INTRODUCTION TO TABLEAU

Center for Data, Analytics and Reporting (CeDAR)
What is Tableau

Tableau is a data visualization tool that lets us analyze virtually any type of structured data and produce highly interactive and attractive graphs, dashboards, and reports in minutes.

Using Tableau Effectively

Tableau makes it easier to create powerful, visual information that communicates what is important better than a spreadsheet or text table. Tableau has advanced capabilities for more technical users, but it dramatically lowers the bar for creating dashboards and performing analytical analysis for non-technical analysts and information consumers.” – Dan Murray, Interworks
As an introduction, let’s take a step back and give the 100,000 foot view of Tableau. It’s important to understand how or why you might be working with your data and to assess what your level of usage might be. Below are some important questions to consider:

- Will I be creating my own reports or will I only access reports others have created?
- Will others need to access the reports I create?
- Will reports I create need to be available to the general public?
- Do I need a license?

The answer to each of these questions will determine the type of access you’ll need and how you’ll need to handle the distribution or publication of your material.
Here at Princeton, we use Tableau in a manner similar to the way in which we use the data warehouse. Differences arise from the structure of the tool itself.

Tableau Desktop is central to the creation of all Tableau visualization and data sources. In fact, if you only want to create reports but do not have a need for circulation or wider consumption, the desktop version would be all you need.

Tableau Server is used when you have a visualization that has been designed to be consumed by others. If you have a specific, restricted audience and would like to control the manner in which they interact with your work, they should be defined on the server and you would publish your work to be accessed.
Data Source -> Tableau Desktop

Tableau Server

Tableau Public

Happy Princeton Users

TABLEAU AT PRINCETON
Tableau Public is a version of server but security has been setup such that the visualizations published here may be accessed without authentication. This is where you would publish work that you want anyone at all to view and consume. An example of this would be a graph demonstrating historical applications to the university. This might be included on the Princeton public website.

CeDAR takes a role in the Princeton Tableau world by centrally managing the Tableau Desktop licenses and providing training. We also maintain the Tableau Servers (Development, Production, and Public). Finally we coordinate the Princeton Tableau User Group where we can all share experiences and ask questions of one another.
The goal for this course is to introduce Tableau within the context of its usage at Princeton University. Upon completion, you should understand:

- How Tableau is used at Princeton
- Basics of the Tableau reporting tool
- Basic calculations
- Common visualization types
- Creating a basic Dashboard
- Publishing and sharing
GETTING YOUR DATA READY

- PLAN
- PREPARE
- PERFORM
Choose a connection or an existing workbook from the Tableau Welcome Page.

Note: Upon installing Tableau, check your local drive for My Tableau Repository
Once you choose your data source, you (and it) are brought to the Data Source Page where you can format your metadata.

Sheets on the left navigation pane behave like tables in a database.
GETTING YOUR DATA READY

- Splitting
  - String fields can be split into multiple fields for easier analysis
  - Automatic or custom split options

- Aliasing
  - Roles (time, ship date/order date)
  - Binning (high/low sales)

- Renaming

- Data types

- Geographic roles

- Calculated fields

- Pivoting

- Data interpreter
  - Helps clean up data
THE INTERFACE
We work in workbooks which contain worksheets, dashboards, and stories.

Worksheets are also known as Views of your data.

We drag and drop fields from the data source onto Shelves.

- Rows, Columns, Filters …

Items that appear on shelves are called Pills.

- If the Pill is blue, it is a Dimension.
- If the Pill is green, it is a Measure.
When you bring your data into Tableau, it automatically places the fields into one of two categories. Dimensions or Measures.

- **Dimensions** are fields that organize your data into categories (or buckets).
  - Individual dimension values are called **Members**
  - Usually Non-numerical and provide critical, contextual meaning to a **Measure**.
    - Who, what, when, where, why

- **Measures** return numeric values for “measuring” different dimensions.
  - Usually aggregated (sum, average, min, max, etc.)
  - Things you can do math on that are generally meaningless without context
Revenue grew $22m during Q2 2017 in the Eastern Region for Technology!
Change between data source, worksheets, and dashboards using the tabs at the bottom.

You can also add new worksheets, dashboards, or storyboards using the “new” buttons.
Once you’ve connected to data and evaluated available dimensions and measures in the Data pane, you’ll need to decide where to drag desired dimensions and measures. You may choose to drag directly onto the visualization or onto a particular shelf or card.

- The most common shelves are the Columns and Rows. Dragging dimensions and measures to these determines the layout of your visualization.

Use cards to navigate pages, filters, and marks on a worksheet.

- The Page shelf acts as a modified Filters shelf allowing you to page through values.
- The Filters shelf allows you to narrow data down.
- The Marks card allows you to customize the display of the ‘marks’ that make up your chart.
Use dashboards to organize and interact with multiple worksheets.
Use stories to combine elements and create directed, interactive analysis
Use **Show Me** to select or change between different visualizations.

- Anytime you’re editing a new or existing worksheet, you’ll notice the Show Me tab at the upper right of the screen.

- Show Me displays a series of thumbnail images representing the different types of charts you can create with just a few clicks.

- If you’ve already created a chart but would like to switch to another, clicking a new thumbnail from the Show Me dialog box will change your current visualization.

**Note:** Only thumbnails for visualizations that are applicable to the dimensions and measures you’ve selected from your data pane will be active.
Add Dimensions and/or Measures from the Data pane to the Shelves and Cards to create visualizations.
Objective: Open Tableau, connect to data, build a basic visualization to show Sales for each Sub-Category broken down by Order Date Year vs. Category. Use color to show sum of Profit.

1. Open Tableau.
2. Connect to Excel.
3. Navigate to Excel Data Source per class instructions
   Typically under this path:
4. Click Open.
5. This is the Data Source screen. Here, we will add sheets from the Excel file to act as the fields for our visualization.
6. Under Sheets, drag Orders to where it says “Drag sheets here”. Our data appears in the bottom pane.
7. In the bottom portion of the left pane, under the Go to Worksheet prompt, click Sheet
8. In the left pane, within the Data tab, under Dimensions, drag Order Date to the Columns shelf and Category and Sub-Category to the Rows shelf.
9. Under Measures, find and drag Sales to the Columns shelf and Profit to the Color mark on the Marks card.
10. Double-click the bottom of the worksheet and rename it to Bar Chart.
Sum of Sales for each Sub-Category broken down by Order Date Year vs. Category. Color shows sum of Profit. The view is filtered on Order Date Year, which keeps 2014, 2015, 2016 and 2017.
Tableau supports an additional method for automatically generating views of data called Automatic Double-Click. To use this method, double-click fields in the Data pane that you’d like to see in your visualization. Each double-click results in a “best guess” for how you would like the field to be presented in your view.

Meeting: The order in which you double-click a measure or a dimension is significant.

<table>
<thead>
<tr>
<th>Text Table</th>
<th>Adding a dimension first produces a text table (or cross-tab). All subsequent clicks on fields result in refinement of the text table.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bars</td>
<td>Adding a measure first and then a dimension produces a bar view. All subsequent clicks result in refinement of the bar view, unless a date dimension is added, at which time the view is changed to a line.</td>
</tr>
<tr>
<td>Line</td>
<td>Adding a measure and then a date dimension produces a line view. All subsequent clicks result in refinement of the line view.</td>
</tr>
<tr>
<td>Continuous Line</td>
<td>Adding a continuous dimension and then a measure produces a continuous line view. Subsequent dimensions result in refinement of the continuous line view. Subsequent measures add quantitative axes to the view.</td>
</tr>
<tr>
<td>Scatter</td>
<td>Adding a measure and then another measure produces a scatter view. Subsequent dimensions result in refinement to the scatter view. Subsequent measures will create a scatter matrix.</td>
</tr>
<tr>
<td>Maps</td>
<td>Adding a geographic field produces a map view with latitude and longitude as axes and the geographic field on the Level of Detail shelf. Subsequent dimensions add rows to the view while subsequent measures further refine the map by adding size and color encoding.</td>
</tr>
</tbody>
</table>
- Analysis can be enhanced by sorting results
- Sorting can be done using buttons for simple sorting

Or ... manually through the advanced sorting dialog which is achieved by right-clicking on a Pill from the Shelf and clicking Sort.
Filtering results allows you to focus on particular aspects of your data.

Filter by dragging data fields from the Data pane to the Filters card.

Filtering can also be created by right-clicking a Pill on a Shelf.

In either case, a Filter dialog box will reflect the data type chosen and prompt you for additional criteria.
Numeric Filter Dialog Box

Text Filter Dialog Box
Filtering Data

- Simple filtering can be done by selecting the headers or marks in a View and choosing the **Keep Only** or **Exclude** options.

- The Dimension members are removed from the View and the filtered fields are added to the Filters shelf.

- When selecting headers that are part of a hierarchy all of the next level members are selected automatically.

- Individual marks can be selected on a View, making it easy to focus on or remove outliers.
Apply Filters to Multiple Worksheets

- When you had a filter to a worksheet, by default it applies to the current worksheet.
- Sometimes, however, you might want to apply the filter to other worksheets in the workbook.
- You can select specific worksheets to apply the filter to or apply it globally to all worksheets that use the same data source or related data sources.

On the Filters shelf, right-click the field and select: **Apply to Worksheets > All Using Related Data Sources**

- Filters that use this option are global across the workbook.
Objective: We see a potential problem with the profitability of the furniture category. Let’s enhance our results from the last exercise by performing a simple sort, and filtering the results by the furniture category.

1. Right-click the Bar Chart worksheet and select Duplicate.
2. Now, rename your new worksheet New Bar Chart.
3. Click the last column in the chart.
4. From the toolbar at the top of the screen, click the Sort Descending button to sort latest year Sales descending.
5. Let’s reduce the data set results by dragging Category to the Filters card.
6. From the Filter dialog box, uncheck Office Supplies and Technology.
7. Click OK.
8. Right-click Category in the Filters card and choose Show Filter to reveal the Filter card.

Note: Filter cards can be moved (dragged) from their default location (which tends to hide under the Show Me box when it’s expanded.

10. Explore.
Sum of Sales for each Sub-Category broken down by Order Date Year vs. Category. Color shows sum of Profit. The data is filtered on Region, which keeps Central, East, South and West. The view is filtered on Category, which keeps Furniture.
Tableau allows for extensive formatting of your views and can be done for an entire worksheet or down to the specific/individual parts.

There are several ways to initiate formatting in Tableau. You may choose options from the Format drop-down menu or right-click any element and choose **Format** from the context menu.

Formatting can include changing some or all of the following:

- Fonts
- Alignment
- Shading
- Borders
- Lines
Highlighters

- Highlighters are used to quickly find and highlight data on a visualization.
- These come in handy when adding a mark (like color) to a visualization makes it too confusing or hard to read.
- Used when there’s already a color mark assigned to the visualization.
- Previously done through legends and dashboard actions.
- Can be used with reference bands and lines.
- Highlighter legend supports text searches and dropdown.
- Multiple highlighters can be added to a single visualization.
Objective: We want to be able to quickly find patterns and trends in our data. If our visualization already contains a color mark, a highlighter is the perfect enhancement to assist the user in understanding what we’re trying to focus on.

1. Create a **New** worksheet. Rename it **Sub-Category Highlight**.
2. Add **Order Date** to the Columns shelf and **Sales** to the Rows.
3. Maybe we want to be able to see the profit when you hover on a line but not have it displayed in the actual Line Chart itself. To do this, drag **Profit** to the Tooltip.
4. Drag **Region** to the Color mark.
5. We want to increase the number of marks on this, so add **Sub-Category** to the Detail mark. The Detail mark increases the context of our visualization.
6. Without reducing the highlighted number of marks, this is difficult to read. We could use a filter, but that would remove the context of the selected marks in relation to the other sub-categories. So … we will add a highlighter instead.

Continued on next page
7. In the Marks card, right-click the **Sub-Category** Pill and select **Show Highlighter**.

8. The Highlighter Legend Box will appear/dock and show the different Sub-Categories. As you mouse over each Sub-Category, you’ll notice each being highlighted in the visualization.


⚠️ **Note**: Selecting **Entire View** from the drop-down in the tool bar will expand the visualization to make it more legible.
The trend of sum of Sales for Order Date Year. Color shows details about Region. Details are shown for Sub-Category.
The **Marks** card provides other options to customize the appearance of your chart. You can change the color, size, shape, and label of your marks as well as customizing your tooltips.

**Tooltips** are small pop-up text boxes that appear when you hover your mouse over a mark. By default, tooltips show values for all relevant fields included somewhere on your visualization.
The Marks Card

- Use the Marks card to refine and enhance results
- Color represents data using different colors
- Size encodes data by assigning different sizes to the marks on your views
- Label assigns text labels to the marks on your views
- Drop a dimension on the Detail box to separate the marks per the members of the dimension
- Tooltips are details that display when you hover over one or more marks in the View
The Marks Card

- Additional marks are available when using certain visualization types
  - Shapes are available when the Mark type supports members being displayed as shapes, like when a Scatter Plot is being used
  - Built-in shapes are available and custom shape palettes can be created
  - Angles are available when using pie charts
  - There are other context-sensitive marks which are available with other, more intricate visualization types.
Scatter Plots

- Scatter Plots provide a way to show correlations between numerical values.
- Scatter plots require at least two measures.
  - One on each of the columns and rows.

Creates a simple Scatter Plot

```
Column | SUM(Sales)  
-------|-------------
Rows    | SUM(Profit) 
```

Creates Matrix of Scatter Plots

```
Column | Region | SUM(Sales)  
-------|--------|-------------
Rows    | Category| SUM(Profit) 
```
Objective: Create a scatter plot using colors and shapes to show the correlation between sales and profit of different product sub-categories by category and region.

1. Create a **New** worksheet. Rename it **Sales & Profit**.
2. From Measures, drag **Sales** to the Columns shelf and **Profit** to the Rows shelf.
3. Drag **Sub-Category** to the bottom (empty) portion of the Marks card.
4. To distinguish our Sub-Categories, add **Category** to Color.
5. Add **Region** to Shape.
6. Right-click anywhere in the scatter plot and choose **Trend Lines > Show Trend Lines**.

This will show us linear trend lines.
Sum of Sales vs. sum of Profit. Color shows details about Category. Shape shows details about Region. Details are shown for Sub-Category.
A crosstab, sometimes referred to as a Pivot Table, is a table that summarizes data in rows and columns of text.

Sometimes, even in Tableau, you just want to see the data and not a visualization.

You can easily convert your visualization into a crosstab.

**Objective: Display the numbers associated with a data view.**

1. Right-click any of the visualizations we’ve created thus far.
2. Select **Duplicate as Crosstab**.

A new sheet will automatically be created beside your visualization, displaying the same information as data in rows and columns of text.
BASIC CALCULATIONS
Basic Calculations

- Calculations are created to enhance the dashboard.
- Tableau takes granular data and aggregates them in the View.
- Calculations help in extending the usage of aggregations.
- If we’re looking for a particular dimension or measure that does not seem to exist in our data source, we can form them from calculations.
Aggregating Data

- When a **Measure** is placed on a Shelf, Tableau automatically aggregates the data.
  - Tableau defaults to Sum.
- You can change the aggregation to other types (Average, Max, Min) by clicking on the Pill, navigating to **Measure (Sum)** and selecting from the list of other choices.

💡 **Note:** You can disaggregate data by navigating to the **Analysis Menu** and deselecting **Aggregate Measures**.
Aggregating Data

- Dimensions can also be aggregated by right-clicking the Pill, selecting Measure, and choosing from the list of options available:
Granularity of Data

- Data granularity refers to the level of detail or depth of data in a View
- Defined by the Dimension fields
- If a Dimension is dragged to Detail, it will change the granularity of the visualization
- Dragging a Measure to Detail will have no effect
Quick Table Calculations

- A quick table calculation is a one-step process where you choose a common, pre-defined calculation type from a list.
- Tableau automatically applies the most typical settings for that calculation type.

To apply a quick table calculation, simply right-click a measure from a Shelf or Mark and choose **Quick Table Calculation** from the context menu.
Calculated Fields

- When your data source doesn’t contain all the fields you need, you can add new ones as calculated fields.
- The calculated fields are saved as part of the data source and can be used as often as necessary.
- There’s several ways to create calculated fields. You can do this easily by using the calculation editor from the drop-down, by double-clicking a Shelf or a Field on a Shelf, or by right-clicking “white space” on the Data pane under Dimensions or Measures.
- Calculated fields can be created from existing calculations.
- Calculations are based on Formulas and Fields.

![Calculated Fields Example](image_url)
Formulas Make Up Calculated Fields

- Formulas can contain functions, fields, operators, parameters, or comments
- The Calculation Editor provides color coding based on the Field added
  - Functions: Light Blue
  - Fields: Orange
  - Operators: Black
  - Parameters: Purple
  - Comments: Grey

Note: Tableau makes attempts to guess what you’re trying to do and provides you with the tools you need for brackets and parenthesis. You should not have to do much typing or guessing. *Don’t “fight” the tool!*
Functions

- Functions can be filtered by category
- Use the Enter search ... box to find specific functions
- Clicking on a function provides tips and examples to guide you

ABS (number)

Returns the absolute value of the given number.

Example: ABS(-7) = 7
Comments

- Comments can provide context or detail on calculations
- Define comments using two forward slashes

Example

```
SUM([Profit])/SUM([Sales])
```

Auto-Completion for Formulas

- Tableau will automatically attempt to fill in a formula
- First attempts to find based on starts with then contains
- Clicking **Enter** will enter your formula or function into your forming calculation
- If you first type a `[` auto-complete will show fields, parameters, or sets instead of functions
- If you’re using multiple data sources, auto-complete will add the fully-qualified name of the Field so you can see exactly where things are being pulled from
Objective: We have been asked to show a visualization that displays the average unit cost per each Sub-Category.

1. Create a **New** worksheet. Rename it **Avg Unit Cost**

2. To find the cost per unit, we need to create a calculated field. Click the drop-down next to the Data pane and select **Create calculated field**.

3. Name the field **Avg Unit Cost**

4. In the expression box, use the following formula: 
   
   \[
   \frac{[Sales]}{[Quantity]}
   \]

5. Click **OK**

6. The default aggregation for **Avg Unit Cost** is “Sum”, but this is not what we’re after. We need to see the **Average**.

7. In the Measures pane, right-click the **Avg Unit Cost** field, and select **Default properties > Aggregation > Average**.

8. Right-click the measure again and select **Default properties > Number Format**... then select **Currency (Standard)**.

9. Click **OK**
10. Add **Sub-Category** to the Columns Shelf and from the Measures pane, drag the newly created **Avg Unit Cost** to Rows.

11. Click the **T** button at the top of your screen to add Labels to your visualization.

We would like to be able to select which years to include.

12. Drag **Order Date** to the Filters card.

13. Select **Years** and click **Next**

14. Select the last 2 years shown in the list.

15. Click **OK**

16. Click the down arrow in the Year Filter pill and select **Show Filter** to make it interactive.
Average of Avg Unit Cost for each Sub-Category.
The data is filtered on Order Date Year, which keeps 2016 and 2017.
Calculations can be used for exception highlighting. In Tableau, this is known as **Spotlighting**.

- **Spotlighting** is based on thresholds set for a selected measure.
- It is a technique for showing discrete thresholds based on the values of a measure. For instance, you might want to color-code Sales so that those over $10,000 appear green and those below $10,000 appear red.
- A spotlighting calculation is just a special case of a calculation that results in a discrete measure.
  - A discrete measure is a calculation that is a dependent variable (and therefore a measure), but which results in a discrete result (as opposed to a continuous result). Thus the name discrete measure.
Objective: We have been asked to create a report that highlights when sales are not doing as well as expected. Any order under $10,000 will be highlighted different from other orders.

1. Create a New worksheet. Rename it Sales Spotlight.
2. Create a Calculated field called Sales Spotlight.
3. In the expression box, use the following formula:
   \[ \text{IF SUM([Sales])}>10,000 \text{ THEN } "Acceptable" \text{ ELSE } "Poor" \text{ END} \]
4. Click OK.
5. Add Segment to the Columns shelf and Category to the Rows shelf. Also, add Sub-Category to the Rows shelf (to the right of Category).
6. For our measure, we will drop Sales onto Text in the Marks card.
7. To provide the desired highlighting, drag our newly created Sales Spotlight onto Color.
8. Click the drop-down arrow of the Sales Spotlight Legend and select Edit Colors.
9. Change “Acceptable” to Green and “Poor” to Red.
Sum of Sales broken down by Segment vs. Category and Sub-Category.
Color shows details about Sales Spotlight.
Objective: Let’s simplify the display data. Adding a group creates a new dimension with grouped members.

1. Under the Office Supplies section of our chart, 
   Ctrl+Click **Envelopes**, **Fasteners**, and **Labels**.

2. When they are highlighted, right-click and select the **Paperclip** icon to Group them.

3. Right-click the highlighted Group and choose **Edit Alias**.

4. Rename the group **Small Stuff**.

**Note:** To ungroup, right-click the Group **Small Stuff** and select **Ungroup**.
TIPS & TRICKS: TOP 10

Objective: At times, it is just easier to view the “Top 10” items by a certain measure rather than viewing all the items of a field. In this case, let’s assume we’d like to view the top 10 Sub-Categories by profit.

1. Create a **New** worksheet. Rename it **Top 10 by Total Profit**.
2. Drag **Sub-Category** to Rows.
3. Drag **Profit** to Text.
4. Drag **Sub-Category** to the Filters shelf.
5. Click the **Top** tab in the Filter [Sub-Category] options box.
6. Check the **By field** option.
7. Select **Top, 10, by Profit, Sum**
8. Click **OK**.
POPULAR VISUALIZATION TYPES
Bar Charts

- Bar Charts are excellent to compare data across categories.
- To create a bar chart, add a dimension to the Rows shelf and a measure to the Columns shelf or vice versa.
- Adding the dimension (blue) to the Columns shelf and the measure (green) to the Rows shelf will result in a Vertical Bar Chart.

Adding the measure (green) to the Columns shelf and the dimension (blue) to the Rows shelf will result in a Horizontal Bar Chart.
Objective: We have been asked to create a bar chart that displays total sales over a four year period. In addition, our users want to see the data by shipping methods but only for the West Region.

1. Create a **New** worksheet. Rename it **Sales by Ship Mode**.

2. Add **Order Date** to the Columns shelf and **Sales** to the Rows shelf.

   ✏ **Note:** Because we have a date and measure on our visualization, Tableau automatically created a line chart. We need to change this.

3. In the Marks pane, change the mark type in the drop-down menu from Automatic to **Bar**.

4. Our next requirement is to show the data by shipping method. To do this drag **Ship Mode** to Color. This changes our bar to a stacked bar.

5. Click the **T** on the toolbar to add Labels to our visualization.

6. Finally, to add to our Filter, right-click **Region** from the Dimensions pane and click **Show Filter**.

7. Click the down-arrow in the Region legend and select **Single Value List**.
Sum of Sales for each Order Date Year. Color shows details about Ship Mode. The data is filtered on Region, which keeps Central.
Heat Maps

- In a Heat map, data is represented in terms of colors. They provide a quick visual summary of the data.
- Heat maps are best used for showing geographical representation of data where each individual value are shown as a color.
- Heat maps enable you to compare data in various categories using different colors.

Example: Heat Map
Objective: Create a Heat Map to display the Order Date Quarter for each Category.

1. Create a **New** worksheet. Rename it **Heat Map**.
2. Drag **Order Date** to the Columns shelf.
3. Expand to show **Quarter**.
4. Right-click the **Year** pill and select **Remove**.
5. Drag **Category** to the Rows shelf.
6. Drag **Profit** to Color.
7. Drag **Sales** to Size.
8. Right-click the **Quarter** pill and select the Quarter from the second tier to show the **Quarter and Year**. This will convert the dimension to a measure.
9. Change the Marks Type to **Square**.
10. Click **Size** and advance the slider to **increase** the size of the marks.
Order Date Quarter for each Category. Color shows sum of Profit. Size shows sum of Sales.
Scatter Plots

- Scatter Plots can provide a very meaningful visualization of two related numeric measures.

- Two different analyses that scatter plots help consider:
  - Comparison/Correlation of the two measures
  - Concentration of data/existence of outliers

- Effective scatter plots include either a small enough number of marks following a general trend to draw quick conclusions about the individual dimensions or a large concentration of marks to draw general conclusions.

Example: Scatter Plot
Objective: Create a Scatter Plot displaying Sum of Sales vs Sum of Profit.

1. Create a **New** worksheet. Rename it **Scatter Plot**.
2. Drag **Sales** to the Columns shelf.
3. Drag **Profit** to the Rows shelf.
4. Drag **Category** to Color.
5. Drag **Segment** to Shape.
6. Drag **Sales** to Label.
7. Click **Size** and advance the slider to increase the size of the marks.
8. Click the drop-down arrow on the Legend for **Segment** to edit the shapes used in the visualization.
9. Change the shape by selecting **Edit Shape** and assigning the **KPI** palette.
10. Click **OK**.
Sum of Sales vs. sum of Profit. Color shows details about Category. Shape shows details about Segment. The marks are labeled by sum of Sales.
Pie Charts

- Do the parts make up a meaningful whole?
  - If not, use a different chart. Only use a pie chart if you can define the entire set in a way that makes sense to the viewer.

- Are the parts mutually exclusive?
  - If there is overlap between the parts, use a different chart.

- Do you want to compare the parts to each other or the parts to the whole?
  - If the main purpose is to compare between the parts, use a different chart. The main purpose of the pie chart is to show part-whole relationships.

- How many parts do you have?
  - If there are more than five to seven, use a different chart. Pie charts with lots of slices (or slices of very different size) are hard to read.
Objective: Create a Create a Pie Chart with Multiple Mark Labels to display Customer Segment, sum of Sales, and % of Total Sales

1. Create a new worksheet. Rename it **Pie with Multiple Marks**.
2. Change the Marks Type to **Pie**.
Notice the “Contextual” Marks card appears for **Angle**.
4. Drag **Segment** to Color.
5. Drag **Segment** to Label.
6. Drag **Sales** to Label.
7. Hover over the **Sales** Pill and click the drop-down arrow.
8. Select **Quick Table Calculation, Percent of Total**.
9. Drag **Sales** to Label (again).
Notice your bar chart still has all equal parts.
10. Drag **Sales** to Angle.
11. Click Label.
12. Click the ellipse (More Button ...) beside Text.
13. Select **<Segment>**, increase the font size and make it bold.

☐ * Did you expand your view?
Segment, % of Total Sales and sum of Sales. Color shows details about Segment. The marks are labeled by Segment, % of Total Sales and sum of Sales.
Box Plot

- Also known as Box and Whisker Plot
- Used to show the distribution of data

- MAXIMUM: Greatest value, excluding outliers
- UPPER QUARTILE: 25% of data greater than this value
- MEDIAN: 50% of data is greater than this value; middle of dataset
- LOWER QUARTILE: 25% of data less than this value
- MINIMUM: Least value, excluding outliers
- OUTLIER: More than 3/2 times of upper quartile
- OUTLIER: Less than 3/2 times of lower quartile
Objective: Create a Box Plot displaying Sum of Profit for each Category.

1. Create a **New** worksheet. Rename it **Box Plot**
2. Ctrl+Click each of the following: **Category, Sub-Category, Profit**
3. Expand the **Show Me** Dialog Box.
4. Select the **Box Plot** thumbnail.
5. Drag **Category** to Color.
6. Click the Size Mark and advance the slider to increase the marks of the size on your view.
Sum of Profit for each Category. Color shows details about Category. Details are shown for Sub-Category.
Tree Maps

- Treemaps are an alternative way of visualizing the hierarchical structure of a diagram while also displaying quantities for each category via area size.

- Each category is assigned a rectangle area with their sub-category rectangles nested inside of it.

- When a quantity is assigned to a category, its area size is displayed in proportion to that quantity and to the other quantities within the same parent category in a part-to-whole relationship.

- The area size of the parent category is the total of its sub-categories.

- Tree maps start from top left (largest) to bottom right (smallest).
Objective: Display sum of Sales and Profit for Regions and States using a Tree Map where Sales is indicated by color and Profit is indicated by size.

1. Create a **New** worksheet. Rename it **Tree Map**.
2. Ctrl+Click each of the following: **Sales, Profit, Region, State**
3. Expand the **Show Me** Dialog Box.
4. Select the **Tree Map** thumbnail.
5. To edit the colors of your Tree Map, click the drop-down arrow on the legend for Sum of Sales.
6. Select **Edit Colors**.
7. Choose a palette to your liking.
8. Click **OK**.
Region and State. Color shows sum of Sales. Size shows sum of Profit. The marks are labeled by Region and State.
Area Charts

- Area charts are commonly used to showcase data that depicts a time-series relationship.
- Unlike Line charts, they can also visually represent volume.
- Information is graphed on two axes, using data points connected by line segments. The area between the axis and this line is commonly emphasized with color or shading for legibility.

Typically used when you need to:

- Know the magnitude of a change
- Compare a small number of categories
- Compare between trends and not exact values
Objective: Create an Area Chart to display sales for each Order Date month in 2016 & 2017. Let the details about Order Date Year be shown in color.

1. Create a new worksheet. Rename it **Area Chart**.
2. Drag **Order Date** to the Columns shelf.
3. Drag **Sales** to the Rows shelf.
4. Change the line mark to **Area**.
5. Drag **Order Date** to Color.
6. From the **Analysis** menu, select **Stack Marks** and turn the marks **Off**.
Sum of Sales for each Order Date Month. Color shows details about Order Date Year. The view is filtered on Order Date Year, which keeps 2016 and 2017.
Objective: We’ve been asked to provide a visualization that represents the sales in cities in both the East and South regions.

1. Create a **New** worksheet. Rename it **South-East Sales**.
2. **Ctrl+Click City** and **Sales** from both Dimensions and Measures.
3. Click **Show Me** to expand its dialog box and choose the recommended thumbnail for the **Symbol Maps** visualization.
4. Drag **Region** to the Filters shelf and place a check in the box next to both **East** and **South**.
5. Filter in the data for the unknown values show at the bottom-right of your map.
6. Click **Size** and use the slider to increase the size of your marks.
7. Add **Region** to Color.
Map based on Longitude (generated) and Latitude (generated). Color shows details about Region. Size shows sum of Sales. Details are shown for City. The data is filtered on Order Date Year, which keeps 2016 and 2017. The view is filtered on Latitude (generated), Longitude (generated) and Region. The Latitude (generated) filter keeps non-Null values only. The Longitude (generated) filter keeps non-Null values only. The Region filter keeps East and South.
CREATING DASHBOARDS
Dashboards

- Dashboards are collections of worksheets
- They allow you to analyze multiple views at once
- Dashboards are shown at the bottom as tabs like worksheets
- Update automatically when data from the source is updated
- Supports all the same formatting as worksheets
\section*{Dashboards}

- When creating a new dashboard, the data pane is replaced with a list of worksheets and objects.
- Objects can be added by simply dragging them onto the dashboard.
- By default, objects are “tiled” when they are added but can be changed to “floating” to allow overlap.
Adding Dashboard Objects

- Dashboard objects allow you to enhance a dashboard with non-worksheet items.

- Objects include:
  - Text boxes
  - Images
  - Web Pages
  - Blank Space
Organizing Dashboards

- You have the ability to show and/or hide specific parts of a dashboard as desired.
  - Title
  - Caption
  - Legends
  - Parameters
Organizing Dashboards

- Dashboards can be sized based on the following options:
  - Automatic: dashboards adjust as needed
  - Exactly: fixed width, scrollable if larger than window
  - Range: scales between min and max size
  - Presets: select from common sizes

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<tbody>
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</tr>
<tr>
<td>Custom</td>
</tr>
</tbody>
</table>
Objective: We have created numerous worksheets. Our users would like to see some of these views on a single page. We will create a dashboard from 3 of our worksheets to enhance it with a global filter.

1. Create a **New** dashboard. Rename it with your name: (Example **Amy’s Dashboard**)
2. Start by changing the size of the dashboard. In the dashboard pane, click the drop-down under **Size**, click the drop-down arrow next to **Fixed Size**, and select **Automatic**.
3. From the Dashboard pane, drag **South-East Sales** to your dashboard.
4. Drag **Avg Unit Cost** below **Sales by City** until the bottom half of the screen is gray (this splits the dashboard screen).
5. Next, drag the **Sales Spotlight** to the bottom right side until the lower half of the screen is gray.
6. Highlight the Year of Order Date filter, click the small drop-down, choose Apply to **Worksheets>**All Using This Data Source. This will make Year of Order Date a global filter that applies to all of the worksheets in our new dashboard.
7. To change the color of the background, and titles, click the **Dashboard** menu and select **Format**.
South-East Sales

Avg Unit Cost

Sales Spotlight

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<tr>
<th>Category</th>
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PUBLISHING & SHARING

Tableau Desktop ➔ Tableau Reader

Tableau Desktop ➔ Tableau Public

Tableau Desktop ➔ Tableau Server

Tableau Desktop ➔ Tableau Online
Publishing & Sharing

- Workbooks can be shared with other Tableau Desktop users, like any other file.
- Alternatively, workbooks can be published to private servers:
  - Princeton Tableau Server
  - Princeton Tableau Public
  - Tableau Public
- You can publish worksheets, dashboards, or stories.
Publishing & Sharing

- Workbooks can be exported and published
- Multiple formats are available to use the output in applications such as PowerPoint, Word, or Excel
- When saving, you can save:
  - Workbooks (.twb)
    - all sheets, dashboards, and stories
  - Packaged workbook (.twbx)
    - All sheets, dashboards, stories, and all reference local data file and images in a single file
OTHER SESSIONS & NEXT STEPS
We in CeDAR are here to answer any questions you may have. In addition, we have provided a few links that should prove to be useful.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Link</th>
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<tr>
<td>Princeton’s Tableau Production Server</td>
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<td><a href="https://tableaud.princeton.edu">https://tableaud.princeton.edu</a></td>
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<td>Princeton Tableau Users Group (TUG)</td>
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Thank you