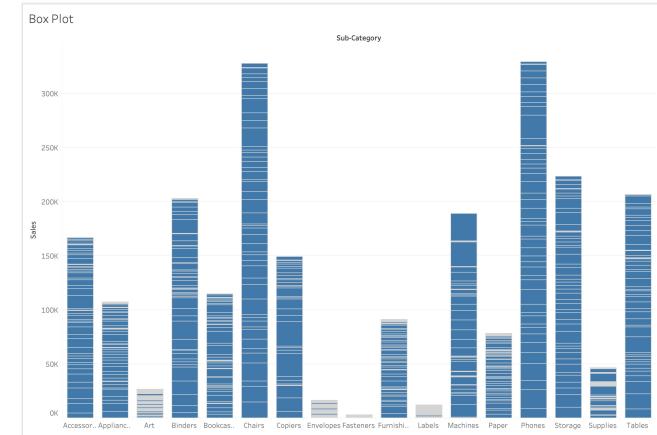
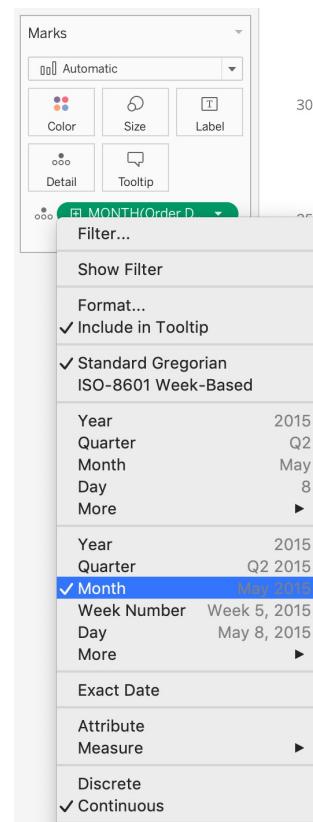


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## 4a. Box-and-whisker Plot

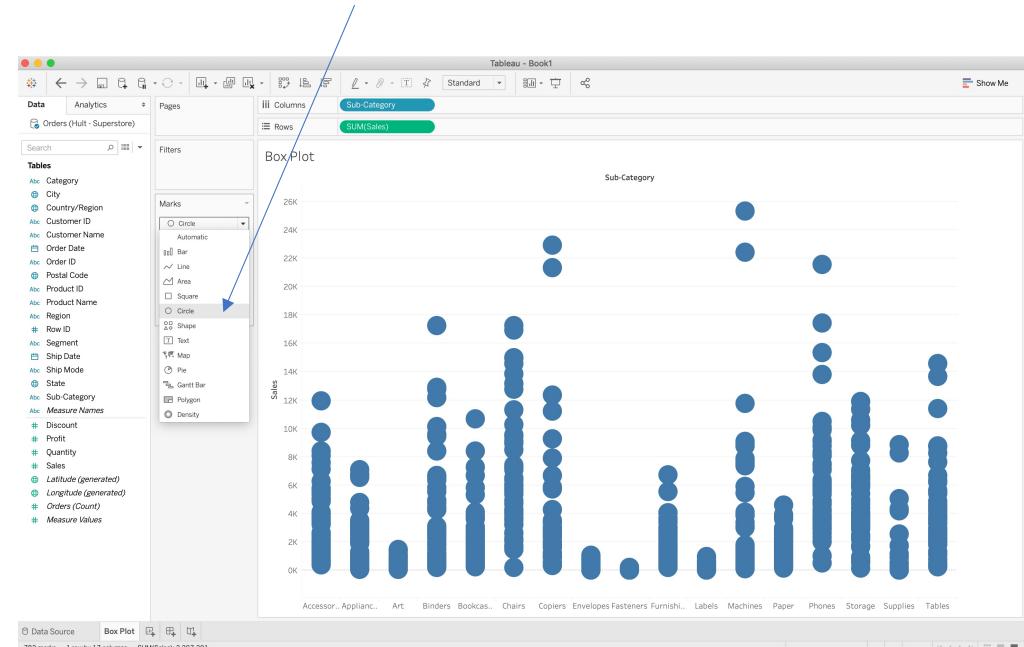
- Next, add the distribution that you care about to the Detail Marks card
- Drag “Order Date” to the “Detail” icon on the Marks card.
- Right-click on the YEAR(Order Date) pill in the Marks card
  - Change it to the 2<sup>nd</sup> “Month” (continuous) in the context menu
- At this point, either use the boxplot template in the Show Me card, or follow the next few steps.





## 4a. Box-and-whisker Plot

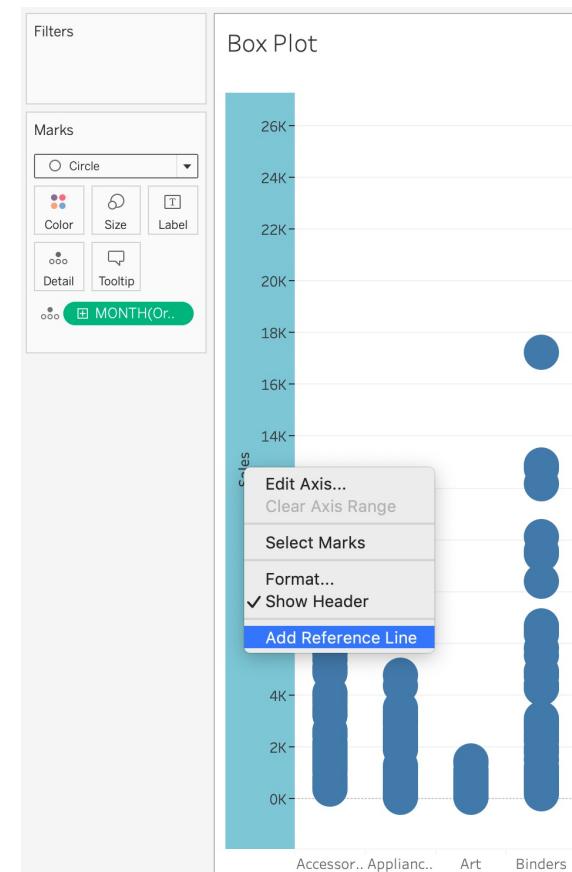
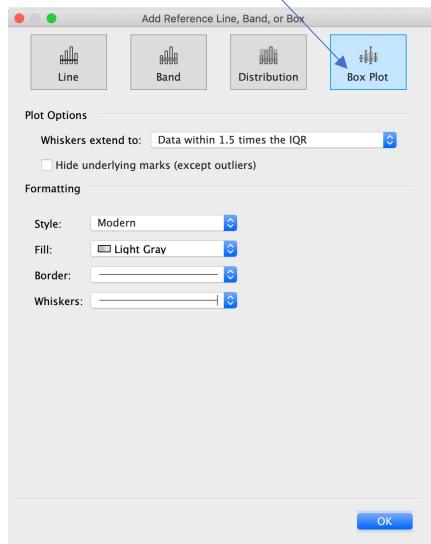
- To convert this stacked bar chart to a dot plot:
  - In the **Marks** card, change “Automatic” to “Circle”





## 4a. Box-and-whisker Plot

- Right-click on the Y-axis (i.e., Sales), and choose “Add Reference Line”
- Select “Box Plot”, OK





## 4a. Box-and-whisker Plot

- The blue dots look too dark, so how about we adjust the color?
- In the Marks card, click the “**Color**” icon.
- Change it to **light blue** and adjust **Opacity** to 50%

Done!



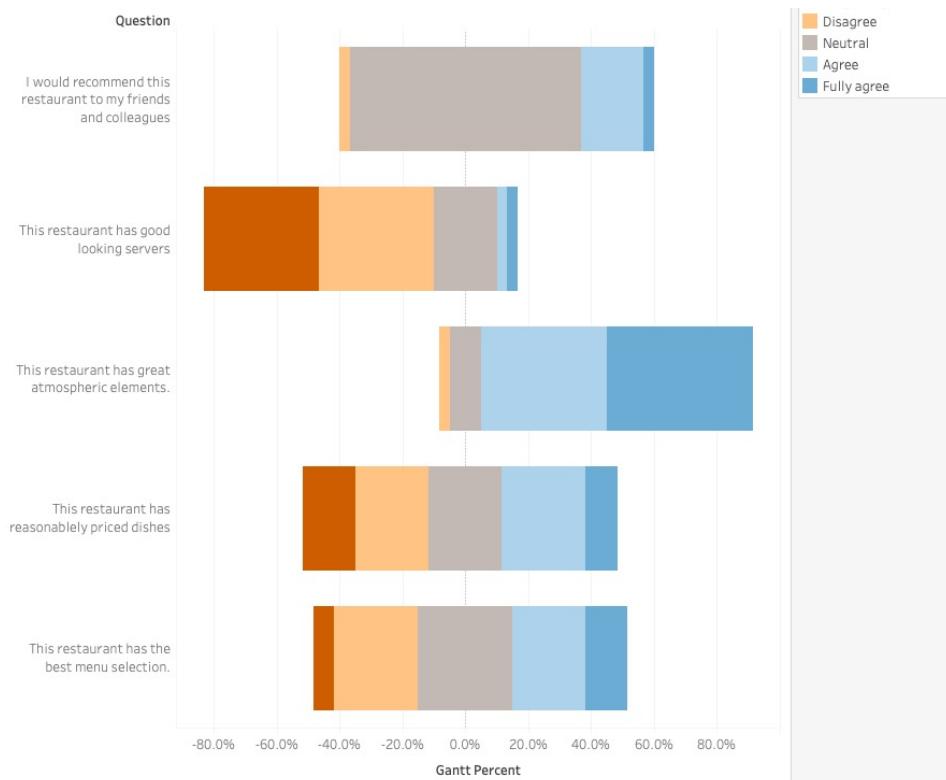


## 4b. Likert Scale Chart



## 4b. Likert Scale Chart

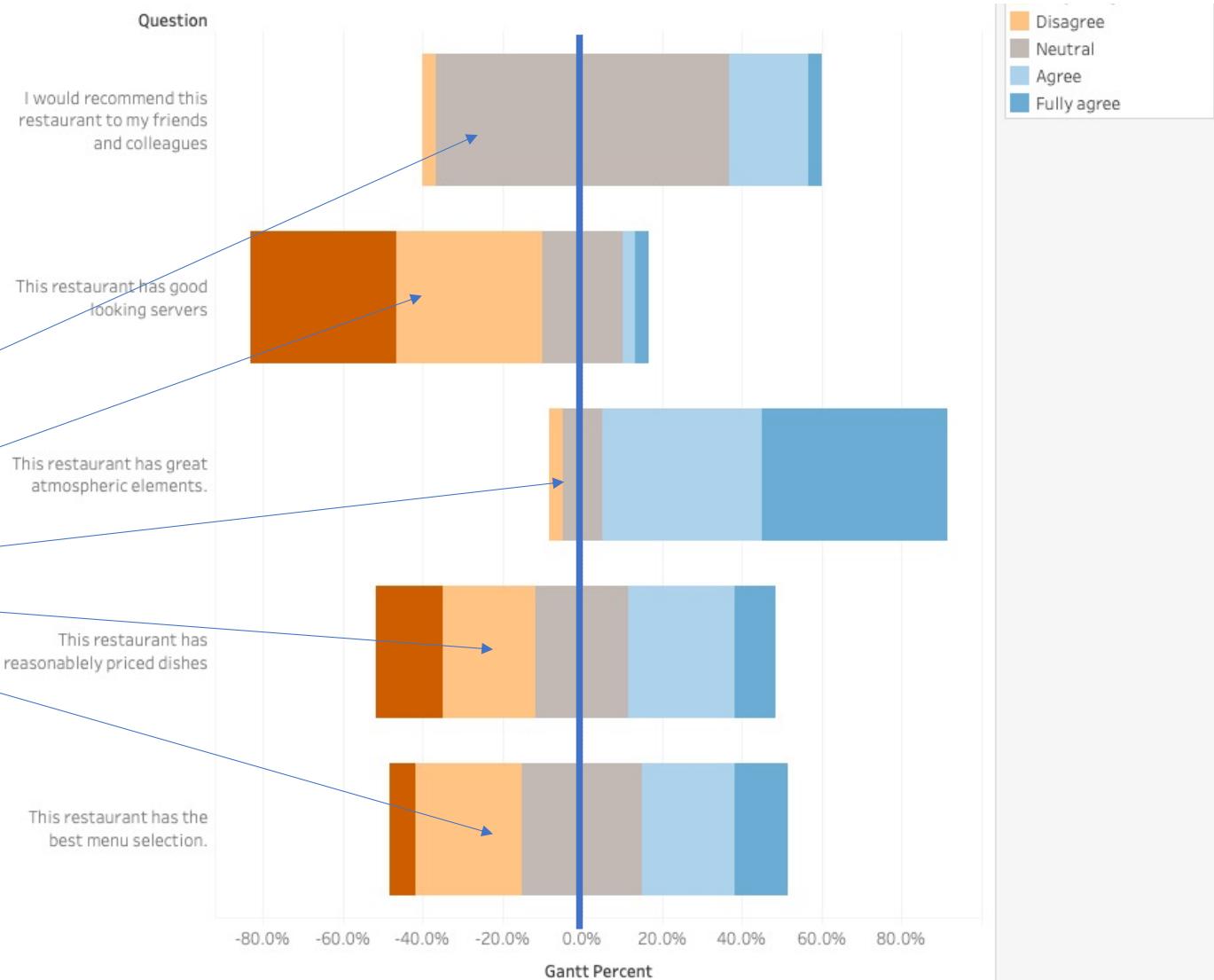
22 pages  
30 minutes



Download  
[formulas2.rtf](#)



## 2.1 How many negative sentiment responses should appear as negative value?





## 4b. Likert Scale Chart

- It's often used to show survey result
- Let's assume we've got a short survey about a restaurant
- 30 people, 5 questions in the survey
- 5-point scale (1=fully disagree; 5=fully agree)

A	B	C	D	E	F	G
1 Question		Fully disagree	disagree	neutral	agree	fully agree
2 Q1	This restaurant has the best menu selection.			X		
3 Q2	This restaurant has great atmospheric elements.				X	
4 Q3	This restaurant has good looking servers					X
5 Q4	This restaurant has reasonably priced dishes		X			
6 Q5	I would recommend this restaurant to my friends and colleagues				X	



## 4b. Likert Scale Chart

Step 1: Reshape (pivot) and inner join the survey data.

Step 2: Create a cross tabulation

Step 2.1: Calculated Field #1: Answer [*the anchor*]

Step 2.2: Calculated Field #2: Negative Scores

Step 2.3: Calculated Field #3: Total Negative Scores

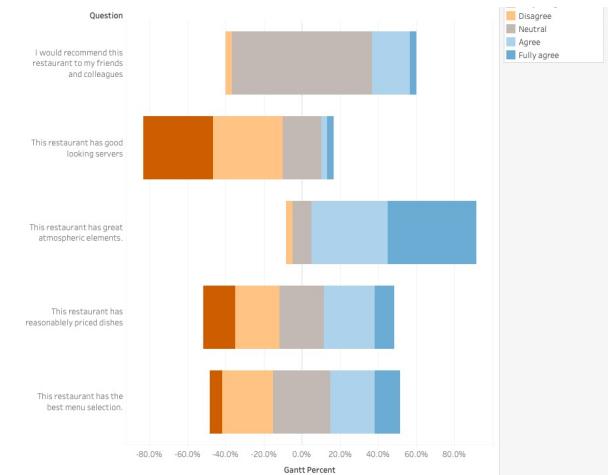
Step 2.4: Calculated Field #4: Total Scores

Step 2.5: Calculated Field #5: Gantt Start

Step 2.6: Calculated Field #6: Percent of Total Sizing

Step 2.7: Calculated Field #7: Gantt Percent

Step 3: Create the GANTT Chart



# Step 1. Reshape and inner join the data



## 4b. Likert Scale Chart

- File → New
- **Hult – Likert Restaurant.xlsx**
- **Responses > Canvas**
- Double click the grey-color “**Responses**” box in Canvas
- **Demographic Information > Canvas** (right of Responses; so that they’re joining)
- First column, hide the first Response ID column (as it’s repeated)
- **Highlight the 5 questions [Q1, SHIFT, Q5], go to the Q5 column, upper right-hand corner, pivot the data**



## 4b. Likert Scale Chart

The screenshot shows the Tableau desktop application interface. In the top right, it says "Tableau - Book1". On the left, the "Connections" pane shows a connection to "Hult - Likert Restaurant" (Microsoft Excel). The "Sheets" pane lists "Demographic Information", "Question Metadata", "Responses", and "Survey". A folder named "New Union" is also visible. The main workspace shows a relationship diagram where "Responses" is connected to "Demographic Information". Below this, there's a toolbar with "Sort fields" and "Data source order" buttons. The data preview area displays the following table:

City	Gender	Age	Pivot Field Names	Pivot Field Values	Responses Response ID
Toronto	Male	20	Q1	2	1
Toronto	Male	20	Q2	4	1
Toronto	Male	20	Q3	3	1
Toronto	Male	20	Q4	1	1
Toronto	Male	20	Q5	3	1
Montreal	Female	23	Q1	3	2
Montreal	Female	23	Q2	5	2
Montreal	Female	23	Q3	2	2
Montreal	Female	23	Q4	2	2
Montreal	Female	23	Q5	3	2
Richmond Hill	Male	33	Q1	4	3
Richmond Hill	Male	33	Q2	4	3
Richmond Hill	Male	33	Q3	5	3
Richmond Hill	Male	33	Q4	3	3
Richmond Hill	Male	33	Q5	3	3

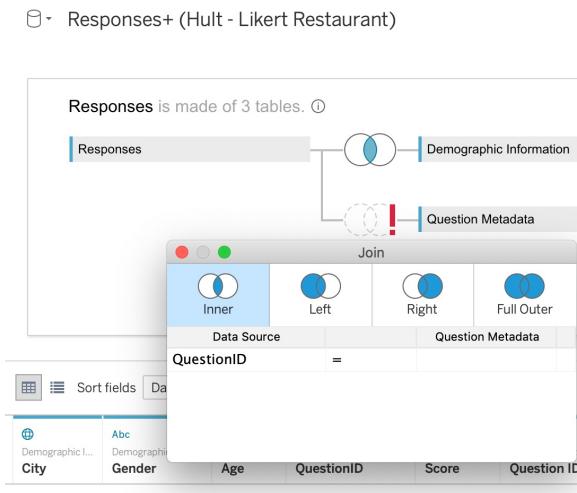
150



## 4b. Likert Scale Chart

- Rename the “Pivot Field Names” column as “Question ID”
- Rename the “Pivot Field Values” column as “Score”
- Drag “Question Metadata” to the Canvas to join (right of Demographic Information), using “Question ID” in the pop-up window

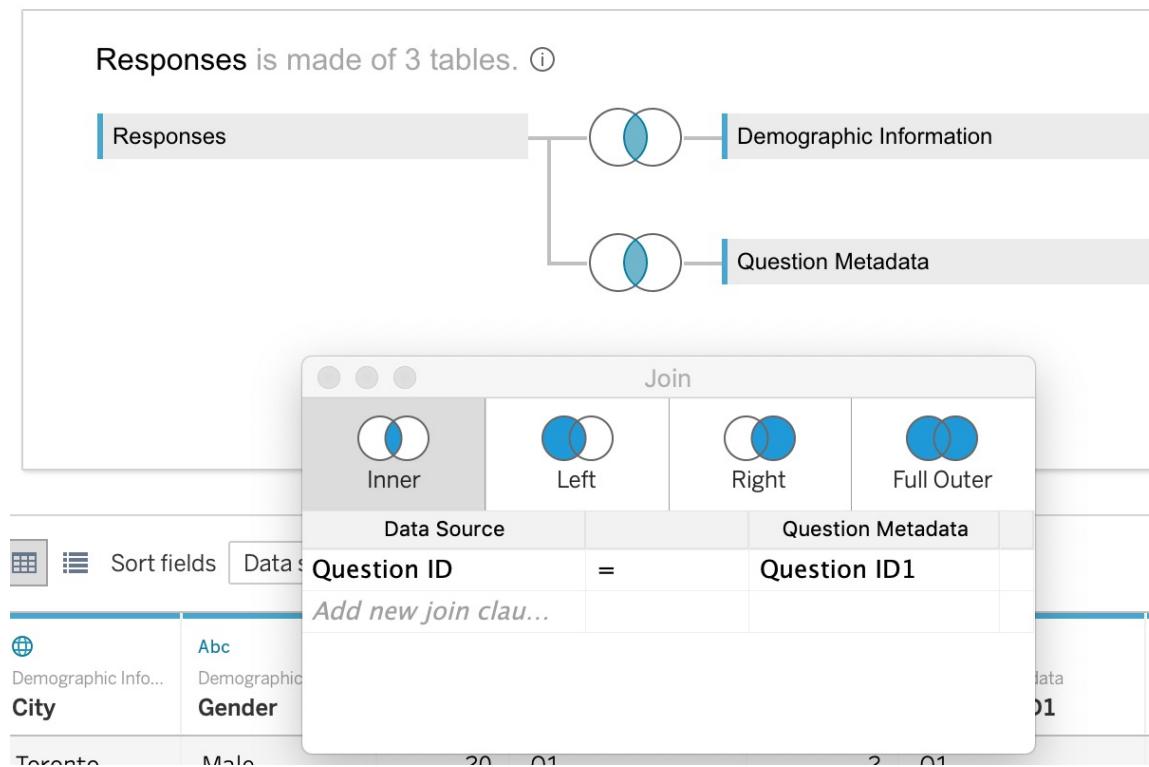
- Question ID = Question ID1



151



## 4b. Likert Scale Chart



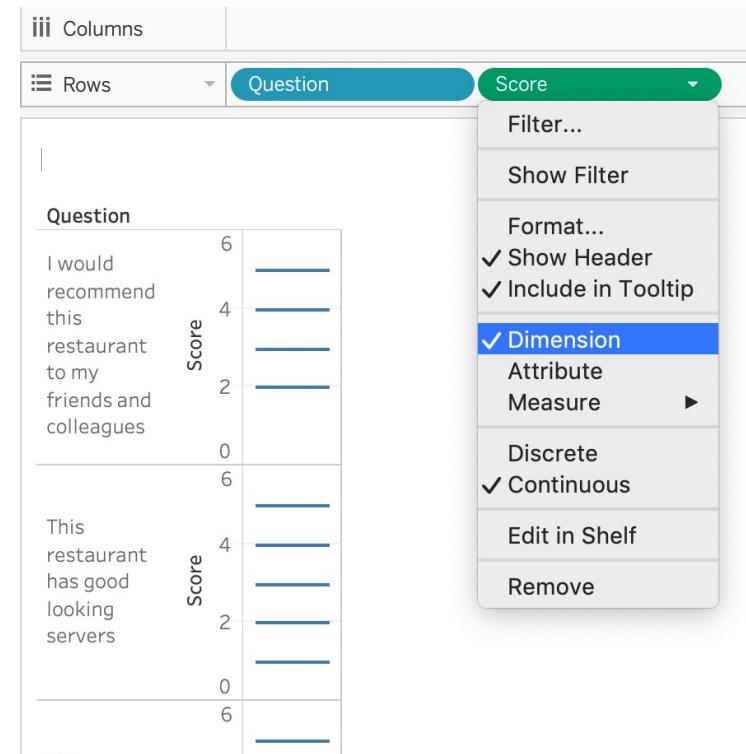
152

## Step 2. Create a Cross Tabulation



## 4b. Likert Scale Chart

- Hide “Question ID 1” as it’s redundant
- Sheet 1, call it “**Crosstab**”
- **Question > Rows**
- **Score > Rows [this is rows!]**
- Since each number in the score pill reflect a particular answer choice, we right-click the green **Score** pill:  
**Dimension, Discrete**
  - You will see a table with ABCs





## 4b. Likert Scale Chart

iii Columns		
Rows	Question	Score

Crosstab

Question	Score
I would recommend this restaurant to my friends and colleagues	2 3 4 5
This restaurant has good looking servers	1 2 3 4 5
This restaurant has great atmospheric elements.	2 3 4 5
This restaurant has reasonably priced dishes	1 2 3 4 5
This restaurant has the best menu selection.	1 2 3 4 5

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Step 2.1: Calculated Field #1: Answer *[the anchor]*



## 4b. Likert Scale Chart

- *Formulas2.rtf*
- Since we want to convert these 1,2,3,4,5 into the actual text such as “fully disagree, disagree...etc., so we create a new calculated field, called “**Answer**”, using this formula

CASE [Score]

when 1 then "Fully disagree "

when 2 then "Disagree"

when 3 then "Neutral"

when 4 then "Agree"

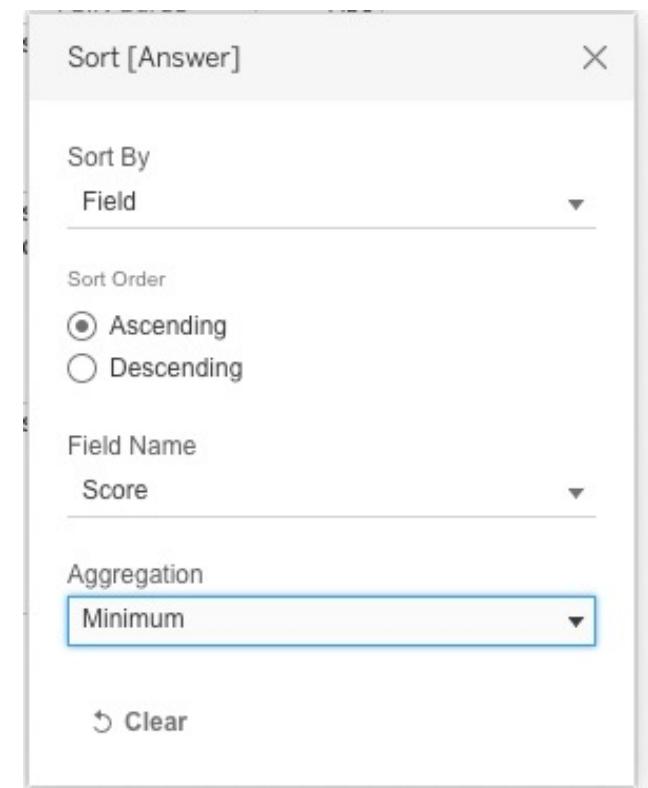
when 5 then "Fully agree"

END



## 4b. Likert Scale Chart

- Drag “**Answer**” and put it on top of “**Score**” in Rows
  - So the 1, 2, 3..become text
- However, notice that when you add this dimension, the text values are not in the sequence they should be, so...
- Go to the **Answer** pill at the top, right-click, **Sort...**
  - Sort by: Field
  - Sort order: Ascending
  - Field name: Score
  - Aggregation: Minimum
  - X





## 4b. Likert Scale Chart

- Drag “Responses (Count)” to the table and put it on top of “ABC”
  - Now the ABCs become numbers
- The next step is to create a series of calculated fields and add them to the right-hand side of the table.

The screenshot shows the Tableau Data Editor interface. On the left, there are three panels: 'Pages' (empty), 'Filters' (empty), and 'Marks'. The 'Marks' panel has 'Automatic' selected and includes buttons for 'Color', 'Size', 'Text', 'Detail', and 'Tooltip', with a green button labeled 'CNT(Response..)' highlighted. On the right, the main workspace displays a table titled 'Likert scale' with the following data:

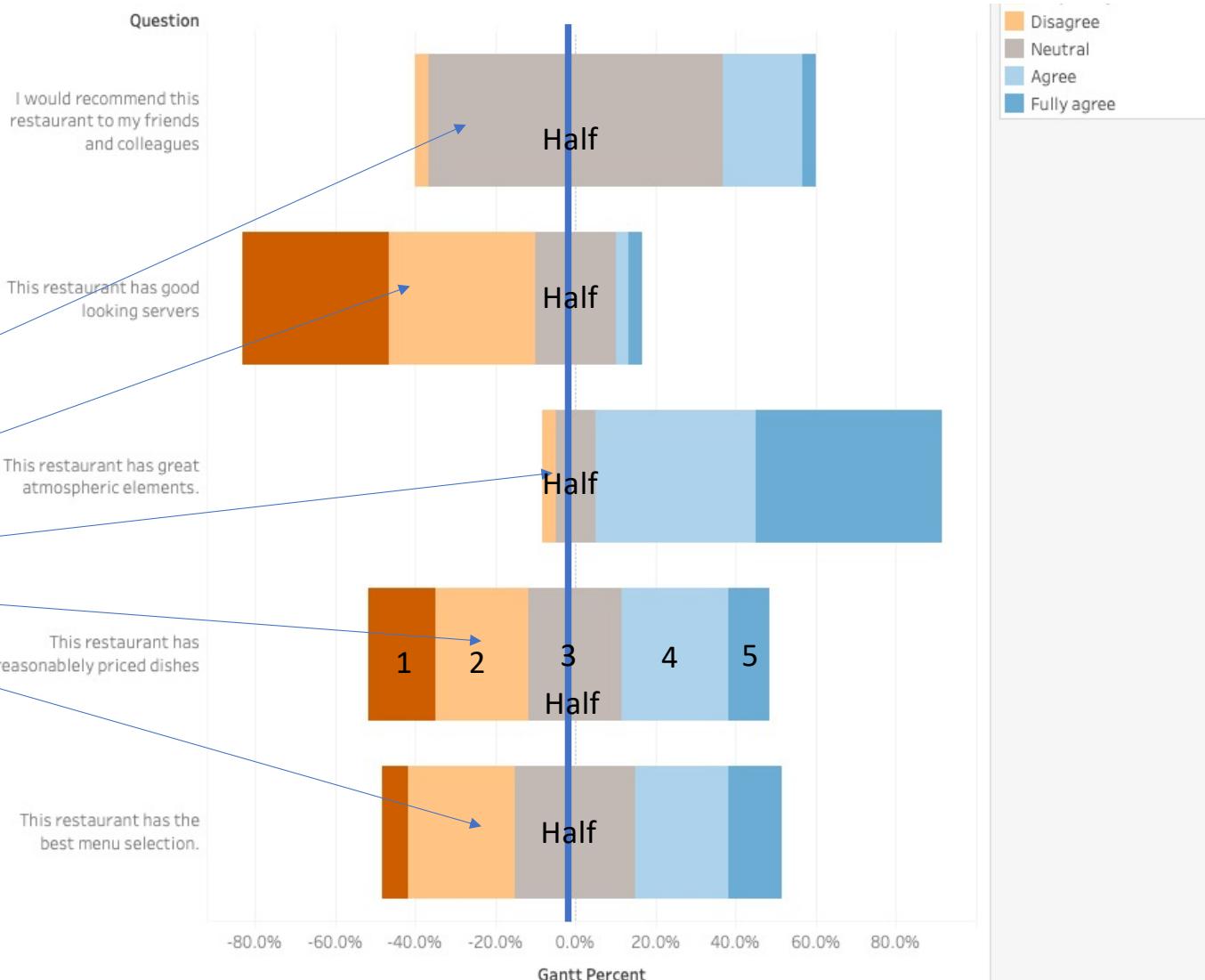
Question	Answer	Count
I would recommend this restaurant to my friends and colleagues	Disagree	1
	Neutral	22
	Agree	6
	Fully agree	1
This restaurant has good looking servers	Fully disagree	11
	Disagree	11
	Neutral	6
	Agree	1
	Fully agree	1
This restaurant has great atmospheric elements.	Disagree	1
	Neutral	3
	Agree	12
	Fully agree	14
This restaurant has reasonably priced dishes	Fully disagree	5
	Disagree	7
	Neutral	7
	Agree	8
	Fully agree	3
This restaurant has the best menu selection.	Fully disagree	2
	Disagree	8
	Neutral	9
	Agree	7
	Fully agree	4



## Step 2.2: Calculated Field #2: Negative Score



**2.2 Negative Score:  
How many negative  
sentiment responses  
should appear as  
negative value?**





## 4b. Likert Scale Chart

- This calculated field will calculate **how many negative sentiment responses were received for each question** and should appear as negative values to be shown to the **left** of the dividing line of 0 in the divergent stacked bar chart.
- To do this we need to count the number of responses received for the two lowest selections on the scale (in this case 1—full disagree and 2—disagree), as well as half of the neutral selection (in this case, 3—neutral).
  - This is because neutral responses in a survey are neither positive nor negative, we want to split them in half to distribute them across the bars in the chart as to not unfairly weight one side of the data.



## 4b. Likert Scale Chart

- Now, create a new calculated field “Negative Score” using this formula

```
IF [Score] < 3 then 1  
ELSEIF [Score] = 3 then 0.5  
ELSE 0  
END
```

- Drag the Negative Score pill to the table (last column)

The screenshot shows the 'Calculated Field' dialog box in Tableau. The title bar says 'Negative Score'. The formula is:

```
IF [Score] < 3 then 1  
ELSEIF [Score] = 3 then 0.5  
ELSE 0  
END
```

Below the formula, a message says 'The calculation is valid.' There are 'Apply' and 'OK' buttons at the bottom.



## 4b. Likert Scale Chart

- Here, the Count of Responses in the negative sentiment ranks (fully disagree and disagree) should match the count in the Negative Score column.
- The Neutral response count in Negative Score should be half the count in the Count of Responses column.
- Also, the two positive sentiment ranks (agree and fully agree) should appear with a count of 0 in the Negative Score column.



## Step 2.3: Calculated Field #3: Total Negative Scores



## 4b. Likert Scale Chart

- The next step is to create a calculated field to calculate the percent of negative values per question.
- Create a new calculated field called “**Total Negative Scores**” using this formula

**TOTAL(SUM([Negative Score]))**



## 4b. Likert Scale Chart

This calculated field is a default table calculation; however, we need to manually change the field being used to compute the calculation.

- Click “Default Table Calculation” link, change from automatic to “Answer”. **Apply, OK**
- Drag “Total Negative Score” to the “Measure Values” card
- Put it below the pills. Now you’ve got 3 pills there.

The screenshot shows the Tableau calculated field editor and the Marks shelf.

**Calculated Field Editor:**

- Title: Total Negative Scores
- Formula: `TOTAL(SUM([Negative Score]))`
- Status: The calculation is valid.
- Buttons: Apply, OK

**Marks Shelf:**

- Marks dropdown: Automatic
- Available options: Color, Size, Text, Detail, Tooltip, Measure Values (selected)
- Measure Values card:
  - CNT(Responses)
  - SUM(Negative Score)
  - Total Negative Sco..  $\Delta$  (highlighted)



## 4b. Likert Scale Chart

- Note that the Total Negative Scores value is the same for each Question. This function simply sums the values in the Negative Score column for each item scored.



## Step 2.4: Calculated Field #4: Total Scores



## 4b. Likert Scale Chart

- Now that we have the percent of the total for the negative values, we need the percent of the total for the entire bar and add up the responses for each item scored.



## 4b. Likert Scale Chart

- Create a new calculated field called “**Total Scores**”, using

**TOTAL(COUNT([Responses]))**

Total Scores

**TOTAL(COUNT([Responses]))**

The calculation is valid.

Default Table Calculation

Apply OK

- Click “**Default Table Calculation**” link, change from automatic to “**Answer**”. **Apply, OK**
- Drag “**Total Scores**” to the “**Measure Values**” card
- Now you have 4 pills there

Marks

Automatic

Color Size Text

Detail Tooltip

Measure Values

CNT(Responses)

SUM(Negative Score)

Total Negative Sco..

Total Scores



## 4b. Likert Scale Chart

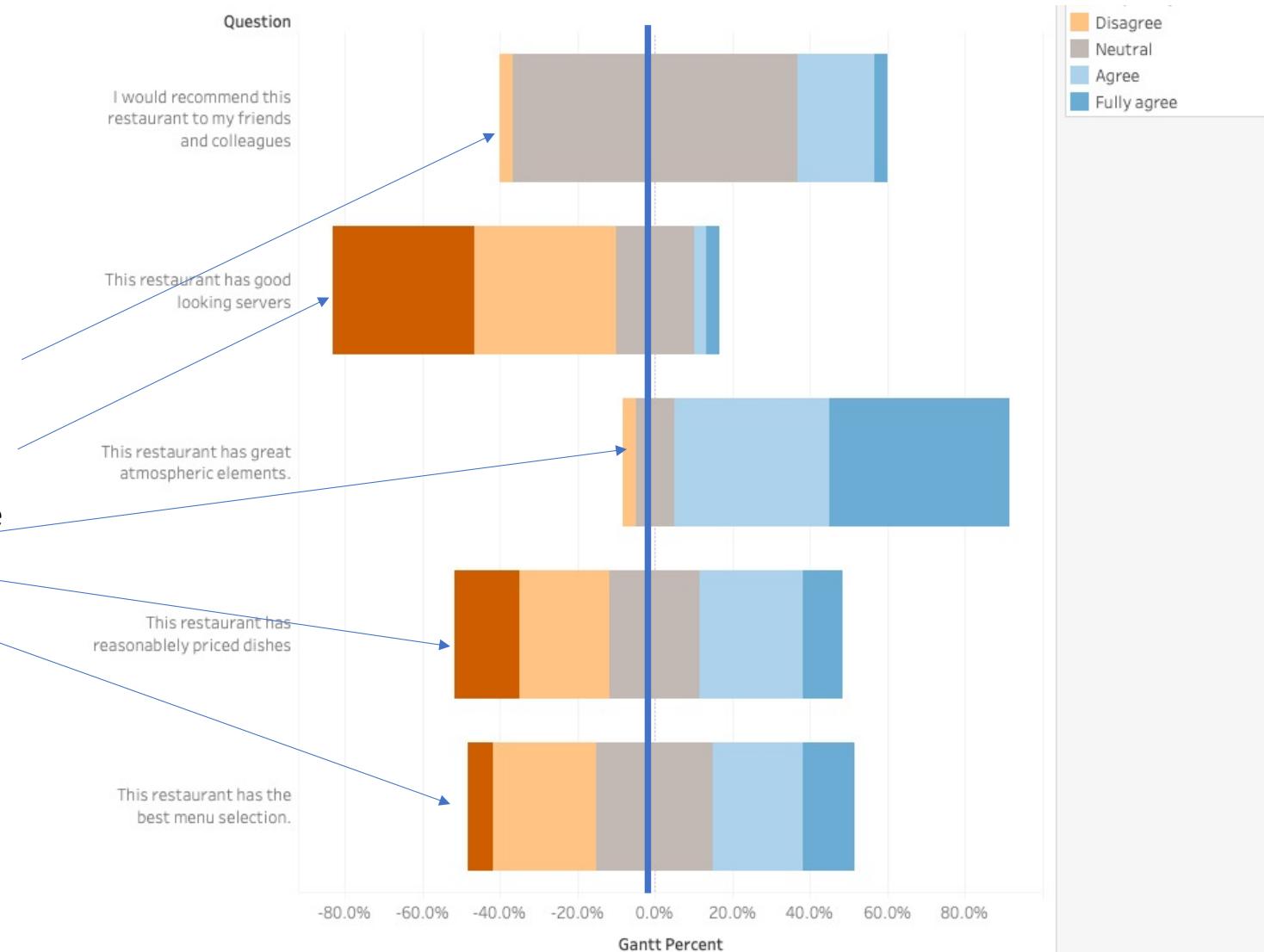
- Added to the crosstab, this calculated field will sum the number of responses per question.
- If your dataset is nice and clean and all questions were answered, the value in this column should be the same all the way down.
- For datasets where not every question was answered, such as this one, you will see variations in the count of responses in this column.



## Step 2.5: Calculated Field #5: Gantt Start



## 2.5 Gantt Start: How far into the negative to begin building the bar chart?





## 4b. Likert Scale Chart

- The next step is to create a calculated field that will determine the percentage offset, or how far into the negative to begin building the bar chart.
- Remember, what we are creating is a modified Gantt chart, so this calculated field is really intended to be the first data point in the Gantt chart.

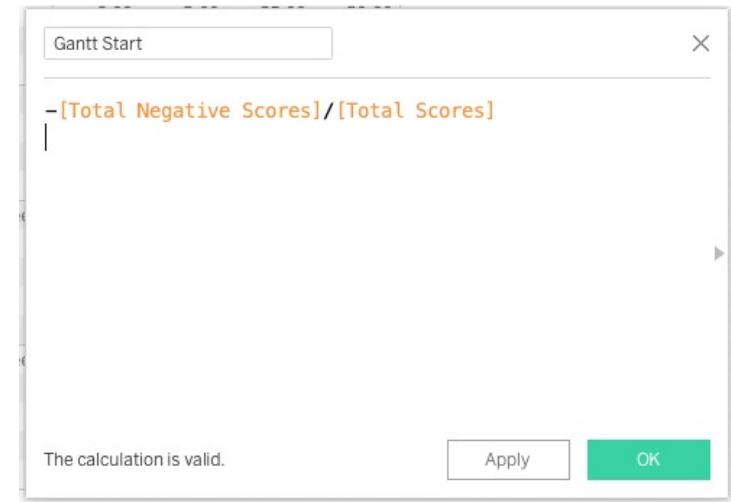


## 4b. Likert Scale Chart

- Create a new calculation field called “Gantt Start” using this formula

-[Total Negative Scores]/[Total Scores]

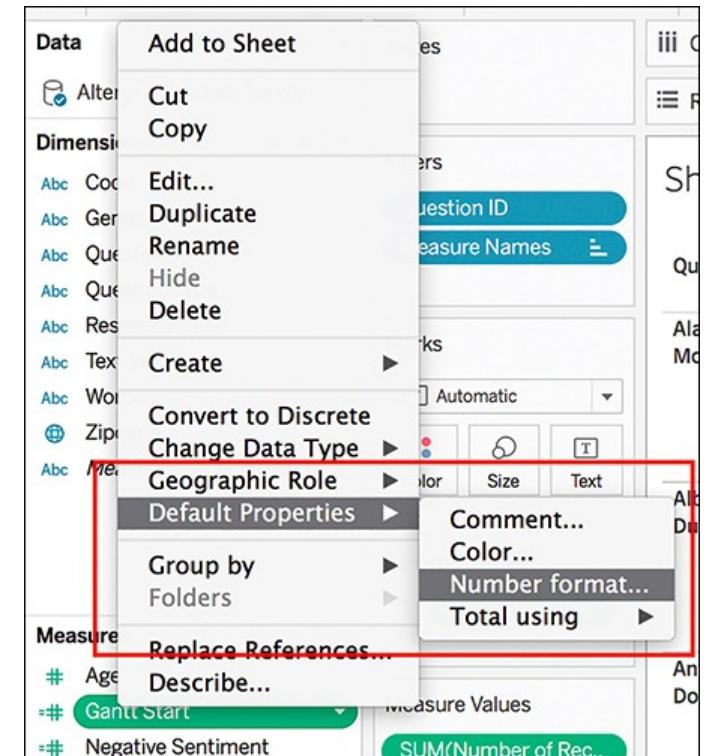
Apply, OK





## 4b. Likert Scale Chart

- Because this number will be expressed as a percent, we need to adjust the number format.
- Go to the “**Gantt Start**” measure on the left, right click, default properties, number format, percentage, **1 decimal place**.
- Drag “**Gantt Start**” to the **Measure Values** card.
- Now you have 5 pills there.





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## Step 2.6: Calculated Field #6: Percent of Total Sizing



## 4b. Likert Scale Chart

- The next step is to build a calculated field to determine the size (how wide) each section of the Gantt chart should be.

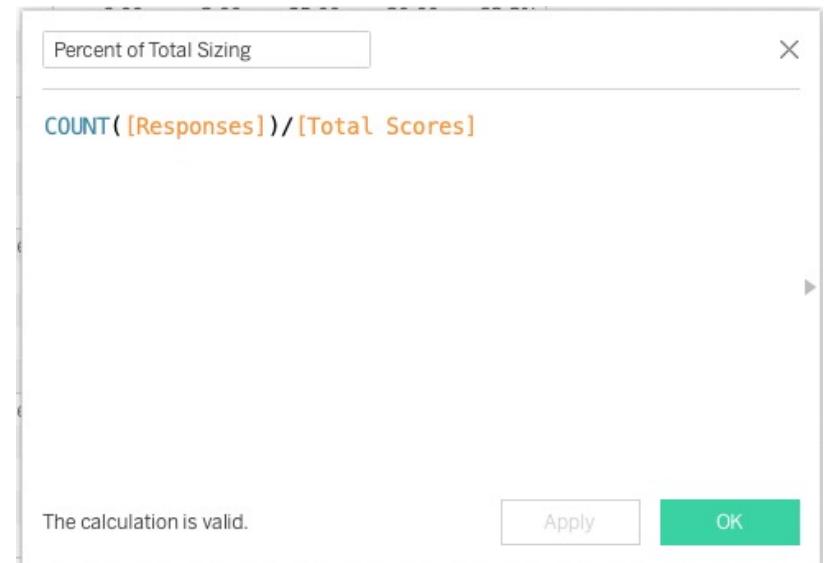


## 4b. Likert Scale Chart

- Create a new calculated field  
“Percent of Total Sizing” using this formula

COUNT([Responses])/[Total Scores]

Apply, OK

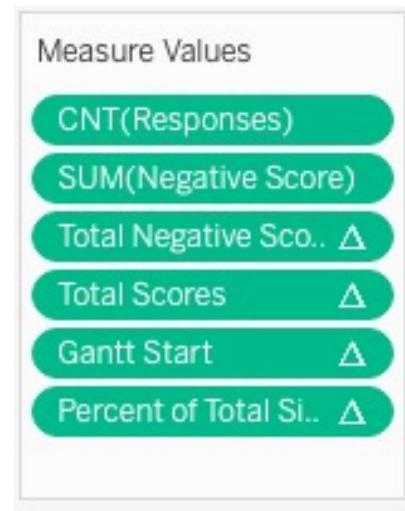


180



## 4b. Likert Scale Chart

- Again, this is a percentage, so you must adjust the default number format for this calculated field, too.
- Go to the “Percent of Total Sizing” measure on the left, right click, default properties, number format, percentage, 1 decimal place.
- Drag “Percent of Total Sizing” to the Measure Values card.
  - Now you have 6 pills there



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## Step 2.7: Calculated Field #8: Gantt Percent



## 4b. Likert Scale Chart

- The last calculated field to build will tell Tableau where to draw each line after the original Gantt Start data point and separate the response value categories.



## 4b. Likert Scale Chart

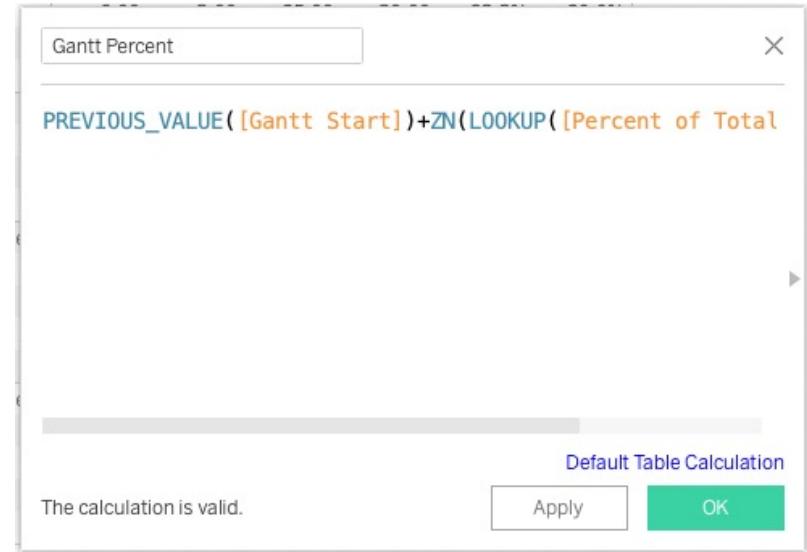
- Create a new calculated field called “Gantt Percent” using formula:

`PREVIOUS_VALUE([Gantt Start])+ZN(LOOKUP([Percent of Total Sizing],-1))`

You need to change the default table calculation to Answer, and adjust the default number format to be a percentage.

Click “Default Table Calculation” link, change from automatic to “Answer”

Apply, OK





## 4b. Likert Scale Chart

- Go to the “**Gantt Percent**” measure on the left, right click, default properties, number format, percentage, **1 decimal place**.
- Drag “**Gantt Percent**” to the **Measure Values** card.
  - Now you have 7 pills there
- The Gantt Percent is the trickiest of all the calculated fields needed to create the divergent stacked bar chart.



## 4b. Likert Scale Chart

- Essentially, the calculated field begins with the table calculation previous value and tells Tableau to look to the previous row of the calculation we've just made.
- However, there is no previous row for the first line in the table, so instead we are directing Tableau to Gantt Start instead.
- We then tell Tableau to add the previous row, this time on Percent of Total Sizing, and minus one.
- Since there is no previous value, we've directed Tableau to **zero nulls (ZN)**. In the next row, we can see this formula begin to work more smoothly



## 4b. Likert Scale Chart

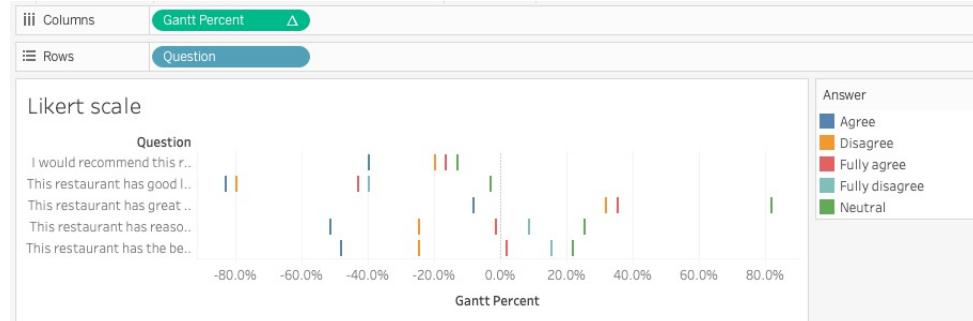
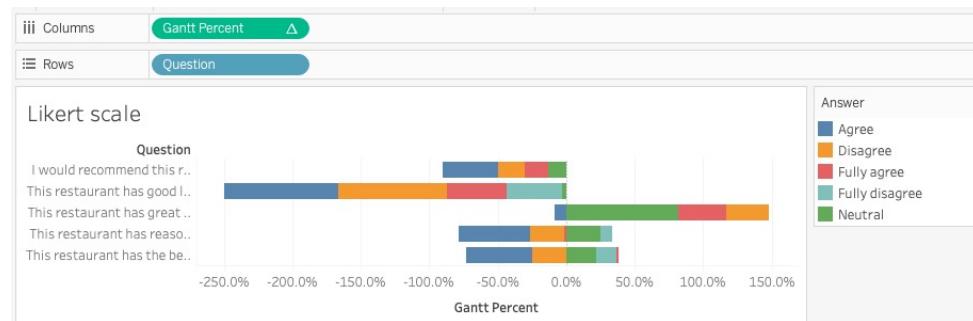
- After all of these new calculated fields have been created and added into the view, the crosstab for the divergent stacked bar chart is complete.
- We are now ready to begin building the visualization in a new sheet.

# Step 3. Create a Likert Scale Chart



## 4b. Likert Scale Chart

- New sheet, call it “**Likert Scale**”
- **Question > Rows**
- **Gantt Percent > Columns**
- Tableau will break immediately, flagging the measure in red and giving the error message that a critical field used to create this calculation is missing from the view
  - [warning box with red color, no worries]
  - The missing field is **Answer**, which is the field we calculated everything over the crosstab.





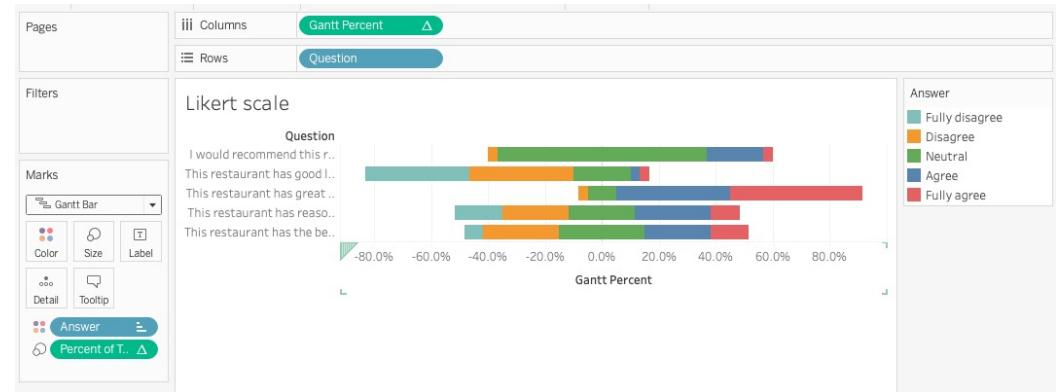
## 4b. Likert Scale Chart

- To fix the problem:
- **Answer > Color** in Marks card
- Immediately we see a divergent stacked bar chart begin to appear! However, as we're actually creating a Gantt chart, we still have quite a bit of work to do.
- Change “automatic” to “**Gantt Bar**”
- This adjusts the view from bars to lines that separate each section of the Gantt chart.



## 4b. Likert Scale Chart

- You need to manually re-sort your Answer options, the same way discussed when making the crosstab table
- Right-click on the “Answer” pill in the Marks card, Sort...
  - Sort By: Field
  - Sort order: Ascending
  - Field name: Score
  - Aggregation: Minimum
  - X

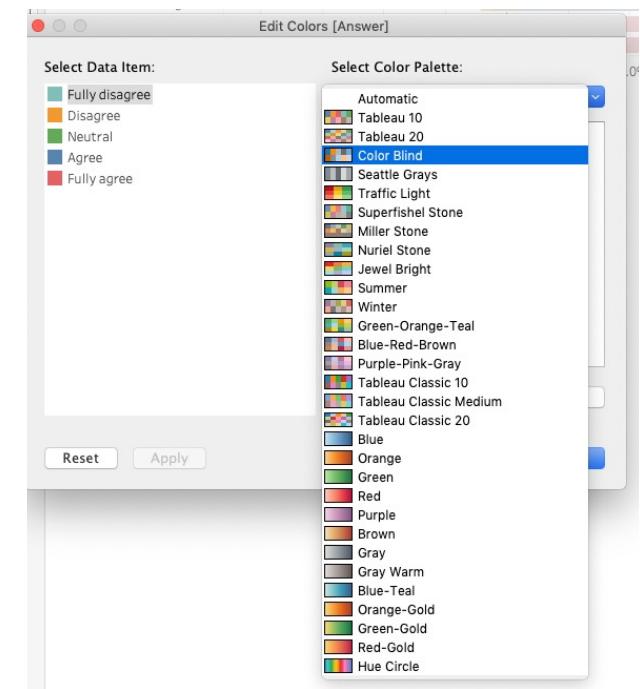


- Drag “Percent of Total Sizing” to the “Size” in Marks.
- Now, the visualization is beginning to take shape.



## 4b. Likert Scale Chart

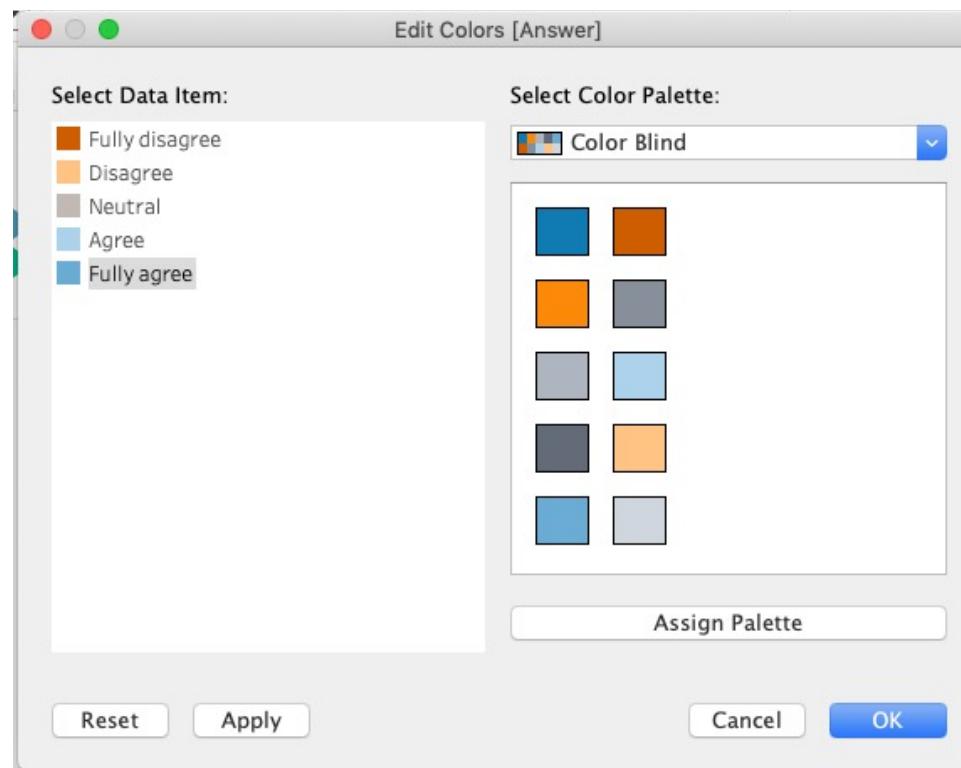
- Tableau has used the automatic color palette. Let's fix the color for the color blind audience.
- Go to the “Answer” card on the right-hand side
- Hover over the “Fully disagree” and right click, select “Edit Colors...”
- Change “Automatic” to “Color Blind”
- Change the color to blue-orange scheme one-by-one. E.g., Fully disagree = orange, fully agree = blue
- Apply, OK



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## 4b. Likert Scale Chart

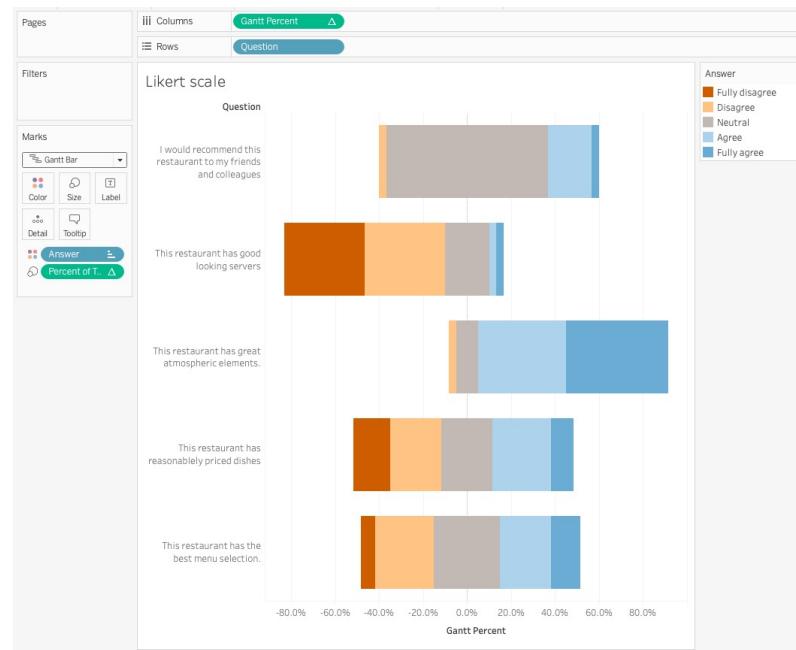


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## 4b. Likert Scale Chart

- Change the view to “Entire View” at the top. Almost done!

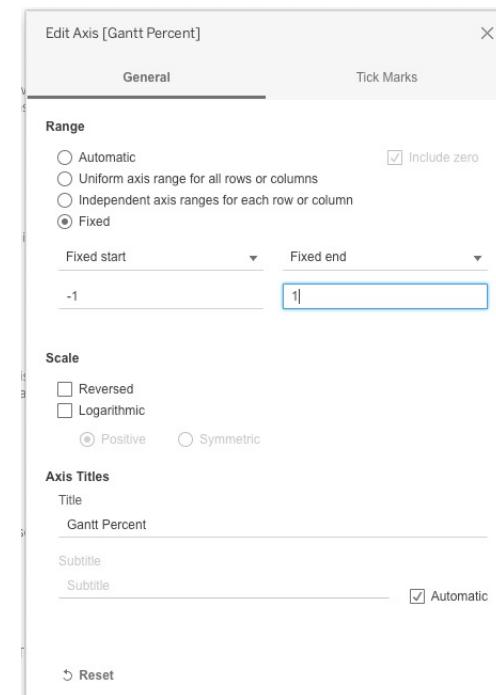


194



## 4b. Likert Scale Chart

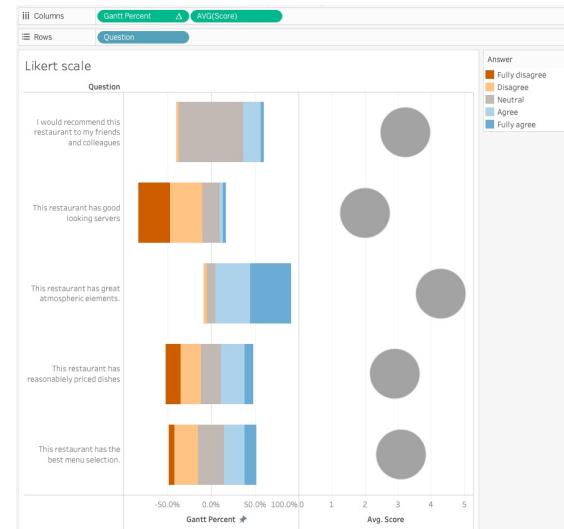
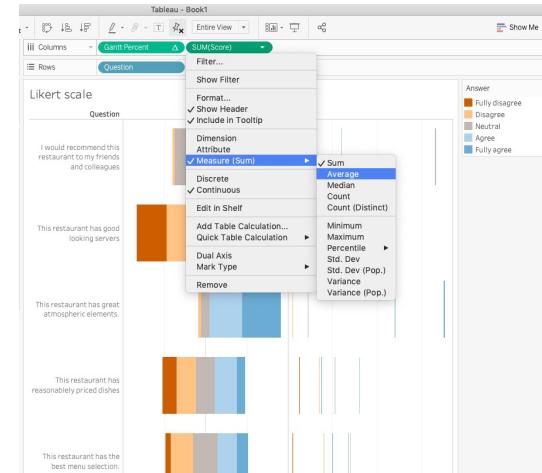
- Let's fine tune it
- Because we know that the axis can range from a  $-1$  to  $1$ , so...
- Go to the x-axis (i.e., Gantt Percent), right click, Edit Axis.., General tab, Range: Fixed: Fixed start is  $-1$ , Fixed end is  $1$
- This shifts the bars slightly so that everything is centered on the zero midpoint.





## 4b. Likert Scale Chart

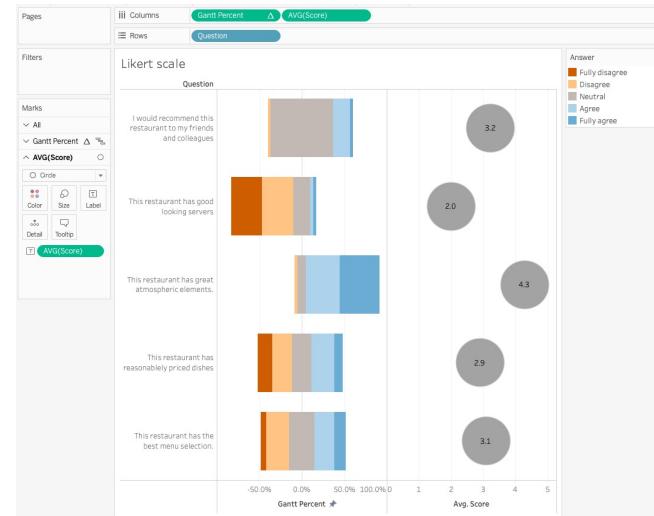
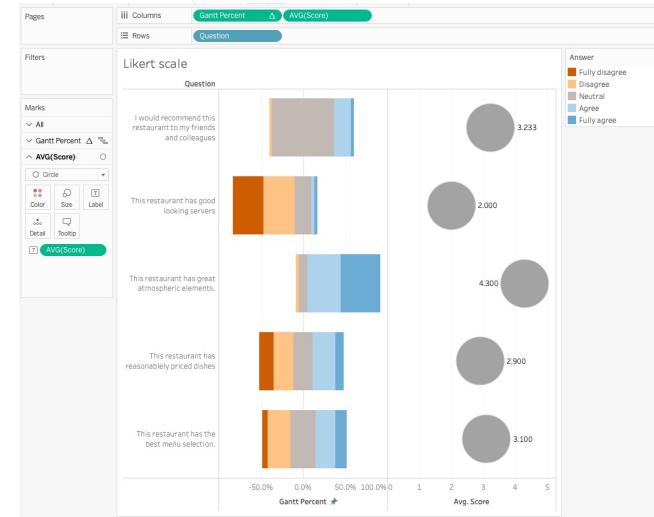
- Let's add the score to the chart
- Drag “**Score**” > Columns
- Right-click the “**SUM(Score)**” pill at the top, Measure (Sum) > Average
- Open “**AVG(Score)**” page in Marks card
- Remove the 2 pills there
- Change from Gantt Bar to **Circle**
- **Size**, Increase Size





## 4b. Likert Scale Chart

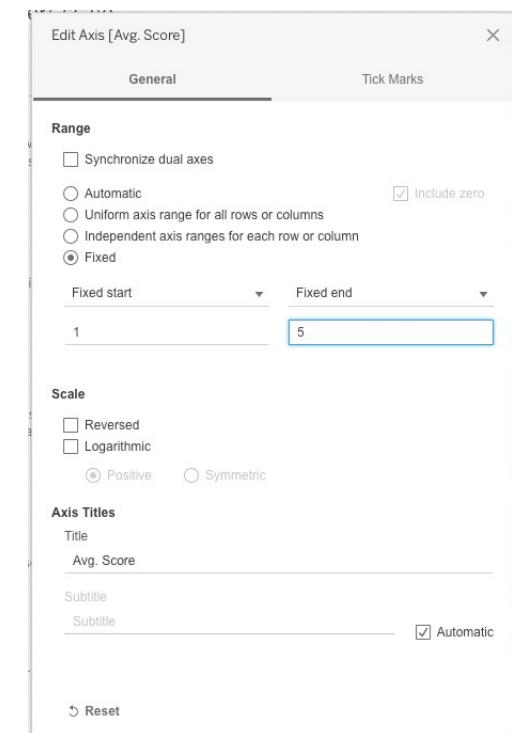
- Press COMMAND key on Mac, then drag “**AVG(Score)**” from the Columns to “**Labels**” in the Marks card
  - Now numbers are showing on the right of the circles
- Label icon, alignment: Horizontal: **centre**
- Right-click the “**AVG(Score)**” pill in the marks card, Format..., Default: Numbers: **Number (Custom)**: Decimal places: **1**





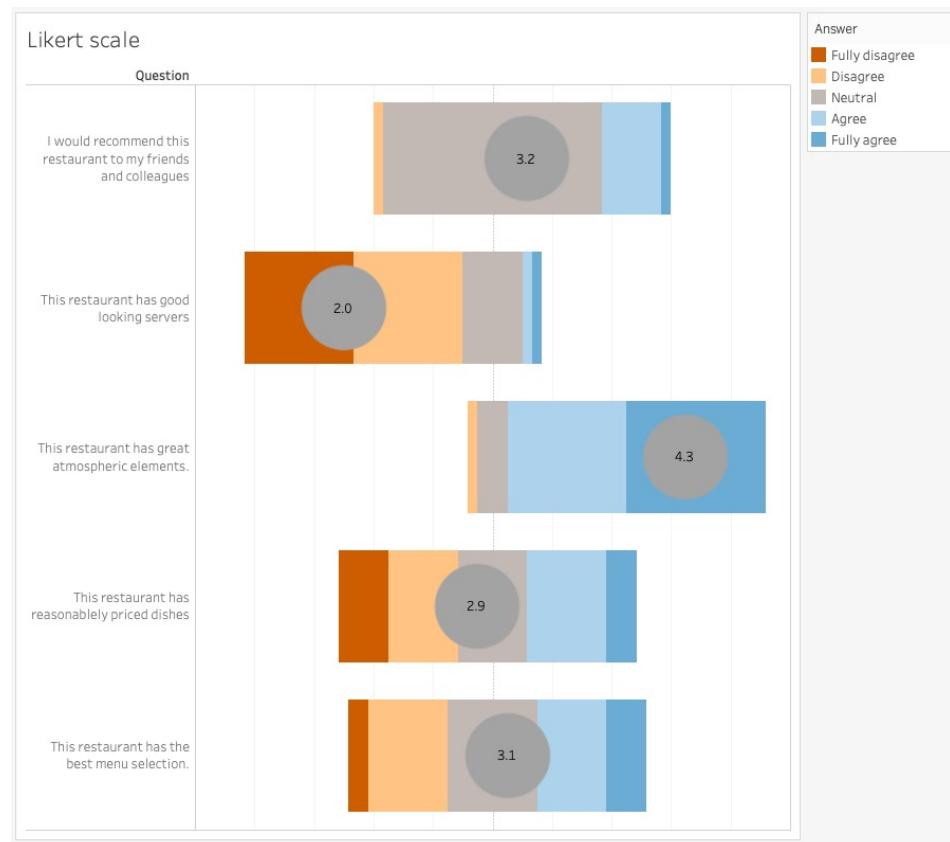
## 4b. Likert Scale Chart

- Go to “**AVG(Score)**” pill in Columns, right-click, Dual-Axis
- Go to the top X-axis (Avg. Score) [in the diagram], right-click, Edit Axis..., General tab, Range, Fixed, Fixed start: **1**, Fixed end: **5**
- Go to the top X-axis (Avg. Score), right-click, uncheck “Show Header”
- Go to the bottom X-axis (Gantt Percent), right-click, uncheck “Show Header”





## 4b. Likert Scale Chart

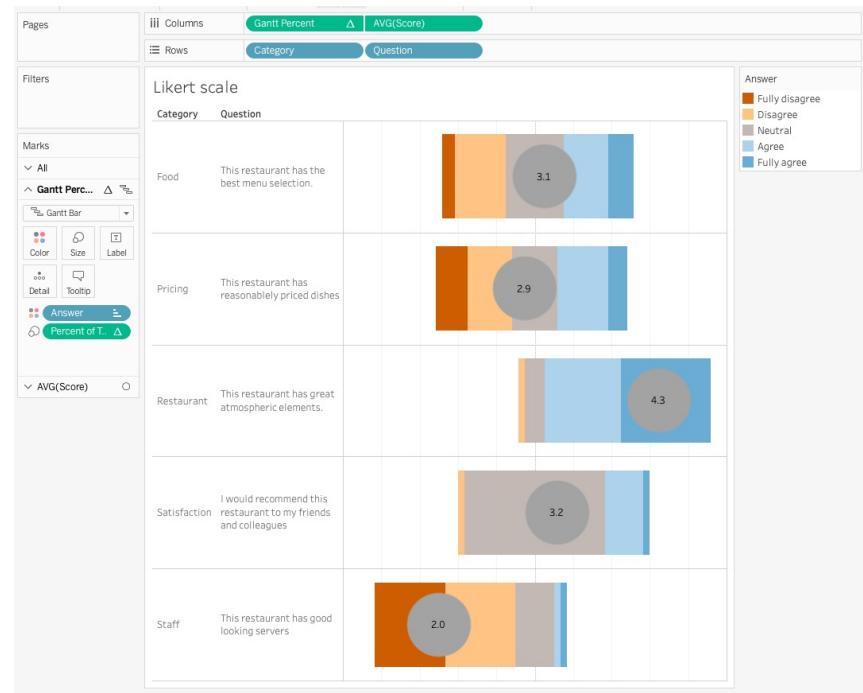


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## 4b. Likert Scale Chart

- Click “X” in the upper left to exit and get back to the Data pane.
- To make it perfect, drag **“Category”** to Rows, put it in front of the Question pill
- If you like, you can drag **Question ID** in front of Category as well in the Rows



Done!

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# Assignments



# Overview of Assignments



- A1: (Individual): Data-Driven Strategic Recommendations and Business Report **60%**
  - Mar 11, 11:59pm Boston Time



- A2: (Team): Visual Data Storytelling **30%**
  - Mar 7, 11:59pm Boston Time



- A3: (Individual): Tableau Chart Building Exercise **10%**
  - Mar 10, 11:59pm Boston Time



## A1: (Individual): Data-Driven Strategic Recommendations and Business Report 60%



- Mar 11, 11:59pm Boston Time
- Let's assume that you're the marketing director of a company and would like to **spend some advertising dollars to boost the sales of those products that are not selling well**. The company just sold California's operation last week to its competitor, so you don't need to worry about that market.
- You need to deliver a presentation to your boss for the budget approval. Your boss is interested in knowing about the sales situation of the sub-category over the **most recent 24-month period** (according to the dataset).



## A1: (Individual): Data-Driven Strategic Recommendations and Business Report 60%



- Use the “**Hult – Superstore.xlsx**” dataset to **build a 4-page story point (title page included, if applicable) using interactive dashboard** to show how sales in each sub-category are performing across the USA (except California), over the most recent 24-month period.
- These 4 pages should be linked together using the **story point** function.
- You are also required to **make use of at least 2 of the following actions** in your dashboard:
  1. Filter actions
  2. Highlight actions
  3. URL actions



## A1: (Individual): Data-Driven Strategic Recommendations and Business Report 60%



- In addition to publishing the interactive dashboard on Tableau Public for your boss to view (and submitting screenshots of each part to Canvas), you are also required to write a short business report for your boss to tell him/her which sub-category and which cities (or states) you are planning on spending most of your advertising budget.
- Length: 1,000-2,000 words.
- Significant marks will be deducted if you write less than 1000 words.
- **Failure to publish your dashboard on Tableau Public will result in a zero (F) grade for this deliverable, even if you have written the report.**
  - If you only publish individual charts and not a dashboard/story point, significant grades will be deducted because dashboard is a requirement for this assignment.

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# A1: (Individual): Data-Driven Strategic Recommendations and Business Report 60%



- General Dashboard Design
- Use of at least 2 actions in dashboard
- Story Point Function
- Story Business Report

Data-Driven Strategic Recommendations and Business Report						
Criteria	Ratings					Pts
General Dashboard Design	25 pts <b>Excellent</b> Dashboard is well designed with excellent combination of graphics and text.	18 pts <b>Good</b> Dashboard has good combination of graphs and text, with a few minor errors.	10 pts <b>Satisfactory</b> Some errors have been detected in the dashboard design. The choice of graphs and texts can be better.	5 pts <b>Unsatisfactory</b> Poor choice of graphs and text. The dashboard does not deliver message properly to the audience.	0 pts <b>No Marks</b> Wholly fails to demonstrate knowledge of a dashboard.	25 pts
Use of at least 2 actions in dashboard	25 pts <b>Excellent</b> Excellent use of 2 or more actions in the dashboard, with no errors.	18 pts <b>Good</b> Good use of 2 or more actions in the dashboard, with some minor errors.	10 pts <b>Satisfactory</b> Use of 2 or more actions in the dashboard, with some significant errors.	5 pts <b>Unsatisfactory</b> There is only one action in the dashboard and the choice of action can be better.	0 pts <b>No Marks</b> No action is being used in the dashboard.	25 pts
Story Point Function	25 pts <b>Excellent</b> Excellent use of the story point function. The slides were presented well in the right sequence.	18 pts <b>Good</b> Good use of the story point function. The sequence and content of the slides can still be improved.	10 pts <b>Satisfactory</b> There is evidence of the use of the story point function. The slide sequence should be improved and the content has some errors.	5 pts <b>Unsatisfactory</b> The story point function was used incorrectly, with confusing slide sequence and problematic content.	0 pts <b>No Marks</b> No story point function has been demonstrated in the published work.	25 pts
Story Business Report	25 pts <b>Excellent</b> Organized and well written. Presents an insightful and thorough analysis of all identified issues.	18 pts <b>Good</b> Organized and clearly written in most places. Presents a good analysis of most of the issues, but lacks depth in many areas.	10 pts <b>Satisfactory</b> Somewhat lacking in organization and clarity. Presents an adequate analysis of most of the issues, but lacks depth in many areas.	5 pts <b>Satisfactory</b> The report is poorly written. Present an incomplete analysis of some of the identified issues.	0 pts <b>No Marks</b> Analysis is missing or entirely inadequate.	25 pts



## A2: (Group): Visual Data Storytelling 30%



- Mar 7, 11:59pm Boston Time
- The objective of this assignment is to help students master the concept of visual data storytelling through the analysis of a dataset.
- In this assignment, the dataset comes from the Office for Diversity, Inclusion, and Belonging at Harvard University. The office surveyed **3 major groups of community members**, namely (i) Academic/Faculty, (ii) Staff, and (iii) Students. The purpose of this survey was to measure their perception about inclusion and belonging at Harvard.
- The survey asked approximately 20,600 community members to indicate their agreements on **9 different statements (questions)**. The dataset is attached. [pilot\\_pulse\\_survey\\_ib\\_data\\_tables.xlsx](#)



## A2: (Group): Visual Data Storytelling 30%



1. I feel like I belong at Harvard.
2. My relationships at Harvard are as satisfying as I would want them to be.
3. I feel like I can be my authentic self at Harvard.
4. The academic/professional goals I have for myself are being met at Harvard.
5. I know what constitutes good performance in my role.
6. I receive meaningful recognition for doing good work.
7. I feel comfortable expressing my opinions to others at Harvard.
8. I believe Harvard leadership will take appropriate action in response to incidents of harassment and discrimination.
9. I have the skills to address hostile behavior that I witness.



## A2: (Group): Visual Data Storytelling 30%



- Let's assume that you're the prime for this project at the Office for Diversity, Inclusion, and Belonging. **You're invited to the President's Office at Harvard to give a 15-minute presentation on the key findings of this survey.** The senior academic administrative team is interested in identifying the specific demographic groups that gave **low scores** on the survey, so that the university can use such insights to guide their future priorities, programs, policies, and procedures.

**DO NOT CREATE A POWERPOINT FILE. Please publish your work on Tableau Public.**

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## A2: (Group): Visual Data Storytelling 30%



- In this assignment, each team is required to perform the following tasks with this dataset:
  - Get rid of irrelevant data.
  - Prepare data to make it Tableau-friendly.
  - Visualize data using relevant charts.
  - Analyze these charts to generate insights.
  - Create a Tableau “presentation” (10 pages max, including the cover page, if applicable) using a combination of charts, dashboards, and story points. Then, publish it on Tableau Public.
  - Students should demonstrate their understanding of the storytelling process when preparing this 15-minute presentation.
  - Deliver the presentation in class on Session 7.

<sup>1</sup>

**DO NOT CREATE A POWERPOINT FILE. Please publish your work on Tableau Public.**

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## A2: (Group): Visual Data Storytelling 30%



- In addition to publishing the data on Tableau Public, each team should also submit to Canvas a MSWord (or PDF) file that includes (i) the **URL of their Tableau Public site** and (ii) **screenshots** of these presentation pages for auditing/grading purpose.
- No written narrative or explanation is required in this file.



# A2: (Group): Visual Data Storytelling 30%



- Composition
- Subject Knowledge
- Analysis

Team Deliverable						
Criteria	Ratings					Pts
Deliverable Composition	<b>30 pts</b> Excellent  Organized and well written. Underlying logic is clearly articulated and easy to follow. Words expressed the intended meaning and supported reader comprehension. Sentences were grammatical with few spelling errors.	<b>25 pts</b> Good  Organized and clearly written in most places. In some areas, the logic and flow of ideas is difficult to follow. Sentences were mostly grammatical and only a few spelling errors were present but did not hinder the reader.	<b>20 pts</b> Satisfactory  Somewhat lacking in organization and clarity, making the logic and flow of ideas difficult to follow. Sentences include grammatical and spelling errors that occasionally hinder the reader.	<b>15 pts</b> Unsatisfactory  The reader had to make considerable effort to understand logic and flow of ideas due to the grammatical and spelling errors.	<b>0 pts</b> No Marks  The deliverable was largely unintelligible due to the flow of logic, grammar, and/or spelling.	30 pts
Deliverable Subject Knowledge	<b>30 pts</b> Excellent  Deliverable demonstrated knowledge of course content, and integrated many major and minor concepts. There is evidence of extensive research and depth of thinking about the topic.	<b>25 pts</b> Good  Deliverable demonstrated knowledge of course content, integrated major concepts, and demonstrated evidence of some research and thinking about the topic.	<b>20 pts</b> Satisfactory  Deliverable partially demonstrated knowledge of course content, partially integrated major concepts, and demonstrated limited evidence of some research and thinking about the topic.	<b>15 pts</b> Unsatisfactory  Deliverables struggle to demonstrate knowledge of course content and concepts that could be shown through evidence, research or original thinking about the topic.	<b>0 pts</b> No Marks  Wholly fails to demonstrate knowledge of course content and concepts.	30 pts
Deliverable Analysis	<b>40 pts</b> Excellent  Presents an insightful and thorough analysis of all identified issues. Includes all necessary evidence and/or calculations.	<b>30 pts</b> Good  Presents a good analysis of most of the issues, but lacks depth in some areas. Is missing some necessary evidence and/or calculations.	<b>20 pts</b> Satisfactory  Presents an adequate analysis of most of the issues, but lacks depth in many areas. Is missing some necessary evidence and/or calculations.	<b>10 pts</b> Unsatisfactory  Presents an incomplete analysis of some of the identified issues. Omits necessary evidence and/or calculations.	<b>0 pts</b> No Marks  Analysis is missing or entirely inadequate.	40 pts
						Total Points: 100



## A3: (Individual): Tableau Chart Building 10%

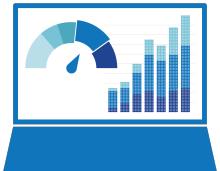


- Mar 10, 11:59pm Boston Time

1. Use the “Hult – Cellphone Brand.xlsx” file to create a **word cloud** graphic to show the phone brands that are used by the 100 employees in the company. Each word should be shown in different color and BOLD.
2. Use the “Hult – Superstore.xlsx” file to create a **line chart** that includes a “2-year forecast” of sales. [Y-axis: “Sales”; X-axis: “Month of Order Date”]
3. Use the “Hult – Superstore.xlsx” file to create a **scatterplot** that includes 5 clusters. [Y-axis: “Profit”; X-axis: “Sales”]
4. Use the “Hult – Superstore.xlsx” file to create a **dual axis map** that combines a filled map (showing “Profits”) and a pie chart map (showing revenue and the 3 categories: Furniture, Office Supplies, and Technology).
5. Use the “Hult – Superstore.xlsx” file to create a **waterfall chart**. [Y-axis: Running Sum of Sales; X-axis: Sub-Category]. The bars should be moving upwards to the right just like my example.



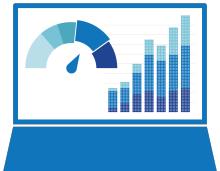
## A3: (Individual): Tableau Chart Building 10%



6. Use the “Hult – Superstore.xlsx” file to create **highlight table** that includes a white border around each cell. The cells should be in yellow (or Orange-Gold) color and the text should be shown in Brown color. [Y-axis: Sub-Category; X-axis: Order Date].
7. Use the “Hult – Superstore.xlsx” file to create a **donut chart**, showing the ship mode on the outer arc together with the percentage of total sales revenue right next to each segment. In the middle of the donut chart, it should show the total sales revenue figure.
8. Use the “Hult – Superstore.xlsx” file to create a **box-and-whisker plot**. [Y-axis: Sales; X-axis: Sub-category]. I need to see the dots in light green color in the background.
9. Use the “Hult – Gantt Chart.xlsx” file to create a **Gantt chart**, in which the first column displays “Task”, the 2nd column displays “Employee”, and that there is a reference line of “May 30, 2020” in the chart. The date “May 30, 2020” has to be displayed next to the reference line.
10. Use the “Hult – Linkert Restaurant” file to create a **Likert scale chart**. The Y-axis should show the 5 survey statements. Also, you must display the Gantt Percent on the X-axis, with the value -100% showing clearly on the left and 100% on the right of the X-axis.



## A3: (Individual): Tableau Chart Building 10%



### Important notes:

1. Publish the charts on your Tableau Public Profile, this is a requirement.  
**You'll receive a zero if you don't publish your charts online.**
2. You also do a screen capture of each chart and paste it onto a MSWord or PDF file, and then upload it to Canvas for auditing purpose.
3. In this MSWord or PDF file, you list your Tableau Public URL at the beginning of the file. **Failure to include this link in your file will result in 1 level grade reduction.**
4. There are 10 graphs that you need to draw in this A3 assignment. Each graph is worth 10 points for a total of 100 points.



# A3: (Individual): Tableau Chart Building 10%



Tableau Chart Building Exercise



Criteria	Ratings												Pts
	100 pts 10 graphs plotted correctly	90 pts 9 graphs plotted correctly	80 pts 8 graphs plotted correctly	70 pts 7 graphs plotted correctly	60 pts 6 graphs plotted correctly	50 pts 5 graphs plotted correctly	40 pts 4 graphs plotted correctly	30 pts 3 graphs plotted correctly	20 pts 2 graphs plotted correctly	10 pts 1 graph plotted correctly	0 pts 0 graphs plotted correctly		
General Data Visualization Design	Data visualization is well designed with excellent combination of graphs and text.	Data visualization is well designed with excellent combination of graphs and text, with a few minor errors.	Data visualization has good combination of graphs and text, with a few minor errors.	Data visualization has good combination of graphs and text, with a few minor errors.	Data visualization design. The choice of graphs and text can be better.	Data visualization design. The choice of graphs and text can be better.	Data visualization design. The choice of graphs and text can be better.	Data visualization design. The choice of graphs and text can be better.	Data visualization design. The choice of graphs and text can be better.	Data visualization design. The choice of graphs and text can be better.	Data visualization design. The choice of graphs and text can be better.	100 pts	

Total Points: 100

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English ▾

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Session Number (Required) \_\_\_\_\_

Student ID (Optional) \_\_\_\_\_

Student Name (Optional) \_\_\_\_\_

Remember my student ID and student name

**JOIN**

Quiz, Tableau Knowledge and Class Attendance

Thank You

