Deeper Into Tableau

Class Objectives

By the end of this lesson, you will be able to:

Create groups and sets

Create maps and use built-in U.S. Census data

Create custom calculations

Apply LOD calculations

Activity: Warm-Up

In this warm-up activity, you will create visualizations using data on colleges and universities

Activity: Explore Data

- Use the provided dataset to visualize interesting questions, such as the following:
- Is there a relationship between an institution's average ACT or SAT scores and the average number of doctorates awarded?
- Which regions in the United States have the greatest percentage of students receiving federal grant aid?
- Is there a correlation between SAT scores and regions?
- Do foreign undergraduates prefer institutions whose highest offered degree is a doctorate, master's, or bachelor's?
- Of institutions that offer bachelor's, master's, or doctorates as the highest degrees, which have the highest graduation rates within four years?
- Is there a relationship between tuition and SAT scores?

- **Hint:**
  - Don't forget to save to Tableau Public once finished.
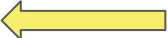
Let's Review

Instructor Demonstration
Groups and Sets

Instructor Do: Groups and Sets

- We can group multiple members in a field into a group. For example, if companies A and B have recently merged, we can group them under a single entity to aggregate their figures.

- In ins_groups_sets, go to the Group tab. Each continent's countries, as well as the total paid fees, are shown. If we want to study a group by its language, it would make sense to group all the Spanish-speaking countries.

- Select multiple countries, right-click, and choose Group
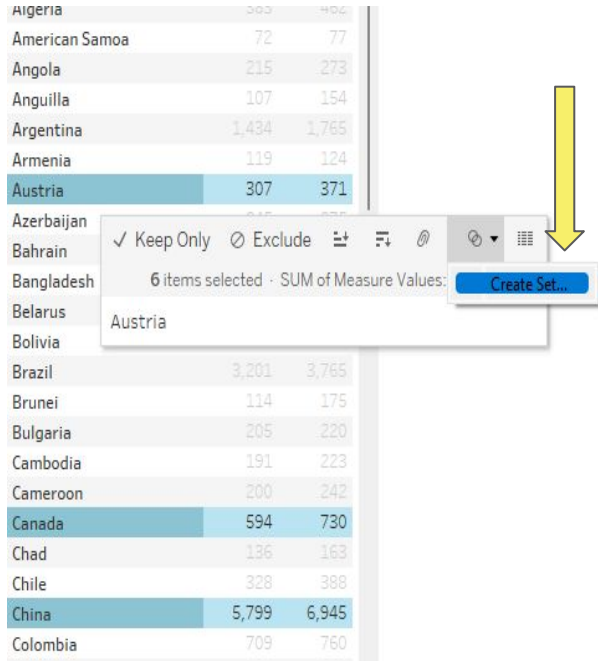
Instructor Do: Groups and Sets

Continent	Country (group)	
AS	Vietnam	746
	Yemen	511
EU	Argentina, Bolivia, Chile a..	607
	Austria	307
	Belarus	277
	Bulgaria	205
	Czech Republic	134

U	Argentin...	607
	Austria	307
	Belarus	277
	Bulgaria	205
	Czech Re	134
	Estonia	116
	Faroe Isl	115
	Finland	102
	France	374
	Germany	
	Greece	232
	Hungary	112
	Italy	831
	Latvia	262

Context menu:
- ✓ Keep only
- ✗ Exclude
- Hide
- 📎 Ungroup
- Format…
- Rotate Label
- **Edit Alias…**

- Now, they are grouped, and their paid fees are also aggregated

- To change the name of the group, right-click it and choose "Edit Alias"

- Similarly, members of a field can be grouped into **sets** in Tableau. **Sets** are more flexible than groups; a set's members can be drawn from multiple dimensions or even conditions.

Instructor Do: Groups and Sets

We can create a set of members from the same field using the following steps:

- Go to the *"Sets0"* sheet. Suppose that we are offering a special discount to Austria, Canada, and China. Click the country members that will have a discount.

- With the selected countries highlighted, hover over one until a menu appears. Select *"Create Set"*... from the menu.

Instructor Do: Groups and Sets

- Name the set *"Discounted Countries"* or something similar. It will appear in the Tables listing on the far left of the window. Drag it to the Rows shelf

- A set bifurcates a field into the following two groups:
  - The **In** group, whose members meet the set's criteria
  - The **Out** group, whose members do not meet the set's criteria

- With these groups, we can perform additional operations and visualizations

Instructor Do: Groups and Sets

We can also create a set to select members that meet a defined criterion. In the following example, we'll create sets to select movie titles that meet two criteria: high paid fees and low rented days.

Instructor Do: Groups and Sets

Right-click on Country, and select Create then Set. Select Condition, and define the criteria. In this example, we're filtering for total profits higher than $1,000. Repeat the process for low rented days. Dragging either of these to the Rows shelf will display the in and out sets.

Sets1b

Sub-Catego..	In / Out of H..	Shipping Cost	Profit
Accessories	In	83,592	129,626
Appliances	In	108,308	141,563
Art	In	41,889	57,830
Binders	In	49,773	72,433
Bookcases	In	155,488	161,924
Chairs	In	164,253	140,396
Copiers	In	159,501	258,568
Envelopes	Out	18,583	28,849
Fasteners	Out	10,300	13,844
Furnishings	Out	40,982	46,845
Labels	Out	8,841	14,989
Machines	In	79,150	58,868
Paper	In	26,864	58,112
Phones	In	184,953	216,717
Storage	In	120,794	108,417
Supplies	Out	24,951	22,559
Tables	Out	79,863	-64,083

Instructor Do: Groups and Sets

We can combine the criteria created by the two sets. Right-click on either pill of a set; in this case, right-click on the High Paid Fees set, and select Create Combined Set. Define the two sets, and select inner join.
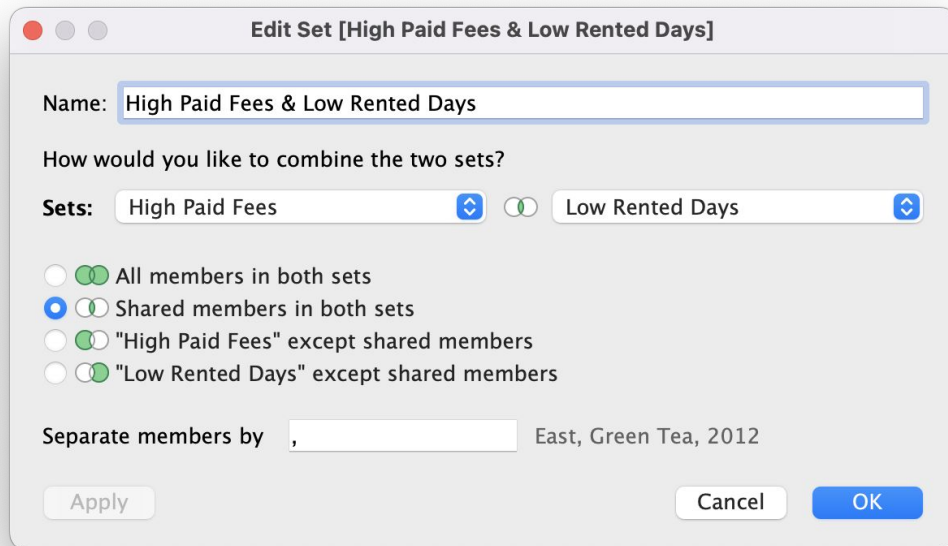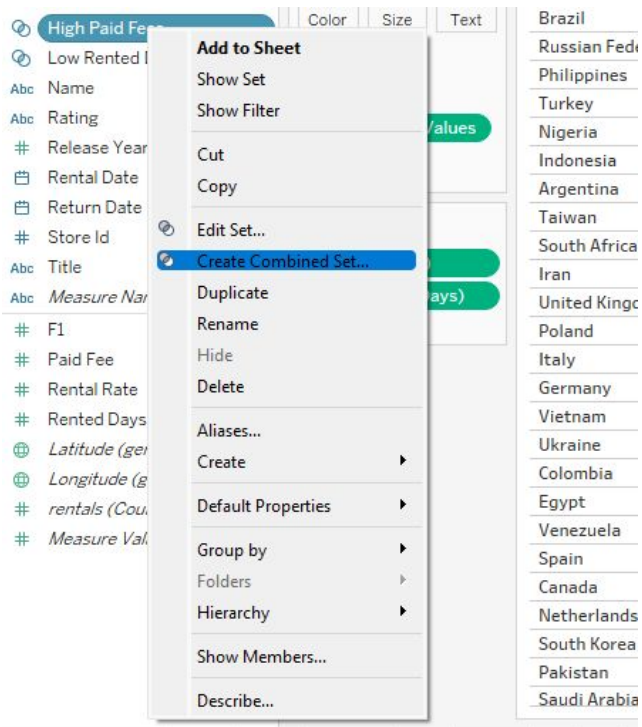
Instructor Do: Groups and Sets

In sheet Sets2, we can now use the combined set filter to visually identify Countries that meet the criteria. Sheet Sets3, captured in the following image, visualizes whether countries that have low rented days and high paid fees have higher rental rates than countries that don't meet the criteria.
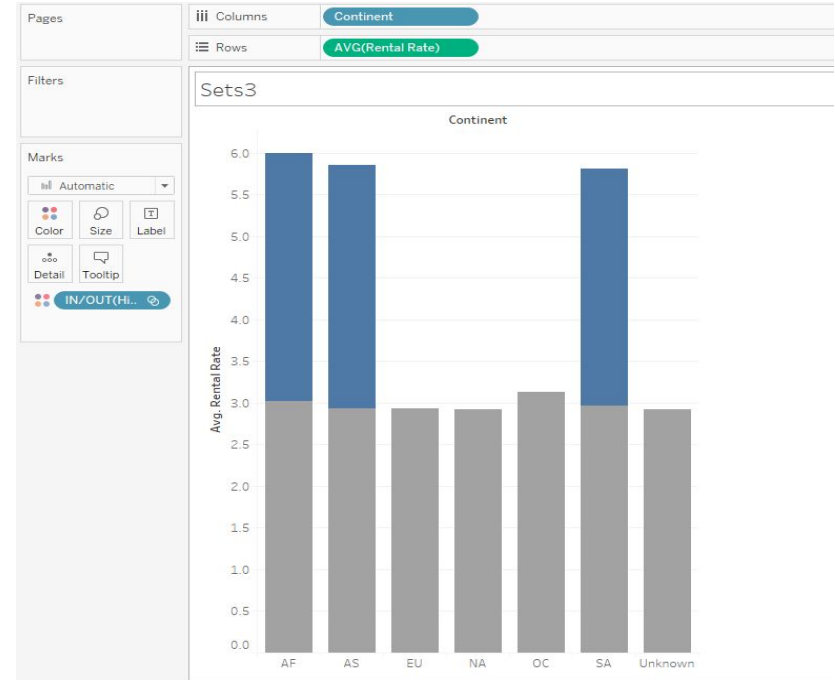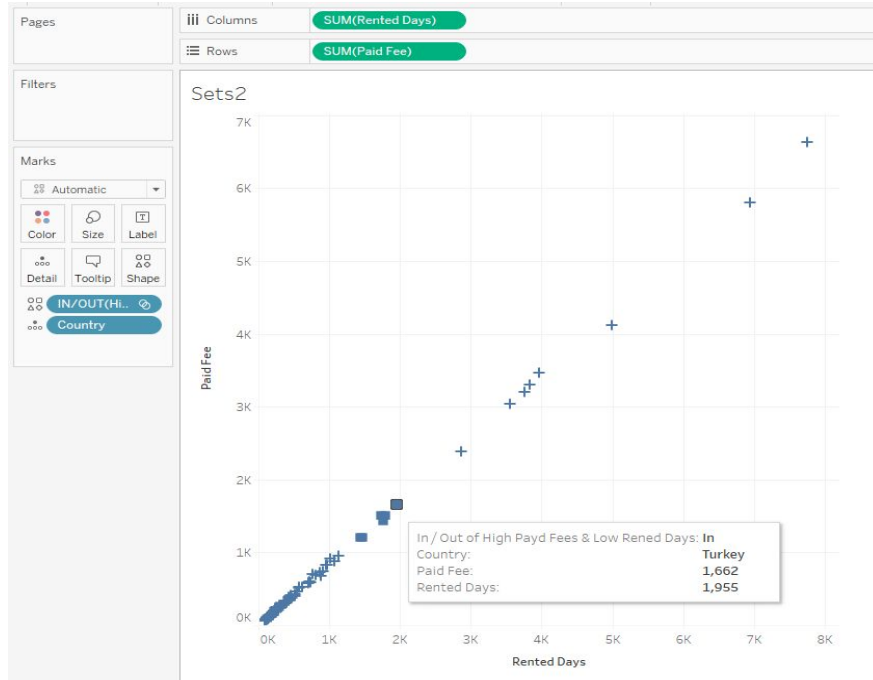
Questions?

Activity: Movie Rental Groups and Sets

In this activity, you will use groups and sets to explore movie rentals at a fictitious rental shop.

Suggested Time:
15 Minutes

Instructions:

Activity: Movie Rental Groups and Sets

- Import the xlsx file from the Resources folder.
- Drag the "rentals" sheet into the area labeled "Drag tables here."
- Group the "Rented Days" field into Short, Medium, and Long rentals.
- In the "Short" group, put any rental shorter than 3 days.
- In the "Medium" group, put any rental from 3 days to 7 days.
- In the "Long" group, put any rental longer than 7 days.
- Create a chart comparing the Rented Days groups by average Paid Fee.
- Create a set for kids movies.
- The kids movies set should have all movies rated G and PG as "In" and the other ratings as "Out."
- Rename the aliases for the set to "Kids Movies" and "Other."
- Create a chart comparing the total number of rentals between kids movies and other movies.
- Create a chart comparing the average fees paid between kids movies and other movies.
- Create a chart comparing the average rental duration between kids movies and other movies.

Let's Review

Instructor Demonstration
Calculations

Instructor Do: Calculations

In addition to Tableau's built-in operations, we can also create custom conditional statements and calculations. For example, Tableau can handle IF statements. Using an IF statement, continents with high revenue are colored blue, less revenue are colored red, and less than 5K in revenue are colored orange.
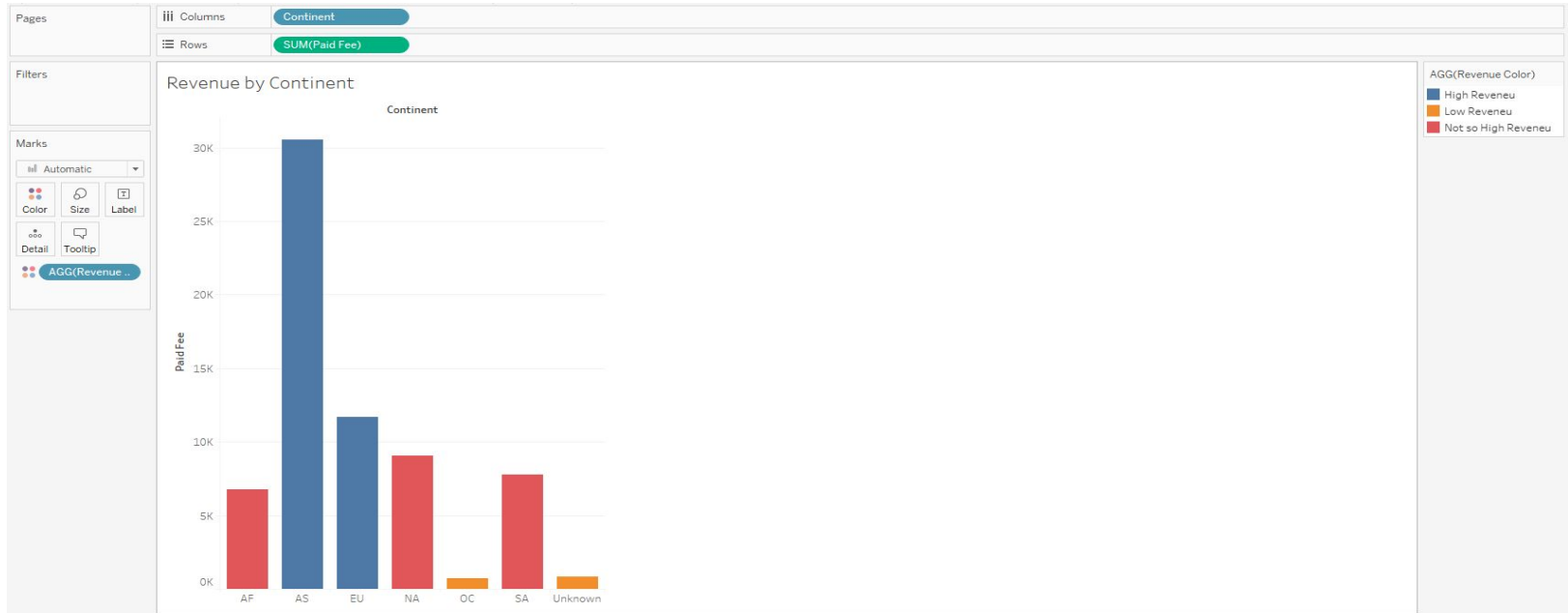
Instructor Do: Calculations

Tableau can also deal with unknown quantities, as we'll find in the IIF1 sheet. Create a new calculated field, and enter the code. Instead of IF, the statement in the preceding code is IIF.
This means if the rented-days total is greater than 1,000, a subcategory is labeled "High Rentals." Otherwise, it is labeled "Low Rentals." However, if the quantity cannot be evaluated, it is "Unknown."

Instructor Do: Calculations

Tableau can also calculate the distinct number of dimensions by using the COUNTD function, which is short for "count distinct." Open the Countd worksheet. Counting the number of rentals across continents is simple, but what if we want to see the number of unique customers in each continent?
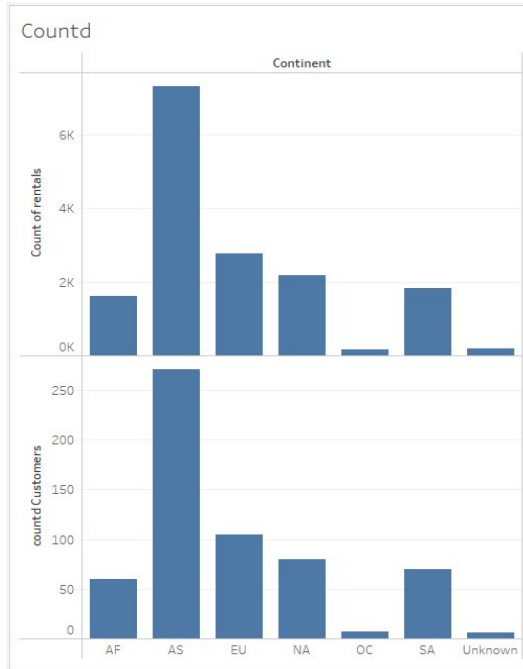
Instructor Do: Calculations

By default, each day's sales are compared against the previous day's sales, but this can be changed by clicking on the Sales pill again, selecting Relative to, and then the desired option.
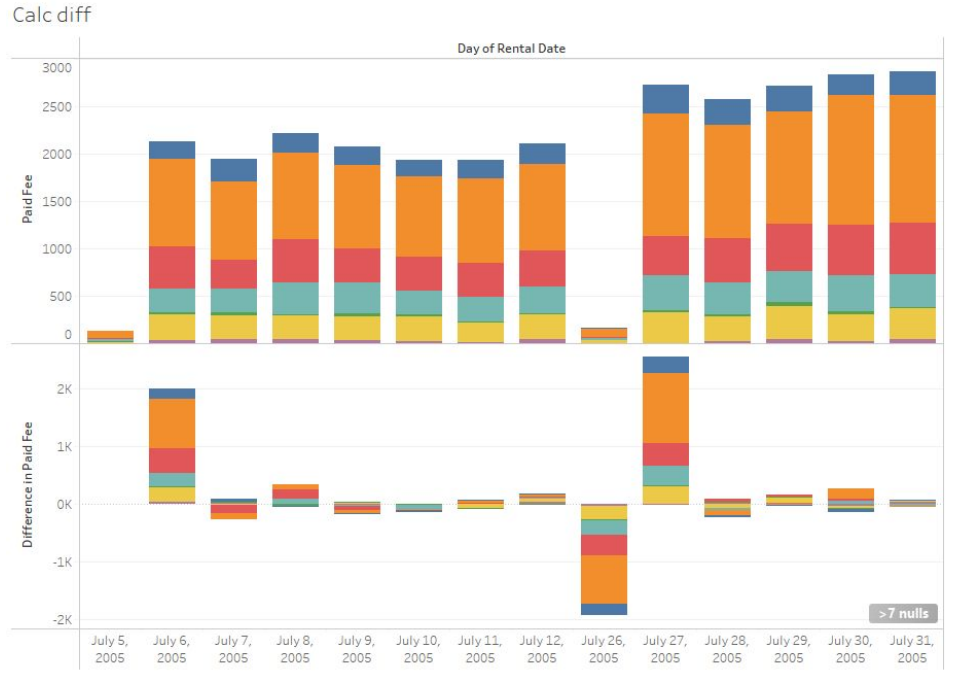

- The top chart is a stacked bar chart of daily revenue in all the continents.

- The bottom chart shows the difference between one day's revenue and the previous day's revenue.

- The bottom chart can be created by dragging the Sales pill to Rows, clicking on the pill to select Quick Table Calculation, and then selecting Difference.

Questions?

Activity: Calculations

In this activity, you will use groups and sets to explore movie rentals at a fictitious rental shop.

Suggested Time:
10 Minutes

Activity: Calculations

Try to create visualizations for the following questions:

- What are the most dangerous hours that produce casualties?
- What are the most dangerous months that produce casualties?
- What speed limit is the most common for accidents to occur in?
- Does the speed limit impact the average number of casualties?
- What are the most common weather conditions for accidents?
- Do light conditions have any impact on accidents?
- Are there any possible problems or issues with these visualizations?
- Use calculations and logical statements to enhance your visualizations, such as:
- Using conditional logic to color dangerous months, locations, and hours.
- Charting the increase or decrease in the number of casualties in each month relative to the previous month.
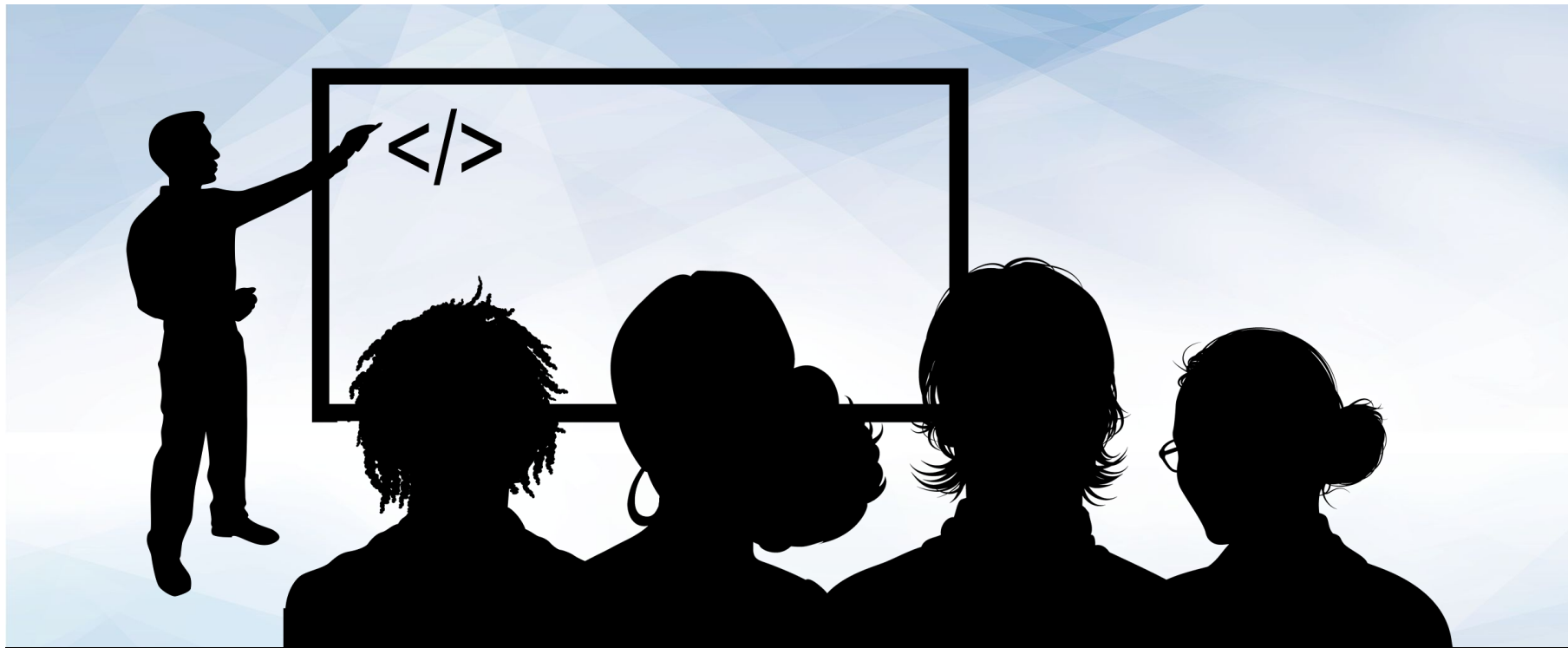- Feel free to revisit earlier datasets to create calculations.

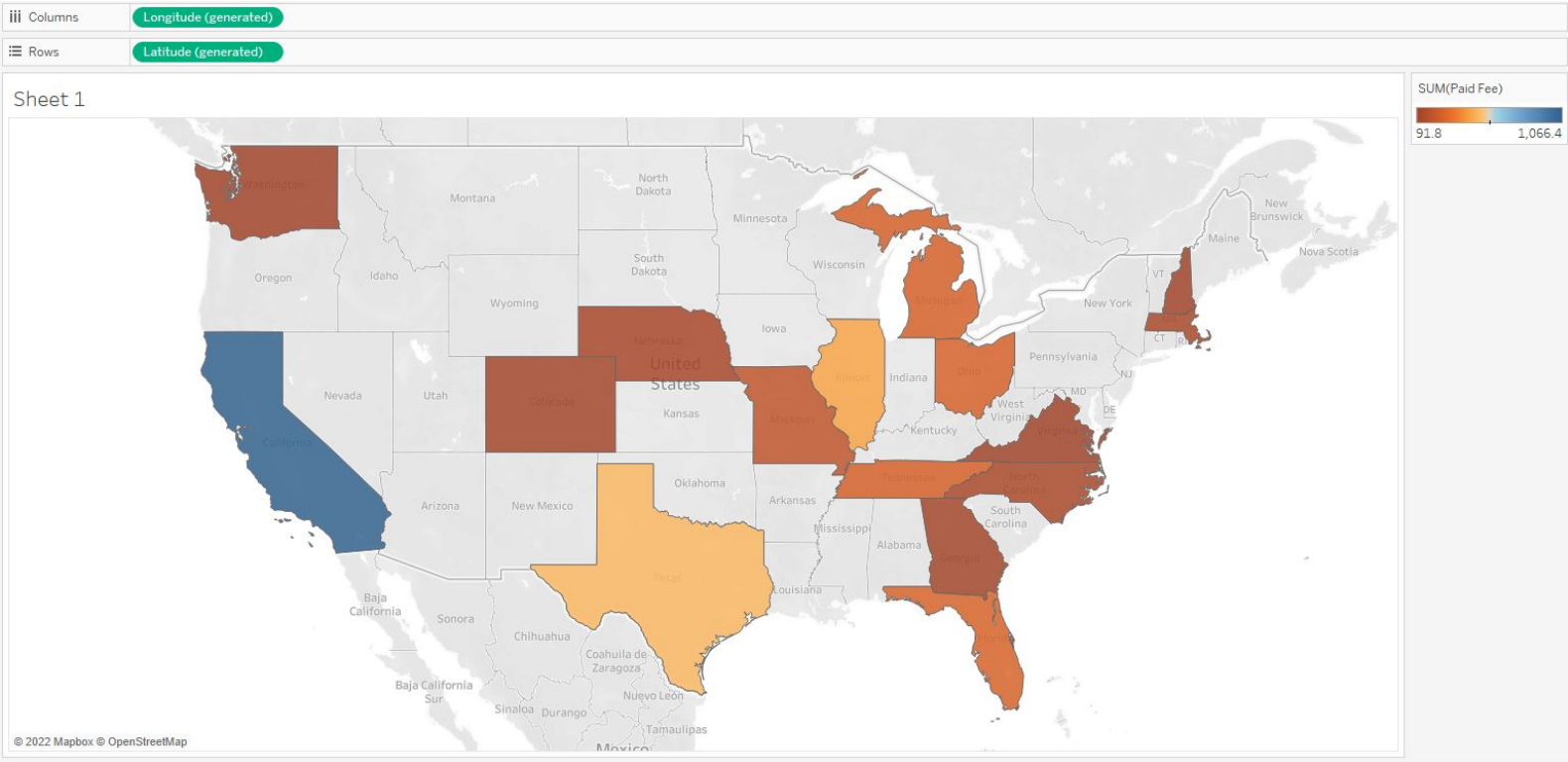**Let's Review**

Countdown timer

15:00

(with alarm)

Instructor Demonstration
Maps

Instructor Do: Maps

Creating a map in Tableau is simple. Below is a map of total profits by state.
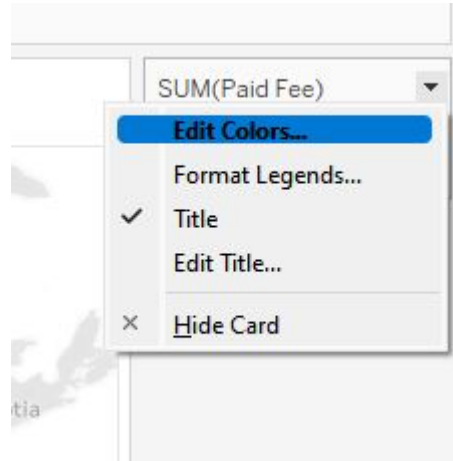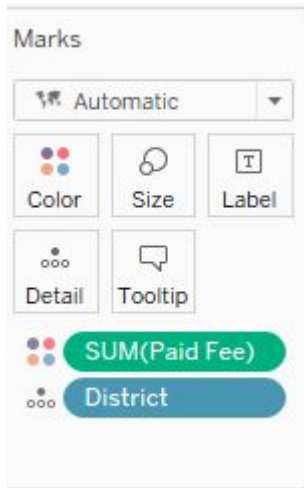
Instructor Do: Maps

- Tableau automatically generates the latitude and longitude coordinates of locations in our data.

- The Latitude (generated) pill goes to the Rows shelf because latitude lines run horizontally.

- The Longitude (generated) pill goes to the Columns shelf because longitude lines run vertically.

- To generate this map, simply drag the Paid Fee pill to Color in the Marks pane.

- The colors can be tweaked by clicking the drop-down menu in the legend and choosing Edit Colors

Instructor Do: Maps

To simply categorize high-revenue states against low-revenue states, we can create a custom logical function, (Analysis -> Create Calculated Field), as used in the following code:
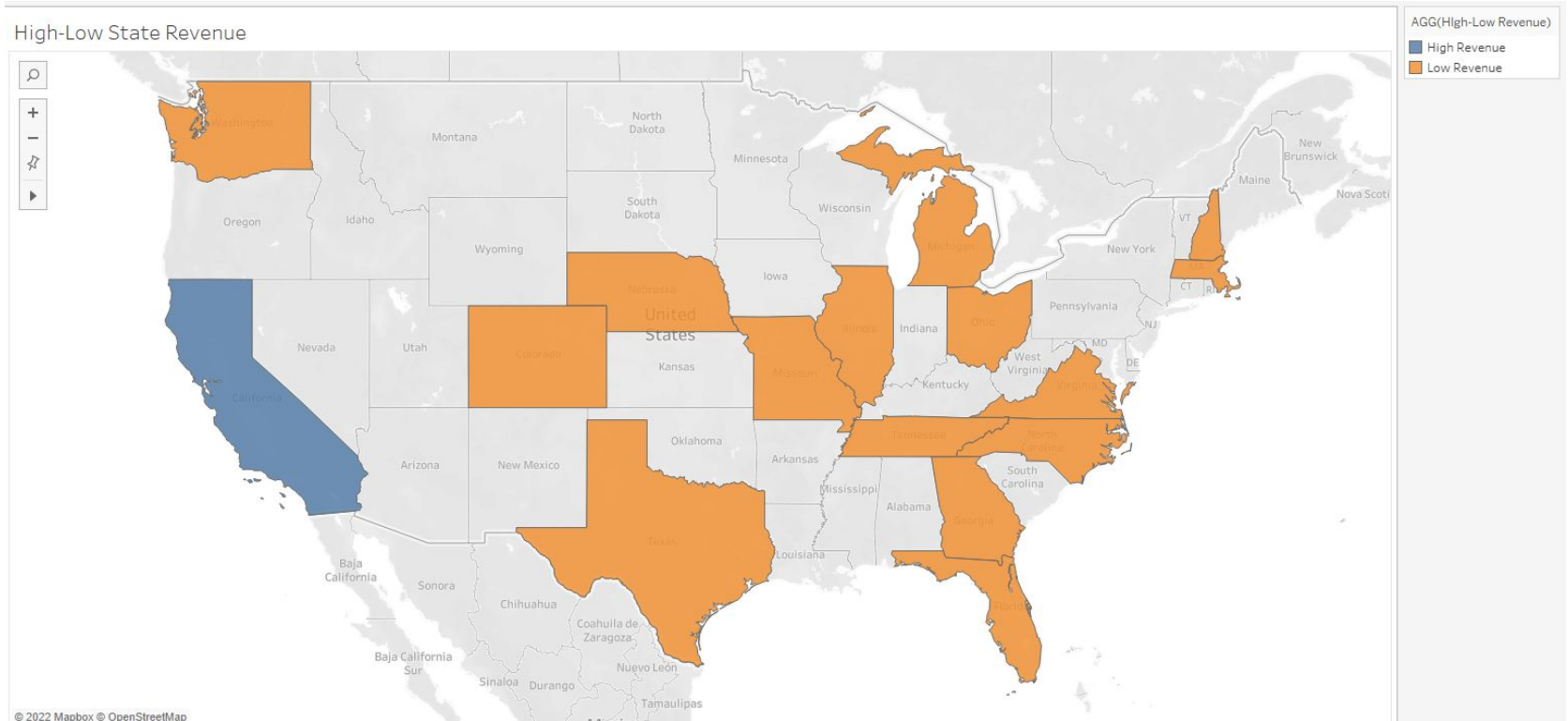
```
High-Low Revenue

If SUM([Paid Fee]) > 500
THEN "High Revenue"
ELSE "Low Revenue"
END




The calculation is valid.
```
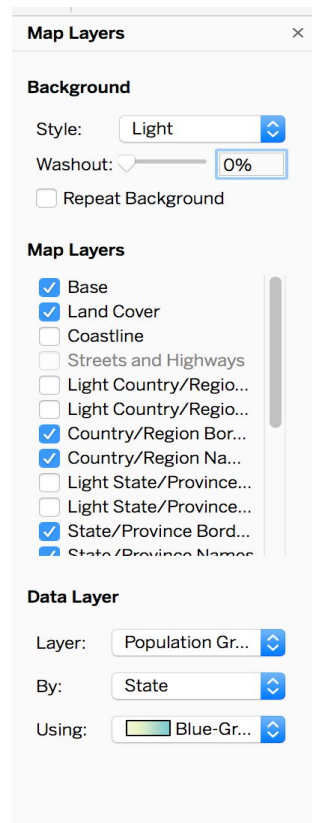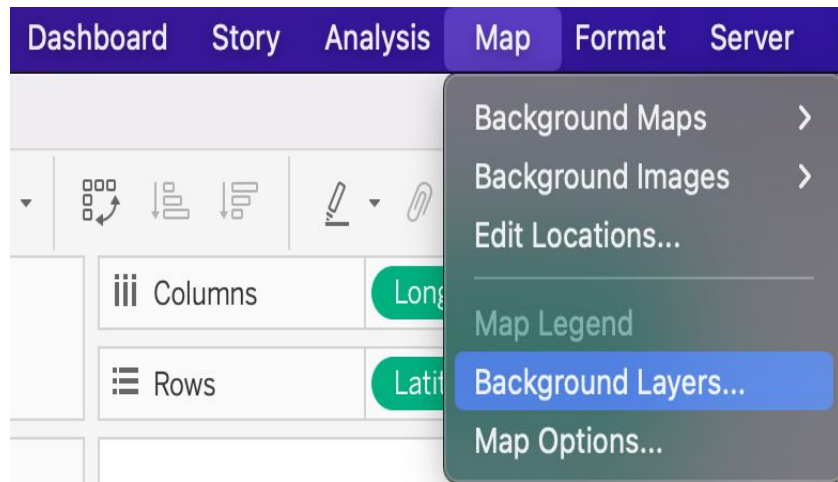
Instructor Do: Maps

The pill for the custom field is then dragged to the Color marks to view this map below:

Instructor Do: Maps

- Tableau has built-in layers to add data from the U.S. Census!

- Click Map in the menu and then Map Layers.

- We have many different layers to choose from, including census information and county/state boundaries.

Questions?

Activity: Maps 1- Earthquakes

In this activity, you will chart the intensity of earthquakes over time. You will also create a map that compares the magnitude of earthquakes versus median household income.

Suggested Time:
10 Minutes

Activity: Maps 1 - Earthquakes

Part 1:

Use earthquakes_database.csv to plot the magnitude of earthquakes measured from 1965 to 2016.

- Earthquakes should be stratified by magnitude, using the Size and Color marks.

- Use Tableau's built-in Census data to determine whether any relationship exists between earthquakes and 2017 median household income, by county

Part 2:

- In a separate worksheet, determine if there has been any trend in the magnitude of earthquakes measured globally over the years.

- Create a global map of earthquakes, with each earthquake's magnitude reflected on the map by size and color. Remember that the Richter scale is logarithmic. How might you reflect this relationship on the map?

Let's Review

Activity: Maps 2 - Unemployment

In this activity, you'll develop more familiarity with map building in Tableau.

Suggested Time:
10 Minutes

Activity: Maps 2 - Unemployment

- Use employment.csv, a dataset constructed from the Bureau of Labor Statistics data, to visualize unemployment in the United States.

- Create a map of unemployment, by county, between 2008 and 2016. Which areas in the United States have been hit hardest during that period?

- Create an unemployment map, by county, for 1990 through 1998. How does it compare and contrast with the 2008-2016 map?

- Create a map of counties with the highest rates of unemployment over the whole dataset. Use Tableau's built-in Census data to discover the relationship, if any, between counties with the highest rates of unemployment and the median per capita income by county.
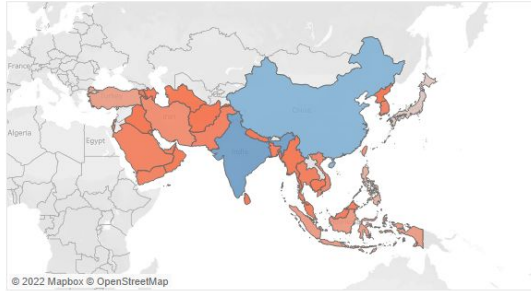
Let's Review
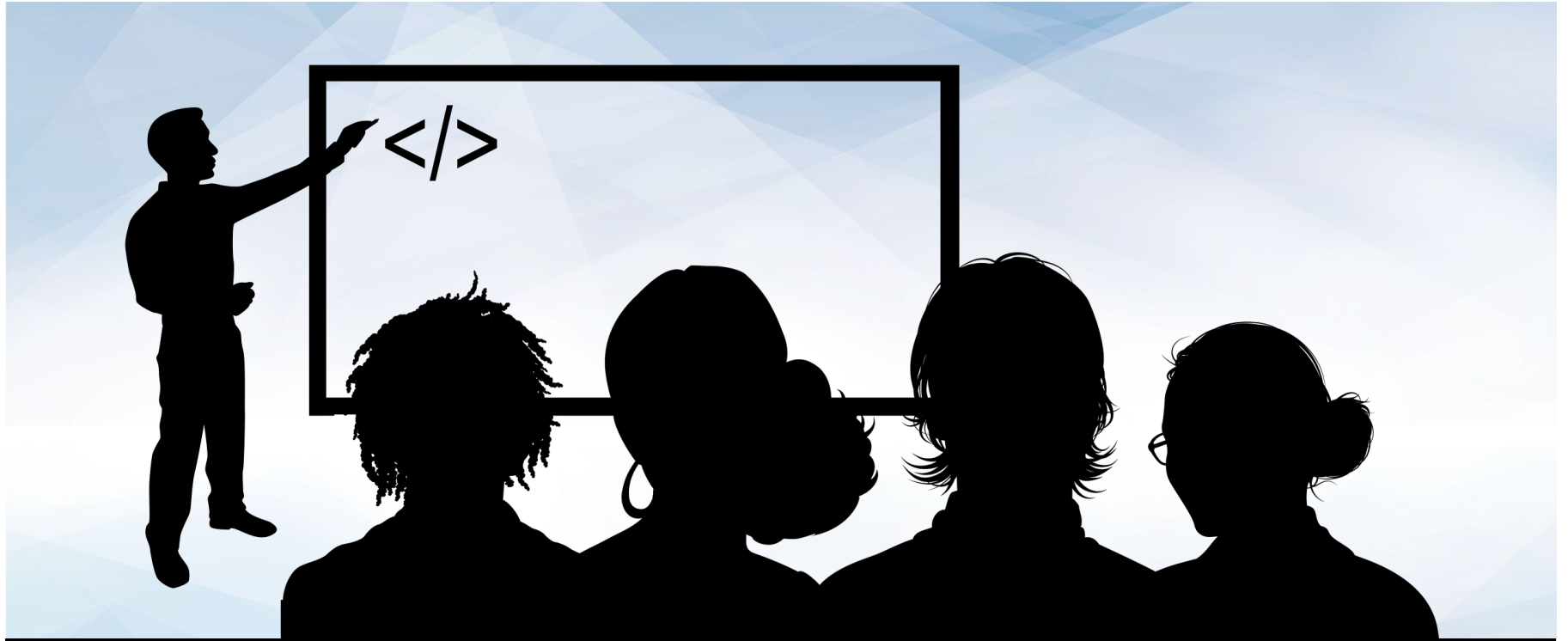
Instructor Demonstration
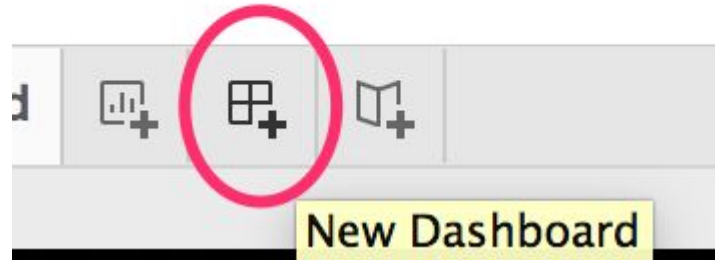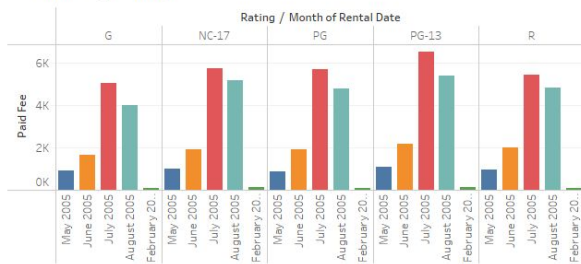Dashboard

Instructor Do: Dashboard

Dashboards allow for a bird's-eye view of several visualizations at once; in Tableau, we can also have elements that interact with each other. We can also have multiple visualizations on a single page.
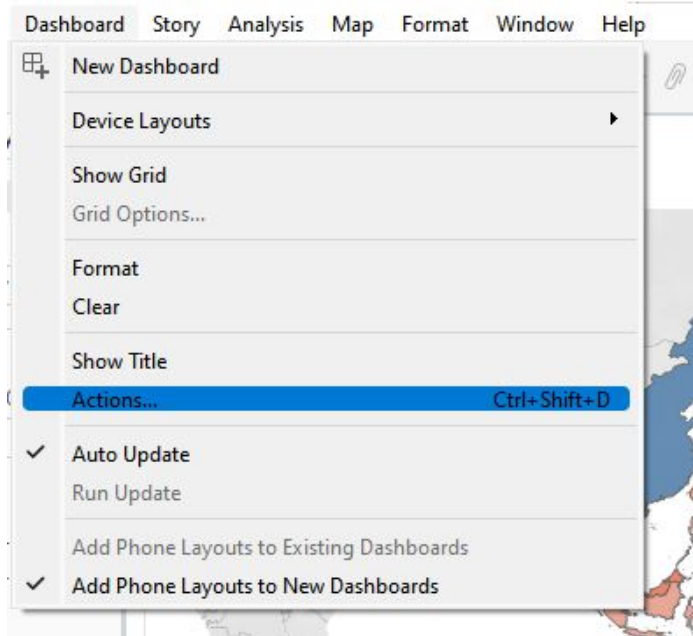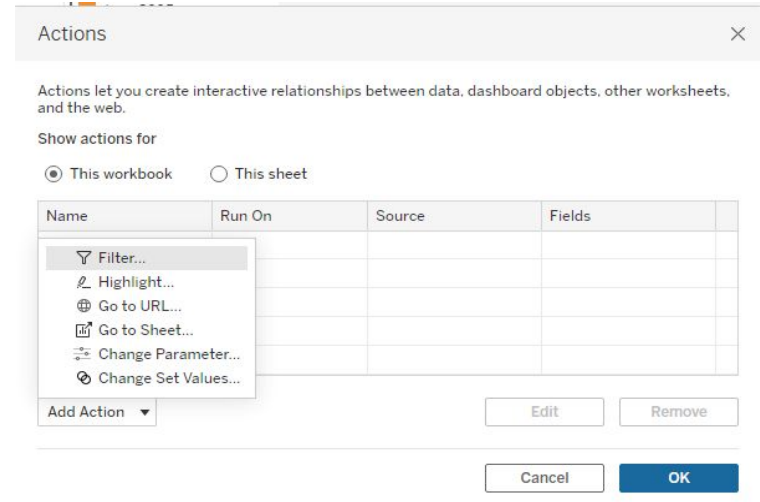
Instructor Do: Dashboard

To create interactive actions, where an action on one chart can affect the visualization in another:

- Go to Dashboard, then select Actions…
- Click Add Action and, in this case, Filter

Instructor Do: Dashboard

Click Select under *"Run action on:"*, and then specify the source and target sheets for the action. To move each chart, click the drop-down arrow, then select Floating.

Instructor Do: Dashboard

With that, the charts are now interactive!

Clicking China on the map changes the Paid Fee by Rating bar chart to reflect only the values for China across the months and by rating.
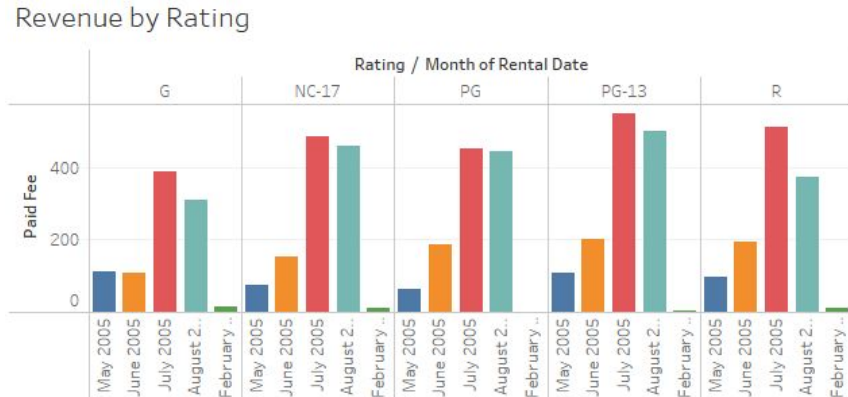
Activity: Dashboard - Most Fun Neighborhood in NYC?

In this activity, you'll find the "most fun" neighborhoods in New York City by mapping bars that have received the highest number of noise complaints.

Suggested Time:
10 Minutes

Activity: Dashboard - Most Fun Neighborhood in NYC?

Part 1: Use the provided dataset to create a map of NYC bars, broken down by boroughs.

- It should show the locations of bars that have been subject to noise complaints.

- A bar should be proportionately represented by the number of complaints it has received.

- A bar should also reflect the borough in which it is located.

- Each zip code in the city should be displayed on the map, as in the following image. Location is everything!

Part 2:

- Create a bar chart that breaks down, per borough, the type of building versus the number of complaints received
- Create a dashboard of the worksheets you just created.

Let's Review

Instructor Demonstration
Level-of-Detail (LOD)

Instructor Do: Level-of-Detail

LOD works so that we can incorporate data that is not available in the current level of visualization.
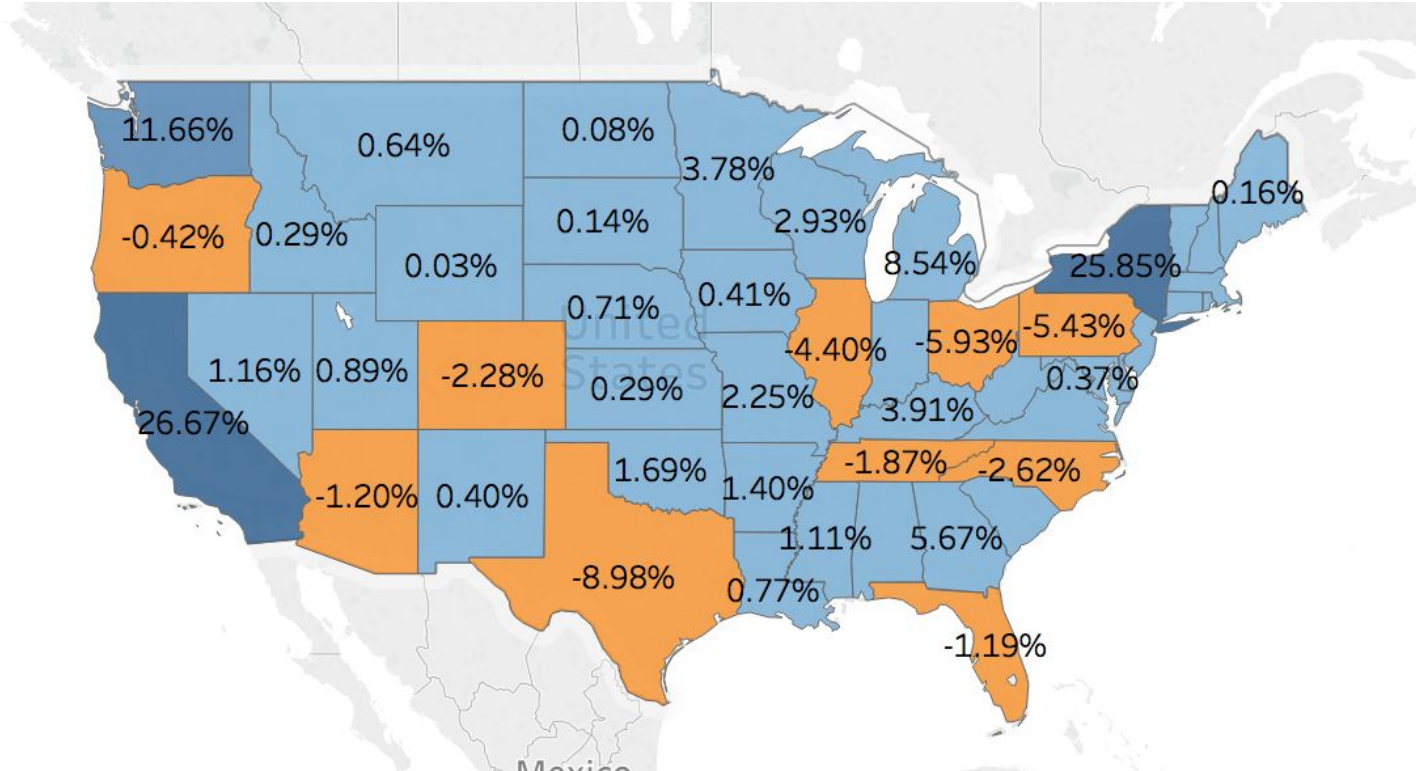
Instructor Do: Level-Of-Detail
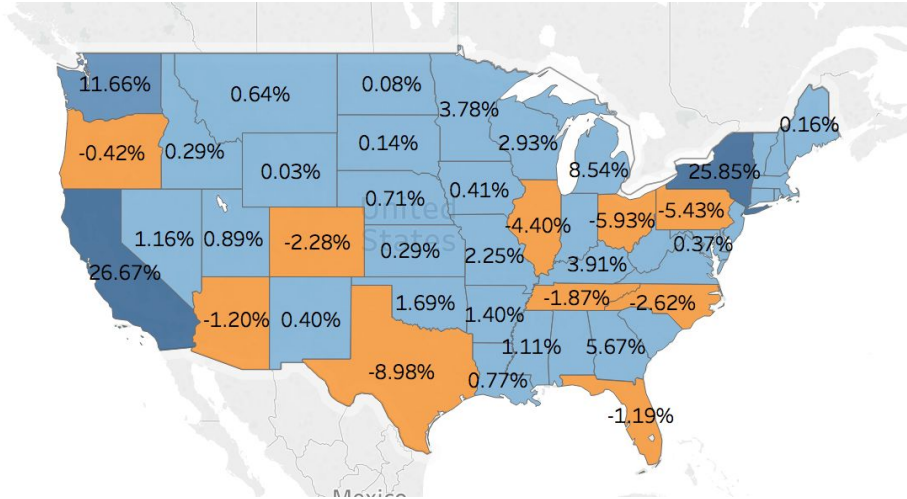
Here we have a map, which shows state-by-state contributions (by percentage) to total national profit:

- The map's level of visualization is by state.

- If the level of visualization were national, only a single profit number would be shown for the whole U.S.

- In addition to the state-level profit, the total national profit, which is a figure from a different LOD than the current visualization, is required.

- The number shown on each state is state profit/total national profit.

Instructor Do: Level-Of-Detail

National Profit

```
{EXCLUDE [State] : SUM([Profit])}
```

The calculation is valid.   Sheets Affected ▾   Apply   OK

Contribution to Nat'l Profit, State

```
SUM([Profit]) / ATTR([National Profit]) * 100
```

The calculation is valid.   Sheets Affected ▾   Apply   OK

All ▾

Enter search text

ABS
ACOS
AND
ASCII
ASIN
ATAN
ATAN2
ATTR
AVG
CASE
CEILING

`ABS(number)`

Returns the absolute value of the given number.

Example: ABS(-7) = 7

An important concept in LOD calculations is **aggregation** versus **granulation**.

- Aggregation means a higher, more abstract level; in this case, the national level is more aggregated than the state level.

- Granulation means a lower, more specific level; in this case, the state level is more granular than the national level.

- For example, at the state level of visualization, if we exclude the state level from a profit calculation, we are referring to the national level of calculation, which is more aggregated.

Instructor Do: Level-Of-Detail

Contribution Toward National Profit, By State
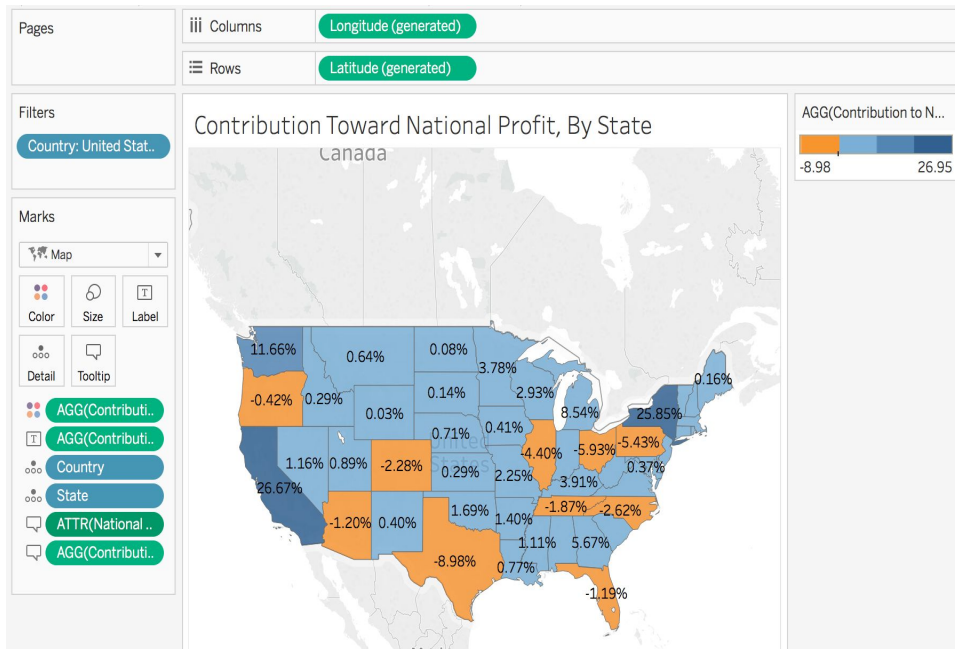
Let's refresh on the concept of attribute, which is also important in LOD calculations:

- ATTR works at the row level: If all rows have the same value, ATTR returns a value; if all rows do not have the same value, it returns an asterisk.

- At the state level, since the national profit is identical for all states, it can be characterized as an attribute.

- At the state level, since all rows (states) do not have the same value, each state's profit cannot be characterized as an attribute.

- This again highlights the concept of aggregation versus granulation.

Activity: Level of Detail

In this activity, you will practice creating LOD calculations.

Suggested Time:
15 Minutes

Activity: Level of Detail

- With the Global Superstore Excel workbook, create a visualization of state-level profit, which visualizes the contribution of each state to the national profit.

- In the next map, visualize each city's contribution toward the state's total profit.

- The label for each state is not the total sum of profits in that state. Rather, it is a state-level visualization of the average of the orders.

- **Hint:**
  - For this map, you will need to research Tableau LOD syntax. What will you use instead of EXCLUDE?
  - Don't forget to save to Tableau Public once finished.

Let's Review

The End