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# Tableau for the Business User

## Course Manual

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# INTRODUCTION TO TABLEAU DESKTOP

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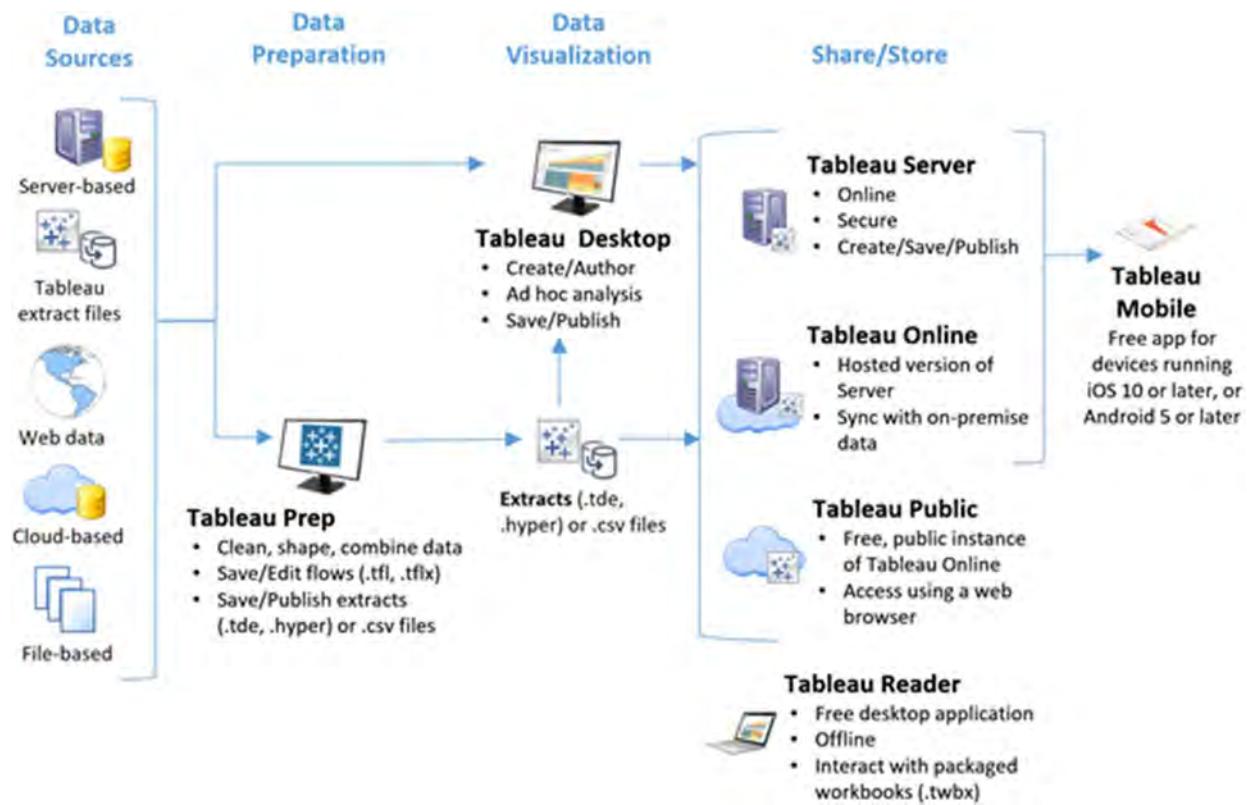
This module contains the following:

- Tableau Product Line
- Tableau Desktop Architecture
- Understanding Desktop Workflow
- Getting Started in Tableau Desktop
- Application Terminology
- Elements of a Visualization
- Visual Cues for Fields
- Quick Reference Guide

## Tableau for the Business User

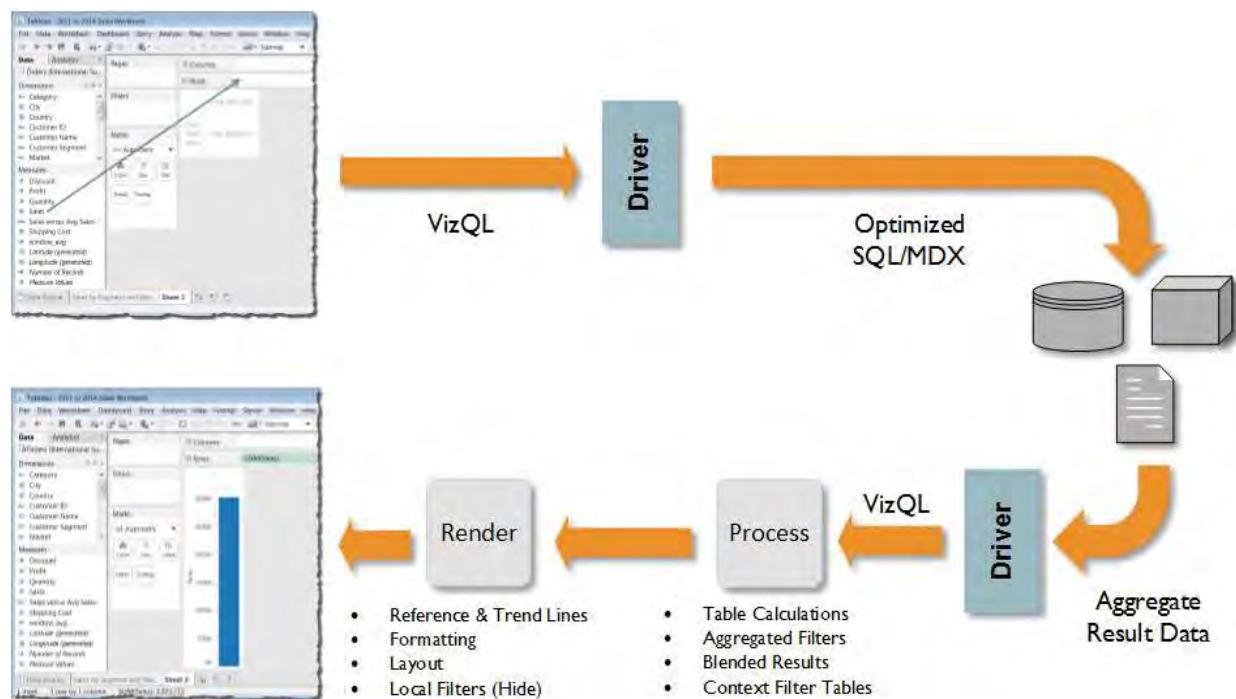
### Tableau Platform

Tableau Desktop is a part of the larger suite of Tableau products.



### Tableau Desktop Architecture

Whenever you drag a field into the view, Tableau executes the query sequence below. The query is sent in VizQL, Tableau's native language to a data source-specific driver. The driver converts the VizQL into the language needed by the data source. The data source performs the necessary aggregations and calculations which are then sent back through the driver and translated into VizQL. Certain processing takes place on the resulting data in Tableau tables. Lastly, those items impacting the rendering of the visualization occur and the result appears in Tableau Desktop.



# Understanding the Desktop Workflow

Tableau Desktop follows three main steps:

### Connect to your data

Tableau can connect to numerous data sources – nearly any database or text file. Modifications to format of the data fields within these data connections can be saved to Tableau Data Source (.tds) files which stores the metadata as a layer between the data source and Tableau.

### Analyze your data and build views

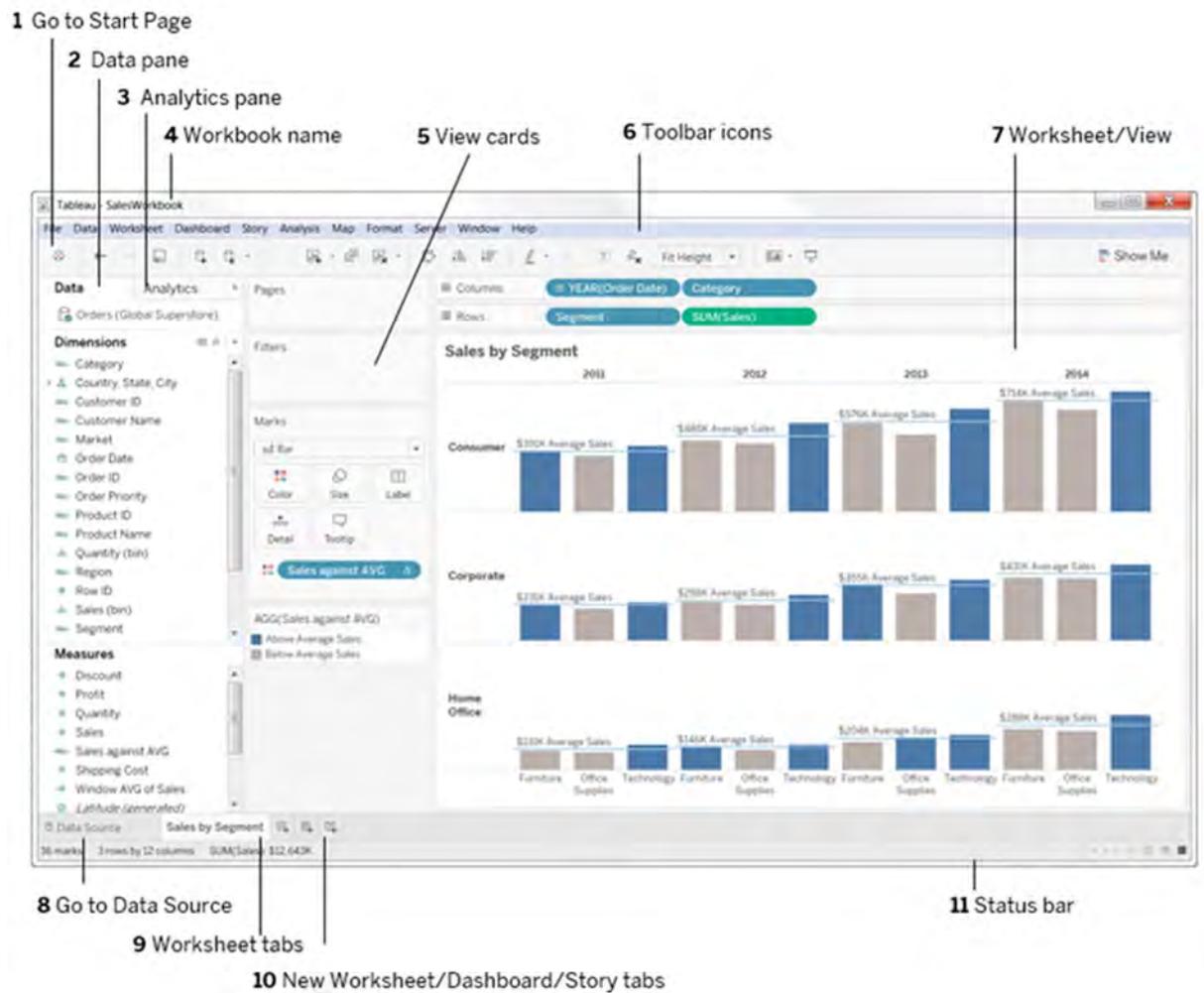
Dimension and measure fields are used to build the visualizations from your data source. Additional calculations can be created to enhance your analysis.

### Share insights using a Dashboard or Story

A dashboard or story can be created to share your analysis with others. A dashboard is a collection of views used to compare and explore data. Stories can be a collection of both dashboards or single views and are used to guide users through a specific story from the built analyses.

The Tableau Desktop workflow is very iterative. It is designed to allow users to make discoveries, change their analyses, and create new analyses as often as needed. It is easy to add new data sources, explore different relationships, and pose different questions.

## Application Terminology

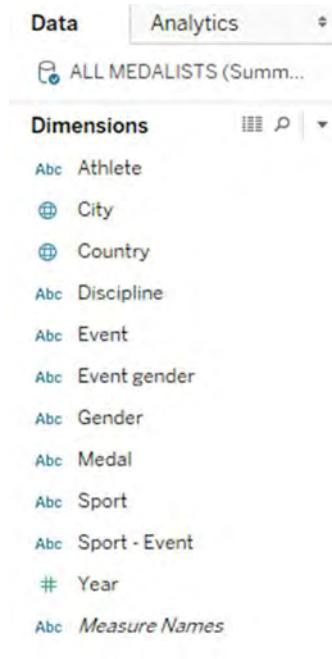


Terminology	Description
1. Go to Start Page	Quick return to Desktop Start Page
2. Data pane	Includes data sources with corresponding dimensions and measures. Can also include user-created parameters, sets, or calculated fields.
3. Analytics pane	Shortcut options to create reference lines, forecasts, trend lines, totals, and box plots.
4. Workbook name	File name of your workbook
5. View cards	Modifies look of worksheet
6. Toolbar icons	Quick access icons
7. Worksheet/View	Workspace for creating your visualizations
8. Go to Data Source	Returns to data source specification page
9. Worksheet tabs	Access to specific worksheet, dashboard or story
10. New Worksheet/Dashboard/Story tab	Add new worksheet, dashboard or story
11. Status bar	Displays information about fields and marks in the view

## Getting Started in Tableau Desktop

The Tableau workspace consists of menus, a toolbar, the Data and Analytics panes, cards and shelves, and one or more sheets, which can be worksheets, dashboards or stories.

To the left of the workspace is the Side Bar with two panes: Data and Analytics.



Component	Description
Dimensions	Fields that contain categorical, qualitative information. Typically sets the level of aggregation for numeric data and creates labels in a view. Considered to be the splicers of your numerical data.
Measures	Fields that contain numbers, which can be aggregated. These fields often create a numerical axis in a view.
Parameters	Dynamic user-created variables that allow consumers to control the view.
Sets	User-defined subsets of data

**Measures**

- Latitude (generated)
- Longitude (generated)
- Number of Records
- Measure Values

To the right of the Side Bar is the View area where you create your visualization. Items from the Data or Analytics Panes can be dragged directly into the view to create a visualization.

## Elements of a Visualization

After connecting to your data, Tableau categorizes each field as either a **Dimension** or a **Measure**.

**Dimensions** are discrete categories of data, while **Measures** are numeric data values. Dragging a dimension or measure to the view starts the visualization process. Tableau transforms your data into **Marks**. These marks can be bars, lines, dots, shapes, numbers and/or text.

## Creating a Visualization

There are two ways to create a visualization:

1. Use recommended views (Show Me)
2. Build on your own

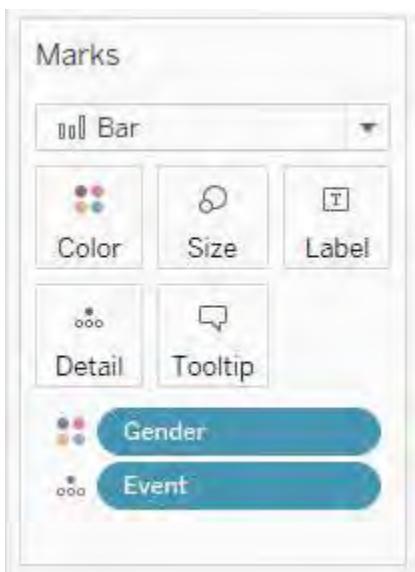
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For the purposes of this training, we will focus on the later of these to better understand how Tableau creates visualizations. Instructions for using Show Me are provided in the Quick Reference Guide at the end of this module.

Tableau utilizes drag and drop. Simply drag fields to Columns, Rows, or the view to begin building a visualization.

### Changing Colors, Sizes, or Mark Types

The Marks card contains the attributes of the marks in your view. From here, you can adjust the Color, Size, Labels, Level of Detail, and Tooltip properties.



Based on the type of mark selected, additional options for Shape, Angle or Path will become available on the Marks card.

### Visual Cues

Tableau displays visual cues in the Data pane and the view. Understanding these cues will help to better understand how Tableau interprets the data fields and how the fields are being used.

### Modifiers

Icon	Description
Abc	Blue icons = discrete field
#	Green icons = continuous field
=#	Icons preceded by an equal sign (=) indicate that the field is a user-defined calculation or copy of another field
=# Profit Ratio !	Exclamation marks indicate that the field is invalid

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## Fields in the Data Pane

Icon	Description
Abc	Text values
#	Numeric values
	Date values
🕒	Date and Time values
T F	Boolean (true/false) values
🌐	Geographic fields
⌚	User-defined set
@	Group
▶️	Hierarchy

## Fields on Shelves

Icon or Visual Cue	Description
Customer Segment	Blue field indicates a discrete field
SUM(Sales)	Green field indicates a continuous field
Order Priority	A Sort icon indicates a sorted field
SUM(Sales)	A delta icon indicates the field has a table calculation
⊕ Category	
⊖ Sub Category	The plus and minus indicates the field is part of a hierarchy, where you can drill up or down.

## Quick Reference Guide

### HOW TO CONNECT TO DATA

1. When opening Tableau, find the data source type you are using and Click on that Data Type (for example Excel)
2. If connecting to a **File**, navigate to the location of the file.
3. If connecting to a **Server**, provide the necessary login information to connect.
4. Drag the sheet(s) or table(s) of the data you want to use to **Drag sheets here**.
5. Review data fields.
6. Click on Sheet 1 to start using this data source.

### HOW TO CREATE A BAR CHART

1. A bar chart requires at least one dimension and one measure.
2. Drag a **dimension** to either **Columns** or **Rows** and a **measure** to the other.
3. Dragging a measure to Columns will create an x-axis for the measure. Dragging a measure to Rows will create a y-axis for the measure.

### HOW TO CREATE A PIE CHART

1. A pie chart requires at least one dimension and one measure.
2. Change the **mark** type to **Pie**.
3. Drag a **dimension** to **Color**.
4. Drag a **measure** to **Angle**.
5. Add labels by either clicking on the **Label** toolbar icon or dragging fields to **Label** on the marks card.

### HOW TO SORT USING TOOLBAR ICONS OR FROM AXIS/HEADER

1. There are two toolbar icons for sorting data:  
 Sorts in ascending or descending order
2. Data can also be sorted by clicking on the header label or the axis.
  - Click once to sort in descending order
  - Click twice to sort in ascending order
  - Click a third time to return to the original sort order
3. For additional sort options, view the Filters and Sorting module.

### HOW TO BUILD A DASHBOARD

1. Click the **New Dashboard** tab to add a dashboard.
2. Under Sheets, drag the first worksheet to the dashboard.
3. Drag in additional sheets to the dashboard, noting the gray area for placement.
4. Add simple filter action from one sheet to another by setting a sheet to **Use as Filter**.
5. For more insight on building a dashboard, view the Introduction to Dashboards module.

# CONNECTING TO AND MODIFYING DATA SOURCES

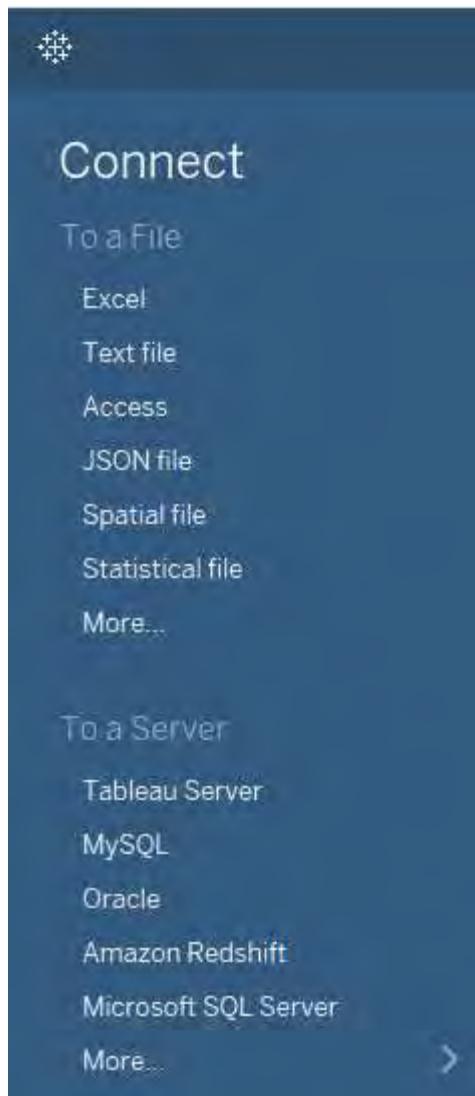
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This module contains the following:

- Creating a Live Data Connection
- Modifying Data Field Attributes
- Creating Splits and Custom Splits
- Saving a Data Source
- Understanding Changes to Data
- Quick Reference Guide

### Creating a Live Data Connection

Tableau Desktop allows you to connect to numerous files and server types. When you first open Tableau, you can connect to a data source by first selecting the type of source you are connecting to from the list of available connections.



#### Create a Live Data Connection to a Single Table

1. On the Tableau Start page, select your data source type.
  - To connect to a **File**, select the file type and navigate to the file location.
  - To connect to a **Server**, choose the server type. You will be prompted to provide server specific connection/login information.
  - To connect to a saved data source, under **Saved Data Sources**, select the data source.

The **Data Source** tab will open, and a list of all available tables will appear under **Sheets**.

2. Double-click the table you want to connect to or click and drag to the white area labeled **Drag sheets here**.

Tableau is currently connected **Live** to your data connection. In a later module, we will discuss creating an **Extract** of your data source.

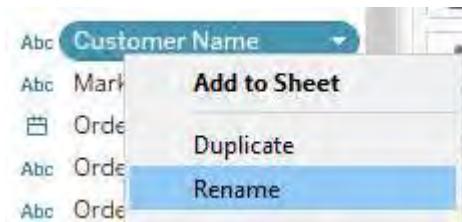
3. At the bottom left of your screen, click **Sheet 1** under **Go to Worksheet**. As you add additional data sources, you can click on any sheet to exit the **Data Source** tab.

## Modifying Data Field Attributes

Data field attributes can be modified, saved and reused.

### Rename a Field

1. From the **Data Pane**, right click on the field you want to rename.
2. Select **Rename** and change the name as desired.
3. Alternatively, rename the field from the **Data Source** view.
4. Click into the field name you want to rename and change the field name.



### Set the Default Properties for a Dimension

1. Right-click the Dimension you want to modify and choose **Default Properties**.
2. The following default properties can be set:
  - **Comment**
  - **Color**
  - **Shape**
  - **Sort**
3. Modify the properties as desired to set as defaults.

### Set the Default Properties for a Measure

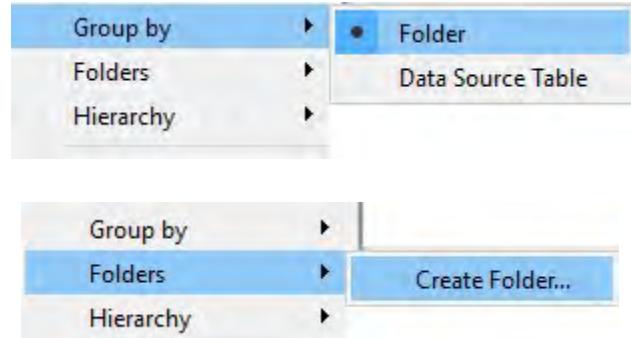
1. Right-click the Measure you want to modify and choose **Default Properties**.
2. The following default properties can be set:
  - **Comment**
  - **Color**
  - **Number Format**
  - **Aggregation**
  - **Totals**
3. Modify the properties as desired to set as defaults.

### Organize Dimensions and Measures with Folders

By default, the fields are listed alphabetically by data source. Alternatively, the data can be grouped in folders.

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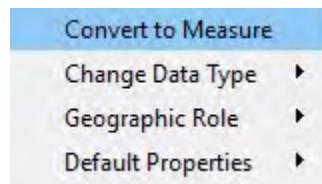
1. From the **Data** pane, right-click anywhere within the **Dimensions or Measures** area.
2. Select the **Group by Folder** option.
3. From the **Data** pane, right-click within the white space of either the **Dimensions or Measures** (depending on where you want to create a folder) and choose **Create Folder** from **Folders**.
4. In the **Create Folder** dialog box, name the folder and then click **OK**.
5. Drag and drop fields into the new folder.
6. Alternatively, you can create the folder from a field and that field will automatically move within the folder.



## Convert a Measure to a Dimension or a Dimension to a Measure

Tableau uses logic to determine if a data field is a **Dimension** or a **Measure**. However, sometimes you may want to convert a **Measure** to a **Dimension** or a **Dimension** to a **Measure**.

1. In the Data pane, drag a **Dimension** field to **Measures** or drag a **Measure** field to **Dimensions**.
2. Alternatively, you can right-click on a **Dimension** and select **Convert to Measure**, or right-click on a **Measure** and select **Convert to Dimension**.



## Creating Splits and Custom Splits

There are times when our data fields are not exactly the way we want them. Perhaps we have a delimited string field that represents country, year and customer ID (MX-2014-1436558). Rather than use it as a single field, we can split this field into two fields – one for state and one for customer ID.

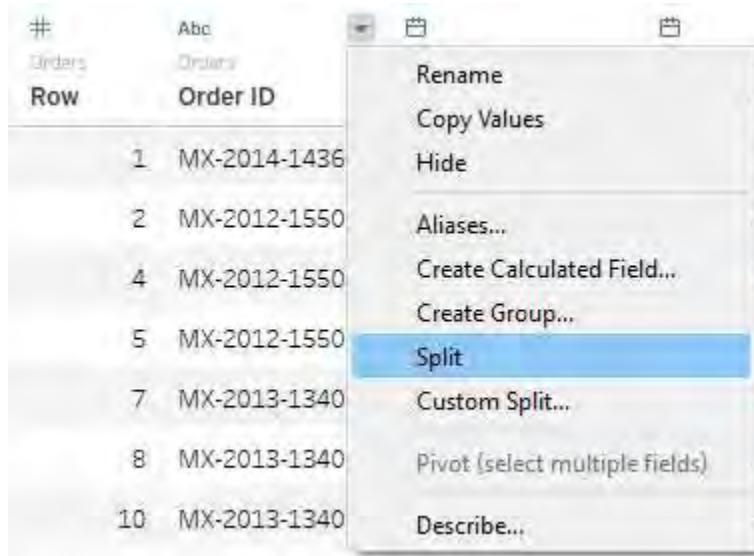
Tableau can split a field into parts by a common separator, such as space, comma, hyphen, etc.

### Create a Split

A **Split** can be performed in either the Data Source window or the Data pane of the worksheet.

- From the **Data Source** window: click the drop down from the column you want to split and select **Split**.

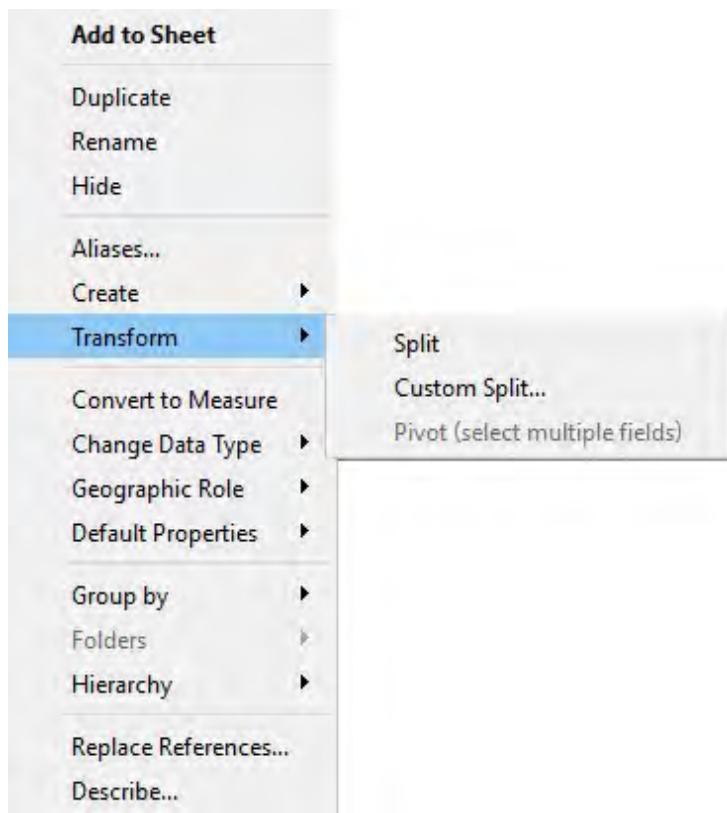
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The new fields will appear next to the split column. Initially, it will be named based on the split column. The fields can be easily renamed.

Abc	=Abc	=#	=#
Orders	Calculated	Calculated	Calculated
Order ID	Order ID - Split 1	Order ID - Split 2	Order ID - Split 3
MX-2014-143658	MX	2014	143658

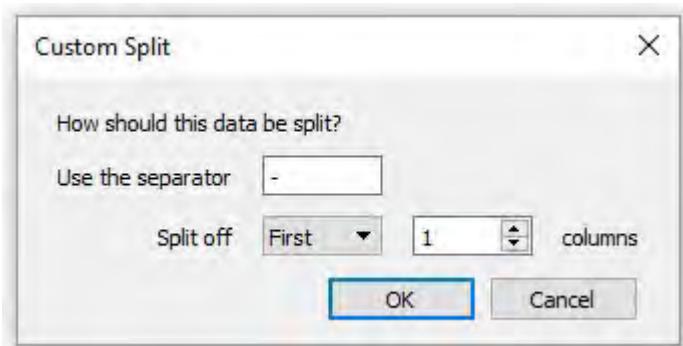
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- Or, from the **Data Pane**, right click on dimension you want to split, select **Transform**, and then click **Split**. The fields will be created as new dimensions.

Using the **Split** option will create a field for each delimited section. However, you might not always want to return all delimited sections, or you may need to specify the separator for the split.

Perhaps, in the example above you only want to derive the country from the Order ID. A **Custom Split** can be used. A **Custom Split** allows you to specify the separator used for the splits and choose which columns you want to split off from the original field.



Create a Custom Split

1. From the **Data Source** window: click the drop down from the column you want to split and select **Custom Split**.
2. Enter the separator and how you want to split off the columns, specifying which and how many columns. When finished, click **OK**.
  - If you choose **First** or **Last**, specify how many columns to include (for example, split off the first 1 column or split off the last 2 columns). You can split up to 10 columns.
  - If you choose **All**, the column will split into as many columns as needed (up to 10).

The newly created fields created by Split or Custom are added as calculated fields (denoted with the =). You can Edit these fields to view the calculations driving the split. Be sure to rename the split fields with relevant and meaningful names.

## Saving a Data Source

Once you make changes to your data attributes for a connected data source, these changes can be saved as a Tableau data source (as a **.tds** file type). Any modification, be it converting a Measure to a Dimension, changing a field's alias, modifying the default properties, are all saved in this data source. Saved data sources can also include parameters, hierarchies, groups, bins, calculated fields, or sets you have created.

This Tableau data source can be saved locally for personal use and easy access on the Data menu. Once you have your data source how you want it, right-click on the data source and choose **Add to Saved Data Sources**. Saving your data source after modifying the data attributes or adding in calculations means you don't have to make those changes again if you use this same data source in a different workbook. You can connect to our saved data source and easily share the file with others in your organization.

To create a server version of your data connection, right-click on the data source you want to share and choose **Publish to Server**. Others can then connect to this data connection from Tableau Server.

## Understanding Changes to Data

It is important to understand the impact changes to your data source can have on your Tableau workbook. When the underlying data for your visualization changes, the visualization may be impacted in different ways dependent on how you connect to the data and what changes have occurred.

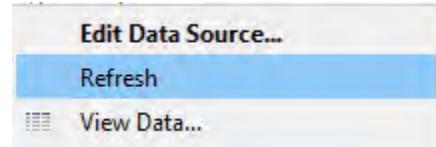
### Impact of Data Connection Type

If you are using a live connection, changes to the underlying data will appear when you open the visualization or refresh the data connection. However, if you are using an extract, changes made to the underlying data are not reflected until you refresh the extract.

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### Refresh a Data Connection

To refresh a data connection, right-click the data connection in the **Data** pane and click **Refresh**.



### Impact of Data Change Type

If the underlying data changes only the values of the data, those changes are reflected in the values displayed within your visualization. This will not break the visualization. If, however, the structure of the underlying data changes (for example, removing or renaming a field), the visualization will break if those changed fields are currently used within a visualization. Errors will be noted in red. Fields that no longer exist will have a red exclamation point (!) next to them in the **Data** pane. Wherever this field is used in the visualization will also appear in red, signifying an issue with that field.

Perhaps your data source changed from using Market to Customer Market. Tableau would no longer be able to find the field for Market. You want to use Customer Market wherever Market was previously being used. Tableau allows you to **Replace References** from one field with another. Right-click on the invalid field in the **Data** pane and select **Replace References**. Choose the field from data source that corresponds to the invalid field.

If changes are made to the underlying data source but that field is not being used within any visualizations in your workbook, the Data pane will update accordingly and there will be no impact on any visualizations.

## Quick Reference Guide

### CREATE A LIVE DATA CONNECTION

1. On the Tableau Start page, select your data source type.
  - To connect to a **File**, select the file type and navigate to the file location.
  - To connect to a **Server**, choose the server type. You will be prompted to provide server specific connection/login information.
  - To connect to a saved data source, under **Saved Data Sources**, select the data source.
2. Double-click the sheet or table you want to connect to or click and drag to the white area labeled **Drag sheets here**.
3. Click **Sheet 1** under **Go to Worksheet**. As you add additional data sources, you can click on any sheet to exit the **Data Source** tab.

### CREATE A SPLIT

1. From the **Data Source** window: click the drop down from the column you want to split and select **Split**.
2. Rename the fields, as desired.
3. Alternatively, from the **Data Pane**, right click on dimension you want to split, select **Transform**, and then click **Split**. The fields will be created as new dimensions.

### CREATE A CUSTOM SPLIT

1. From the **Data Source** window: click the drop down from the column you want to split and select **Custom Split**.
2. Enter the separator and how you want to split off the columns, specifying which and how many columns. When finished, click **OK**.
  - If you choose **First** or **Last**, specify how many columns to include (for example, split off the first 1 column or split off the last 2 columns). You can split up to 10 columns.
  - If you choose **All**, the column will split into as many columns as needed (up to 10).
3. Rename the fields, as desired.
4. Alternatively, from the **Data Pane**, right click on dimension you want to split, select **Transform**, and then click **Custom Split**. Follow step 2 and 3. The fields will be created as new dimensions.

### SAVE A DATA SOURCE

1. Right-click on the data source and choose **Add to Saved Data Sources**.
2. Save the **.tds** file in the **Data Source** folder in the **My Tableau Repository folder** to add it to the Saved Data Sources list. Alternatively, the file can be saved anywhere.
3. To create a server version of your data connection, right-click on the data source you want to share and choose **Publish to Server**.

# FILTERS AND SORTING

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This module contains the following:

- Filters
- Sorts
- Quick Reference Guide

### Filters

Filters are very helpful and widely used in Tableau to restrict the data included in a worksheet/visualization to what is relevant to the user. There are many use cases for filters, just as there are many formats, adjustments, and customizations possible. Filters can be set based on dimensions (including dates) and measures (including calculations).

We recommend that you become closely in-tune with Tableau filters and how they work.

In this section, we'll discuss:

- Dimension Filters
- Date Filters
- Measure Filters
- How to show and modify filters

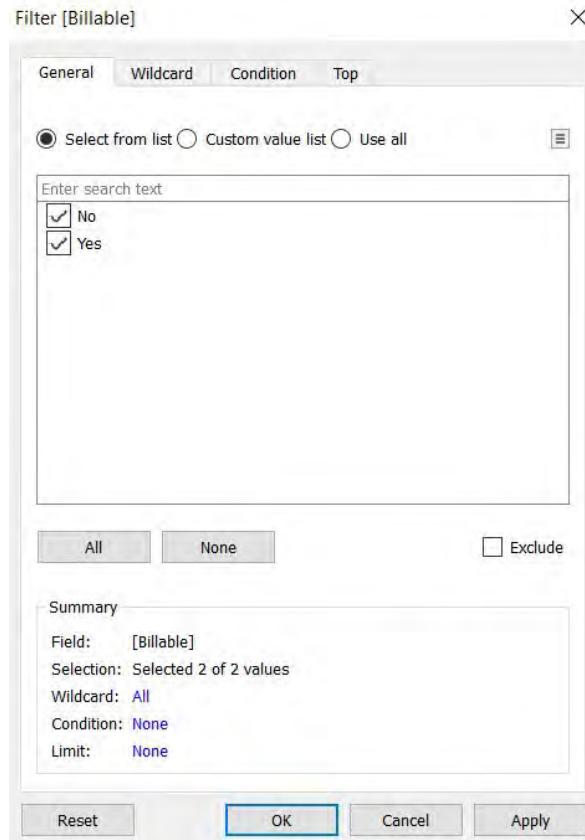
# Tableau for the Business User

## Dimension Filters

1. Drag a **Dimension** to the **Filter** shelf.
2. In the Filter Field window, select how you want to restrict the values of this filter. These selections are added together to reflect the results of the filter. Options include:

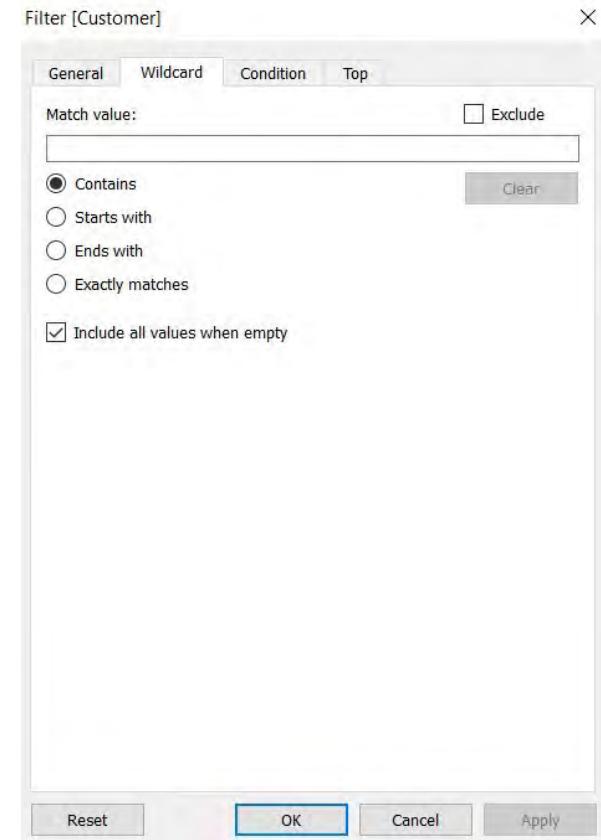
### General

Include or exclude values as selected



### Wildcard

Enter text with which to filter the values



# Tableau for the Business User

## Condition

Enter value criteria based on a selected measure or formula.

Filter [Customer]

The dialog shows the 'Condition' tab selected. Under 'By field:', 'Quantity' is chosen with a sum operation and a condition of '> 50'. The 'Range of Values' section shows a minimum of 1 and a maximum of 1,889. Buttons at the bottom include 'Reset', 'OK' (highlighted), 'Cancel', and 'Apply'.

## Top

Enter top or bottom N ranking based on a selected measure or formula.

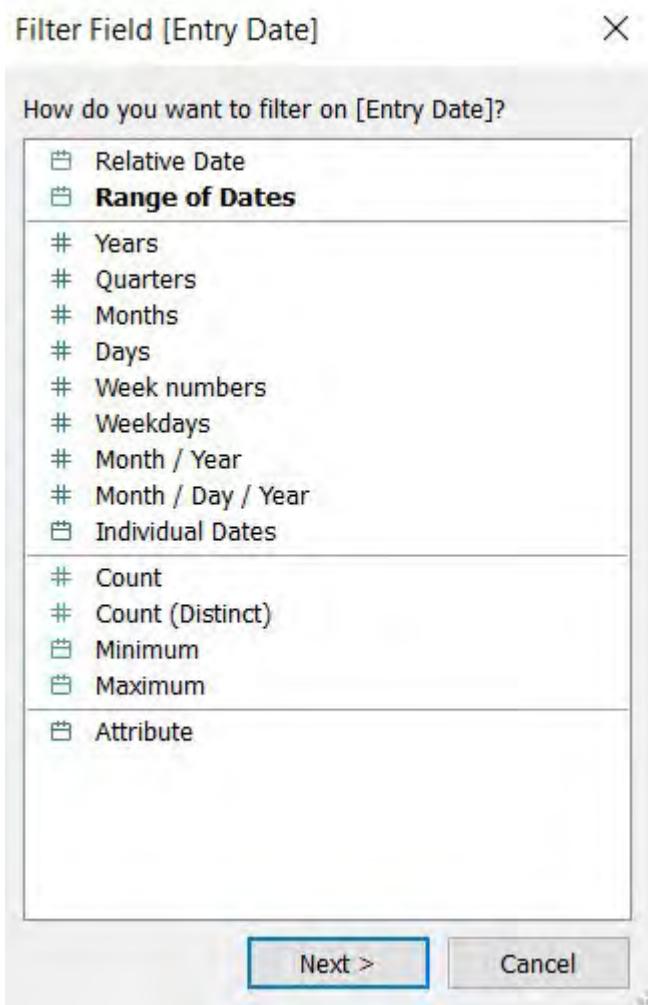
Filter [Customer]

The dialog shows the 'Top' tab selected. Under 'By field:', 'Top 10' is selected with 'Quantity' and 'Sum' operations. A 'by' dropdown is present. The 'By formula:' section is empty. Buttons at the bottom include 'Reset', 'OK' (highlighted), 'Cancel', and 'Apply'.

# Tableau for the Business User

## Date Filters

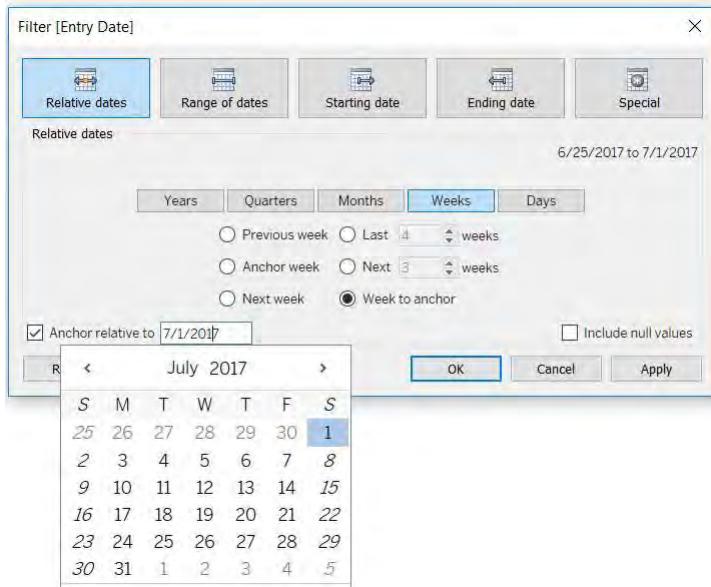
1. Drag a **Date** field to the **Filters** shelf.
2. In the **Date Filter** window, select the type of filter you want to use. Options include:
  - Relative Date:** Range compared to today's or a selected "anchor" date.
  - Range of Dates:** Limited based on selection.
  - Discrete Dates:** Selection of specific values within a date dimension.
  - Minimum Date:** Starting point for a date range.
  - Maximum Date:** End point of a date range.



# Tableau for the Business User

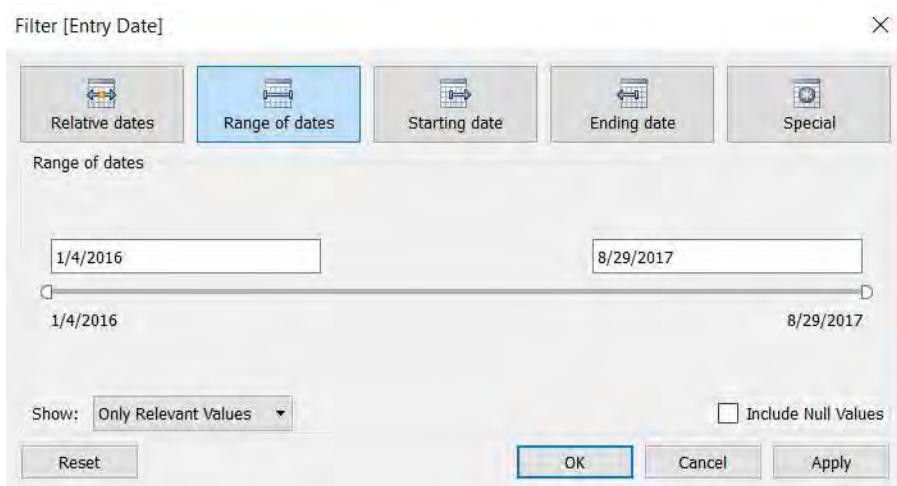
## Create a Relative Date Filter

1. Select a time interval dimension by which to filter.
2. Select a relative number (or previous/next).
3. Set an **Anchor Date** if desired.



## Create a Range of Dates Filter

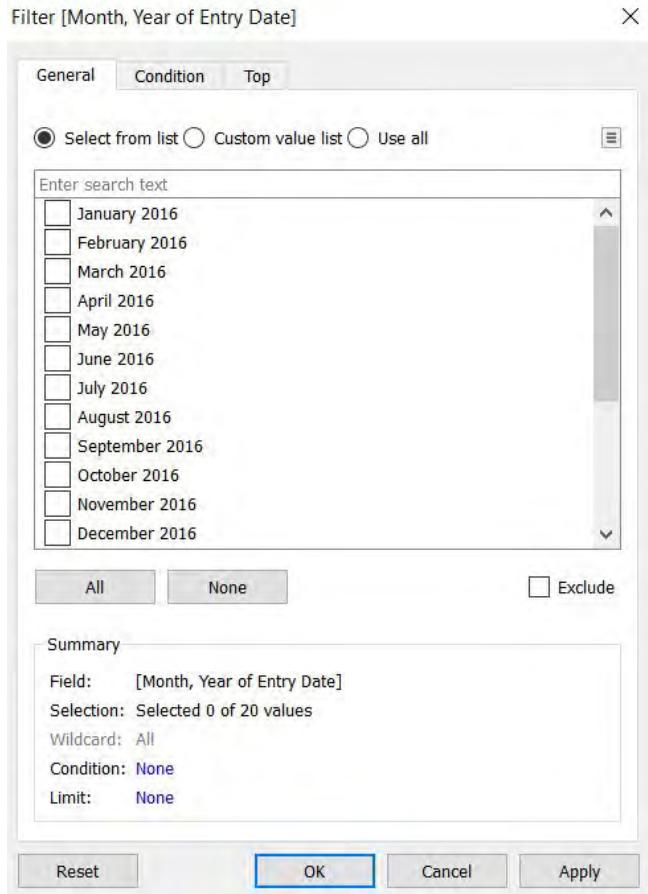
1. Select beginning and end dates by which to filter, using one of three methods:
  - a. Type in dates
  - b. Select each entry field and choose dates from the calendars.
  - c. Place the slider on selected dates.
2. Customize as desired.



# Tableau for the Business User

## Create a Discrete Date Filter

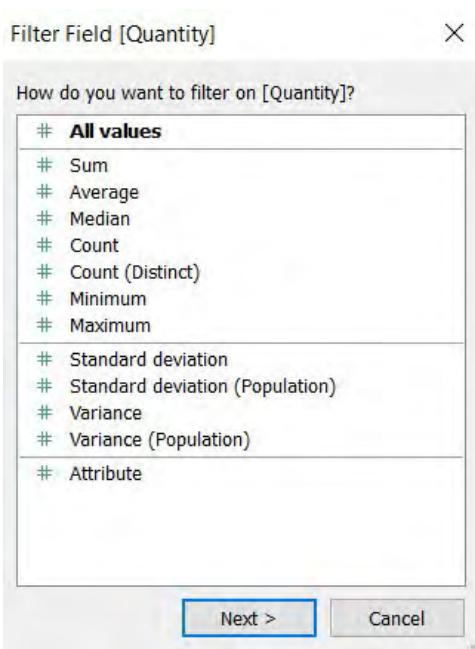
1. Select a time interval dimension (e.g., Month, Month & Year) by which to filter.
2. Include or exclude desired values. Click on Exclude to use the filter to exclude values.
3. Set **Conditions** based on a selected measure or formula, if desired.
4. Select **Top/bottom N** rankings based on a selected measure or formula, if desired.



## Creating Measure Filters

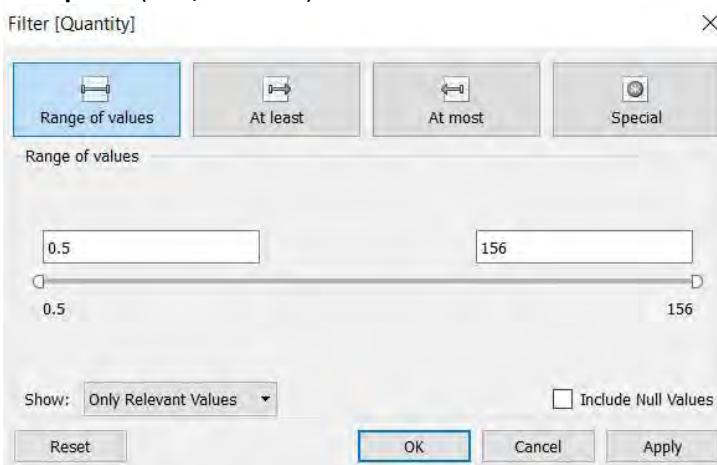
1. Drag a **Measure** to the **Filter** shelf.
2. In the Filter Field window, select how you want to aggregate this Measure filter. Common options include Sum, Average, Count, Count Distinct, Min, Max, etc.

## Tableau for the Business User



3. In the Filter window, select how you want to restrict the Measure. Your options are:

**Range of Values** (All Values Within)  
**At Least** (All Values Equal to or Above)  
**At Most** (All Values Equal to or Below)  
**Special** (Null/Non-Null)



### Show Filters in the Worksheet View

If desired, display the filter for users to see and adjust.

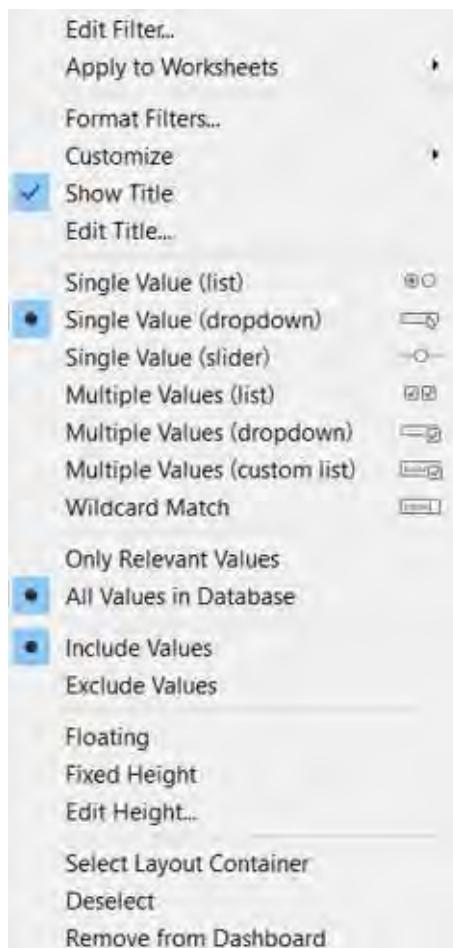
1. Right-click on the filter and select **Show Filter**.
2. Using the dropdown arrow in the top-right corner of the filter, change the format, appearance, and custom options as desired. This includes:  
**Edit Title**: Text, font, and alignment

## Tableau for the Business User

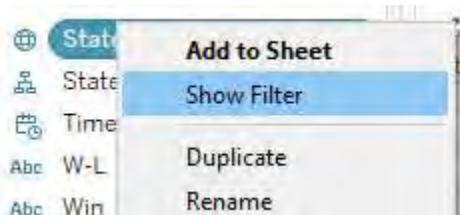
**Formats:** Single-select or multi-select variations

**Custom options:** Apply button, show “All”, include/exclude selection, etc.

**Relevant Values:** Exclude to hide values based on other filters



NOTE: When creating filters, you can right click on a dimension or measure and select **Show Filter**. This will create the filter from the field (add it to the Filter shelf) and show the filter for user interaction all at once.



## Sorts

One important function for users when working with measured data is the ability to sort in descending/ascending or a customized/pre-set order. These are known as computed or manual sorts in Tableau.

Sorting in Tableau can have complications (more on that in future sessions), but we'll walk through these core lessons with you. In this section, we'll discuss:

- Computed Sort
- Manual Sort
- Default Sort

### Computed Sorts

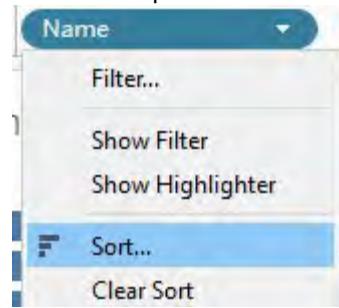
Tableau can apply rules to organize data in pre-set methods, including based on alphabetic order or ascending/descending order. These are dynamic in nature, meaning that as filters affect the data shown in the view, the sort will reset automatically.

Computed Sorts can be set in several ways:

- One-Click: Hover on an axis and select the sort icon that appears. Cycle through descending, ascending, or no sort options.

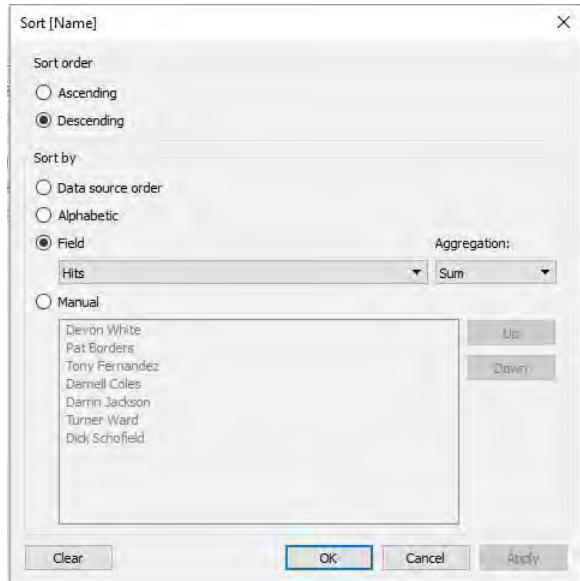


- Toolbar: Select the descending/ascending sort options on the tooltip.
- Dialog Window: Select the dropdown arrow from a dimension on the view, then select the Sort menu option to view the Sort dialog window.



Make selections as desired, including sorting based on alphabetic order or selected measure calculation, including fields which are not in the view.

# Tableau for the Business User



## Manual Sorts

Tableau sorts can also be customized with pre-set orders, determined within the worksheet via a manual process. These can be set in two ways:

- **Sort Dialog Window:** As discussed above, the dropdown arrow from a dimension on the worksheet leads you to a sort dialog window. There the **Manual** option allows you to shift values up and down the order as desired.
- **Manual Reordering:** Within the worksheet, values of the dimension can be reordered by selecting header labels and dragging them up or down the order.

## Default Sorts

Dimensions can be pre-set to sort in a specific order across a workbook. Use **Default Properties** to set the default **Sort** order.

## Quick Reference Guide

### FILTER BY DIMENSION

1. Drag a **Dimension** to the **Filter** shelf.
2. In the Filter Field window, select how you want to restrict the values of this filter. Options include:
  - General
  - Wildcard
  - Condition
  - Top

### FILTER BY DATE

1. Drag a **Date** field to the **Filters** shelf.
2. In the **Date Filter** window, select the type of filter you want to use. Options include:
  - **Relative Date**: Range compared to today's or a selected "anchor" date.
  - **Range of Dates**: Limited based on selection.
  - **Discrete Dates**: Selection of specific values within a date dimension.
  - **Minimum Date**: Starting point for a date range.
  - **Maximum Date**: End point of a date range.

### FILTER BY MEASURE

1. Drag a **Measure** to the **Filter** shelf.
2. In the Filter Field window, select how you want to aggregate this Measure filter. Common options include Sum, Average, Count, Count Distinct, Min, Max, etc.
3. In the Filter window, select how you want to restrict the Measure. Your options are:
  - **Range of Values (All Values Within)**
  - **At Least (All Values Equal to or Above)**
  - **At Most (All Values**
  - **Special (Null/Non-Null)**

### SHOW FILTERS

1. Right-click on the filter and select **Show Filter**.
2. Using the dropdown arrow in the top-right corner of the filter, change the format, appearance, and custom options as desired. This includes:
  - **Edit Title**: Text, font, and alignment
  - **Formats**: Single-select or multi-select variations
  - **Custom options**: Apply button, show "All", include/exclude selection, etc.
  - **Relevant Values**: Exclude to hide values based on other filters

### CREATE A COMPUTED SORT

1. Use either of the following methods to create a computed sort:
  - Use sort icon on the axis.
  - Select the descending/ascending sort options on the toolbar.
  - Right-click on a dimension in the view and select Sort. Use the Sort Dialog Window to set specifics.

### CREATE A MANUAL SORT

1. Use either of the following methods to create a manual sort:
  - Right-click on a dimension in the view and select **Sort**. Use the **Sort Dialog Window** and select **Manual**. Order the members as desired.
  - Within the worksheet, drag and drop to reorder values within the view.

---

# CREATING GROUPS AND HIERARCHIES

---

This module contains the following:

- Using Groups
- Creating and Using Hierarchies
- Quick Reference Guide

## Using Groups

There are times when working with large numbers of dimension members that you want to group these members together such that you have a new dimension to use. For example, this could be several similar products grouped in a single category, or states grouped as "Region",

Here are two methods to create a group:

### Create a Group from the View

- CTRL + click to select several dimension labels in the view, and then click the **Group** icon.



This icon can be found on the toolbar, within the tooltip, or by right-clicking. This new group appears in the **Data** pane, initially labeled as the dimension used followed by (group), for example State (group).

The screenshot shows the Tableau Data pane. In the Columns section, there is a green highlighted field named "AVG(Price)". In the Rows section, there are three dimensions: "Country", "Province", and "Region 1". The "Region 1" dimension has five items: "Nevada", "California", "Diamond Mountain", "Sonoma-Napa", and "Rutherford". A context menu is open over the "California" item, with the "Group" icon circled in red. The tooltip for the icon says "Keep Only". Below the menu, it says "5 items selected: SUM of AVG(Price) Group Members".

- To add or remove group members, in the **Data** pane, right-click the new group, choose **Edit Group**, and edit the members.

### Create a Group from the Data Pane

Right-click a dimension in the Data pane, and then select Create Group.

### Creating and Using Hierarchies

Databases commonly organize data into hierarchies. Take for example, geographic data. There is a hierarchical structure with country at the top of the hierarchy, followed by smaller subdivisions such as region, state, and postal code.

Tableau allows you to manually generate a hierarchical structure in your **Data** pane for any dimension. Using a hierarchy within your views or dashboards allows the users to drill up or down throughout the hierarchy. Users can click a plus (+) sign and drill into the data to display more details based on the hierarchy you created or click a minus (-) sign to roll the data back up to the higher level of detail.



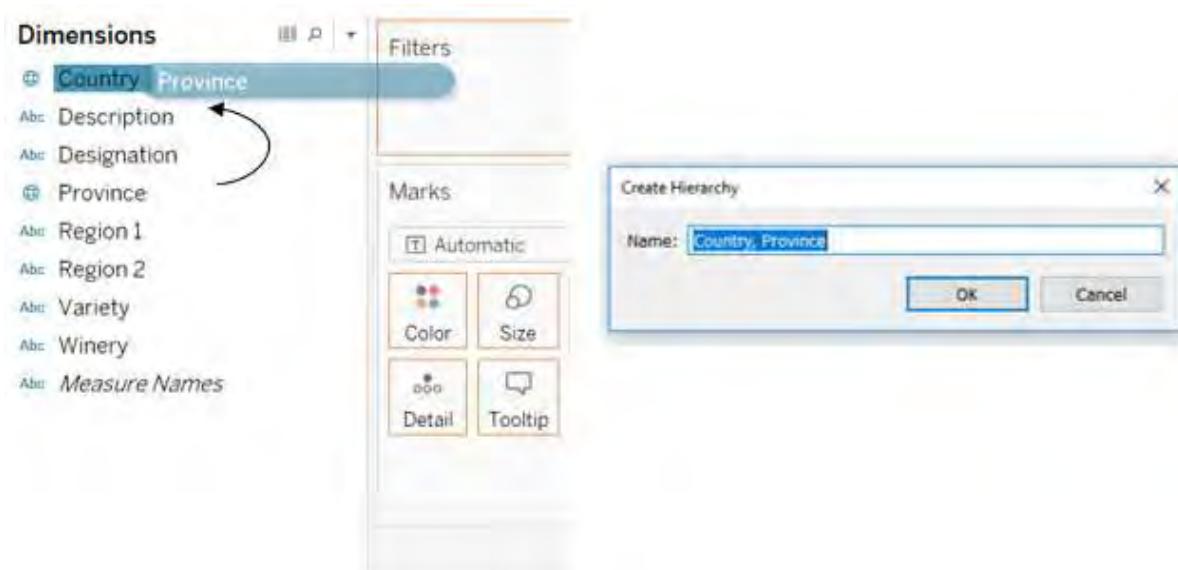
Clicking the plus (+) sign in the view on the left expands the data from Country to Province. Clicking on the minus (-) sign in the view on the right would collapse the hierarchy from Province to Country.

Here are two ways to build a hierarchy.

#### Build a Hierarchy Using Drag and Drop

## Tableau for the Business User

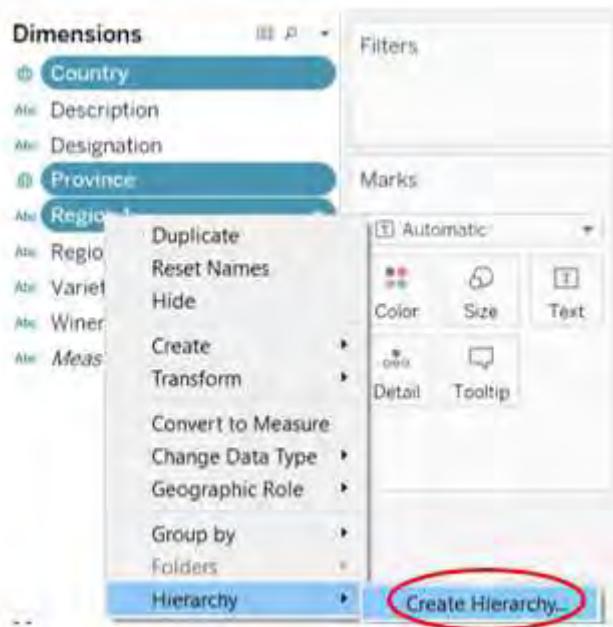
1. Drag and drop the child field onto the parent field in the **Data** pane.
2. If desired, rename the hierarchy from within the **Create Hierarchy** dialog box (for example, “Location Hierarchy”).
3. Click OK.



### Build a Hierarchy Using Context(Right-Click) Menu

1. In the **Data** pane, CTRL-click to multi-select the fields to add to the hierarchy.
2. Right-click one of the selected dimensions, navigate to **Hierarchy**, and then select **Create Hierarchy**.

## Tableau for the Business User



You can re-order fields in a hierarchy by dragging and dropping them into the desired order.

- Edit the group by right clicking on the new dimension in the **Data** Pane and selecting **Edit Group**.
  - Change the **Field Name** of the group to “Show Top 5 by Average Price”
  - Notice how Tableau created two groupings – one including the 5 selected states and one for Other. **Rename** the “California, Kentucky, Nevada, and 2 more” to “Top 5 by Average Price”
  1. Change the **Color** of the bars for Top 5 by Average Price to red.

## Quick Reference Guide

### CREATE GROUPS

1. Right-click a dimension in the **Data** pane, and then select **Create Group**.  
OR
2. Select members either by CTRL + click on the dimension members' names or by using the mouse to create a box to select several members in the view, and then click the **Group** icon.
3. Use the newly created group in the view.

### CREATE HIERARCHIES

1. Drag and drop the child field onto the parent field in the **Data** pane
2. Or Right-click one of the selected dimensions, point to **Hierarchy**, and then select **Create Hierarchy**.
3. Drag the new hierarchy to the far left of Rows.
4. Use the plus (+) sign and drill into the data to display more details based on the hierarchy you created.

### CREATE VISUAL GROUPS

1. From within the view, CTRL + click on the bars to select or create a box around the bars to select multiple members in the view, and then click the **Group** icon.
2. The newly created group will automatically appear on the color shelf of the marks card.

# UNDERSTANDING DATES

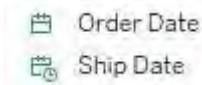
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This module contains the following:

- Working with Dates in Tableau
- Understanding Discrete and Continuous Dates
- Using Discrete Date Parts
- Different Date Parts of Different Shelves
- Creating Custom Date
- Quick Reference Guide

# Working with Dates in Tableau

Dates are often an important part in our analysis in Tableau. For relational data source, Tableau considers date and times as Dimensions, and places them in Dimensions area of the Data pane. Date fields are noted by the calendar icon. Date/time fields are noted by a calendar and clock icon.

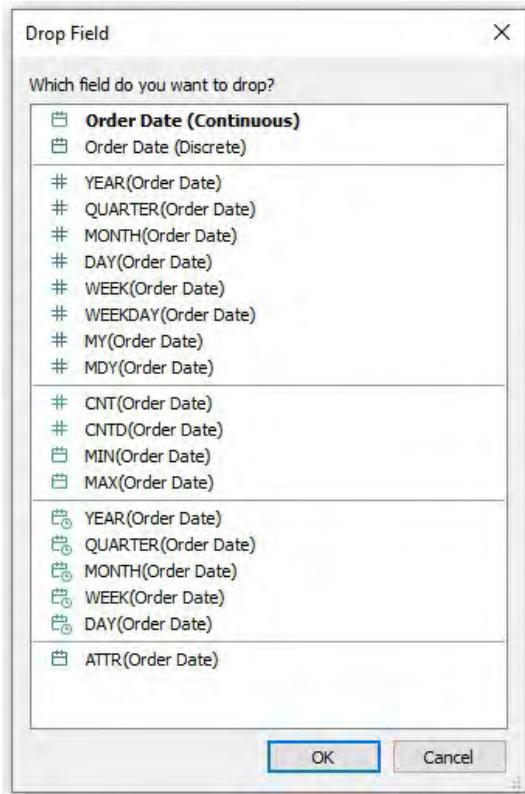


Placing a date field on a shelf shows the date at the highest level within the data. For example, if the date field includes year information, the default level of the hierarchy is year. If the date field contains data for only 3 months, then the default level is month.

### Setting the Date Level for a Date Field

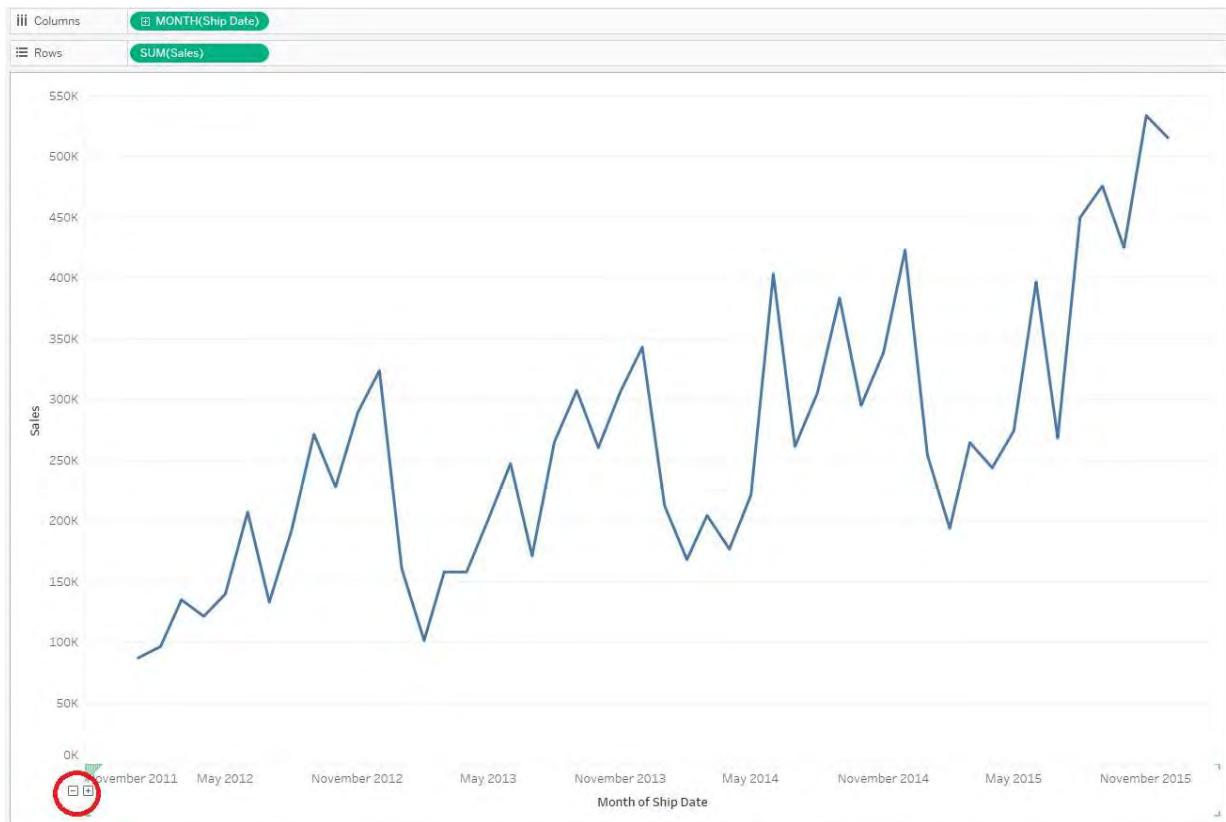
1. Drag a date field to the **Rows** or **Columns** shelf.
2. Click the drop-down arrow on the date field and select the desired date/time level (year, quarter, month, week, day, hour, etc.)

**SHORTCUT:** Right-click and drag a date field to the **Rows** or **Columns** shelf. A Drop Field menu will appear. Select the specific date level to use. The difference between these options will be discussed in the next section.



### Discrete and Continuous Dates

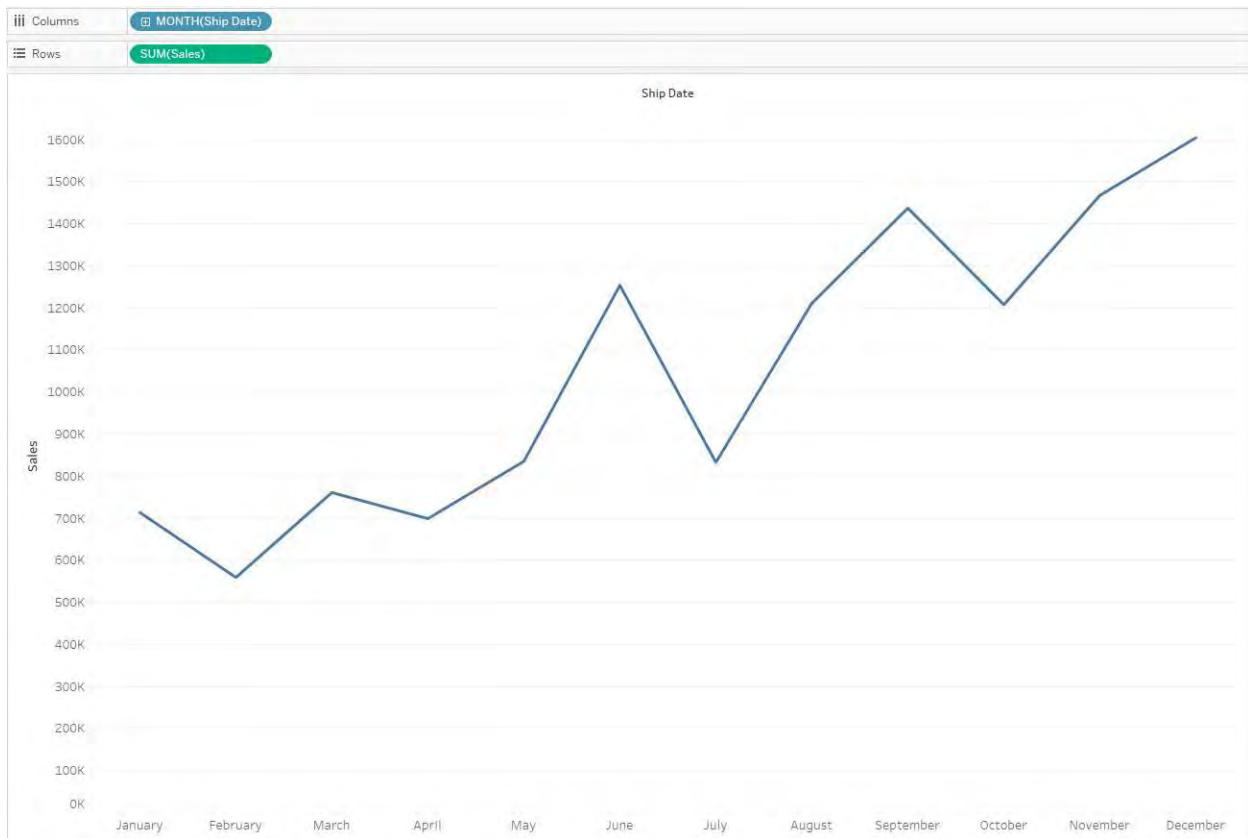
Tableau can display dates as either discrete date parts or continuous date values. Continuous date values represent the chronological progression of time. When you add a continuous date dimension to a view, Tableau creates a timeline for the axis. Continuous dates are used when you want to show trends over time, from the first data point in time to the last data point in time. As a reminder, continuous fields are shown in green.



Dates are hierarchical in Tableau, meaning you can drill up and down from one date interval to another by clicking on the plus or minus signs next to the continuous date axis.

## Tableau for the Business User

When a discrete date dimension is added to the view, Tableau organizes the dates as parts, independent of linear time and creates a header based on the selected time interval. You should use discrete dates to show your data organized by date units. For example, you want to see aggregated data for all Januaries over several years. As a reminder, discrete fields are shown in blue. Notice, the drill down hierarchy is not present in the view using discrete dates. However, the hierarchy still exists, and the developer can choose to set the drill down of the hierarchy accordingly, but this hierarchy will not be modifiable by the user.



These different date/time behaviors create different views. You might need to change your date dimension to discrete or continuous to achieve your desired view.

### Changing Date Dimensions from Discrete to Continuous and Continuous to Discrete

To make a date dimension continuous by default:

- Right-click on the field in the **Data** pane and select **Convert to Continuous**. The field icon is now green and defaults to a continuous dimension when added to the **Rows** or **Columns** shelf.

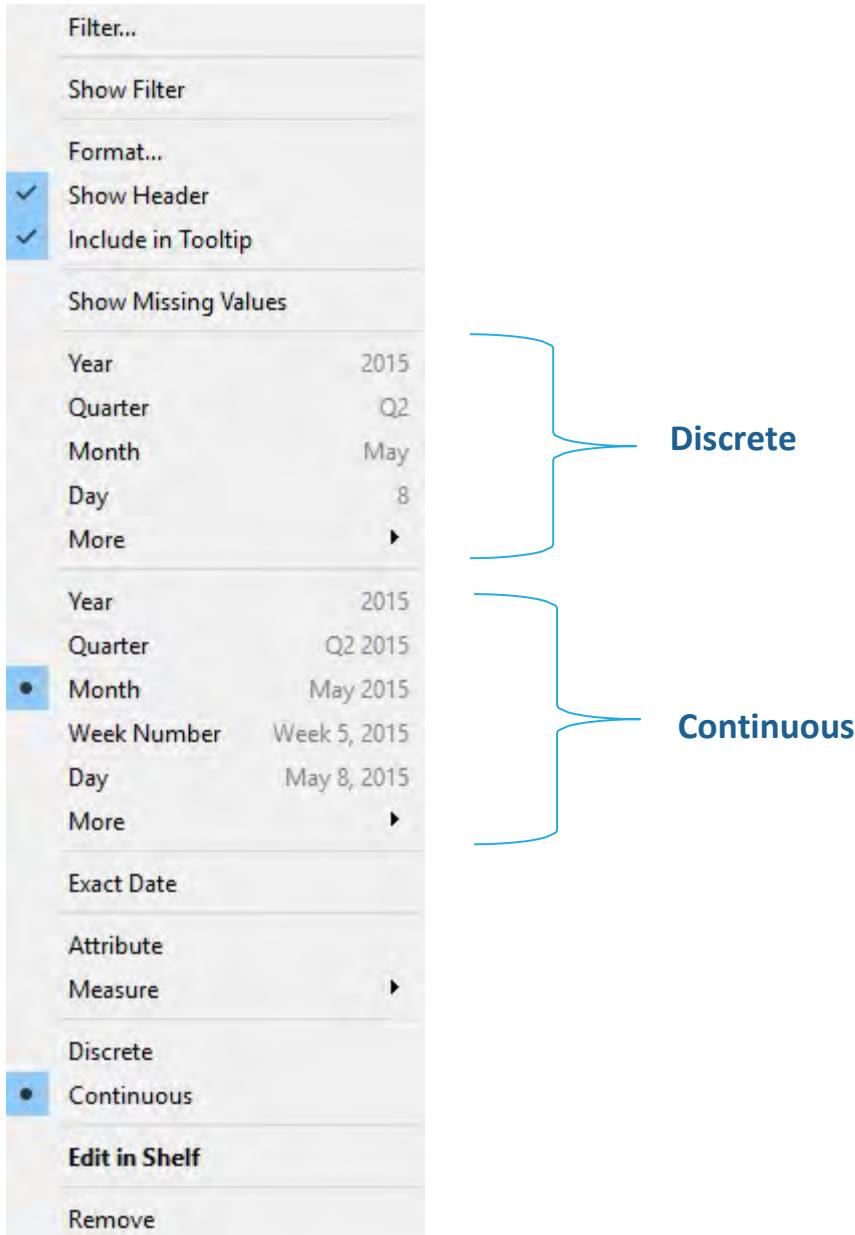
To change the date dimension to discrete from continuous:

- Right-click on the field in the **Data** pane and select **Convert to Discrete**. The field icon is now blue and defaults to a discrete dimension when added to the **Rows** or **Columns** shelf.

## Tableau for the Business User

To make a date dimension continuous in a view:

1. Drag the date field to **Rows or Columns**.
2. Click the drop-down menu and choose the date unit you want to use from the continuous date levels.



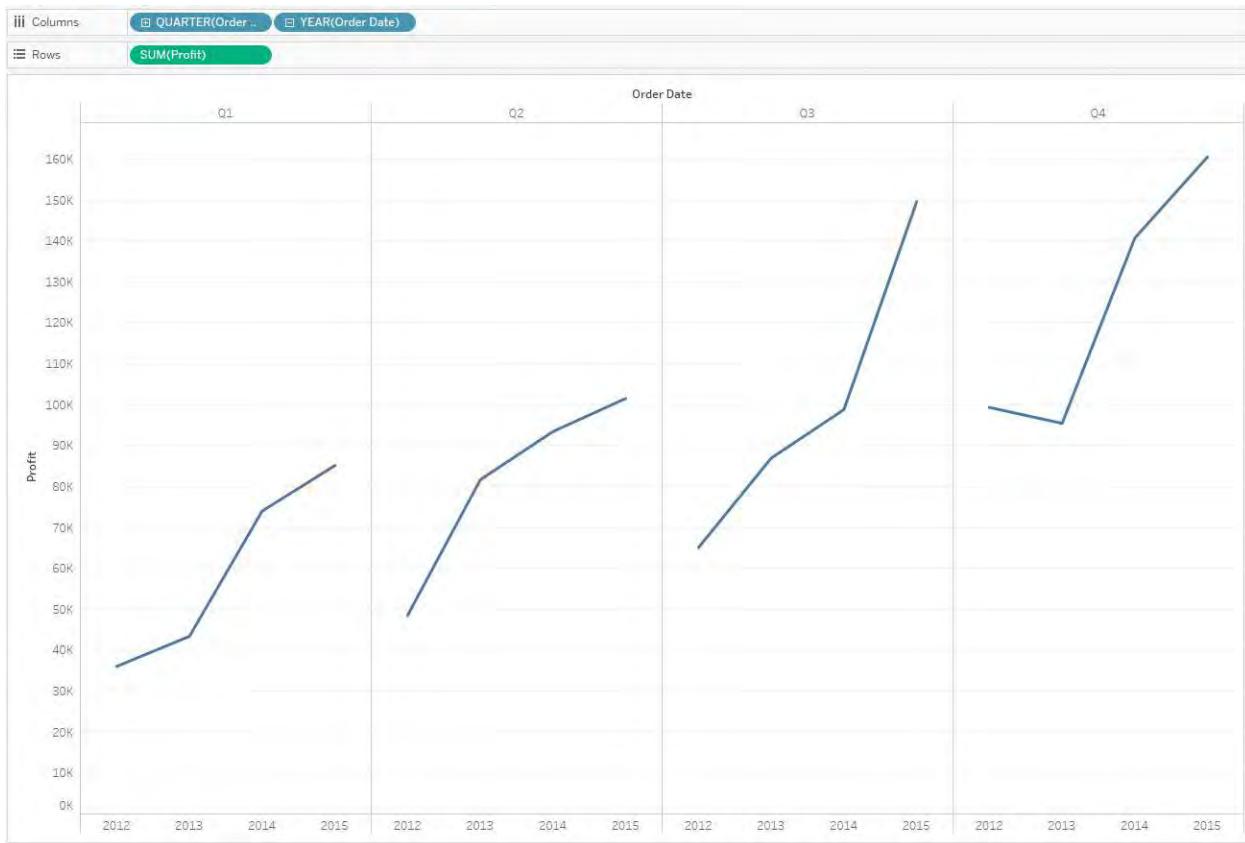
Use the same steps to select a discrete date. Notice based on the selection either Discrete or Continuous is selected at the bottom. You can change dates from Discrete or Continuous from here, but certain functionality will be different. It is not recommended to change the date field type from here, but rather stick to selecting from the Discrete or Continuous sections above.

## Using Discrete Date Parts

Discrete data parts can be organized in whatever order you like; they do not have to stay in their traditional hierarchical order.

### Reorder the Date Hierarchy

You can order discrete dates according to any hierarchy that produces the views you want. In the example below, Quarter is shown before Year of Order Date, allowing the user to analyze quarterly profit trends over years.



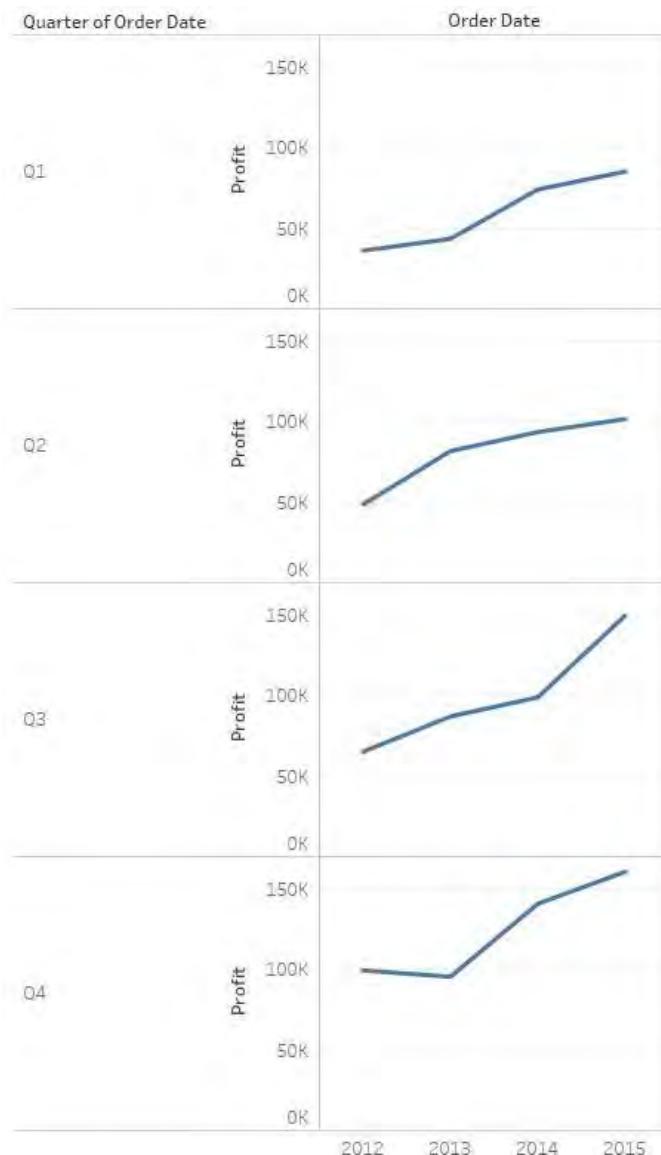
### Change Hierarchical Order of Date Fields

1. Drag a date field into the view to the **Rows** or **Columns** shelf.
2. Drag a measure to the field (for example, Profit) to Rows.
3. Click the plus (+) sign in the date field to expand the date hierarchy.
4. Drag fields around on the **Rows** or **Columns** shelves to reorder the hierarchy.

# Tableau for the Business User

## Different Date Parts on Different Shelves

Different date parts can be placed on different shelves. The view below, the Year of Order date is on Columns, while the Quarter of Order Date is on Rows.



## Place Date Parts on Different Shelves

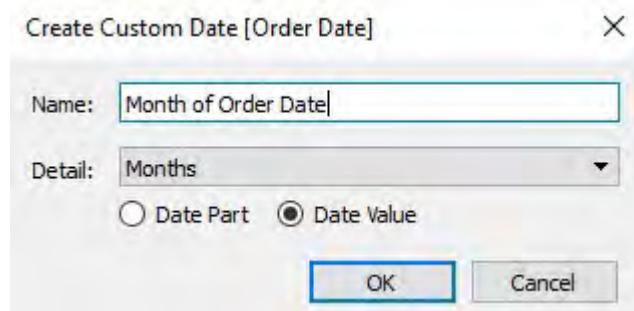
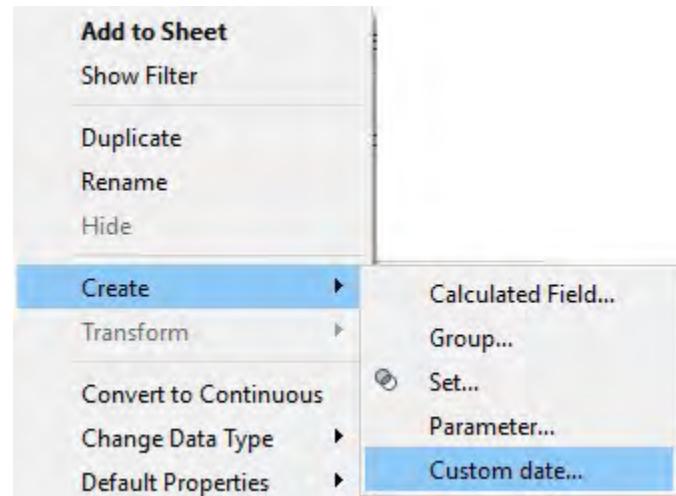
1. Drag the discrete date field into the view the **Rows** or **Columns** shelf.
2. Click the plus (+) sign in the date field to expand the date hierarchy.
3. Select one of the expanded date parts and move it to a different shelf.

## Creating Custom Dates

Custom dates are calculated date fields that you can save in the **Data** pane and reuse these new fields as either discrete date parts or continuous date values. Using custom dates breaks the natural date hierarchy created by Tableau and allows each field to represent just the date interval – like a **DATETRUNC( )** function.

### Create a Custom Date

1. In the **Data** pane, right-click on the date field from which to create the custom date. Point to **Create** and select **Custom Date**.
2. In the **Create Custom Dialog** box, give the new custom date field a meaningful name in the Name field. By default, the field is named based on the selected type of date field (discrete or continuous) and date interval.
3. From the Detail drop-down list, select the date type you want to use.
4. Choose **Date Part** to set the date as discrete, or **Date Value** to set the date as continuous.
5. Click **OK**. The new date field has been added to the **Dimensions** in the **Data** pane.



## Quick Reference Guide

### SETTING THE DATE LEVEL

1. Drag a date field to the **Rows or Columns** shelf.
2. Click the drop-down arrow on the date field and select the desired date/time level (year, quarter, month, week, day, hour, etc.)
3. Alternatively, right-click and drag a date field to the **Rows or Columns** shelf. A Drop Field menu will appear. Select the specific date level to use.

### CHANGE THE HIERACHICAL ORDER OF DATE FIELDS

1. Drag a date field into the view to the **Rows or Columns** shelf.
2. Drag a measure to the field (for example, Profit) to Rows.
3. Click the plus (+) sign in the date field to expand the date hierarchy.
4. Drag fields around on the **Rows or Columns** shelves to reorder the hierarchy.
5. Drag a date field to the **Rows or Columns** shelf.
6. Click the drop-down arrow on the date field and select the desired date/time level (year, quarter, month, week, day, hour, etc.)
7. Alternatively, right-click and drag a date field to the **Rows or Columns** shelf. A Drop Field menu will appear. Select the specific date level to use.

### USE DATE PARTS ON DIFFERENT SHELVES

1. Drag the discrete date field into the view to the **Rows or Columns** shelf.
2. Click the plus (+) sign in the date field to expand the date hierarchy.
3. Select one of the expanded date parts and move it to a different shelf.

### CREATE A CUSTOM DATE

1. In the **Data** pane, right-click on the date field from which to create the custom date. Point to **Create** and select **Custom Date**.
2. In the **Create Custom Dialog** box, give the new custom date field a meaningful name in the Name field. By default, the field is named based on the selected type of date field (discrete or continuous) and date interval.
3. From the **Detail** drop-down list, select the date type you want to use.
4. Choose **Date Part** to set the date as discrete, or **Date Value** to set the date as continuous.
5. Click **OK**. The new date field has been added to the **Dimensions** in the **Data** pane.

---

# USING MULTIPLE MEASURES IN A VIEW

---

This module contains the following:

- Using Measure Values and Measure Names in a View
- Combined or Shared Axis Charts
- Dual Axis Charts
- Quick Reference Guide

## Measure Names and Measure Values

Measure values and measure names are Tableau-generated fields that serve as containers for more than one measure. You can see the **Measure Names** field at the bottom of the list of **Dimensions** and the **Measure Values** field at the bottom of the **Measures** list in the Data pane.

When you create a combined axis or dual axis view, these fields appear in the view automatically. Additionally, a new **Measure Values** card appears showing the included fields.

The screenshot shows the Tableau Data pane with two sections: Dimensions and Measures. In the Dimensions section, the 'Measure Names' field is circled in red. In the Measures section, the 'Measure Values' field is also circled in red.

**Dimensions**

- Area Code
- Date
- Market
- Market Size
- Product
- Product Type
- State
- Type
- Measure Names**

**Measures**

- Budget COGS
- Budget Margin
- Budget Profit
- Budget Sales
- Cogs
- Inventory
- Margin
- Marketing
- Profit
- Sales
- Total Expenses
- Latitude (generated)*
- Longitude (generated)*
- Number of Records
- Measure Values**

## Invoking Measure Names/Measure Values

When creating a crosstab with multiple measures, drag the second measure to the pane of the crosstab until **Show Me** appears.

		Market			
Product Type	Product	Central	East	South	West
Coffee	Amaretto	\$14,012	\$2,994		\$9,263
	Colombian	\$28,911	\$47,385	\$21,663	\$30,352
	Decaf Irish Cream	\$26,157	\$6,262	\$11,596	\$18,233
Espresso	Caffe Latte			\$15,443	\$20,456
	Caffe Mocha	\$35,218	\$16,646	\$14,166	\$18,874
	Decaf Espresso	\$24,483	\$7,720	\$15,381	\$30,578
	Regular Espresso			\$24,031	
Herbal Tea	Chamomile	\$36,571	\$11,111		
	Lemon	\$21,982	\$27,177	\$14,494	\$32,273
	Mint	\$9,335	\$11,991		\$14,384
Tea	Darjeeling	\$30,284	\$14,094		\$28,773
	Earl Grey	\$32,883	\$6,507		\$27,382
	Green Tea	\$5,209	\$11,576		\$16,065

# Tableau for the Business User

Invoking **Measure Names** and **Measure Values** has made four changes:

- **Measure Values** shelf appears holding **SUM(Profit)** and **SUM(Sales)**
- **SUM (Sales)** on **Text** has been replaced by **Measure Values**
- **Measure Names** has been added to the Columns shelf to provide the splicing by measure (**Profit** and **Sales**)
- **Measure Names** has been added to the filter shelf with **Profit** and **Sales** checked (this is how Tableau knows what measures to show on the crosstab).



Pages		Columns		Market		Measure Names																																																																																																																																																					
		Rows		Product Type		Product																																																																																																																																																					
<b>Filters</b> <span style="background-color: #00AEEF; color: white; padding: 2px;">Measure Names</span>  <b>Marks</b> <input type="checkbox"/> Automatic <span style="border: 1px solid #ccc; padding: 2px;">Color</span> <span style="border: 1px solid #ccc; padding: 2px;">Size</span> <span style="border: 1px solid #ccc; padding: 2px;">Text</span> <span style="border: 1px solid #ccc; padding: 2px;">Detail</span> <span style="border: 1px solid #ccc; padding: 2px;">Tooltip</span> <span style="background-color: #00AEEF; color: white; padding: 2px;">Measure Values</span>  <b>Measure Values:</b> <span style="background-color: #00AEEF; color: white; padding: 2px;">SUM(Profit)</span> <span style="background-color: #00AEEF; color: white; padding: 2px;">SUM(Sales)</span>				<b>Market</b> <table border="1"> <thead> <tr> <th rowspan="2">Product Type</th> <th rowspan="2">Product</th> <th colspan="2">Central</th> <th colspan="2">East</th> <th colspan="2">South</th> <th colspan="2">West</th> </tr> <tr> <th>Profit</th> <th>Sales</th> <th>Profit</th> <th>Sales</th> <th>Profit</th> <th>Sales</th> <th>Profit</th> <th>Sales</th> </tr> </thead> <tbody> <tr> <td>Coffee</td> <td>Amaretto</td> <td>\$5,104</td> <td>\$14,012</td> <td>\$1,010</td> <td>\$2,994</td> <td></td> <td></td> <td>(\$1,224)</td> <td>\$9,263</td> </tr> <tr> <td></td> <td>Colombian</td> <td>\$8,525</td> <td>\$28,911</td> <td>\$27,256</td> <td>\$47,385</td> <td>\$8,767</td> <td>\$21,663</td> <td>\$11,256</td> <td>\$30,352</td> </tr> <tr> <td></td> <td>Decaf Irish Cream</td> <td>\$9,635</td> <td>\$26,157</td> <td>\$2,726</td> <td>\$6,262</td> <td>\$2,935</td> <td>\$11,596</td> <td>(\$1,307)</td> <td>\$18,233</td> </tr> <tr> <td>Espresso</td> <td>Caffe Latte</td> <td></td> <td></td> <td></td> <td></td> <td>\$3,873</td> <td>\$15,443</td> <td>\$7,502</td> <td>\$20,456</td> </tr> <tr> <td></td> <td>Caffe Mocha</td> <td>\$14,642</td> <td>\$35,218</td> <td>(\$6,232)</td> <td>\$16,646</td> <td>\$5,202</td> <td>\$14,166</td> <td>\$4,066</td> <td>\$18,874</td> </tr> <tr> <td></td> <td>Decaf Espresso</td> <td>\$8,859</td> <td>\$24,483</td> <td>\$2,411</td> <td>\$7,720</td> <td>\$5,930</td> <td>\$15,381</td> <td>\$12,302</td> <td>\$30,578</td> </tr> <tr> <td></td> <td>Regular Espresso</td> <td></td> <td></td> <td>\$10,065</td> <td>\$24,031</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Herbal Tea</td> <td>Chamomile</td> <td>\$14,435</td> <td>\$36,571</td> <td>\$764</td> <td>\$2,193</td> <td>\$3,178</td> <td>\$11,183</td> <td>\$8,854</td> <td>\$25,631</td> </tr> <tr> <td></td> <td>Lemon</td> <td>\$6,253</td> <td>\$21,982</td> <td>\$7,902</td> <td>\$27,177</td> <td>\$2,593</td> <td>\$14,494</td> <td>\$13,121</td> <td>\$32,273</td> </tr> <tr> <td></td> <td>Mint</td> <td>\$4,069</td> <td>\$9,335</td> <td>(\$2,243)</td> <td>\$11,991</td> <td></td> <td></td> <td>\$4,328</td> <td>\$14,384</td> </tr> <tr> <td>Tea</td> <td>Darjeeling</td> <td>\$10,769</td> <td>\$30,284</td> <td>\$6,500</td> <td>\$14,094</td> <td></td> <td></td> <td>\$11,784</td> <td>\$28,773</td> </tr> <tr> <td></td> <td>Earl Grey</td> <td>\$10,334</td> <td>\$32,883</td> <td>\$3,404</td> <td>\$6,507</td> <td></td> <td></td> <td>\$10,426</td> <td>\$27,382</td> </tr> <tr> <td></td> <td>Green Tea</td> <td>\$1,227</td> <td>\$5,209</td> <td>\$5,654</td> <td>\$11,576</td> <td></td> <td></td> <td>(\$7,112)</td> <td>\$16,065</td> </tr> </tbody> </table>		Product Type	Product	Central		East		South		West		Profit	Sales	Profit	Sales	Profit	Sales	Profit	Sales	Coffee	Amaretto	\$5,104	\$14,012	\$1,010	\$2,994			(\$1,224)	\$9,263		Colombian	\$8,525	\$28,911	\$27,256	\$47,385	\$8,767	\$21,663	\$11,256	\$30,352		Decaf Irish Cream	\$9,635	\$26,157	\$2,726	\$6,262	\$2,935	\$11,596	(\$1,307)	\$18,233	Espresso	Caffe Latte					\$3,873	\$15,443	\$7,502	\$20,456		Caffe Mocha	\$14,642	\$35,218	(\$6,232)	\$16,646	\$5,202	\$14,166	\$4,066	\$18,874		Decaf Espresso	\$8,859	\$24,483	\$2,411	\$7,720	\$5,930	\$15,381	\$12,302	\$30,578		Regular Espresso			\$10,065	\$24,031					Herbal Tea	Chamomile	\$14,435	\$36,571	\$764	\$2,193	\$3,178	\$11,183	\$8,854	\$25,631		Lemon	\$6,253	\$21,982	\$7,902	\$27,177	\$2,593	\$14,494	\$13,121	\$32,273		Mint	\$4,069	\$9,335	(\$2,243)	\$11,991			\$4,328	\$14,384	Tea	Darjeeling	\$10,769	\$30,284	\$6,500	\$14,094			\$11,784	\$28,773		Earl Grey	\$10,334	\$32,883	\$3,404	\$6,507			\$10,426	\$27,382		Green Tea	\$1,227	\$5,209	\$5,654	\$11,576			(\$7,112)	\$16,065		
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In the above crosstab, adding both the **Sales** and **Profit** fields to the view invoked the **Measure Values** and **Measure Names** fields, with a column of data for each measure now in the crosstab.

Additional measures can be added to the crosstab by dragging a measure to the **Measure Values** shelf, dragging a measure to the pane, or selecting the measure from the **Measure Names** filter. Conversely, a

## Tableau for the Business User

measure can be removed by unchecking the measure from the **Measure Names** filter or by dragging the measure out of the **Measure Values** shelf.

## Combined or Shared Axis Charts

Combined (or "shared") axis charts have more than one measure on the same axis, which is useful for viewing multiple measures on the same scale.

A combined-axis chart uses multiple measures on the same axis and highlights the relationship between measures.



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## Build a Combined-Axis Chart

1. Drag a measure to Rows.



2. Drag a second measure on to the vertical axis, dropping it when you see the light green double-bar icon.
3. Drag a dimension to Columns.
4. To color by Measure Names, drag an additional instance of Measure Names from Columns to Color on the Marks card, and edit the colors as desired.



## Creating Dual Axis Charts

Dual axis charts are used to show two different measures compared against each other. They use two measure axes and a single dimension axis. Dual axis charts are used when looking to show:

- Two measures with different mark types
- Two measures using two different scales
- Two measures with different measurement units
- Two measures with same scale and units

### Build a Dual Axis Chart

1. Drag a dimension to **Columns**
2. Drag a measure to **Rows**.
3. Drag another measure onto the view to the opposite axis and drop the field when you see the black dashed line and single green ruler.
4. If you have two measures that have the same measurement units and you want the scales to be the same on the axis, right-click the axis of the second measure you added and choose **Synchronize Axis**.

**NOTE:** You can only synchronize the second axis to the first.

## Dual Axis Chart with Multiple Mark Types

There are times when you want to use different marks for each distinct measure in your view. For example, you may want to create a view with a line showing a target across months and a bar chart showing actual values across those months. This type of encoding is also known as a combo chart.

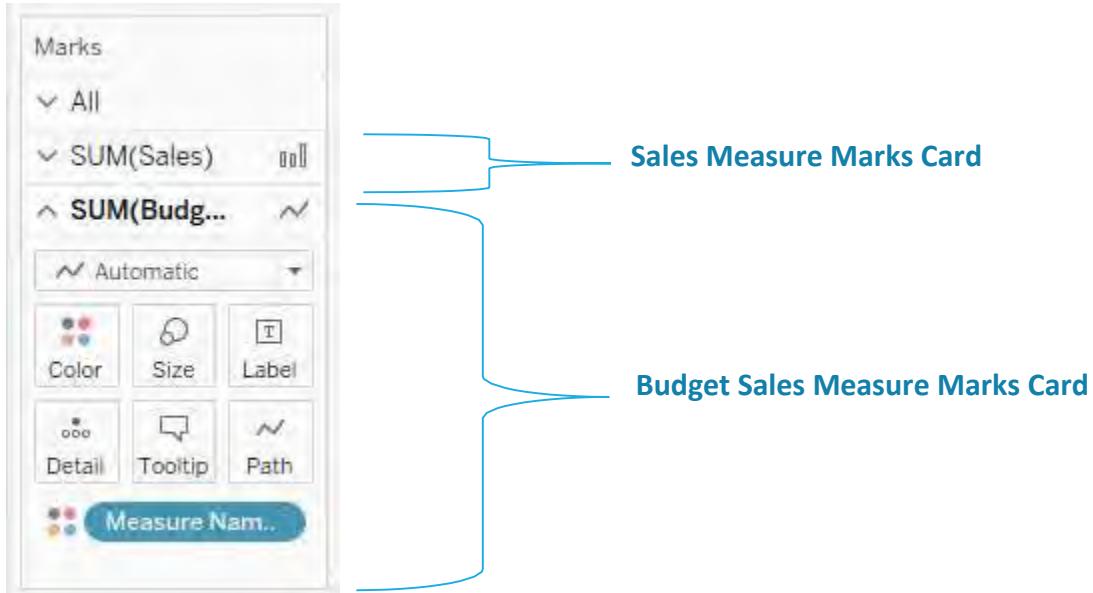
When using a dual axis chart, Tableau creates a marks card for each measure, allowing you to independently set the properties of that mark.

### Build a Dual Axis Chart with Multiple Mark Types

1. Drag a dimension to **Columns**
2. Drag a measure to **Rows**.
3. Drag another measure to **Rows** next to the first measure.
4. Right-click the second measure and choose **Dual Axis**.
5. On the **Marks** card, change the marks types of each individual measure.

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Notice the split Marks card allowing you to set the properties independently for the measure that you added to the view.



## Quick Reference Guide

### CREATE COLUMNS OF MULTIPLE MEASURES IN A CROSSTAB

1. Create the shell of a crosstab by dragging dimensions to columns and/or rows.
2. Add a single measure to text.
3. With one measure already in the crosstab, drag a second measure to the pane until **Show Me** appears.
4. Drop second measure in pane to activate **Measure Names** and **Measure Values**.
5. To add additional measures to the cross tab, do one of the following:
  - From the **Measure Names** filter, select all desired measures
  - Drag additional measures to the **Measure Values** shelf
  - Drag additional measures to the pane until **Show Me** appears.

### CREATE A SHARED/COMBINED AXIS CHART

1. Create a graph with dimensions and a single measure
2. To add a secondary measure that shares the same axis as the first measure, drag the secondary measure to the axis until a green double ruler appears.
3. Drop the measure on the axis to activate **Measure Names** and **Measure Values**
4. To add additional measures to the chart, do one of the following:
  - From the **Measure Names** filter, select all desired measures
  - Drag additional measures to the **Measure Values** shelf
  - Drag additional measures to the axis until the green double ruler appears.

### CREATE A DUAL AXIS CHART

1. Drag a dimension to **Columns**
2. Drag a measure to **Rows**.
3. Drag another measure onto the view to the opposite axis and drop the field when you see the black dashed line and single green ruler.
4. If you have two measures that have the same measurement units and you want the scales to be the same on the axis, right-click the axis of the second measure you added and choose **Synchronize Axis**.

### CREATE A DUAL AXIS CHART WITH MULTIPLE MARK TYPES

1. Drag a dimension to **Columns**
2. Drag a measure to **Rows**.
3. Drag another measure to **Rows** next to the first measure.
4. Right-click the second measure and choose **Dual Axis**.
5. On the **Marks** card, change the marks types of each individual measure.

# CREATING SCATTER PLOTS

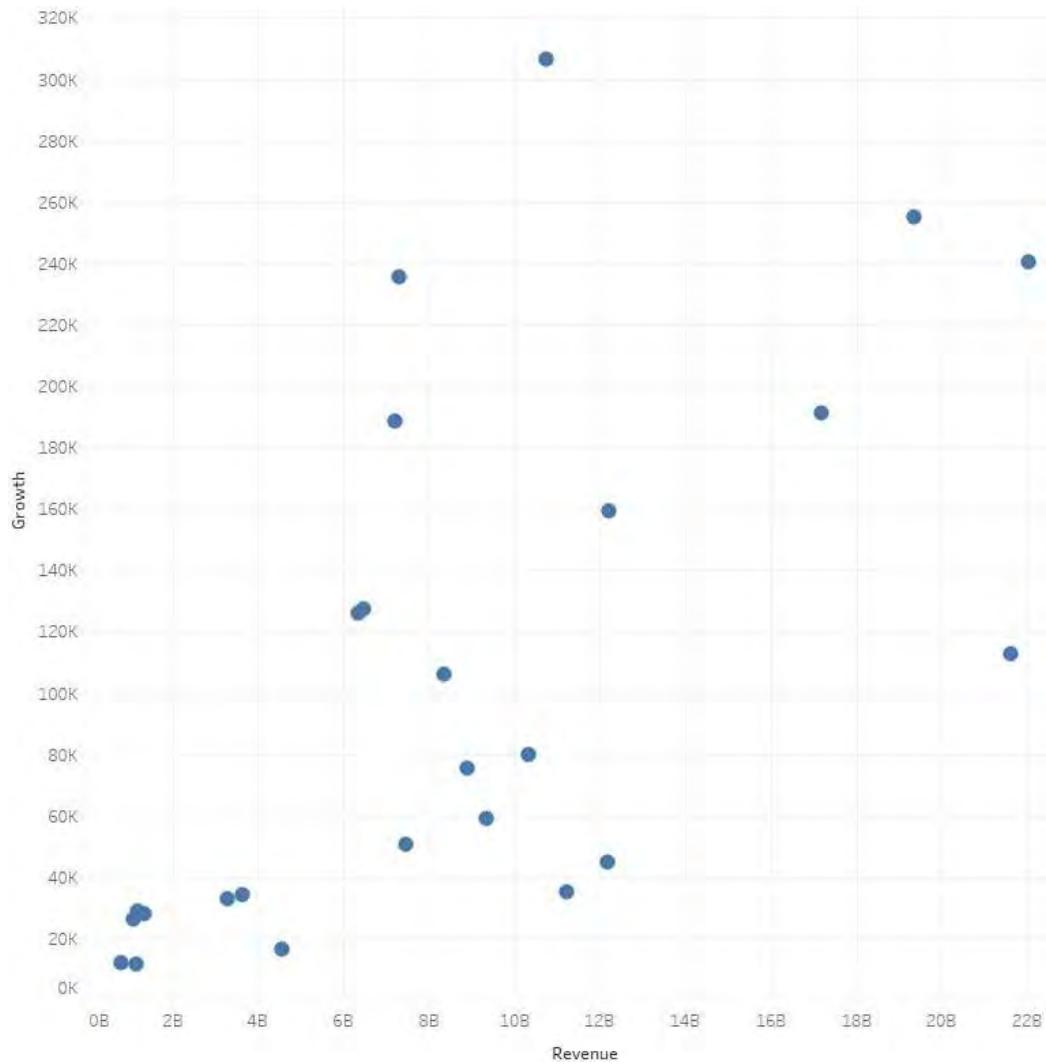
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This module contains the following:

- Showing Correlations and Outliers with Scatter Plots
- Best Practices for Scatter Plots
- Quick Reference Guide

## Fundamentals of Scatter Plots

A scatter plot is a set of points plotted on a horizontal and vertical axis. They are useful tools for showing the extent of correlation between two measures.



## Why Use a Scatter Plot?

Scatter plots are used to answer many questions about relationships between variables, for example:

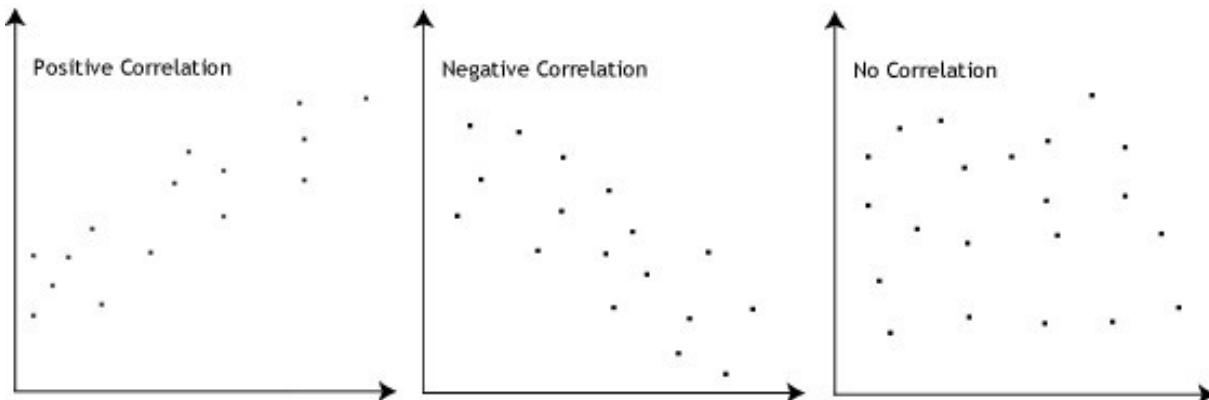
- What is the correlation between revenue and growth?
- What is the relationship between wind and topography during wildfire season?

Scatter plots are also helpful to show where data deviates from the overall trend. These are called outliers.

- Which products have high revenue but low growth?
- Are there years with low rainfall but also low incidences of wildfires?

### What are Correlations?

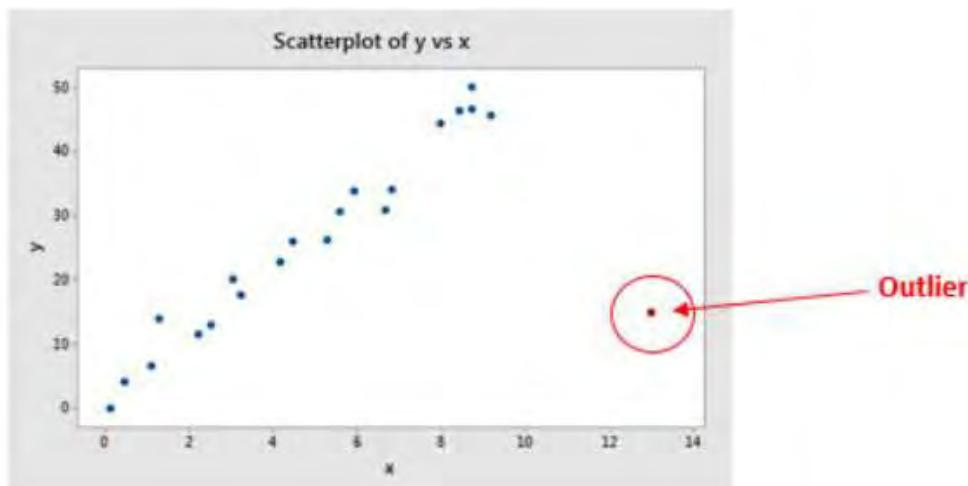
A correlation is the statistical relationship between two values. There are three types of correlation named for the direction of the correlation:



Correlation Type	Description
Positive	Both variables move in the same direction. As one variable increases, the other variable increases.
Negative	The variables move in opposite directions. As one variable increases, the other variable decreases.
No Correlation	Values in the variables show no apparent relationship.

### Outliers

Outliers are values that appear to not fit the pattern of the rest of the data. Scatter plots are a very effective visualization technique for seeing outliers.



## Tableau for the Business User

What should I do with outliers?

You could do one of the following:

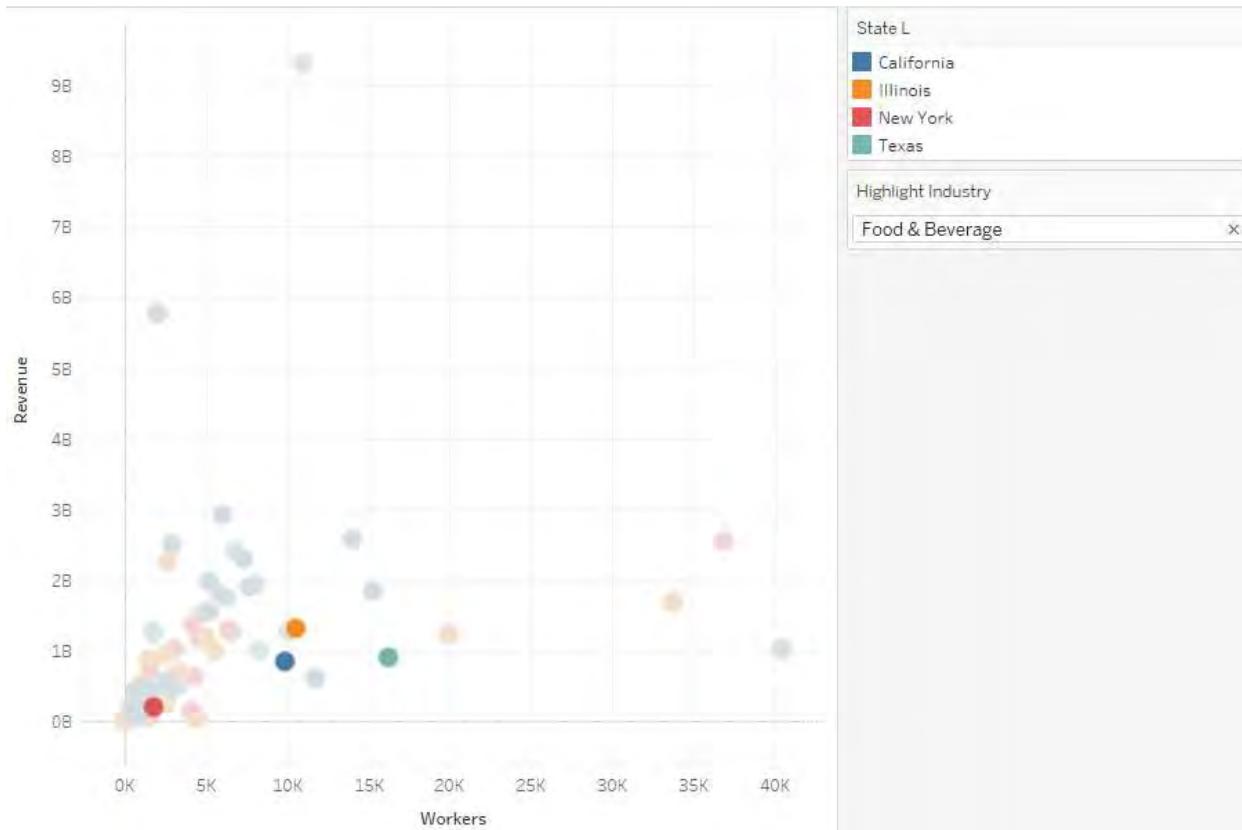
To	Do the Following:
Exclude the outliers from your view	CTRL + click and hover over the marks to select <b>Exclude</b> on the Tooltip menu.
Call out the outliers using an annotation	Right-click a mark, select Annotate, click <b>Mark</b> , use the <b>Edit Annotation</b> dialog box to create your annotation, and then click <b>OK</b> .

### Analyze Using the Highlighter

Use the highlighter to perform ad-hoc analysis of the data in scatter plots. The highlighter allows you to quickly find and compare specific values within the context of the data set.

To show the highlighter:

1. Select a specific discrete dimension within the view.
2. Right-click the field on the **Marks** card, and then click **Show Highlighter**.



## Tableau for the Business User

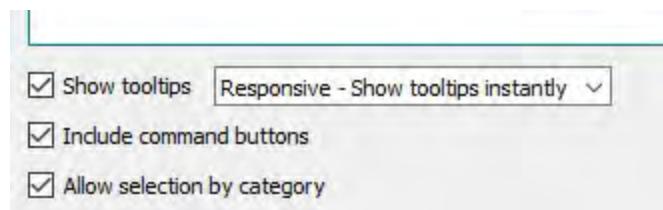
### Analyze Using the Tooltip

Discrete dimension or measures within a tooltip can become an active link if tooltip selection is turned on for your worksheet. You can select any of these dimensions or measures from within the tooltip to view any other marks in the view that have that same value.



When the category of **Bookcases** is selected in the tooltip, any mark in the view with a category of **Bookcases** is selected.

To turn this functionality on or off, click **Tooltip** on the **Marks** card, and then click the **Allow selection by category** check box at the bottom of the **Edit Tooltip** dialog box.



### Best Practices for Scatter Plots

- Use **Color, Shape, and Size** for dimensions with fewer than 10 members
- Use **Detail** on the **Marks** card for dimensions with many members
- Use a highlighter to allow fast ad-hoc search and comparisons when there are many marks
- Consider using transparency, change the shape and size of marks, reduce the amount of data to limit the number of marks to better see more individual marks.

## Quick Reference Guide

### CREATE A SCATTER PLOT

1. Select two **Measures** that to view the relationship between and drag one to **Column** and one to **Rows**.
2. Drag a dimension to **Detail** to show the points on the scatter plot.
3. Drag other dimensions to **Color**, **Size**, or **Shape** on the **Marks** card to allow for additional analysis.

### ADD A HIGHLIGHTER

1. From a dimension in the view, right-click and select **Show Highlighter**.
2. Use the highlighter to select a single member to highlight in the view.

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# TEXT TABLES AND ALTERNATIVES

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This module contains the following:

- Creating Text Tables
- Creating Highlight Tables
- Creating Heat Maps
- Quick Reference Guide

## Creating Text Tables

Text tables, or crosstabs, are one of the most common representation of data, and are useful for viewing specific numeric values.

Country	Year	Year						
		2000	2002	2004	2006	2008	2010	2012
United States	243	84	265	52	317	97	254	
Russia	187	38	191	41	146	25	140	
Germany	118	61	149	54	99	54	94	
Australia	183	2	156	2	149	3	114	
China	79	16	94	13	184	19	125	
Canada	31	74	17	69	34	90	55	
Italy	65	21	104	25	43	5	68	
Great Britain	54	6	57	1	77	1	126	
France	66	15	53	15	77	14	78	
Netherlands	79	8	77	13	61	11	69	
South Korea	73	7	52	19	78	18	61	
Japan	44	2	93	1	51	7	84	

### Create a New Crosstab

1. Drag a dimension from the **Data** pane to the **Columns** shelf.
2. Drag a dimension from the **Data** pane to the **Rows** shelf.
3. Drag a measure to **Text** on the **Marks** card.
4. To display more than just one measure, drag and drop the additional measures into the view (where it says **Show Me**) in the crosstab you have created. This action causes **Measure Names** and **Measure Values** to create a column for each measure. More information on **Measure Names** and **Measure Values** can be found in the Using Multiple Measures in a View module.

The crosstab shown above was created using the Olympic Results data as follows:

Drag this field	To
Years	Columns
Country	Rows
Total Medals	Text on Marks card

### Create a Crosstab from an Existing View

You can create a crosstab directly from an existing view by right-clicking the tab for the worksheet you want to duplicate, and choose **Duplicate as Crosstab**

Alternatively, with the worksheet to be duplicated active, from the **Worksheet** menu, choose **Duplicate as Crosstab**.

## Tableau for the Business User

### Grand Totals, Subtotals, and Changing Aggregation

The diagram illustrates a Tableau data view with the following structure:

Sport	Country	Year				Grand Total
		2000	2004	2008	2012	
<b>Athletics</b>	Australia	3	6	4	3	16
	Canada	-	-	1	1	2
	China	1	2	2	6	11
	France	-	5	2	2	9
	Germany	5	2	1	8	16
	Great Britain	6	7	4	6	23
	Italy	2	3	2	1	8
	Japan	1	2	4	1	8
	Russia	18	28	29	23	98
	<b>United States</b>	28	39	32	48	147
<b>Total</b>	<b>64</b>	<b>94</b>	<b>81</b>	<b>99</b>	<b>338</b>	
<b>Gymnastics</b>	Canada	-	1	-	-	1
	China	12	3	24	12	51
	France	2	1	2	1	6
	Germany	-	-	2	3	5
	Great Britain	-	-	1	8	9
	Italy	-	2	-	1	3
	Japan	-	9	7	7	23
	Netherlands	-	-	-	1	1
	Russia	25	8	2	12	47
	South Korea	2	2	1	1	6
<b>United States</b>	<b>6</b>	<b>19</b>	<b>20</b>	<b>10</b>	<b>55</b>	
<b>Total</b>	<b>47</b>	<b>45</b>	<b>59</b>	<b>56</b>	<b>207</b>	
<b>Grand Total</b>	<b>111</b>	<b>139</b>	<b>140</b>	<b>155</b>	<b>545</b>	

Annotations in the diagram:

- A bracket on the left labeled "Subtotals" groups the first ten rows under the "Athletics" sport.
- A bracket on the right labeled "Row Grand Totals" groups the last row under the "Grand Total" column.
- A bracket at the bottom labeled "Column Grand Totals" groups the last row under the "Grand Total" column.

### Adding Grand Totals and Subtotals

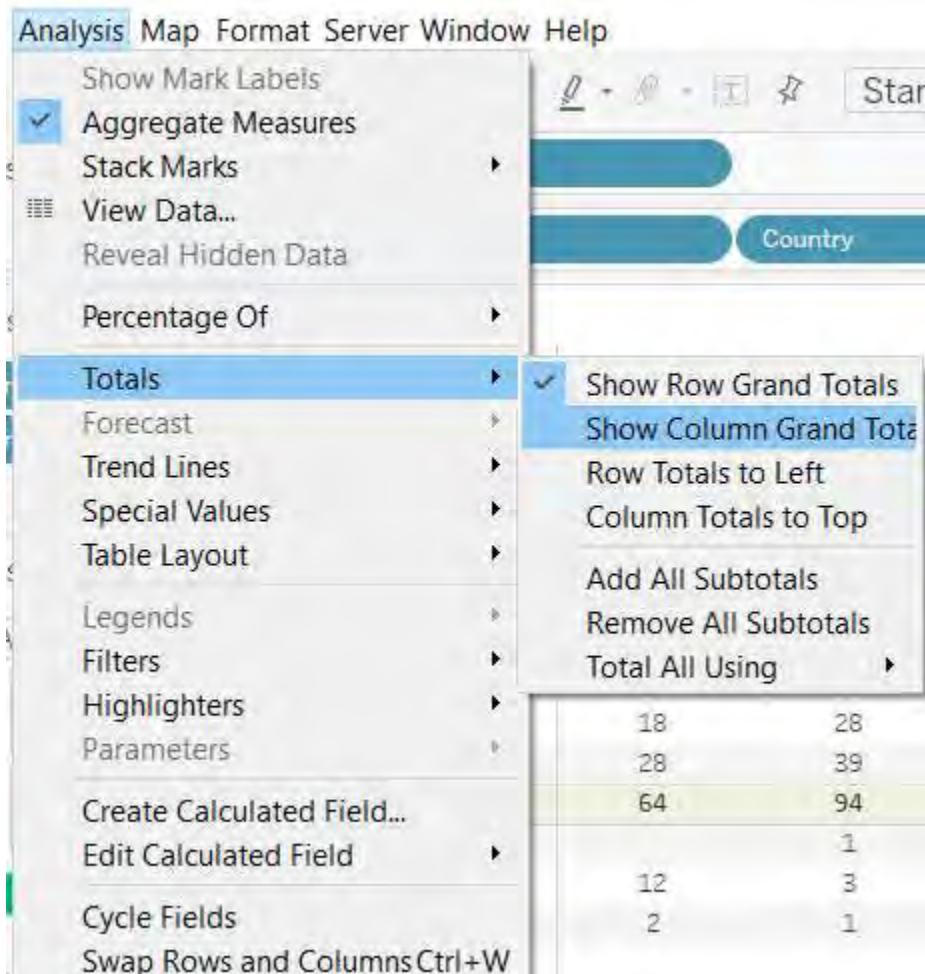
Commonly with crosstabs, you may want to show grand totals and subtotals. But they can be added to any view, not just crosstabs.

To add grand totals and subtotals, you can access the options from the **Analysis** menu or the **Totals** options on the **Analytics** pane.

## Tableau for the Business User

### Show Row and Column Totals

1. On the **Analytics** menu, select **Totals** and choose **Show Row Grand Totals**.
2. Repeat step one but choose **Show Column Grand Totals**.

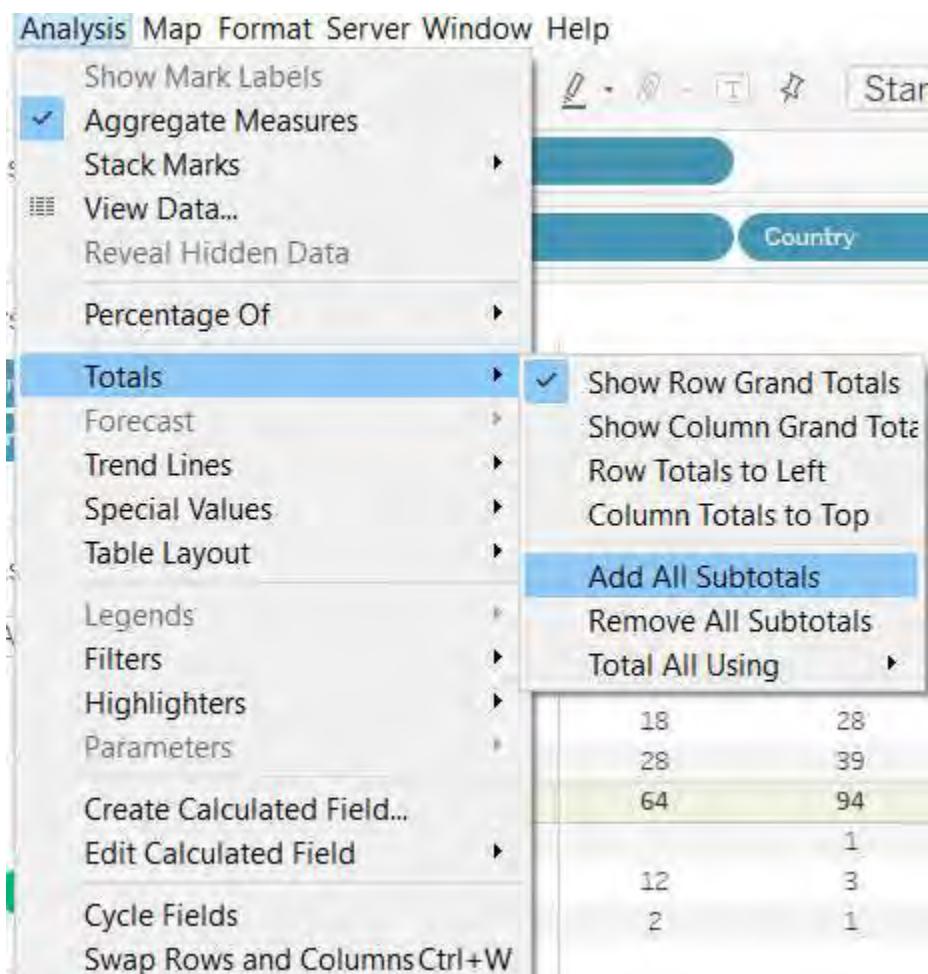


3. To remove grand totals, return to the **Analytics** menu, select **Totals**, and choose **Show Row Totals** or **Show Column Totals** again to uncheck and deactivate the grand totals.

## Tableau for the Business User

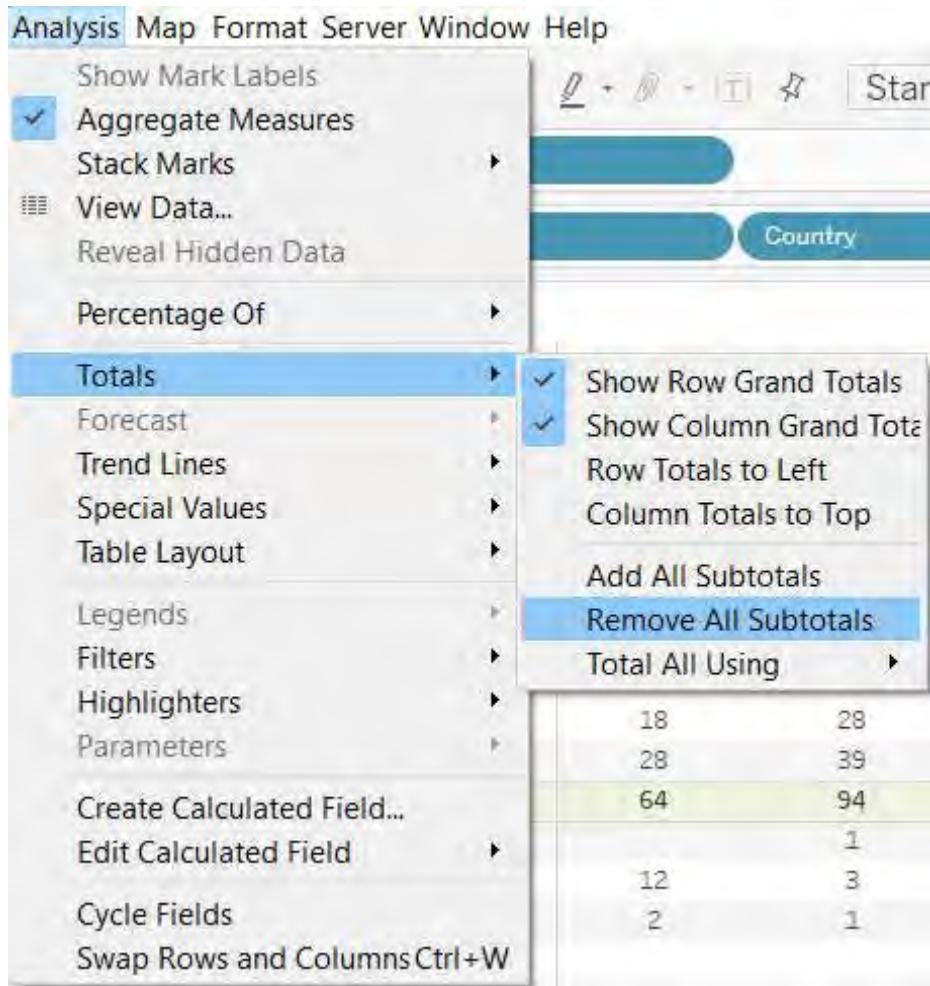
### Show Subtotals

1. On the **Analytics** menu, select **Totals** and choose **Add All Subtotals**.



## Tableau for the Business User

2. To remove subtotals, return to the **Analytics** menu, select **Totals**, and choose **Remove All Subtotals** to deactivate the subtotals.



### Using the Analytics Pane to Show Totals and Subtotals

1. From the Analytics pane, drag Totals to your view. Options to show Subtotals, Column Grand Totals, and Row Grand Totals appear. Drag Totals to the type of total you want to add to your view.



## Tableau for the Business User

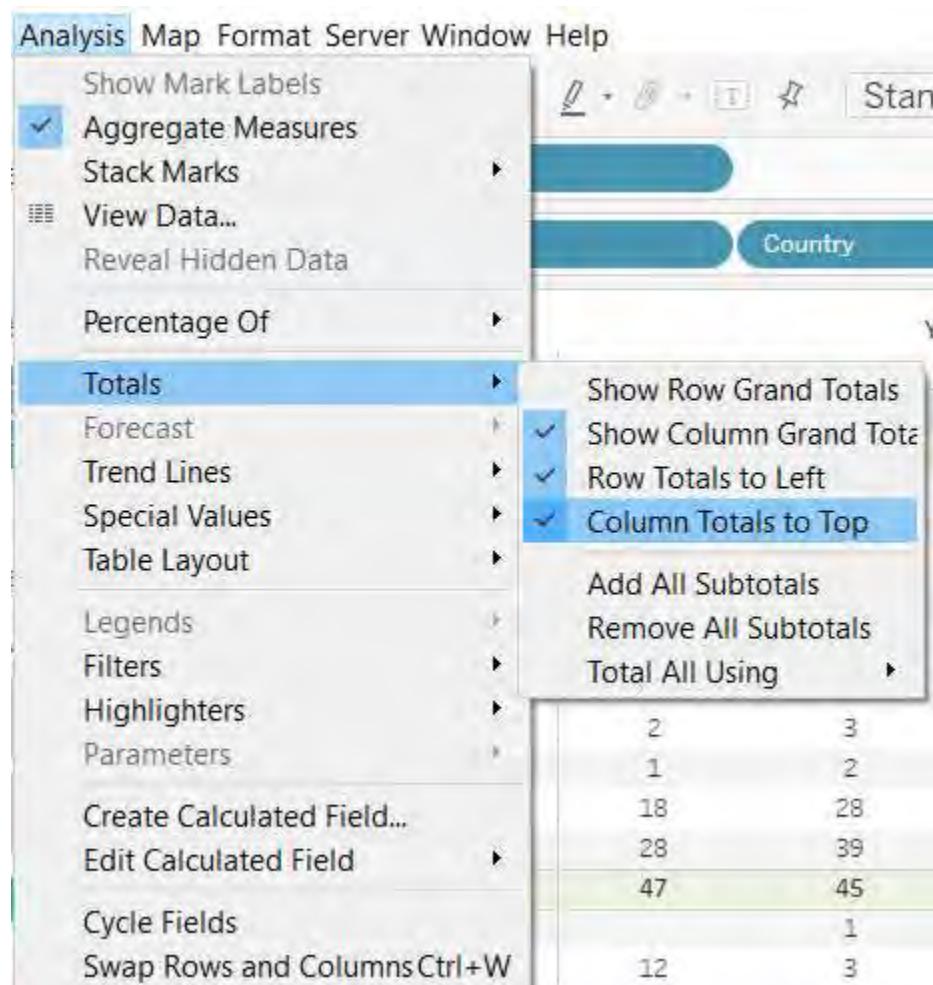
2. To remove totals, this must be done through the methods mentioned above from the Analysis menu.

### Position of Totals and Subtotals

By default, totals are placed at the bottom of the view and subtotals are placed to the right of the view. This position can be changed if desired.

You can change the position of the **Row Grand Totals** to appear to the left or right of the view, and **Column Grand Totals** to appear to the top or the bottom of the view.

From the **Analysis** menu, click **Totals** and then check or clear **Row Totals to Left** or **Column Totals to Top** to change the position of your totals.



## Tableau for the Business User

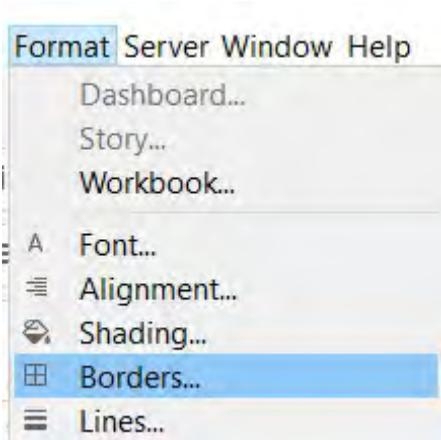
### Formatting

Crosstabs can be formatted to make totals stand out and easier to view.

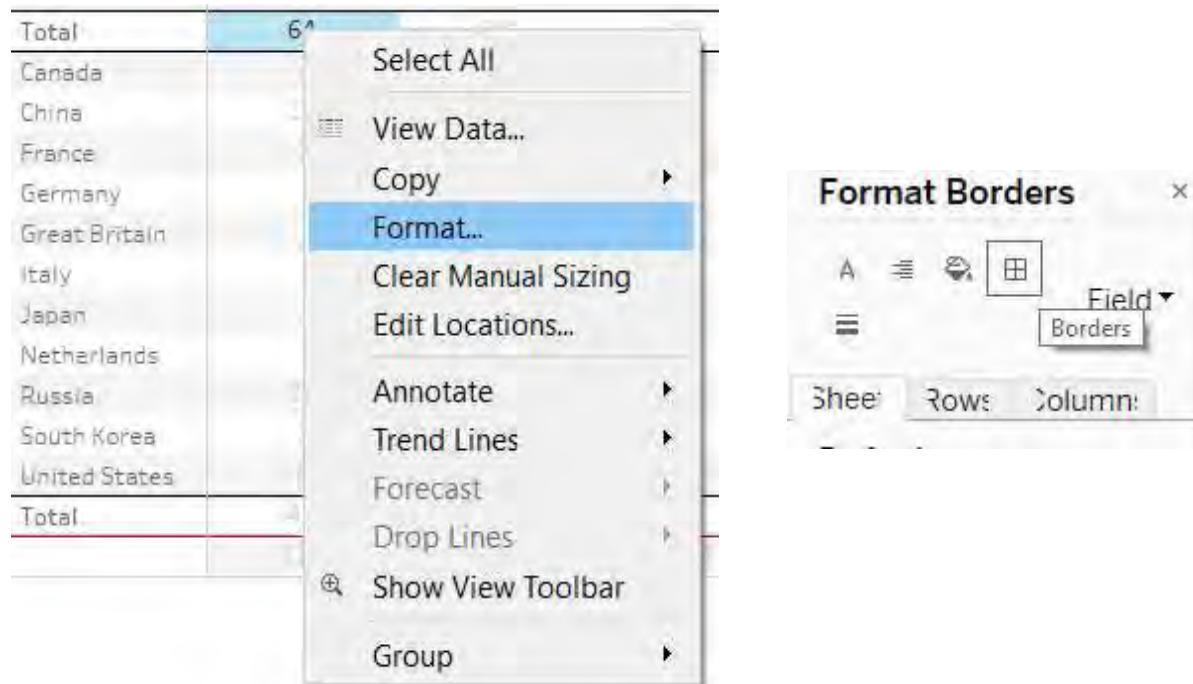
Sport	Country	Year			
		2000	2004	2008	2012
Athletics	Australia	3	6	4	3
	Canada			1	1
	China	1	2	2	6
	France		5	2	2
	Germany	5	2	1	8
	Great Britain	6	7	4	6
	Italy	2	3	2	1
	Japan	1	2	4	1
	Russia	18	28	29	23
	United States	28	39	32	48
Total		64	94	81	99
Gymnastics	Canada		1		
	China	12	3	24	12
	France	2	1	2	1
	Germany			2	3
	Great Britain			1	8
	Italy		2		1
	Japan		9	7	7
	Netherlands				1
	Russia	25	8	2	12
	South Korea	2	2	1	1
Total		47	45	59	56
Grand Total		111	139	140	155

**Borders** between the rows, including rows for subtotals and grand totals can be modified from the **Format** menu by clicking **Borders**.

## Tableau for the Business User

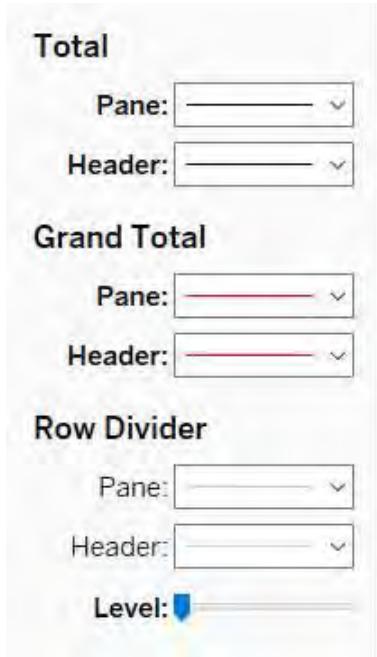


Alternatively, right click on the row to format and select **Format**. Select **Borders** from the Format pane.



Select the **Rows** tab and then adjust the **Pane** and **Header** lines in the **Total** and **Grand Total** sections. Use the **Level** slider in the **Row Divider** to draw the lines across each dimension as needed. The same approach can be used to add vertical dividers, by using the **Columns** tab rather than the **Rows**.

## Tableau for the Business User

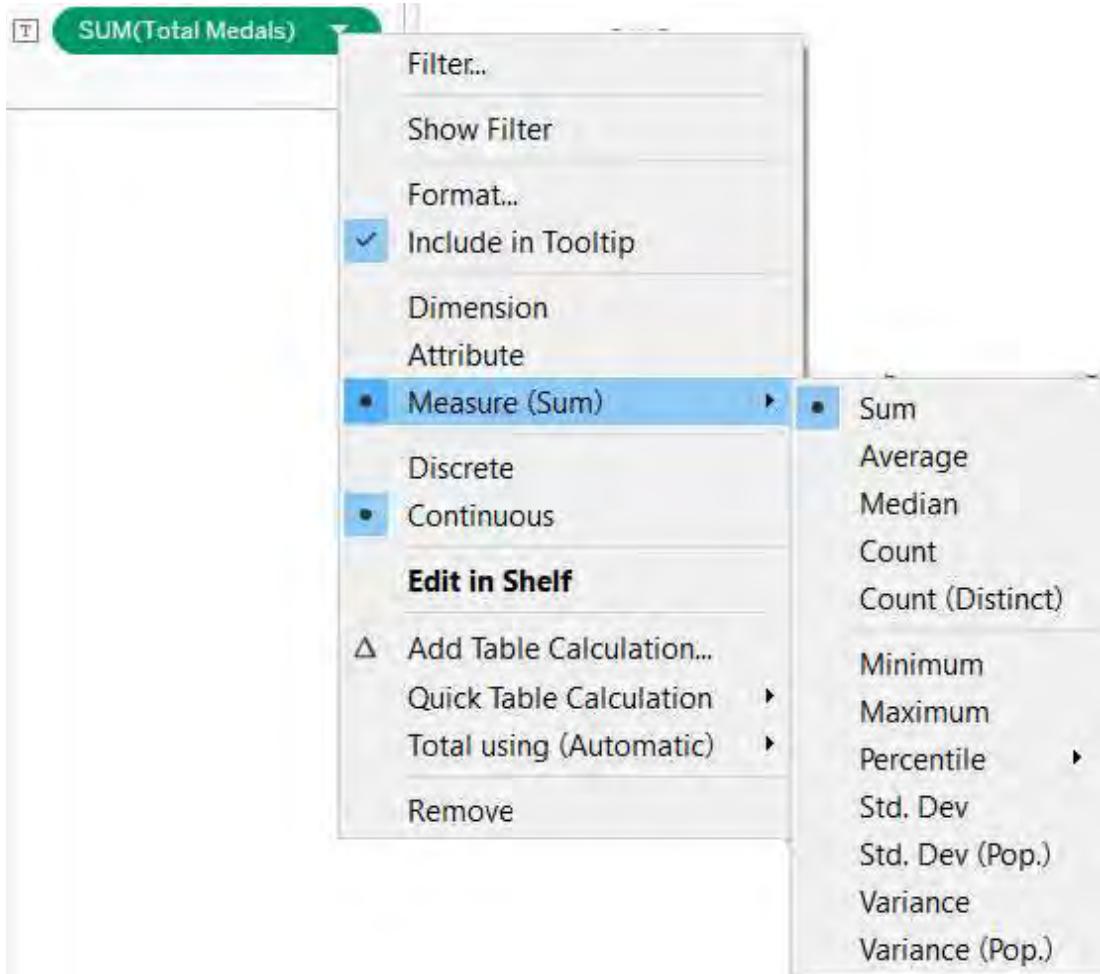


There are many other formatting options to explore including font, alignment, shading, borders, and lines (when using graphs).

### Changing the Aggregation

The aggregation of the marks can be changed from their default. Right click on the measure and select Measure from the context menu. From here, you can set the aggregation level (for example Sum, Average, Median, Count, Count (Distinct), Minimum, Maximum).

## Tableau for the Business User



## Creating Highlight Tables

It is not always easy to find outliers in a crosstab. Other visualizations, like highlight tables and heat maps, allow for faster insight. A highlight table is simply a color-encoded crosstab, that calls attention to very high or low data values while still showing detailed values in text. It emphasizes outliers and patterns in color, making it easier to find those important data values quicker than in a crosstab.

Sport	Year			
	2000	2004	2008	2012
Athletics	64	94	81	99
Basketball	47	60	48	60
Canoeing	32	42	44	37
Cycling	59	58	47	64
Equestrian	35	37	37	33
Fencing	53	52	51	56
Football	30	51	33	71
Gymnastics	47	45	59	56
Hockey	80	80	66	81
Rowing	106	100	102	108
Swimming	156	161	184	180
Volleyball	36	46	48	48
Waterpolo	51	38	51	38
Grand Total	796	864	851	931

In the example highlight table above, Total Medals Won are shown in color, and are broken down by Years for various Sports played in the Summer Olympics. The highest values are shown in dark blue, with the lowest values in light blue. Notice that Tableau automatically adjusts the font color for the labels against the darker backgrounds.

### To Create a Highlight Table

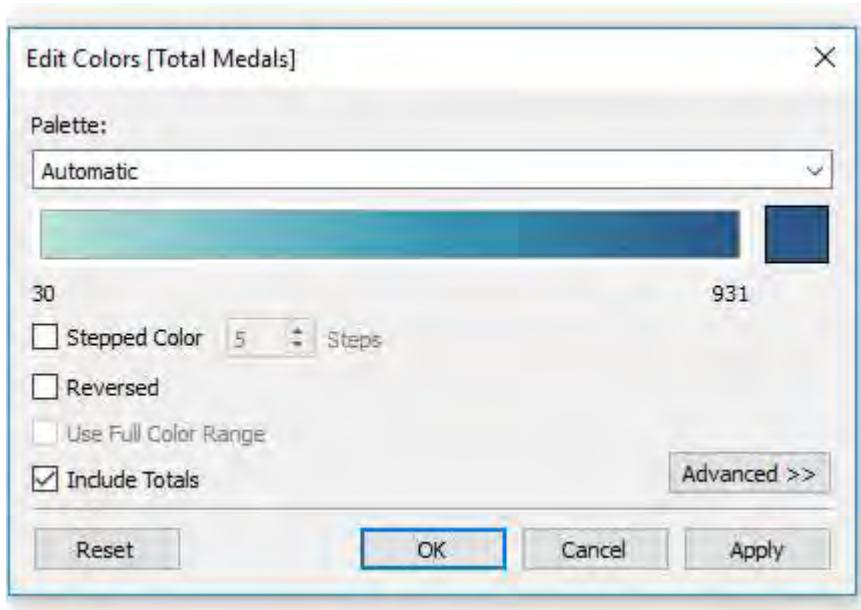
1. Drag at least one dimension to the **Rows** shelf or **Columns** shelf.
2. Drag a measure to **Text** on the **Marks** card.
3. To display more than just one measure, drag and drop the additional measures into the view (where it says **Show Me**) in the crosstab you have created. This action causes **Measure Names** and **Measure Values** to create a column for each measure. More information on **Measure Names** and **Measure Values** can be found in the Using Multiple Measures in a View module.
4. If there is only one measure, drag another instance of the same measure to **Color** on the **Marks** card.  
 OR  
 Drag **Measure Values** to **Color** on the **Marks** card

## Tableau for the Business User

5. On the **Marks** card, from the drop-down list of mark types, choose **Square**.

### To Show Totals in a Highlight Table

1. From the **Analysis** menu, select **Totals**, and choose Show **Column Grand Totals** (or similarly row grand totals or all subtotals). Notice how the totals are not included in the color encoding. Alternatively, you can access **Totals** from the **Analytics** pane. Drag **Totals** into the view and select which **Totals** to include: **Subtotals**, **Column Grand Totals**, or **Row Grand Totals**.
2. Tableau allows you to decide whether you want to include the Totals in the color encoding. To include it, click **Color** on the **Marks** card, and then click **Edit Colors**.
3. In the **Edit Colors** dialog, select **Include Totals** to include the totals in the color encoding, then click **Apply**.



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Note that including the totals in the color encoding will skew the coloring with these higher totals.

Sport	2000	2004	2008	2012
Athletics	64	94	81	99
Basketball	47	60	48	60
Canoeing	32	42	44	37
Cycling	59	58	47	64
Equestrian	35	37	37	33
Fencing	53	52	51	56
Football	30	51	33	71
Gymnastics	47	45	59	56
Hockey	80	80	66	81
Rowing	106	100	102	108
Swimming	156	161	184	180
Volleyball	36	46	48	48
Waterpolo	51	38	51	38
Grand Total	796	864	851	931

4. To remove totals from the color encoding, clear the **Include Totals** check box, and click OK.

## Creating Heat Maps

The steps to create a heat map are very similar to crosstabs and highlight tables, with one exception. Heat Maps allow for encoding by both size and color, allowing for more informative and engaging visualizations.

1. Drag one (or more) dimension to **Columns** and one (or more) dimension to **Rows** to build a crosstab.
2. Drag one measure to Size and one measure to Color on the **Marks** card.
3. Use the **Marks** card to adjust shape sizes and color palette if needed.



In this example, the total medals won is shown by the size of the squares, and by color intensity. Different measures can be used for color and size.

## Quick Reference Guide

### CREATE A CROSSTAB

1. Drag a dimension from the **Data** pane to the **Columns** shelf.
2. Drag a dimension from the **Data** pane to the **Rows** shelf.
3. Drag a measure to **Text** on the **Marks** card.
4. To add more than one measures, drag the next measure to the view (**Show Me**) to create **Measure Names** and **Measure Values**.

### CREATE A HEAT MAP

1. Drag one (or more) dimension to **Columns** and one (or more) dimension to **Rows** to build a crosstab.
2. Drag one measure to **Size** and one measure to **Color** on the **Marks** card.
3. Use the **Marks** card to adjust shape sizes and color palette if needed.

### CREATE A HIGHLIGHT TABLE

1. Drag at least one dimension to the **Rows** shelf or **Columns** shelf to build a crosstab.
2. Drag a measure to **Text** on the **Marks** card.
3. If any subsequent measures are to be displayed, drag and drop them into the view with the existing measure in the highlight table you have created. This action causes **Measure Names** and **Measure Values** to create a column for each measure.
4. If there is only one measure, drag another instance of the same measure to **Color** on the **Marks** card.
5. If there are multiple measures, drag **Measure Values** to **Color** on the **Marks** card
6. On the **Marks** card, from the drop-down list of mark types, choose **Square**.

# COMPARING DATA CONNECTION OPTIONS

---

This module contains the following:

- Understanding Data Connection Options
- Overview for Joins, Cross Database Joins, Blending, and Unions
- Joins
- Cross Database Joins
- How Data Blending Works
- Using Data Blending
- Filter Across Multiple Data Sources
- Unions
- Quick Reference Guide

## Understanding Data Connection Options

Until now, we have only addressed connecting to a single data source at a time. However, there are many instances where you may need to connect to multiple data tables or files and combine them for use within Tableau.

Method	Description	Use this when...
<b>Join</b>	A relationship of two tables in a single database using a common field.	Your data exists in two separate tables in your database.
<b>Blend</b>	A combination of data from different databases or text tables based on a common dimension. Behaves like a left join.	Your data exists in different data sources.
<b>Cross Database Join</b>	A relationship across two different databases or text tables based on a common field.	Your data exists in different data sources.
<b>Union</b>	Appended rows from different tables with the same column names.	The tables have the same columns but are not stored in the same file.

### Join

Joins relate two or more tables from one database into a single result set

- Tables require a common field to define the relationship between the rows.
- Usually a key field or indexed field

In the tables below, **Department ID** is the common field:

#### Employee Table

Department ID	Employee	Vacation Hours
1	A	12
2	B	15
3	C	20

#### Department Table

Department ID	Department Name
1	Sales
2	Marketing
4	R&D

Changing the join logic changes the results

#### Inner Join

Returns only transactions that occur in both tables and is the default join in Tableau.

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In the example (Employee Table and Department Table), only matches for Department IDs that appear in both tables are returned.

Department ID	Employee	Vacation Hours	Department Name
1	A	12	Sales
2	B	15	Marketing

Not returned:

- Employee and Vacation hours for Department ID 3 (no corresponding Row in Department table)
- Department ID 4 - R&D (no corresponding row in Employee Table)

### Left Join

Left join returns all rows from the left table and only matching rows from the right table

Department ID	Employee	Vacation Hours	Department Name
1	A	12	Sales
2	B	15	Marketing
3	C	20	

- In the example, the left join relationship more accurately reflects the actual employee vacation hours.
- The vacation hours for Department ID 3 is included because the record was in the table on the left.

### Right Join

Right join changes the direction of the join

Department ID	Employee	Vacation Hours	Department Name
1	A	12	Sales
2	B	15	Marketing
4			R&D

- In the example, a right join could help identify departments where no vacation hours have been taken.

### Full Outer Join

Full outer join returns all records from both tables

Department ID	Employee	Vacation Hours	Department Name
1	A	12	Sales
2	B	15	Marketing

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1	A	12	Sales
2	B	15	Marketing
3	C	20	
4			R&D

- Leaves nulls where no matches exist
- In the example, a full outer join could help discover where details are missing about a department, or where no vacation hours have been taken yet.

## Cross Database Join

Cross database joins relate two or more tables across different databases

- Not supported with some database combinations (consider blending)

Set up a multi-connection data source

Join tables from the different databases

- By default, uses an inner join, but can choose left join
- Different color tables and columns indicate different data connections

Performance considerations: row-level join

## Data Blending

An alternative to joining:

- Joins require data tables to reside in the same source
- Data blends can combine data from multiple, unrelated sources

Blending should not be a replacement for creating joins

- Joins are recommended if the data exists in the same source

Primary and secondary sources in a blend

- Primary source is the one that is used first in the view; all others are secondary
- Blending is done on member aliases of common dimensions
- Edit the relationship for custom definitions

## Calculations in Data Blends

- If you create table calculations across data sources, make sure data is aggregated at the same level
- Calculations you create are stored in the primary data source

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## Unions

Unions append rows from similar data sources together

- From tables in a single Excel file
- From multiple text files (.txt, .csv, .tab, .tsv) in a common folder or directory
- Require similar structure and column names

Before Union

Market	Category	Sales
East	A	\$5
East	B	\$10
South	B	\$15

Market	Category	Sales
South	C	\$10
East	A	\$20
South	C	\$5

After Union

Market	Category	Sales
East	A	\$5
East	B	\$10
South	B	\$15
South	C	\$10
East	A	\$20
South	C	\$5

## Merging Fields

Nulls can occur if columns aren't identical.

If columns represent the same thing but are simply misnamed, merge mismatched fields can be used to avoid nulls. In the example below, the column Sales was misspelled in the second file used in the Union. As a result, there are two fields containing sales information: Sales and Saales.

Nulls after a union

Market	Category	Sales	Saales
East	A	\$5	null
East	B	\$10	null
South	B	\$15	null
South	C	null	\$10
East	A	null	\$20
South	C	null	\$5

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After Merge mismatched fields

Market	Category	Sales&Saales
East	A	\$5
East	B	\$10
South	B	\$15
South	C	\$10
East	A	\$20
South	C	\$5

The Sales&Saales field can be renamed to Sales, and the union is ready for use in Tableau.

After renaming field name

Market	Category	Sales
East	A	\$5
East	B	\$10
South	B	\$15
South	C	\$10
East	A	\$20

## Joins

There are times when you may want to combine multiple data tables from a single source for use within Tableau. This collection of tables must contain a common key field. A join can be performed to combine the related data on those common fields, resulting in a virtual table that extends horizontally by adding the fields from the multiple data tables.

You can also join multiple tables in Tableau, but these relationships need to be defined for each new table included in the data source. There can be multiple clauses within each join, and clauses can be different when joining more than two tables.

## Overview of Join Types

There are four types of joins that can be used with your data in Tableau: inner, left, right, and full outer. The tables you can join and the different join types available for you to use depend on the file or database you connect to in Tableau. If the join type is not available, it will be greyed out in the options for the join.

Join Type	Description / Result	
Inner	An inner join returns a table that contains values that have matches in both tables.	
Left	A left join results in a table that contains values from the left table and corresponding matches from the right table.	

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Right	A right join results in a table that contains values from the right table and corresponding matches from the left table.	
Full Outer	A full outer join returns a table that contains all values from both tables.	

\*If no corresponding matches are not found when joining, you will see null values in the data grid.

In the example tables below, both tables contain a column for the Department ID field, but the values aren't the same in each table.

**Employee Table**

Department ID	Employee	Vacation Hours
1	A	12
2	B	15
3	C	20

**Department Table**

Department ID	Department Name
1	Sales
2	Marketing
4	R&D

Changing the join logic between these two tables changes the way Tableau displays the results. Review each example of joins.

**Inner Join**

An inner join is the default join in Tableau. An inner join returns instances that have been recorded in both tables. In the following example, using an inner join to relate the Employee to the Department table returns only records where a match is found for the Department ID in both the Employee and Department tables.

Department ID	Employee	Vacation Hours	Department Name
1	A	12	Sales
2	B	15	Marketing

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### Left Join

A left join returns all rows from the left table and only matching rows from the right table. The following example shows the results of Employee on the left and Department on the right.

Department ID	Employee	Vacation Hours	Department Name
1	A	12	Sales
2	B	15	Marketing
3	C	20	

Notice there is no Department Name for Department ID 3 since Department ID 3 is not in the Department table.

### Right Join

A right join uses logic similar to a left join, but changes the direction of the join. A right join returns all rows from the table on the right and only matching rows from the left table. If the database does not support a right join, you can achieve the same result by placing Department table on the left, and then creating a left join to the Employee table.

Department ID	Employee	Vacation Hours	Department Name
1	A	12	Sales
2	B	15	Marketing
4			R&D

Notice there is no Employee or Vacation Hours for Department ID 4 since Department ID 4 is not in the Employee table.

### Full Outer Join

A full outer join returns all records from both tables, and leaves nulls where there is no match between the two.

Department ID	Employee	Vacation Hours
1	A	12
2	B	15
3	C	20

Department ID	Department Name
1	Sales
2	Marketing
4	R&D

Department ID	Employee	Vacation Hours	Department Name
1	A	12	Sales
2	B	15	Marketing
3	C	20	
4			R&D

Since the Employee table does not contain Department ID 4, no employee or vacation hours for Department ID 4 are returned. Similarly, since the Department table does not contain Department ID 3, no Department Name for Department ID 3 is returned.

## Using Joins in Tableau

Combining tables from the same database require only a single connection in the data source. Typically, joining tables from the same database yeilds better performance because querying data that is stored on the same database takes less time and leverages the native capabilities of the database to perform the join.

### How to: Join tables from the same database

1. Launch Tableau Desktop and connect to your data.
2. On the **Data Source** page, select the file, database, or schema and double-click or drag a table to the canvas area labeled **Drag sheets here**.
3. To connect to a second table, double-click that table OR drag the table name to the canvas area.
4. The join icon will display the type of join used to connect your tables. You can mouse-over the icon to display a tooltip that describes the join.
5. To edit the join relationship, click on the join icon.
6. Add one or more join conditions by selecting a field from one of the available tables used in the data source, a join operator, and a field from the added table. Make sure the join condition reflects how you want to join the tables.
7. When finished, close the Join dialog box.

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## Cross-Database Joins

In the previous section, we discussed joining data from the same database or file. When related data is stored in tables across different databases or files, you can use a cross-database join to combine the tables.

To create a cross-database join you must create a multi-connection data source. Each data source must be added as their own connection to the different database or file before you join.

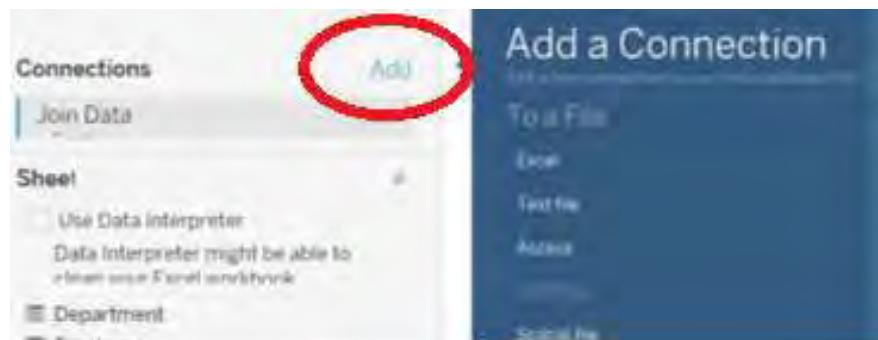
The screenshot shows the Tableau 'Connect' page on the left and the 'Data' pane on the right. The 'Connect' page has sections for 'To a File' (Excel, Text file, Access, JSON file, Spatial file, Statistical file, More...) and 'To a Server' (Tableau Server, MySQL, Oracle). The 'Data' pane shows a toolbar with 'File', 'Data', 'Worksheet', and 'Dashboard' tabs. Below the toolbar are icons for 'New Data Source', 'New Connection', and 'New Worksheet'. A red circle highlights the 'New Data Source' icon. Another red circle highlights the 'Connect to Data' link under the 'Data' tab.

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## Add another connection

A new connection is only required if the data comes from a different database or file. For example, add new connections to each file/database if you want to use data from both an Excel file and MySQL data table.

In the left pane, under **Connections** click the **Add** button to add a new connection.



If the connector you need is not available in the Add a Connection list, cross-database joins are not supported for that combination of data sources. Instead of joining tables, consider using data blending.

## Combine your data using a cross-database join

Drag tables from each connection to the canvas to create the cross-database join. The join process is the same as a regular join outlined earlier in this module.

Tableau color codes the connections, tables and columns to differentiate between the primary connection (blue) and additional connections (orange).

A screenshot of the Tableau desktop application. The window title is 'B+ Students Attendance+ (Multiple Connections)'. The interface shows two data sources: 'Students Attendance' (blue) and 'Target Attendance' (orange). The 'Connections' pane on the left lists 'Student Attendance' (blue), 'Target Attendance' (orange), and 'New Union'. The 'Sheet' pane contains several items: 'Comparing Measures', 'Passing Score', 'Students Attendance' (blue), 'Subjects Master List' (blue), 'Target Attendance' (orange), and 'New Union'. The main canvas displays a table with five rows and six columns. The columns are labeled: 'All Students' (blue), 'All Subjects' (blue), 'Attendance' (blue), 'All Subjects' (orange), 'Subject (Target)' (orange), and 'Attendance' (orange). The data in the table is as follows:

By default, Tableau creates an inner join, but you can choose a left join.

## Continue to prepare your multi-connection data source for analysis

After you've created a cross-database join, continue to prepare your multi-connection data source for analysis. You can modify your data source as you can with any other data source in Tableau. You can rename

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and reset fields, create calculations, clean your Excel data with the Data Interpreter, change the data types of text and Excel-based fields, and so on.

## About queries and cross-database joins

For each connection, Tableau Desktop sends independent queries to the databases in the join. The results are stored in a temporary table, in the format of a Tableau data extract (.tde, .hyper) file. A sample of the data in the extract (the first 1,000 rows) is displayed in the data grid for you to review.

## About working with multi-connection data sources

When working with multi-connection data sources, keep the following considerations in mind:

Consideration	Description
<b>Join key data type</b>	Before you join tables using a cross-database join, make sure that the data types of the join keys match. Depending on your data connection, you can fix mismatches in one of three ways: using the Metadata grid (for text or Excel-based data), using Convert to custom SQL, or using a join calculation. See the online help topic "Join Your Data" for more information.
<b>Integrating an extract (.tde, .hyper)</b>	When integrating extract files, make sure that the connection to the extract (.tde, .hyper) is the first (primary) connection. This preserves any customizations that might be a part of the extract, including changes to default properties, calculated fields, groups, aliases, etc. Note: If you need to connect to multiple extract files in your multi-connection data source, only the customizations in the extract in the first connection are preserved.
<b>Calculations</b>	Any calculations used must be supported by Tableau extracts and by all connections used in the data source.
<b>Stored procedures</b>	Stored procedures are not available for multi-connection data sources.
<b>Pivot</b>	To pivot data, you must use text columns or Excel columns from the same connection. That is, you cannot include columns from different databases in a pivot
<b>Union</b>	To union data from within a connection, you must use text tables or Excel tables from the same connection. That is, you cannot union tables from different databases
<b>Collation</b>	Collation refers to the rules of a database that determine how string values should be compared and sorted. When you work with cross database joins, you might join columns that have different collations. Tableau maps certain collations to others to minimize interpreting values incorrectly. Refer to online help for more details.

## Performance Considerations

Since data integration produces a row-level join, it is sensitive to the size of the underlying data sources.

- For each connection, Tableau Desktop sends independent queries to the databases in the join. The results are stored in a temporary table, in the format of an extract (TDE)file. The more data you must move, the longer it takes.
- The further the data must travel, the longer it takes.
- The slower the rate of data flow, the longer it takes.
- The more things need to be matched, the longer it takes--performance will be impacted by the number of records that must be joined.
- When publishing a multi-connection data source, Tableau Desktop will recommend that you create an extract for best server performance.

## How Data Blending Works

Data blending is an alternative to joining, depending on factors like the type of data and its granularity. Data blending simulates a traditional left join. The main difference between the two is when the join is performed with respect to aggregation.

- Left Join (not cross-database): a single query is sent to the database where the join is performed. The results of the join are then sent back to Tableau for aggregation.
- Blend: a query is sent to the database for each data source that is used on the sheet. The results of the queries are sent back to Tableau, and then combined. The view uses all rows from the primary data source, the left table, and the aggregated rows from the secondary data source, the righttable, based on the dimension of the linking fields.

**NOTE** Dimension values are aggregated using the ATTR aggregate function, which means the aggregation returns a single value for all rows in the secondary data source. If there are multiple values for the rows, an asterisk (\*) is shown. Measure values are aggregated based on how the field is aggregated in the view.

### When to Use Data Blending

Consider data blending in the following situations:

- You cannot use a cross-database join (for example, for data sources such as cubes or some extract only connections like Salesforce).
- The data to combine is at different levels of detail.
- Your tables do not match up with each other correctly after a join.
- A join causes duplicate data--a symptom of data at different levels of detail.
- You're working with large sets of data, and joins are affecting performance. In this case, data blending might help. Because Tableau handles combining the data after the data is aggregated, there is less data to combine.

### Prerequisites for Data Blending

Data blending requires a primary data source and at least one secondary data source. When you designate a primary data source, it functions as the main table or main data source. Any subsequent data sources that you use on the sheet are treated as a secondary data source. Only columns from the secondary data source

that have corresponding matches in the primary data source appear in the view. After designating primary and secondary data sources, you must define the common dimension or dimensions between the two data sources. This common dimension is called the linking field. If the linking fields have the same name, Tableau creates the relationship automatically, and shows a link icon next to the date field in the secondary data source when the field is in the view. If the two dimensions don't have the same name, you can define a relationship that creates the correct mapping.

## Using Data Blending

The data source from which a field is first added to the view is automatically selected as the primary data source; all others are secondary. Here are two ways to blend data in Tableau.

### How to: Blend data sources with common fields

1. Add two data sources to a view.
2. Create a simple view using one data source.
3. Select the second data source and look for a field with a broken link icon  . This indicates a common dimension field that can be used as a link between the data sources.
4. Click the icon to activate the link, which changes the icon to a connected orange link .

### How to: Blend data sources using a custom-defined relationship

1. Open the first data source in a worksheet.
2. Add the second data source.
3. On the Data menu, select Edit Relationships.
4. In the Relationships dialog box, under Primary data source, select the primary data source. NOTE By default, Tableau selects the first data source to which you connected as the primary. If you choose to set the second data source as the primary, select it under Primary data source. The entry under Secondary data source updates automatically with the other data source.
5. Select Custom and then click Add.
6. On the Add/Edit Field Mapping dialog box, first click to select a field under Primary data source field, and then click the field you want to map to it under Secondary data source field, and then click OK.
7. Click OK to close the Relationships dialog box.
8. When you drag a field into your view on a worksheet, you will see the connected fields as a connected orange link .

The blending is done on the member aliases of the common dimensions, so if the underlying values aren't an exact match, they will need to be edited either in the data or using Tableau.

### Calculations in Data Blends

Some tips for working with calculations used in data blends:

## Tableau for the Business User

- If you are creating table calculations across the data sources, you need to make sure the data is aggregated at the same level.
- The calculations you create are stored in the primary data source

## Filter Across Multiple Data Sources

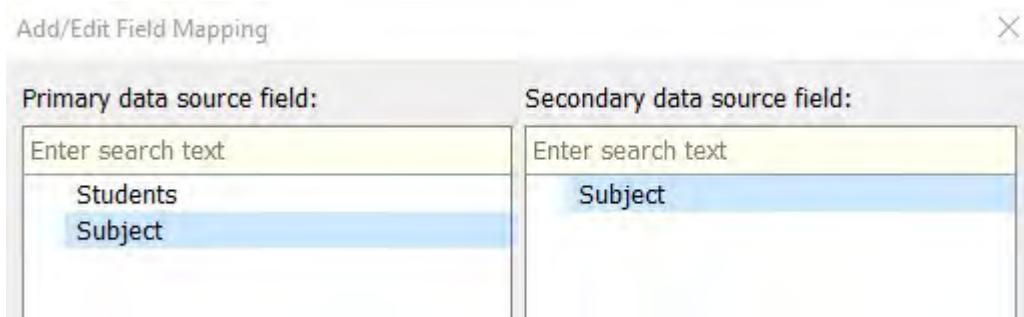
For a dashboard with multiple views, each using a different data source, you can create a single filter that applies to all of them.

### Create Relationships Between Data Sources

To filter views across multiple data sources, there must be a relationship between one or multiple fields in their primary data sources. Sometimes Tableau will automatically create this relationship because your data sources have fields in common, for example "State". This is called an automatic relationship. You can also create a relationship manually.

#### How to: Create a Primary Data Source Relationship

1. On the **Data** menu, select **Edit Relationships**.
2. In the **Relationships** dialog box, under **Primary** data source, select the primary data source.
3. Select **Custom** and then click **Add**.
4. On the Add/Edit Field Mapping dialog box, first click to select a field under Primary data source field, and then click the field you want to map to it under Secondary data source field, and then click OK.



5. Click **OK** to close the Relationships dialog box.

### Add a Filter

After you have defined the relationships between data sources, add a filter to one of the worksheets, using one of these methods, then filter the members as desired:

# Tableau for the Business User

- Drag the dimension from the **Data Pane** to the **Filters** shelf, and then, optionally, right-click and select **Show Filter**.
- Or, right-click the dimension in the **Data Pane** and select **Show Filter**.

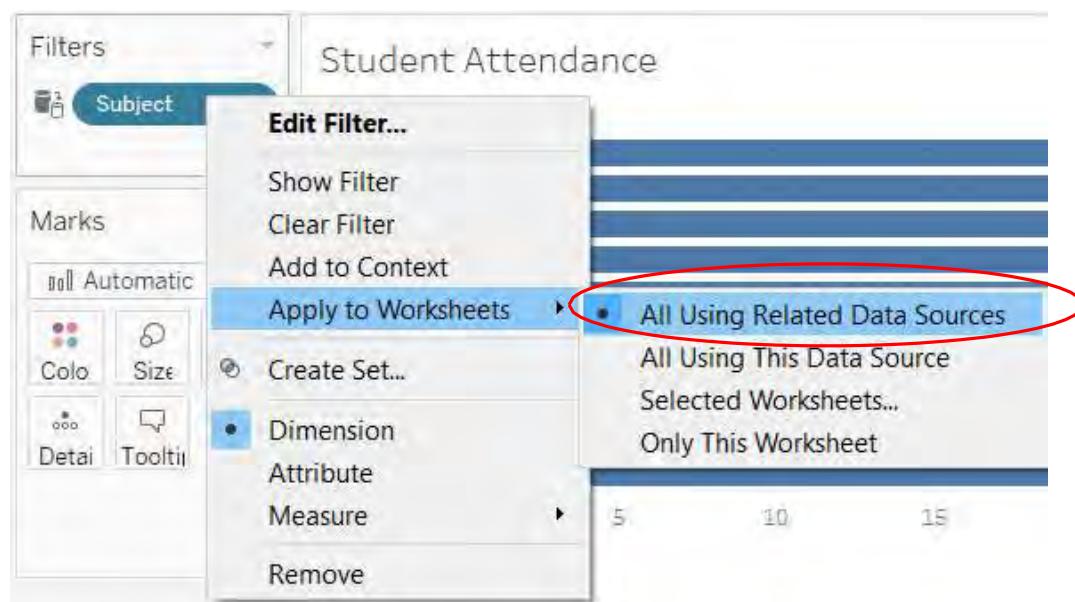
The filter can also be added directly onto a dashboard.

- On a dashboard, from the **Analysis** menu, select **Filters** and then click the desired field name.

## Apply Filter to Related Data Sources

After you set up your filter, you can apply it to all the worksheets in your workbook that use related data sources, or you can apply it to selected worksheets.

To apply the filter to all worksheets that use related data sources, right-click the field on the **Filters** shelf and select **Apply to Worksheets > All Using Related Data Sources**.



After you apply the filter, the icon will change to indicate the change. Worksheets also using this filter will show a similar icon (with the shading reversed).



## Tableau for the Business User

### Unions

Another way to connect tables is by using a union. A join appends columns from one table to another table. In contrast, a union appends rows from one table to another table. For best results, the tables that you combine must have the same structure. That is, each table must have the same number of fields, and related fields must have matching field names and data types. For example, consider two tables of Employee data in an Excel file:

Department ID	Employee	Vacation Hours	Department ID	Employee	Vacation Hours
1	A	12	1	D	15
2	B	15	3	E	20
3	C	20	3	F	14

The resulting union, containing rows from both tables:

Department ID	Employee	Vacation Hours
1	A	12
2	B	15
3	C	20
1	D	15
3	E	20
3	F	14

You can union your data to combine two or more tables in your Excel or Google Sheets workbook data; text file data; JSON file data; Amazon Redshift, Google Big Query, HP Vertica, Microsoft SQL, MySQL, Oracle or PostgreSQL database data. To union your data, the tables must come from the same connection.

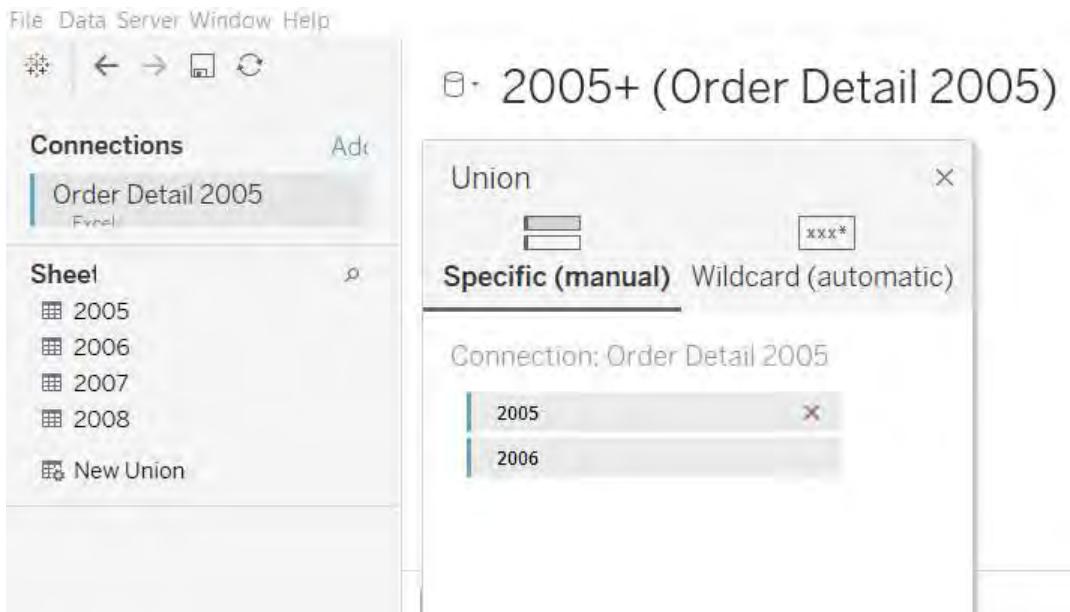
### Union Tables Manually

Use this method to manually union distinct tables—that is, Excel or Google Sheets in worksheets, text files, JSON files, or database tables. This method allows you to drag individual tables from the left pane of the Data Source page and into the Union dialog box.

# Tableau for the Business User

## How to: Union Data Manually

1. Connect to the data you want to union.
2. On the **Data Source** page, double-click the **New Union** button to open the **Union** dialog box.
3. Drag the tables you want to union and drop them onto the **Union** dialog box. You can drag them one at a time, or multi-select using **CTRL+ Click** or **SHIFT+ Click** to drag and drop several.



4. Click **Apply** or **OK** to union

## Union Tables Using Wildcard Search

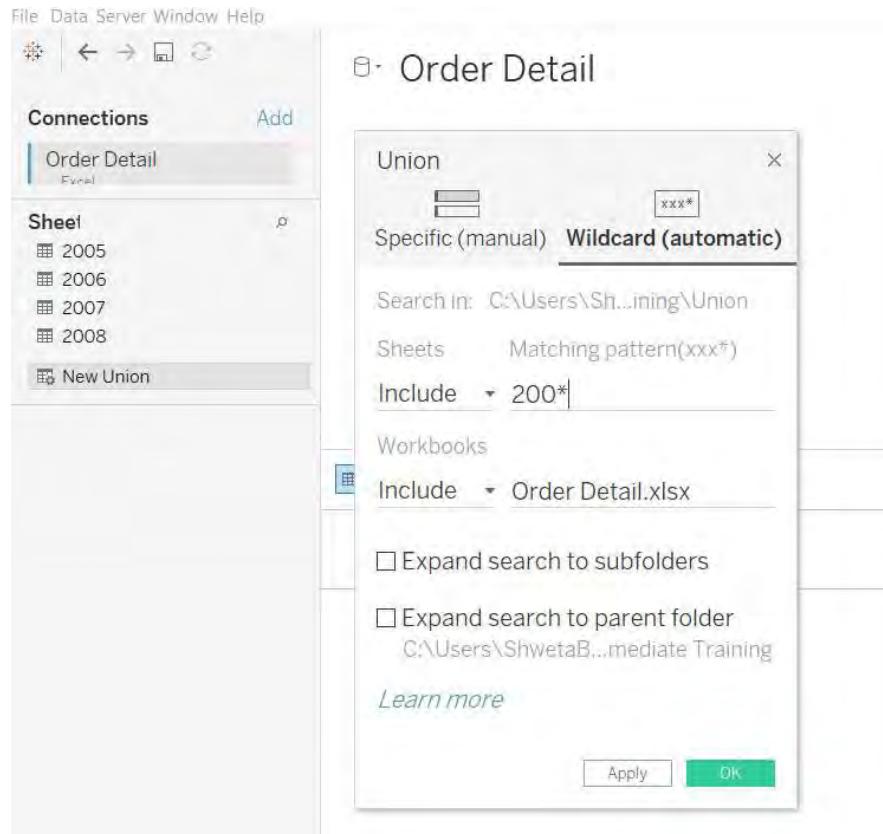
Use this method to set up search criteria to automatically include tables in your union. Use the wildcard character, which is an asterisk (\*), to match a sequence or pattern of characters in the Excel workbook and worksheet names, Google Sheets workbook and worksheet names, text file names, JSON file names, and database table names.

When working with Excel, text file data, and JSON file data, you can also use this method to union files across folders, and worksheets across workbooks. Search is scoped to the selected connection. The connection and the tables available in a connection are shown on the left pane of the Data source page.

# Tableau for the Business User

## How to: Union Data with Wildcard Search

1. Connect to the data you want to union.
2. On the **Data Source** page, double-click the **New Union** button to open the **Union** dialog box.
3. Click **Wildcard (automatic)** in the **Union** dialog box.
4. Enter the search criteria that you want Tableau to use to find tables to include in the union. For example, you can enter **200\*** in the **Include** text box to union tables in Excel worksheets that starts with "200" in their names.



## Tableau for the Business User

### Merging fields

Some tables might contain columns of the same data but might have different names. For example, one table might contain a field named **Employee**, but another table might use the field name **Employee Name**.

Performing a union on tables with slight differences can result in null values.

Department ID	Employee	Vacation Hours	Employee Name
1	A	12	null
2	B	15	null
3	C	20	null
1	null	15	D
3	null	20	E
3	null	14	F

To avoid nulls, you can use the **Merge mismatched fields** option to edit the union:

Employee &		
Department ID	Employee Name	Vacation Hours
1	A	12
2	B	15
3	C	20
1	D	15
3	E	20
3	F	14

After you merge fields, you can use the field generated from the merge in a pivot or split or use the field as a join key. You can also change the data type of the field generated from a merge.

### How to: Merge Mismatched Fields

1. Perform either a manual or a wildcard union.
2. Select the columns in the data preview that you want to merge.
3. Right-click the selected columns, and then click **Merge Mismatched Fields**.

## Quick Reference Guide

### HOW TO JOIN TABLES

1. Launch Tableau Desktop and connect to your data.
2. On the **Data Source** page, select the file, database, or schema and double-click or drag a table to the canvas area labeled **Drag sheets here**.
3. To connect to a second table, double-click that table OR drag the table name to the canvas area.
4. The join icon will display the type of join used to connect your tables. You can mouse-over the icon to display a tooltip that describes the join.
5. To edit the join relationship, click on the join icon.
6. Add one or more join conditions by selecting a field from one of the available tables used in the data source, a join operator, and a field from the added table. Make sure the join condition reflects how you want to join the tables.
7. When finished, close the Join dialog box.

### HOW TO CREATE A CROSS-DATABASE JOIN

1. Launch Tableau Desktop and connect to your first data connection (primary).
2. In the left pane, under **Connections**, click the **Add** button to add a new connection.
3. Repeat step 2 until all data connections have been added.
4. From the primary data source, select the file, database, or schema and double-click or drag a table to the canvas area labeled **Drag sheets here**.
5. Drag tables from each connection in order to create the cross-database join.
6. The join icon will display the type of join used to connect your tables. You can mouse-over the icon to display a tooltip that describes the join.
7. To edit the join relationship, click on the join icon.
8. Add one or more join conditions by selecting a field from one of the available tables used in the data source, a join operator, and a field from the added table. Make sure the join condition reflects how you want to join the tables.
9. When finished, close the Join dialog box.

## HOW TO BLEND DATA SOURCES WITH COMMON FIELDS

1. Add two data sources to a view.
2. **Edit the Relationship** between the two data sources.
3. Create a simple view using one data source.
4. Select the second data source and look for a field with a broken link icon . This indicates a common dimension field that can be used as a link between the data sources.
5. Click the icon to activate the link, which changes the icon to a connected orange link .

## HOW TO FILTER ACROSS MULTIPLE DATA SOURCES

1. Edit the Relationship between the multiple data sources used on the dashboard.
2. From one of the data sources, drag the dimension from the **Data Pane** to the **Filters** shelf, and then, optionally, right-click and select **Show Filter**. Alternatively, right-click on the field and select **Show Filter** to add the field to the filter shelf and show the filter in one step.
3. To apply the filter to all worksheets that use related data sources, right-click the field on the Filters shelf and select **Apply to Worksheets > All Using Related Data Sources**.

## HOW TO UNION DATA MANUALLY

1. Connect to the data you want to union.
2. On the **Data Source** page, double-click the **New Union** button to open the **Union** dialog box.
3. Drag the tables you want to union and drop them onto the **Union** dialog box. You can drag them one at a time, or multi-select using **CTRL+Click** or **SHIFT+ Click** to drag and drop several.

## HOW TO UNION DATA WITH WILDCARD SEARCH

1. Connect to the data you want to union.
2. On the **Data Source** page, double-click the **New Union** button to open the **Union** dialog box.
3. Click **Wildcard (automatic)** in the **Union** dialog box.
4. Enter the search criteria that you want Tableau to use to find tables to include in the union. For example, you can enter **200\*** in the **Include** text box to union tables in Excel worksheets that starts with "200" in their names.

## HOW MERGE MISMATCHED FIELDS

1. Perform either a manual or a wildcard union.
2. Select the columns in the data preview that you want to merge.
3. Right-click the selected columns, and then click **Merge Mismatched Fields**.
4. Rename the fields as desired.

# DATA EXTRACTS

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This module contains the following:

- Using Data Extracts
- Quick Reference Guide

## Using Data Extracts

A Tableau data extract (.hyper) is a compressed snapshot of data stored and loaded into memory as required to render a viz in Tableau. Extracts utilize columnar storage that stores column values together rather than row values, reducing the input/output required to access and aggregate the column values. Additionally, the extract uses all parts of a computer's memory, to make the query more efficient. The extract is loaded directly into memory by the operating system and Tableau doesn't have to continually open or process the file as it needs to access the data.

You can create an extract that contains all records in the source data, or you can define filters and limits to include the desired portion of the data. Extracts can also be used to aggregate source data. When you need to refresh extracted data, you can either fully refresh the data to replace all the content, or you can increment the extract, which only adds rows that are new since the last refresh.

### Deciding When to Use an Extract

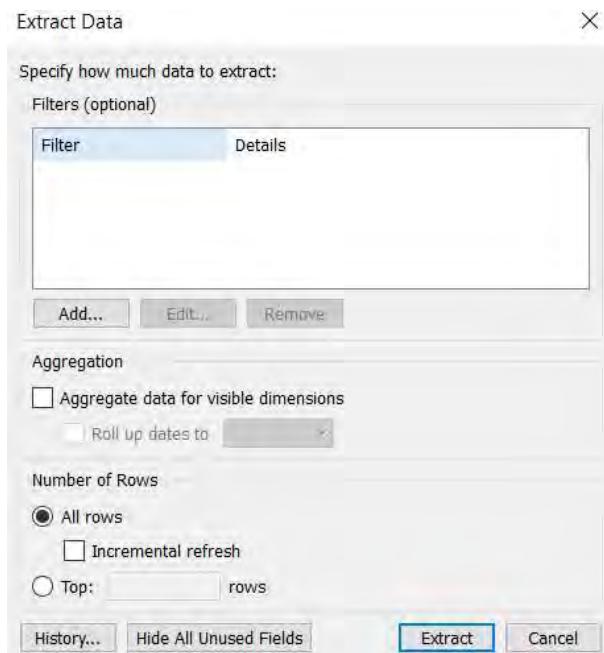
Use an extract to:

- Provide a local copy of the data to make the workbook "portable"
- Limit access to the source database (for security, administrative, or load reasons)
- Provide performance improvements over direct database access

AVOID using an extract when:

- You want to control where the data resides
- You want all queries run against the source system for the freshest data

### Configuring and Running an Extract



When you choose to extract data, you can choose to run the extract immediately, or you can configure it with the following options:

## Tableau for the Business User

### Configuring an Extract

1. Right-click your data connection and choose **Extract Data**.

Option	Description
<b>Filters</b>	Choose a field to use as a filter, and then select field members to be included in or excluded from the extract.
<b>Aggregation</b>	Select to summarize the data based on all the visible (not hidden) dimensions. For date-based dimensions, you can roll up dates based on criteria in the drop-down list.
<b>Number of Rows</b>	Determine how many rows to extract (all rows, or only a limited number). Check the Incremental Refresh check box to update rows based on date/time field.
<b>History</b>	Displays a dialog box that shows the date and time for past refreshes, whether the refresh was full or incremental, and the number of rows that were added. If the refresh was from a file, it also shows the source file name.
<b>Hide All Unused Fields</b>	Automatically hide any fields in the Data pane not used in the current workbook. Hidden fields are not included in the extract.

2. Once you have set the options, click **Extract**.

## Quick Reference Guide

### HOW TO CREATE AN EXTRACT

1. Create an extract from either the **Data Pane** or the **Data Source** tab.
2. From the **Data Pane**:
  - Right-click on the data source and select **Extract Data**.
3. From the **Data Source** tab:
  - Select the **Extract** radio button under **Connection** in the top right corner of the **Data Source** tab.
4. Configure the following options:
  - **Filters**: Choose a field to use as a filter, and then select field members to be included in or excluded from the extract
  - **Aggregation**: Select to summarize the data based on all the visible (not hidden) dimensions. For date-based dimensions, you can roll up dates based on criteria in the drop-down list.
  - **Number of Rows**: Determine how many rows to extract (all rows, or only a limited number). Check the Incremental Refresh check box to update rows based on date/time field.
  - **History**: Displays a dialog box that shows the date and time for past refreshes, whether the refresh was full or incremental, and the number of rows that were added. If the refresh was from a file, it also shows the source file name.
  - **Hide All Unused Fields**: Automatically hide any fields in the Data pane not used in the current workbook. Hidden fields are not included in the extract.
5. Click **Extract**

### HOW TO CONNECT TO LIVE

1. Right-click on the data source in the **Data Pane** and uncheck **Use Extract**
2. OR from the **Data Source** tab, select the **Live** radio button under **Connection** in the top right corner.

# CREATING CALCULATIONS

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This module contains the following:

- Using Calculations in Desktop
- Creating and Editing Calculated Fields
- Understanding Where Calculations Occur
- Calculations and Aggregations
- String Functions
- Date Functions
- Join Calculations
- Aggregating Dimensions in Calculations
- Quick Reference Guide

# Using Calculations in Desktop

Calculated fields are custom fields derived from existing data in your data source. Not all fields needed for our analysis exist within our original data source. In these instances, we can use calculated fields to create new fields. For example, you can use Sales and Profit in a calculated field to determine the ratio of sales to profit (Profit Ratio).

A calculation can include some or all the following components:

Component	Description
Fields	Includes both data source fields and calculated fields
Functions	Functions you can use to create a formula
Operators	All standard operators, such as addition (+), subtraction (-), multiplication (*), modulo (%), and division (/), as well as comparisons (==, =, >, <, >=, <=, !=, <>), and logical (AND, OR, NOT).
Parameters	User-defined variables used as placeholders that can be inserted into calculations to replace constant values
Comments	Annotations for your calculations. Use two forward slash characters (//) to add a comment to a calculation.

Within Tableau, there are three types of calculations:

Calculation	Description
Calculated Fields	Custom calculations created using the Calculation Field editor and computed on the underlying data source
Table Calculations including Quick Table Calculations	Calculations computed locally from the data in the view. Quick Table Calculations are predefined table calculations, but you can also specify the parts of the formula for the Table Calculations yourself.
Row and Column Totals	Predefined calculation of subtotals and grand totals of the data in the view. These are a type of table calculation.

## Creating and Editing Calculated Fields

You can write calculated fields in two ways:

- Type them directly on **Columns**, **Rows**, or the Marks card. These are considered ad-hoc calculations.
- Use the Calculation Field Editor

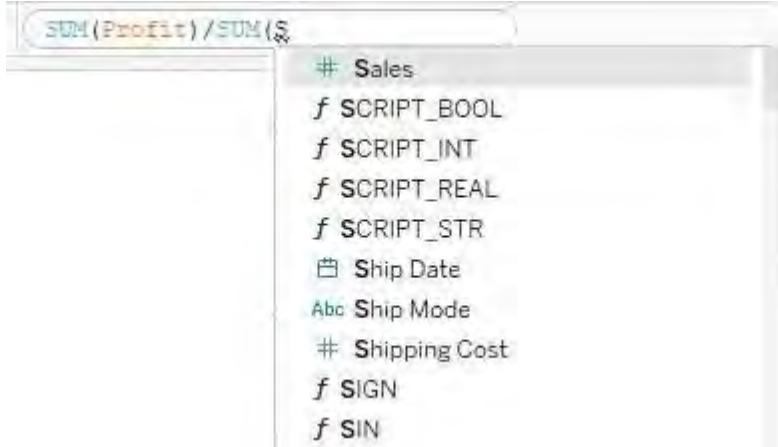
### Create Ad-Hoc Calculations

Ad-Hoc calculations are used when you need a quick and simple formula for analysis. For example, if you have **SUM(P<sub>rofit</sub>)** on **Columns**, simply double click the field and add in / **SUM(S<sub>ales</sub>)** to create an ad-hoc calculation for Profit Ratio.



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As you type the components of the calculation, Tableau suggests fields or function to complete your formula.



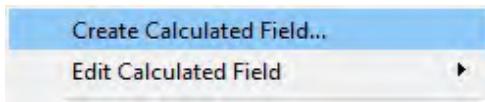
Press **ENTER** to apply your calculation to the view.

This ad-hoc calculation can be saved by dragging it to the Data Pane. When prompted, give the new calculated field a name (Profit Ratio in this case).

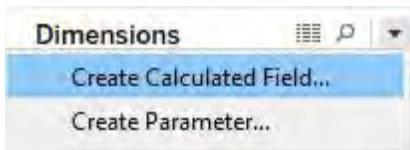
## Use the Calculated Field Editor

Calculated fields can also be created through the Calculated Field Editor. The editor can be opened in a variety of ways:

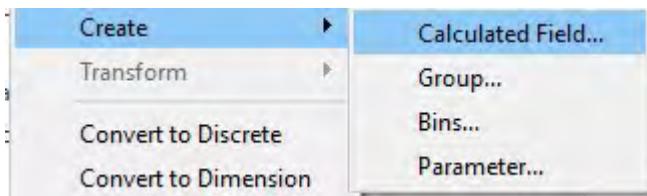
- Click the Analysis menu and choose **Create Calculated Field**.



- Right-click in an empty area in the **Data** Pane and choose **Create Calculated Field**.



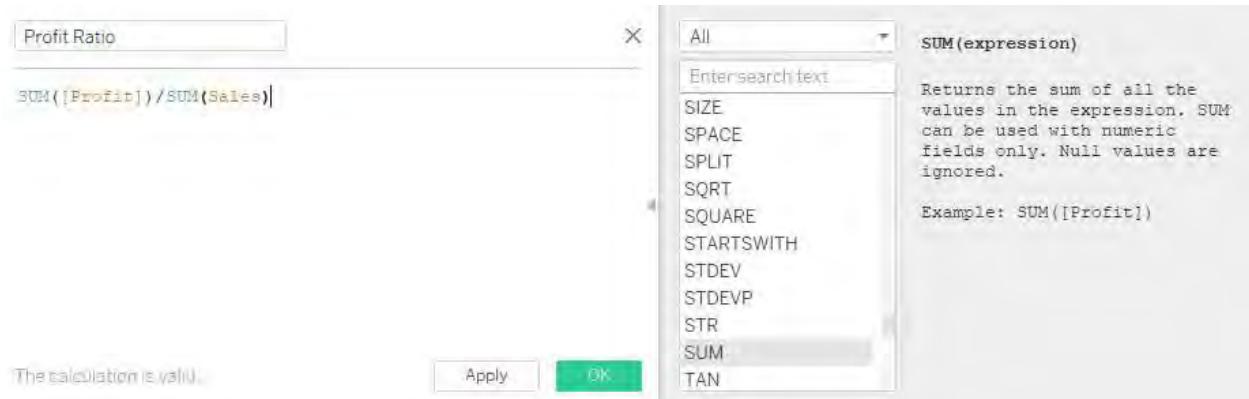
- Right-click on a specific data field in the **Data** pane, point to **Create**, and choose **Calculated Field**.



Start by naming your new field. Type your formula in the **Formula** window and click **Apply**. This saves the calculation and keeps the editor open. Or, if you are finished with your calculation, click **OK** to save the calculation and close the formula window.

# Tableau for the Business User

Rather than type in field names, you can also drag and drop fields directly from the Data pane into the editor.



## Formula Editor Conventions

Tableau provides visual cues for the components of the calculated field within the Formula editor.

Color or Symbol	Description
Red squiggly line	Syntax error. View error message to troubleshoot.
//Gray text	Comments – ignored by the calculation but are useful for documenting complex calculation logic
[Orange Text]	Field names
Blue Text( )	Functions
[Purple Text]	Parameters
<b>Bold Text</b>	Calculation is computed locally within Tableau on aggregated results (i.e., table calculation)
Plain Text (not bold)	Calculation computed at the database level

Additionally:

- UPPER/lower case are ignored except for in field names and any functions entered within quotes (for example `DATEPART('day', [Order Date])`).
- ENTER/RETURN/SPACE are all ignored
- Use " or ' for string fields.

## Types of Calculated Fields

There are many types of calculated fields. Just a few of these are listed below:

- Math operations, such as addition or subtraction
- Logic statements like If/Else or Case
- Aggregating data, for example sum, average, or maximum
- Manipulating strings to concatenate strings together or split them apart

- Date formulas
- Handling Null values by using ZN to replace null values with zero (0).

## Understanding Where Calculations Occur

It is important to understand how Tableau employs calculations to determine what kind of calculations to use in your analysis.

- Calculated fields are processed in the database or file.
- Table calculations are processed locally.

When you generate and use a calculation:

1. Tableau generates a query and sends it to the database. All calculations (except table calculations) are passed to the database (or data file).
2. The database processes the query.
3. The database returns filtered, aggregated rows of data, including calculated columns.
4. Tableau performs local processes, including table calculations (such as totals, rank, percent of total).
5. Tableau renders the visualization.

## Calculations and Aggregations

Aggregating (or not aggregating) fields in a calculation affect the order of operations, resulting in different and potentially incorrect results. For example, when calculating averages, you should apply an overall aggregate first before computing the ratios. However, there are times when you may not want to aggregate the data first – when you want to compute line-item calculations for each record, row by row.

## String Functions

There are often when you may want to combine string fields into a single field. In this instance, you will need to concatenate the fields. When doing math, the plus sign (+) is the addition operator. When working with strings, the plus sign is the concatenation operator.

For example:

[First Name] + [Last Name] = First Name Last Name

Consider the example:

"John "+"Smith"=John Smith

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Notice that no space is included between the first and last name. You will need to insert a space in the formula:

[First Name] +" "+ [Last Name] = First Name Last Name

The example now becomes:

"John" +" "+ "Smith" = John Smith

## Date Functions

Tableau has numerous date functions that can be used to perform calculations on date fields. For example, you can calculate the difference between dates or add some amount of time to an existing date field.

Many date functions use date parts in their calculation, and some only return a date part. Tableau recognizes the following as date parts in date functions: year, month, day, hour, minute, or second.

In the example below, the date calculation subtracts 3 months to the Order Date field:

DATEADD('month', -3, [Date])



## Join Calculations

If trying to join tables and fields do not match, the query will not return the expected values. In many cases, you can fix mismatches between the fields by using a join calculation.

Common mismatches include:

- String mismatch: parts of fields for join need to be isolated or multiple fields need to be concatenated.
- Date mismatch: date values of the fields for the join are at a different level of detail or in a different date format.
- Data type mismatch: fields used for the join do not have the same data types (for example, a string field and a number field).

### Creating a Join Calculation

1. On the **Data Source** page, connect to the first data source.
  2. If needed, examine the field(s) you want to use for the join, along with their associated data types.
- An example of cross-database join is shown below:

## Tableau for the Business User

The screenshot shows the Tableau Data Source view. On the left, the 'Connections' section lists a single connection named 'Membership' (Microsoft Excel). Below it, the 'Sheets' section lists two sheets: 'Club Membership' and 'New Union'. The 'Club Membership' sheet is currently selected. The data preview for this sheet shows three columns: 'Member Since', 'Membership Code', and 'Family Members'. The 'Membership Code' column contains values like '10004: Aaron Bergman', '10337: Aaron Hawkins', etc., and is highlighted with a red box. The 'Family Members' column contains numerical values such as 2, 2, 2, 1, 4, 3, and 5.

Member Since	Membership Code	Family Members
2000	10004: Aaron Bergman	2
2016	10337: Aaron Hawkins	2
2017	10674: Aaron Smayling	2
2013	10250: Adam Bellava...	1
2016	10333: Adam Hart	4
2017	10666: Adam Shilling...	3
2007	10136: Adrian Barton	5
....	....	....

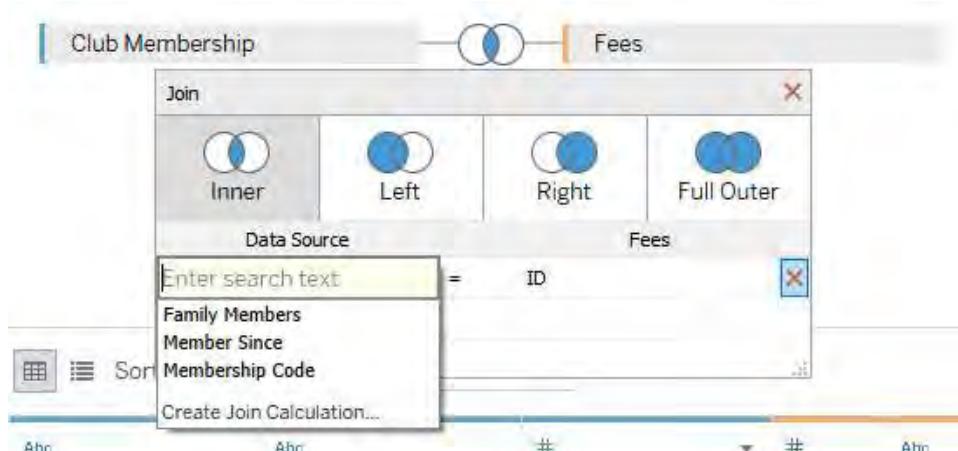
3. Connect to the second data table or data source.
4. If needed, in the **Sheets** section, click the **View Data** icon for the second table or data source. Examine the field(s) you want to use for the join.

## Tableau for the Business User

The screenshot shows the Tableau desktop interface. On the left, under 'Connections', there is a 'Membership' connection (Microsoft Excel) and a 'Fees by Member' connection (Microsoft Excel). Under 'Sheets', there are two items: 'Fees' and 'New Union'. The 'Fees' sheet is currently selected and previewed on the right. The preview title is 'View Data: Fees' and it shows 795 rows of data. The columns are 'First Name', 'Last Name', 'Fees', and 'ID'. A red box highlights the 'ID' column.

First Name	Last Name	Fees	ID
Aaron	Bergman	10	10,004
Aaron	Hawkins	8	10,337
Aaron	Smayling	6	10,674
Adam	Bellavance	8	10,250
Adam	Hart	9	10,333
Adam	Shillingsburg	6	10,666
Adrian	Barton	10	10,136
Adrian	Hane	5	10,326
Adrian	Shami	5	10,661
Aimee	Bixby	6	10,156
Alan	Barnes	5	10,060
Alan	Dominguez	7	10,297
Alan	Haines	6	10,285
Alan	Hwang	9	10,373
Alan	Schoenberger	9	10,652
Alan	Shonely	4	10,667
Alejandro	Ballentine	6	10,306
Alejandro	Grove	5	10,133

5. In the join dialog box, under **Data Source** on the drop-down list, select **Create Join Calculation** for the relevant data source.



## Tableau for the Business User

- Type the formula for the join calculation in the **Calculated Field editor**.



- For the other table or data source, select the join field or create another join calculation.
- Change the join type, if needed, and make any other metadata changes.

The screenshot shows the Tableau Data Source Editor. It displays a joined view of the 'Club Membership' and 'Fees' tables. The joined fields are 'Member Since' and 'Membership Code'. A new calculated field, 'Family Members', is present. The data table shows member information and fees. The 'Sort fields' and 'Data source order' sections are visible at the top of the data pane.

Member Since	Membership Code	Family Members	ID	Last Name	First Name	Fees
2000	10004: Aaron Bergman	2	10004	Bergman	Aaron	10
2016	10337: Aaron Hawkins	2	10337	Hawkins	Aaron	8
2017	10674: Aaron Smayling	2	10674	Smayling	Aaron	6
2013	10250: Adam Bellavance	1	10250	Bellavance	Adam	8
2016	10333: Adam Hart	4	10333	Hart	Adam	9
2017	10666: Adam Shillingsburg	3	10666	Shillingsburg	Adam	6
2007	10136: Adrian Barton	5	10136	Barton	Adrian	10
2016	10326: Adrian Hane	2	10326	Hane	Adrian	5
2017	10661: Adrian Shami	3	10661	Shami	Adrian	5
2008	10156: Aimee Bixby	1	10156	Bixby	Aimee	6

Join calculations are not saved as calculated fields, but they can be edited using the Calculated Field editor accessed from the join dialog box.

# Calculations and Aggregations

Aggregating (or not aggregating) fields in a calculation affect the order of operations, resulting in different and potentially incorrect results. For example, when calculating averages, you should apply an overall aggregate first before computing the ratios. However, there are times when you may not want to aggregate the data first – when you want to compute line-item calculations for each record, row by row.

## Calculations Performed on the Database

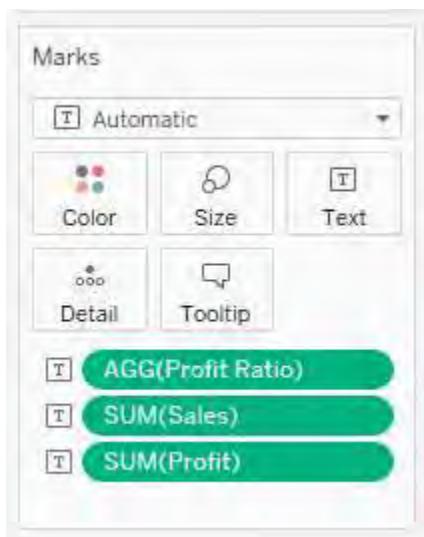
When asking Tableau to create a calculated field, the query is processed by the database. This adds a new column to your existing data set. If you have a large number of records (millions or billions), you may want to consider adding these calculated fields into the data table itself, so they do not need to be calculated each time.

### Row by Row

Also known as record-level calculations, row by row refers to calculations where Tableau is not pre-defining an aggregation for the data source to apply. The query is sent to the database, and the database calculates the results for each record, row by row. These results are aggregated after the initial calculations have been run and can then be customized locally in Tableau for the chosen aggregation once used in the view.

### Aggregate Calculations

Aggregate calculations are written to compute within entire columns of data in the data source as opposed to individual records (as with row by row). Fields with pre-defined aggregations in the calculation display as AGG([Field Name]) when dragged into the view. You would use this approach, for example, if you wanted to analyze the overall gross margin for every product in your data source. The calculation would be computed across the whole data set and not for every row.



# Aggregating Dimensions in Calculations

When creating a calculation, the same level of aggregation must be applied to all components of the calculation. This is true for both measures and dimensions.

You need an aggregate dimension when:

- Blending multiple sources in which the dimensions do not have a consistent level of detail
- Requesting that a dimension member be returned when you are aggregating elsewhere in the calculation

## Functions for Aggregating Dimensions

Dimensions can be aggregated by using any of the following options:

Function	Description
<b>MIN</b>	Returns the minimum of two arguments, which must be of the same type. Returns NULL if either argument is Null. MIN can also be applied to a single field in an aggregate calculation.
<b>MAX</b>	Returns the maximum of two arguments, which must be of the same type. Returns NULL if either argument is Null. MAX can also be applied to a single field in an aggregate calculation.
<b>ATTR</b>	Returns the value of the expression if it has a single value for all rows. Otherwise, returns an asterisk. Null values are ignored.

Using MIN and MAX generally yields better performance, however ATTR is useful for working with multiple data sources.

## Quick Reference Guide

### CREATE AD-HOC CALCULATIONS

1. Click on any **Row**, **Column** or the **Marks Card** to start creating the ad-hoc calculation.
2. Start typing the calculation.
3. To save the ad-hoc calculation, drag it to the **Data** pane.

### USE THE CALCULATED FIELD EDITOR

1. Start by opening the Calculated Field Editor in one of the following ways:
  - Click the Analysis menu and choose **Create Calculated Field**.
  - Right-click in an empty area in the **Data** Pane and choose **Create Calculated Field**.
  - Right-click on a specific data field in the **Data** pane, point to **Create**, and choose **Calculated Field**.
2. Once the editor is open, name your field.
3. Type your formula in the **Formula** window or drag and drop fields from the **Data** pane.
4. Click **Apply** to apply changes or click **OK** to save the calculated field to the **Data** pane.

### CREATING JOIN CALCULATIONS

1. On the **Data Source** page, connect to the first data source.
2. If needed, examine the field(s) you want to use for the join, along with their associated data types.
3. Connect to the second data table or data source.
4. If needed, in the **Sheets** section, click the **View Data** icon for the second table or data source. Examine the field(s) you want to use for the join.
5. In the join dialog box, under **Data Source** on the drop-down list, select **Create Join Calculation** for the relevant data source.
6. Type the formula for the join calculation in the **Calculated Field** editor.
7. For the other table or data source, select the join field or create another join calculation.
8. Change the join type, if needed, and make any other metadata changes.

---

# QUICK TABLE CALCULATIONS

---

This module contains the following:

- Table Calculation Overview
- Using Quick Table Calculations
- Null Values in Table Calculations
- Statistical Analysis Using Table Calculations
- Quick Reference Guide

## Table Calculation Overview

Table calculations are computations that are applied to the values for a measure in the view. They are computed locally on the results of the query from the data source. The query results are stored in a table, which Tableau uses for this second pass aggregations from table calculations (for example, **Running Total** of **SUM(Sales)** by **Order Date**).

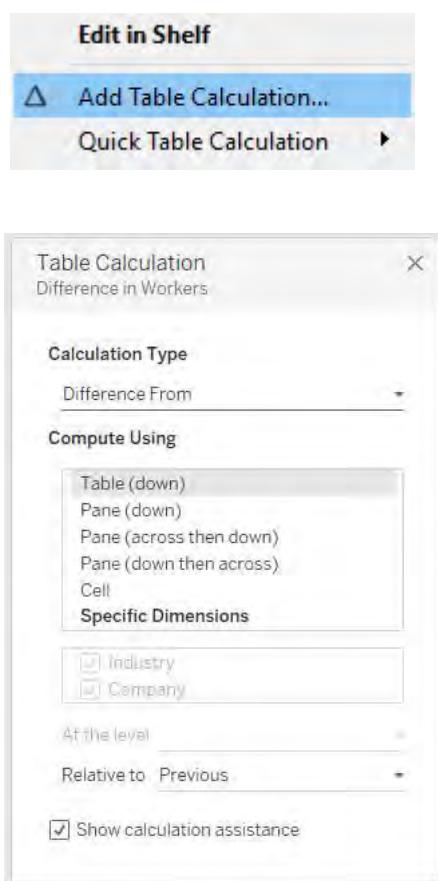
### Scope and Direction

When first defining a table calculation, you must set the scope and direction of the calculation. The first of these, scope, defines the area where the calculation is performed or for each group the calculation is computed. There are three possible scopes: **Table**, **Pane**, and **Cell**.

Table calculations also have a specific direction of across (default) or down along which the calculation is computed. Additionally, a combination of across and down can also be selected.

### Add a Table Calculation

1. Right-click any measure in a worksheet and choose **Add Table Calculation**.
2. Use the **Table Calculation** dialog box to set up the calculation you want to use, for example **Difference From** with scope of Table and a direction of Down: **Table (down)**.
3. Observe how the view changes as the table calculation scope and direction are modified, for example, change to **Table (across)**.



## Tableau for the Business User

### Levels of Control

Table calculations have four levels of user control:

Level of user control	Description
Quick Table Calculation	Accessible from the measure in the view; modifies the measure and default scope and direction
Add Table Calculation	Accessible from the measure in the view; allows for more customization in creating the table calculation from an existing measure
Edit Table Calculation	Available from the measure in the view once a table calculation has been applied, and allows changes in the direction and scope
Custom Table Calculation	Save the table calculation (drag and drop the field with the table calculation applied from your worksheet to the Data pane), and then edit the saved calculation in the Calculation Field editor. Can also be written from scratch with the Calculated Field editor.

## Using Quick Table Calculations

Quick table calculations are predefined computations that can be run against the data in your view. Right-click the measure you want to use for the calculation, select Quick Table Calculation, and select the type of quick table calculation to use from the available list (see table below).

Quick table calculations use a default scope and direction for operations, such as "Table (across)". They also use a default comparison type, such as the measure compared to the "previous" cell. Descriptions are based on default behavior.

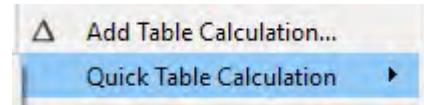
Quick Table Calculation	Description
Running total	Adds totals across the table.
Difference	Calculates the difference from previous column, across a table.
Percent difference	Calculates the percent difference from previous column, across a table.
Percent of total	Calculates the values percent of the total sum in a table.
Rank	Calculates the integer rank of the value across the table.
Percentile	Calculates the statistical percentile of the value across the table.
Moving average	Calculates the average value based on a range around the current value.
YTD Total	Calculates the running total from the beginning of the year across the table.

## Tableau for the Business User

Compound growth rate	Calculates the current value as a percentage from the first value.
Year over year growth	Calculates a percentage for the current value compared to the same period in the previous year.
YTD Growth	Calculates a percentage change from the same time period in the previous year and then calculates a running total over a year

### Add a Quick Table Calculation

1. Right-click any measure in a worksheet and choose **Quick Table Calculation**.
2. Select the calculation you want to use, for example **Running Total**.



A field used in a table calculation displays with an icon:



### Edit a Quick Table Calculation

Click the drop-down menu on the field with the table calculation icon, and do one of the following:

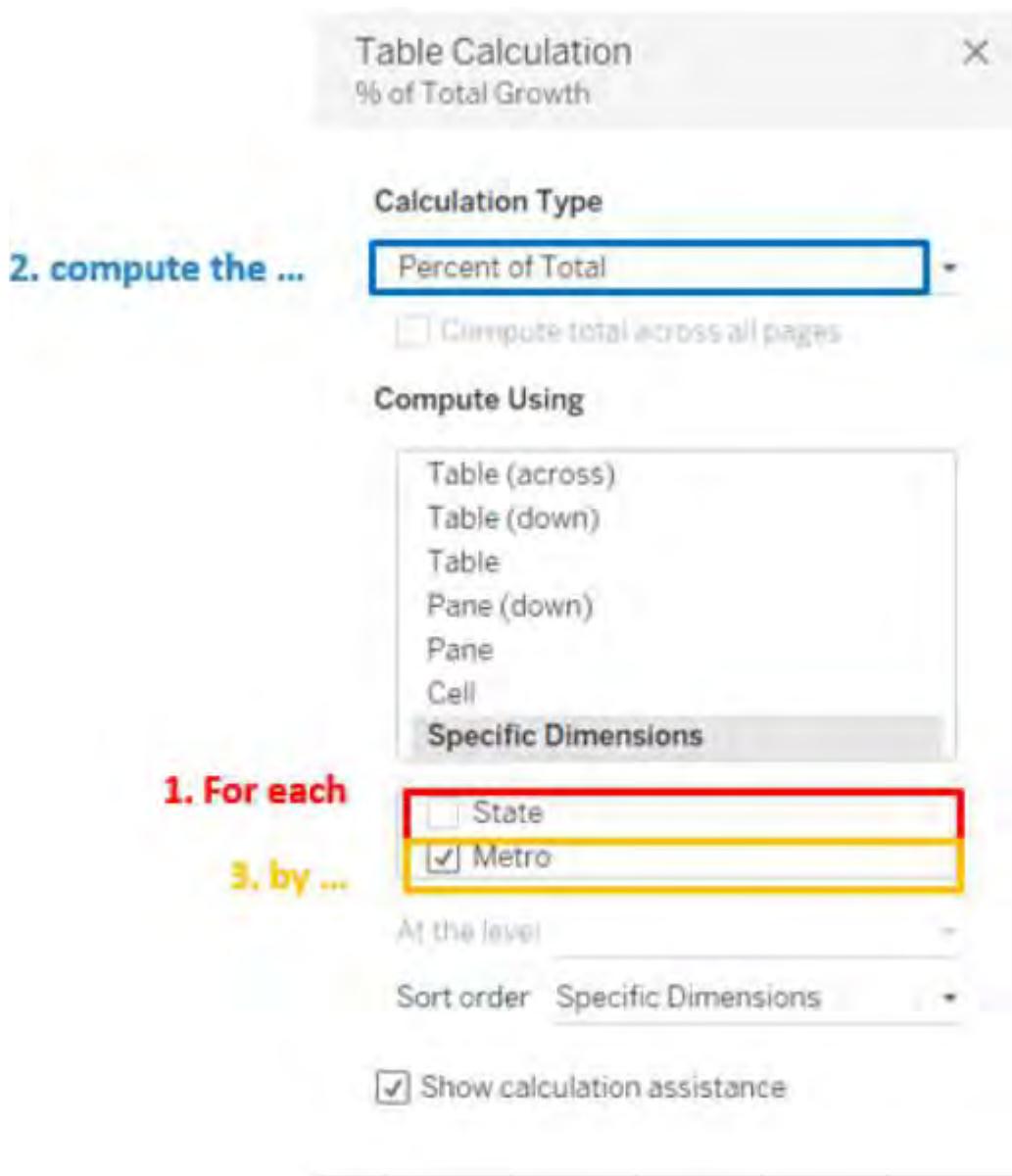
- Change the **Calculation Type** option: Allows you to use a different table calculation or modify aggregation for that calculation.
- Change the **Compute Using** option: Allows you to change the computation scope from the quick table calculation default to another option, for example, **Table (down)** or **Pane (down)**.
- Change the **Relative To** option (where applicable): Allows you to change the comparison from the default to another option, for example, **Previous to First**.
- **Edit Table Calculation:** Opens the calculation for editing in the **Table Calculation** dialog box.
- **Edit in Shelf:** Opens the calculation for editing directly on the shelf.

## Tableau for the Business User

### How to Read a Table Calculation

Right-click on the measure with the table calculation and select **Edit Table Calculation**. The selections can be translated using the following structure:

For each [any dimension not checked], compute the [Calculation Type] by [any dimension checked].



Additionally, checking the box for **Show calculation assistance** at the bottom will highlight the scope and direction within the view to better assist with understanding the table calculation.

## Statistical Analysis with Table Calculations

Table calculations can be used for statistical analysis.

Table calculation	Used for
<b>Moving Average</b>	Smoothing short-term fluctuation in data to display clearer, long-term trends
<b>Percentile</b>	Computing percentiles for a set of value within the scope of the table calculation

### Moving Average

Field	Setting
<b>Calculation Type</b>	Moving Calculation
<b>Summarize values using</b>	Average – Select the option from the drop-down menu after the Calculation Type option
<b>Previous values</b>	How many values to use before the current value
<b>Next values</b>	How many values to use after the current value
<b>Include current value</b>	Check to include the current value
<b>Null if there are not enough values</b>	If there are not enough values to create the moving calculation, select this option to make the result of these values Null.
<b>Compute Using</b>	Options are based on the visualization. For a typical crosstab, you can start with Table(Across).
<b>Add secondary calculation</b>	Select to run an additional calculation on the result, such as converting a value to a percent of total. A dialog box expands for you to add the second calculation.

### Percentile

Field	Setting
<b>Calculation Type</b>	Percentile
<b>Compute Using</b>	Table(Across). This is the default setting, but it can be changed.
<b>Order drop-down menu</b>	Use the drop-down menu after the Calculation Type option. Choose Descending or Ascending for the order to use.

## Quick Reference Guide

### CREATE A QUICK TABLE CALCULATION

1. Right-click any measure in a worksheet and choose **Add Table Calculation**.
2. Use the Table Calculation dialog box to set up the calculation you want to use, for example Difference From with scope of Table and a direction of Down: Table (down).
3. Observe how the view changes as the table calculation scope and direction are modified, for example, change to Table (across).

### READ A QUICK TABLE CALCULATION

1. Right-click on the measure with the table calculation and select **Edit Table Calculation**.
2. The selections can be translated using the following structure:
3. For each **[any dimension not checked]**, compute the **[Calculation Type]** by **[any dimension checked]**.

### EDIT A QUICK TABLE CALCULATION

1. Click the drop-down menu on the field with the table calculation icon, and do one of the following:
  2. Change the **Calculation Type** option: Allows you to use a different table calculation or modify aggregation for that calculation.
  3. Change the **Compute Using** option: Allows you to change the computation scope from the quick table calculation default to another option, for example, **Table (down)** or **Pane (down)**.
  4. Change the **Relative To** option (where applicable): Allows you to change the comparison from the default to another option, for example, **Previous to First**.
  5. **Edit Table Calculation:** Opens the calculation for editing in the **Table Calculation** dialog box.
  6. **Edit in Shelf:** Opens the calculation for editing directly on the shelf.

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# LEVEL OF DETAIL (LOD) EXPRESSIONS

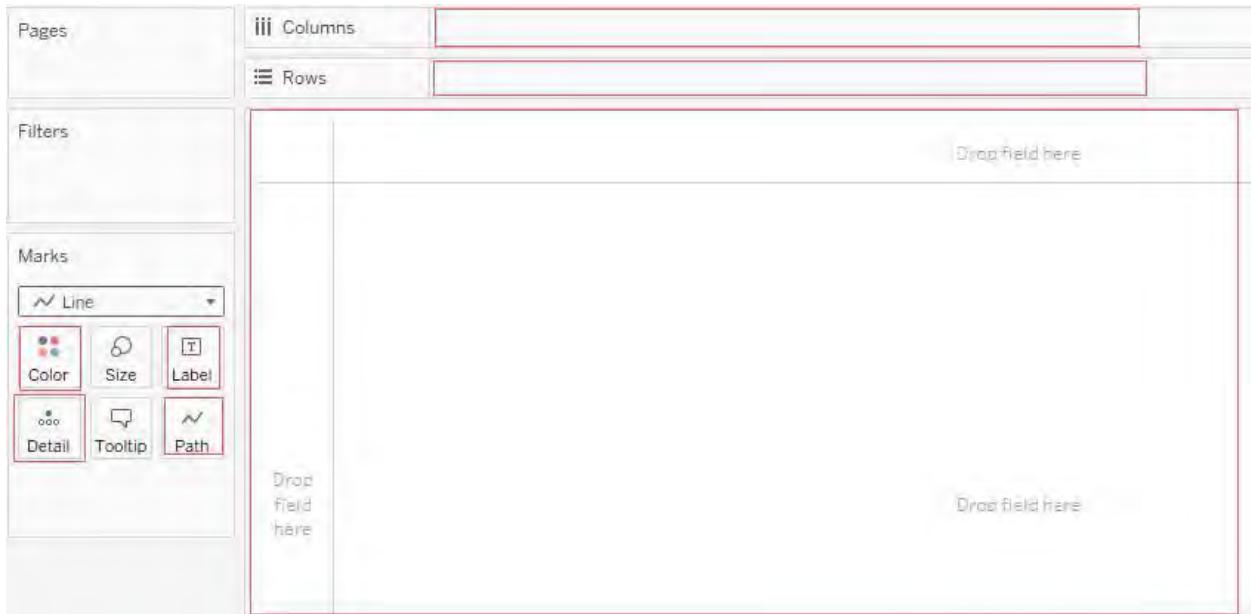
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This module contains the following:

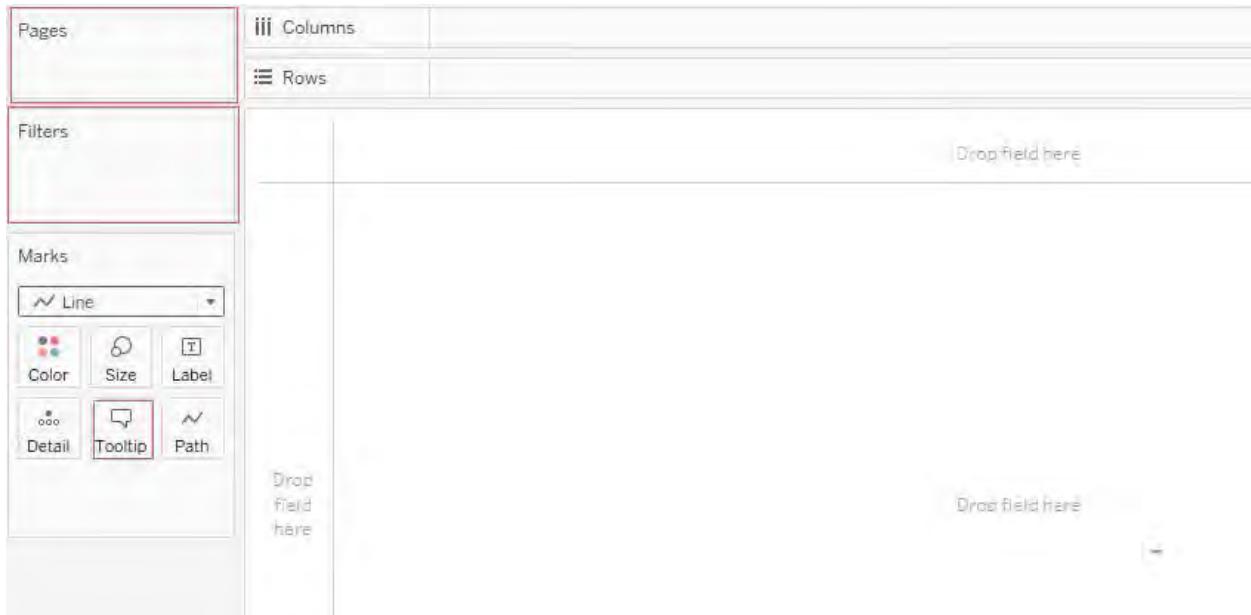
- Understanding Level of Detail (LOD) Expressions
- Common Use Cases for LOD Expressions
- Quick Reference Guide

### Understanding Level of Detail (LOD) Expressions

Level of detail refers to the granularity or aggregation of the data in your view. In Tableau, you typically do this by dropping the dimensions into your view. Based on these dimensions, your data will be aggregated accordingly – to the level of detail of the visualization.



Placing dimensions in the red areas will add them to the viz LOD.



Placing dimensions on pages, filters or tooltips does not impact the level of detail. These dimensions will simply be used to modify the data in the view without displaying it visually.

# Tableau for the Business User

Level of Detail (LOD) expressions allow you to determine the levels of detail (the dimensions) used in a calculation without having these dimensions in the visualization/view.

LOD expressions are calculated using data source level queries, meaning all the calculations happen at the data source.

There are three types of LOD expressions:

- FIXED
- INCLUDE
- EXCLUDE

FIXED LOD expressions aggregate the view to the level of detail specified in the expression. INCLUDE and EXCLUDE LOD expressions behave relative to what is in the view's current level of detail.

## Syntax and Types

The syntax for an LOD expression is:

{Keyword: [Column1], [Column2], [ColumnN]: Aggregate Expression}

For example:

{**FIXED** [**City**]: **SUM**([Sales])}

The sum of sales would be calculated by city regardless of what is shown in the view.

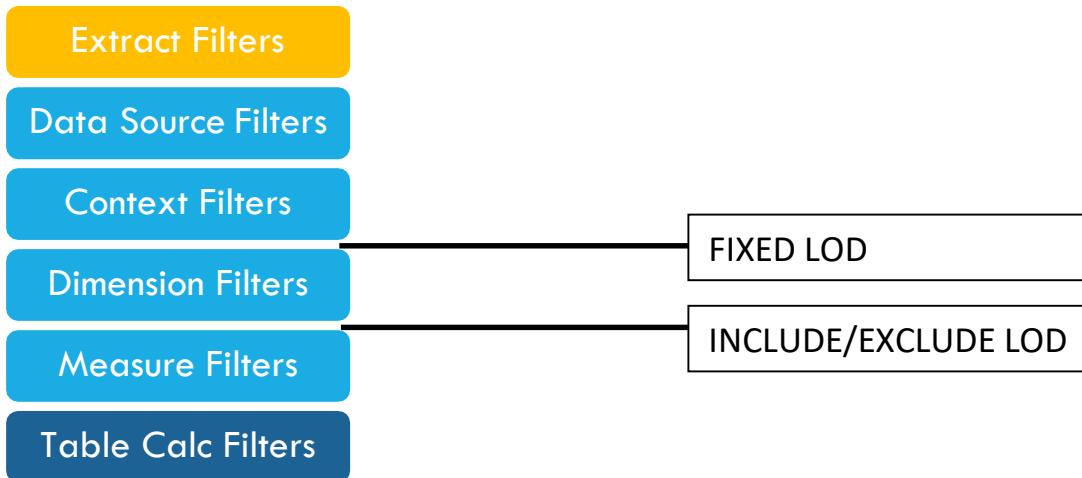
Keyword	Description	Example
<b>FIXED</b>	Allows you to specify the aggregation or granularity independent of the fields used in the level of detail of the visualization.	<code>AVG({<b>FIXED</b> [<b>State</b>]: <b>SUM</b>([Sales])})</code> Total sales for each state, averaged across all states.
<b>INCLUDE</b>	Calculates results at a level less aggregated than the visualization's level of detail.	<code>AVG({<b>INCLUDE</b> [<b>City</b>]: <b>SUM</b>([Sales])})</code> Sum of Sales, including the City level of detail.
<b>EXCLUDE</b>	Calculates results at a level more aggregated than the visualization's level of detail.	<code>AVG({<b>EXCLUDE</b> [<b>City</b>]: <b>SUM</b>([Sales])})</code> Sum of Sales, excluding the City level of detail.

## Order of Filtering

A key difference between INCLUDE/EXCLUDE and FIXED is where each one occurs in the filtering hierarchy shown below. FIXED LOD Expressions are computed before dimension filters, but after context filters. This

## Tableau for the Business User

has some distinct advantages. INCLUDE/EXCLUDE filters are applied after Dimension filters but before Measure Filters.



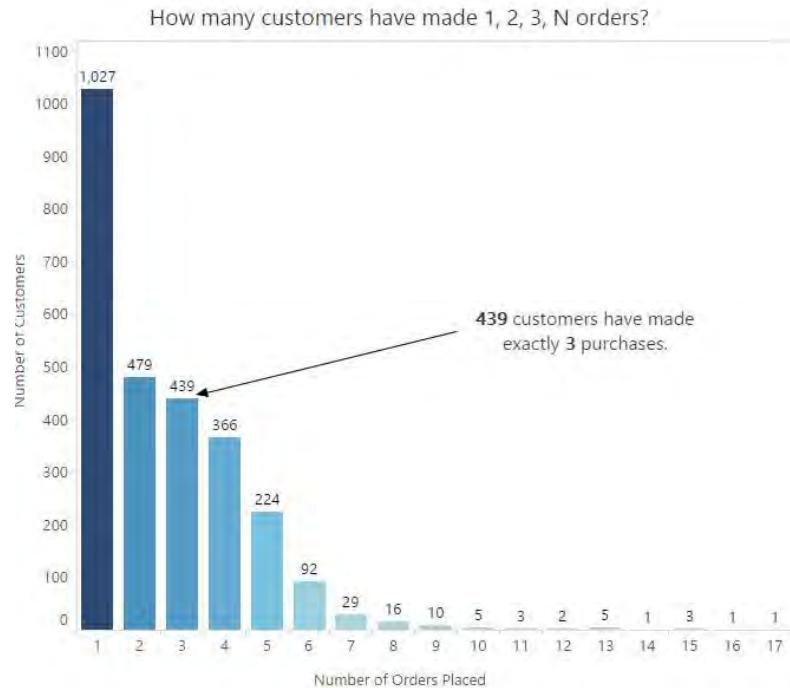
## Common Use Cases for LOD Expressions

A great resource for LOD Expressions is the Tableau blog post: [Top 15 LOD Expressions](#). The blog outlines 15 example workbooks with customized data source that can be downloaded and reviewed for further details. Below are just a few examples provided in that post:

### Customer Order Frequency

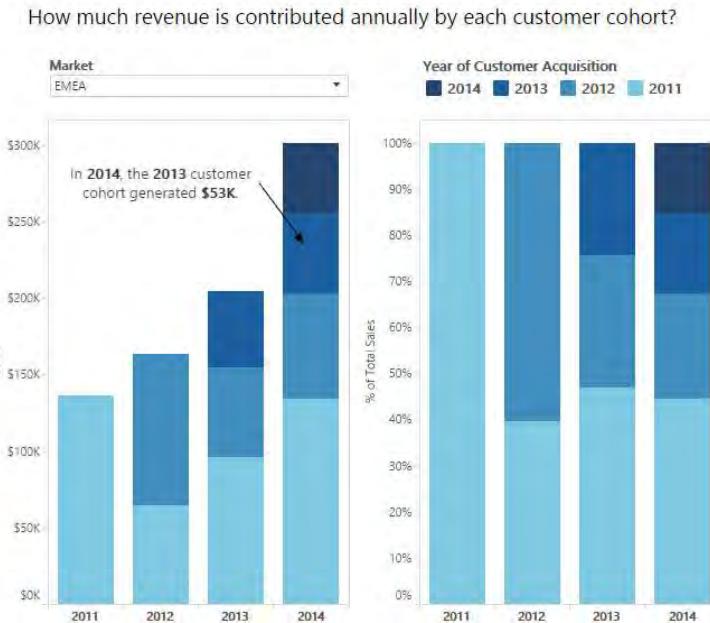
Sample Use Case: To know the number of customers who made one order, two orders, three orders, etc.

## Tableau for the Business User



### Cohort Analysis

Sample Use Case: To view groups of customers by the year of their first purchase to compare sales contributions annually across cohorts.

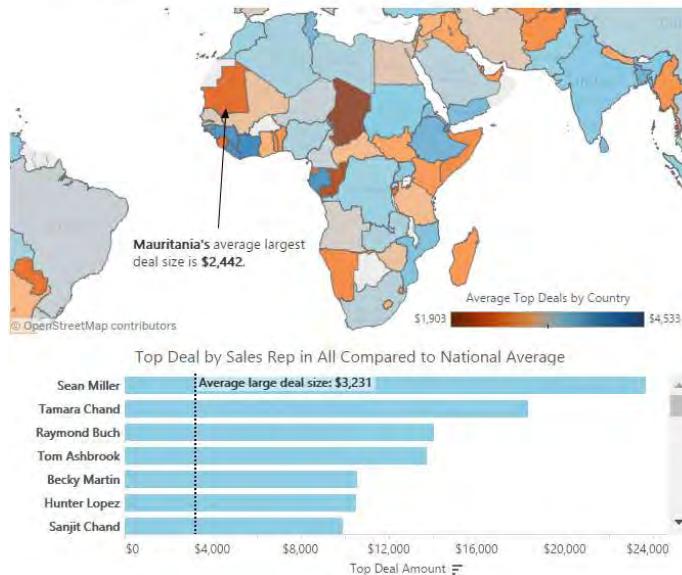


### Totals and Averages Across Segments

## Tableau for the Business User

Sample Use Case: What is the largest deal that each sales rep has closed and what is the average of these top deals by country?

What is the top deal closed by sales rep, and the average of these deals by country?  
Select a country to see each sales rep's top deal vs the country average.



## Quick Reference Guide

### HOW TO CREATE AN LOD EXPRESSION

1. Determine the level of detail of your view/visualization.
2. Determine what level of detail you want for your calculation.
3. Use the following syntax:  
  
**{Keyword: [Column1], [Column2], [ColumnN]:  
Aggregate Expression}**
4. Specify either **FIXED**, **INCLUDE** or **EXCLUDE** as the keyword.
  - **FIXED** – Outlines exactly the level of detail for the aggregate expression
  - **INCLUDE** – adds additional granularity with each specified dimension
  - **EXCLUDE** – removes a level of granularity with each specified dimension
5. Specify the dimensions for your LOD expression.
6. Specify the aggregate expression (example:  
`SUM(Sales))`

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# USING REFERENCE LINES AND BANDS

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This module contains the following topics:

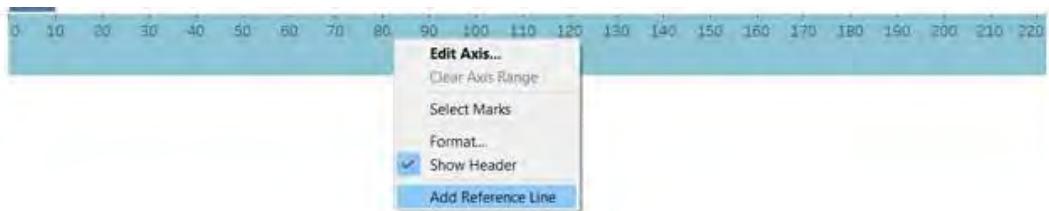
- Reference Lines
- Reference Bands
- Quick Reference Guide

## Reference Lines

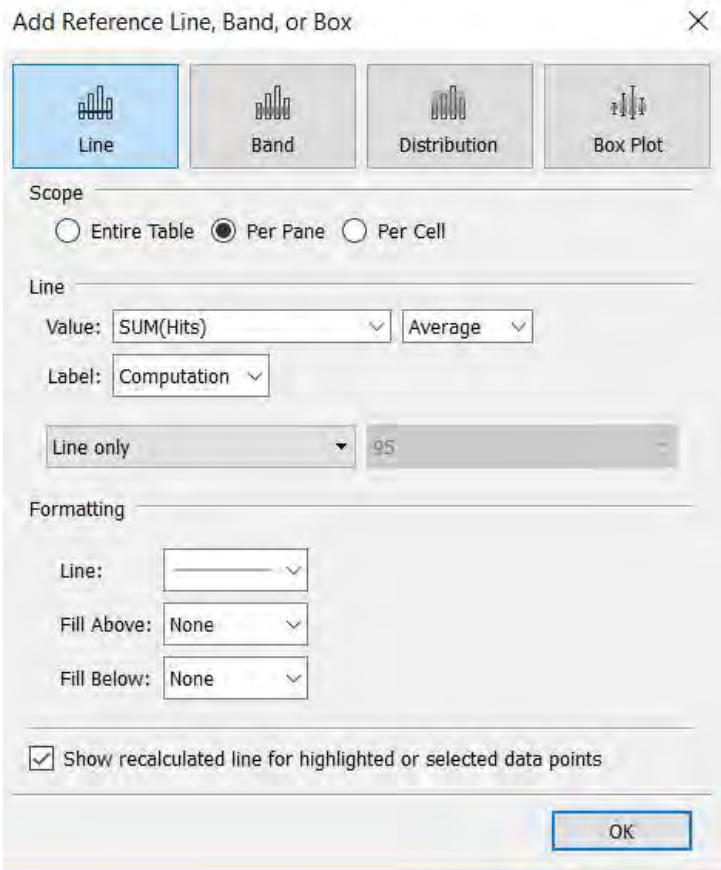
Reference lines are a helpful aid to users in terms of providing points of comparison. They can be shown based on a fixed constant or on a calculated value such as the average of a measure in the worksheet. Calculations can involve the table shown on the view, or be based on a pane of data, or on data cells.

### Adding a Reference Line

1. Right-click on the desired axis and select **Add Reference Line**.



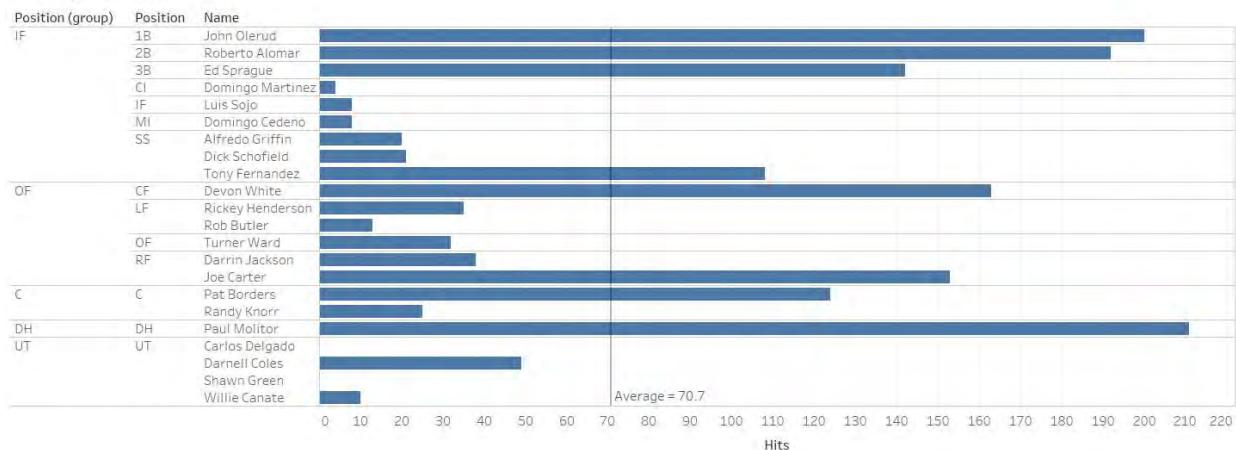
2. In the dialog box, choose **Line** and whether you want to calculate the reference line based on the **Table**, the **Pane**, or for each **Cell**. This is known as the line's scope – see examples below for the differences.



# Tableau for the Business User

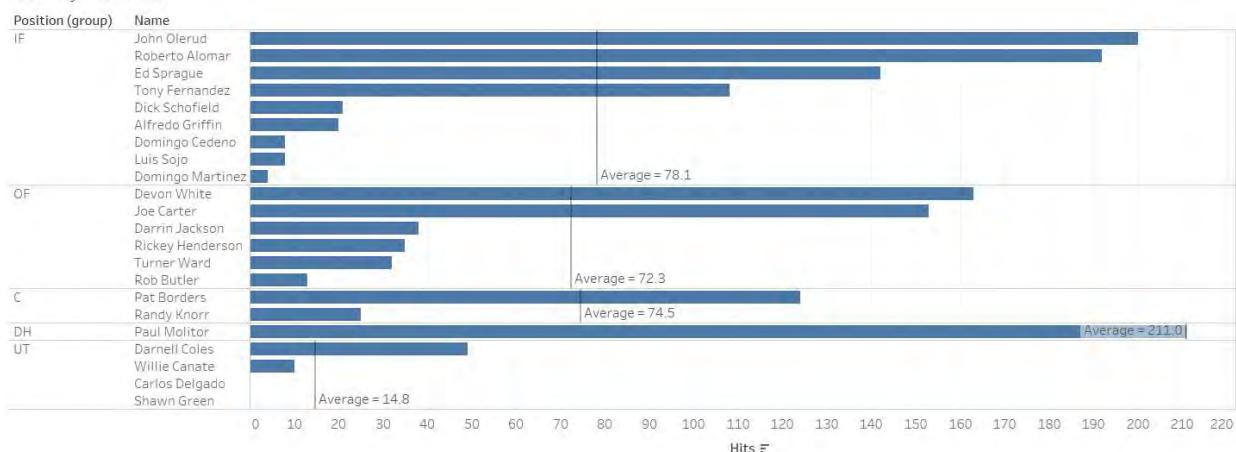
## a. Entire Table Scope:

Hits by Position



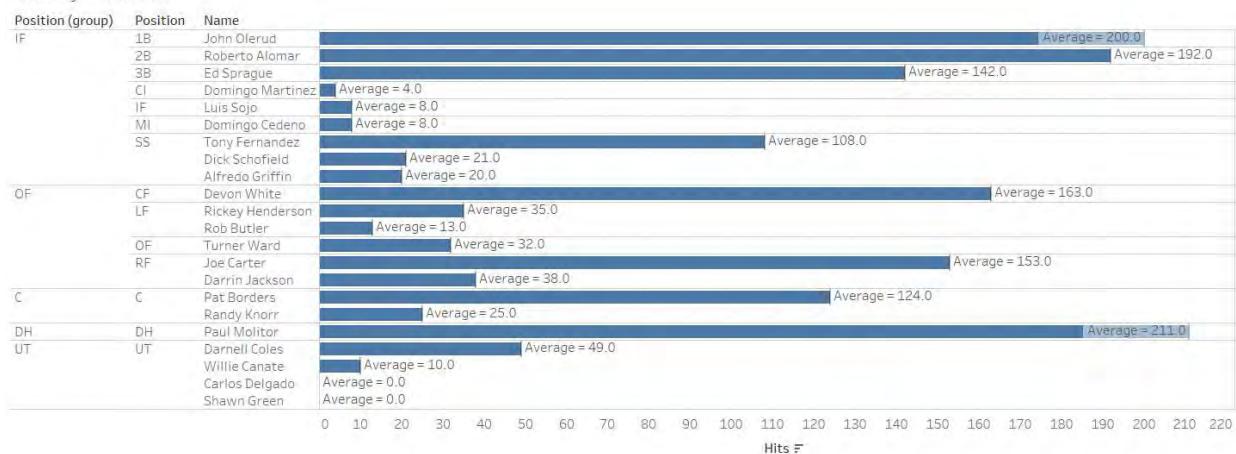
## b. Per Pane Scope:

Hits by Position



## c. Per Cell Scope:

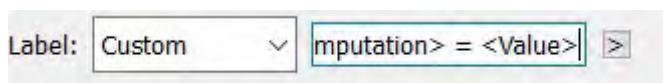
Hits by Position



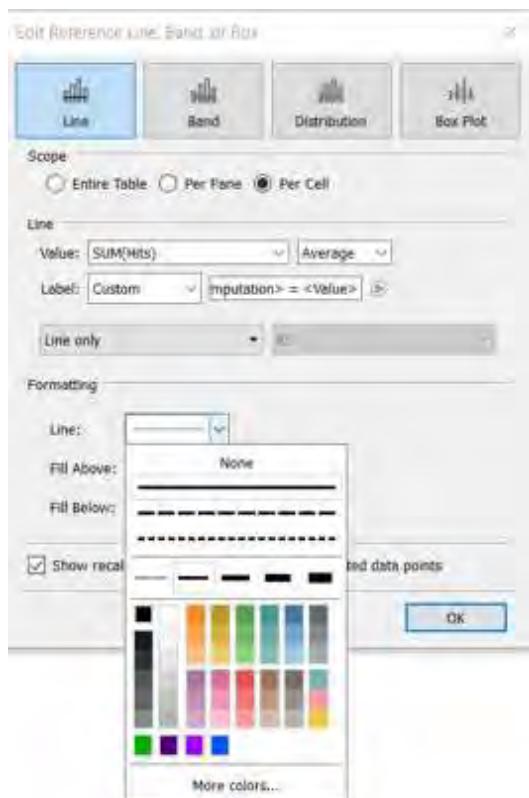
- Within the **Line** section of the dialog window, first select the measure to generate the reference line, and then select the desired Value aggregation. Options include:

## Tableau for the Business User

- a. Average
  - b. Median
  - c. Maximum
  - d. Minimum
  - e. Sum
  - f. Total (Aggregates underlying data across the table, pane, or cell)
  - g. Constant (Enter desired fixed value)
4. The reference line's label can be edited at the time it is created. You may choose to not show a label, or to state the computation (e.g., "Average"), or the value (e.g., "78.1"). Alternatively, the **Custom** option allows you to include multiple fields using the text window and dropdown arrow, as shown below:



5. The formatting of the line can also be edited. You may select a solid, dashed, or dotted line, adjust its weighting and color, and choose to include a shading fill above or below the line.



# Tableau for the Business User

## Editing Reference Lines

1. Right-click on the desired axis.
2. Select **Edit Reference Line**.
3. Select the desired line to remove (if multiple lines) from the right-side menu.
4. Modify features as desired as discussed above.

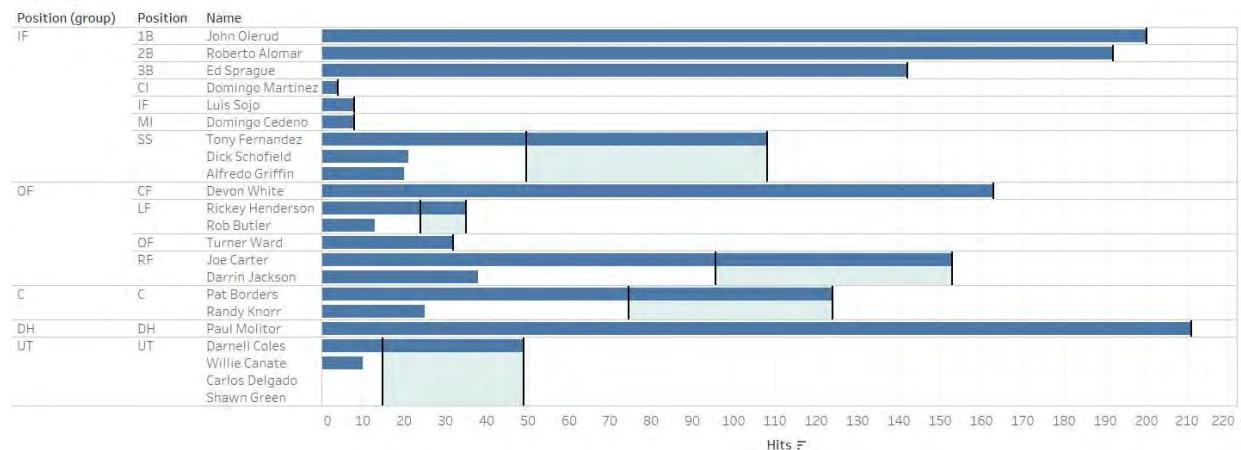
## Removing Reference Lines

1. Right-click on the desired axis.
2. Select **Remove Reference Line**.
3. Select the desired line to remove (if multiple lines) from the right-side menu.

## Reference Bands

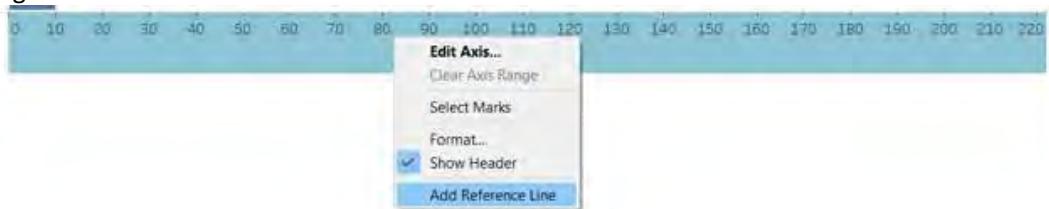
Reference bands are similar in nature to reference lines but have high and low thresholds based on the criteria set.

Hits by Position



## Adding Reference Bands

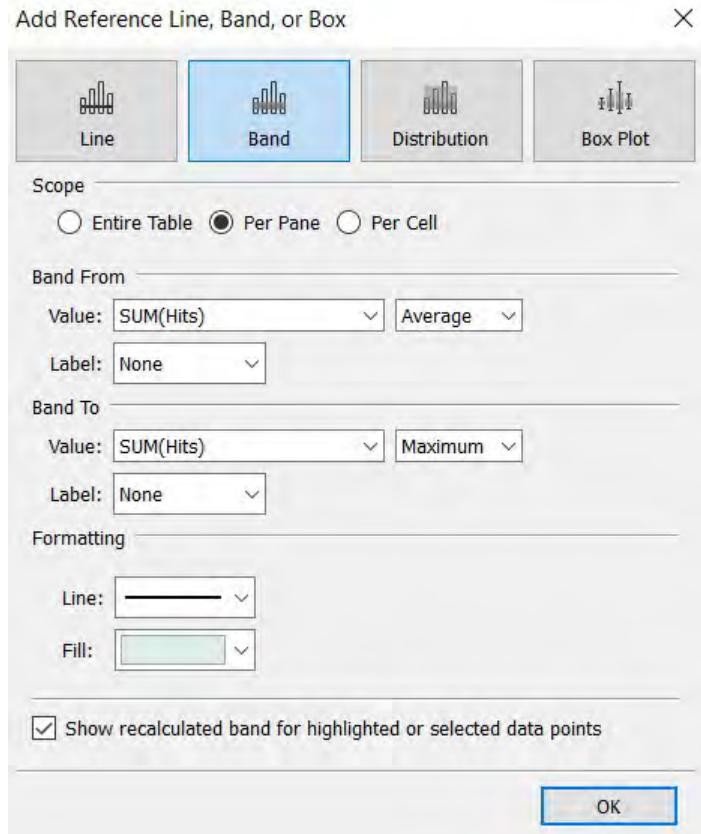
1. Right-click on the desired axis and select **Add Reference Line**.



2. In the dialog box, choose **Band**. Follow the same steps as with Reference Lines, except the following:
  - a. Choose the values to band from and to, such as from Minimum to Maximum or from Average to Maximum.

## Tableau for the Business User

- b. Edit label, line, and fill formatting as desired.



### Editing Reference Bands

1. Right-click on the desired axis.
2. Select **Edit Reference Line**.
3. Select the desired band to remove (if multiple bands) from the right-side menu.
4. Modify features as desired as discussed above.

### Removing Reference Bands

1. Right-click on the desired axis.
2. Select **Remove Reference Line**.
3. Select the desired band to remove (if multiple band) from the right-side menu.

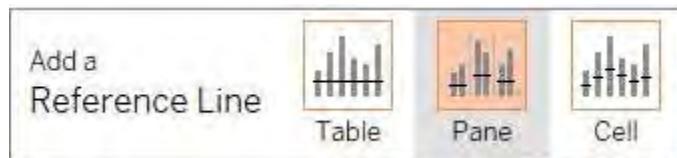
# Tableau for the Business User

## Using the Analytics Pane

Many common data analysis tools are located within the Analytics Pane. The Analytics Pane allows you to add any of these options with a single drag and drop action. More specifically, you can use the Analytics Pane to quickly add a constant line, average line, reference line or reference band, to name a few.

The screenshot shows the Tableau Analytics pane. At the top, there are tabs for 'Data' and 'Analytics'. The 'Analytics' tab is selected. Below the tabs, there are three main sections: 'Summarize', 'Model', and 'Custom'. Under 'Summarize', there are icons for Constant Line, Average Line, Median with Quartiles, Box Plot, and Totals. Under 'Model', there are icons for Average with 95% CI, Median with 95% CI, Trend Line, Forecast, and Cluster. Under 'Custom', there are icons for Reference Line, Reference Band, Distribution Band, and Box Plot. Some items in the 'Model' and 'Custom' sections are greyed out, indicating they are unavailable.

To select an item from the Analytics Pane, simply drag the item to the view. A new window will appear to specify the scope of the calculation.



Upon selecting the scope, the reference line, in the case above, will be automatically generated in the view. Changes to the reference line can be made as discussed previously.

Depending on the content and type of your visualization, some analytic tools will be unavailable and are greyed out.

## Quick Reference Guide

### CREATE REFERENCE LINES & BANDS

1. Select a desired axis, then **Add Reference Line** from the menu.
2. Select **Line or Band**.
3. Select **Scope: Table, Panel, or Cell**.
4. Select **Value Computation**: Average, Minimum, Maximum, etc., including “From” and “To” for a Reference Band.
5. Adjust **Label** as desired.
6. Adjust **Line** formatting as desired.
7. Adjust **Fill** as desired.

### DELETE REFERENCE LINES & BANDS

1. Select the desired axis, then **Remove Reference Line**. Select the targeted line/band if multiple exist.

### EDIT REFERENCE LINES & BANDS

1. Select the desired axis, then **Edit Reference Line**. Select the targeted line/band if multiple exist.
2. Adjust the settings, including the scope (Table, Panel, Cell), computation (e.g., average, maximum), labels, lines, and fill shading.

### USING THE ANALYTICS PANE

1. Switch from viewing the **Data Pane** to the **Analytics Pane** by clicking on the **Analytics Pane** tab.
2. Select an available analytics tool (greyed out tools are unavailable).
3. Drag and drop the tool into the view.
4. When selecting a **Constant Line, Average Line, Reference Line, or Reference Band**, a new window will appear to specify the scope of the calculation.
5. To modify the line, follow the previously outlined steps to edit a reference line or band.

# SHOWING PARTS OF THE WHOLE

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This module contains the following topics:

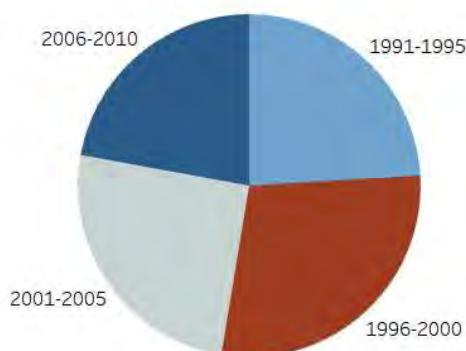
- Pie Charts
- Tree Maps
- Quick Reference Guide

## Pie Charts & Tree Maps

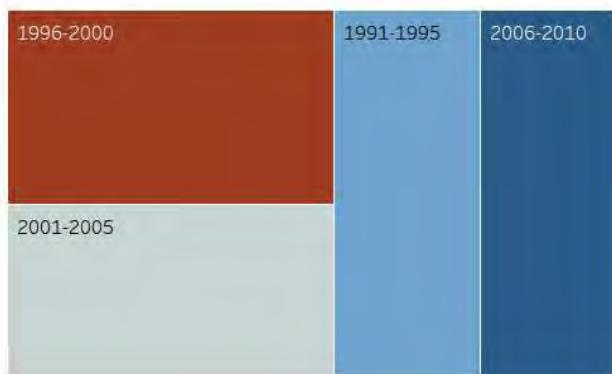
Tableau offers a variety of options for data visualizations which compare relative values within dimensions. One such tool is the well-known, traditional pie chart. Creating these in Tableau is a straight-forward process that will be covered in this section. However, Tableau also enables similarly efficient development of tree maps. While not as well known, tree maps work better with our human mind's capabilities in terms of sizing up relative sizes of areas with ninety-degree angles. Each of these tools have their use cases.

Which range of years has the highest value? Which has the least?

Pie Chart



Tree Map



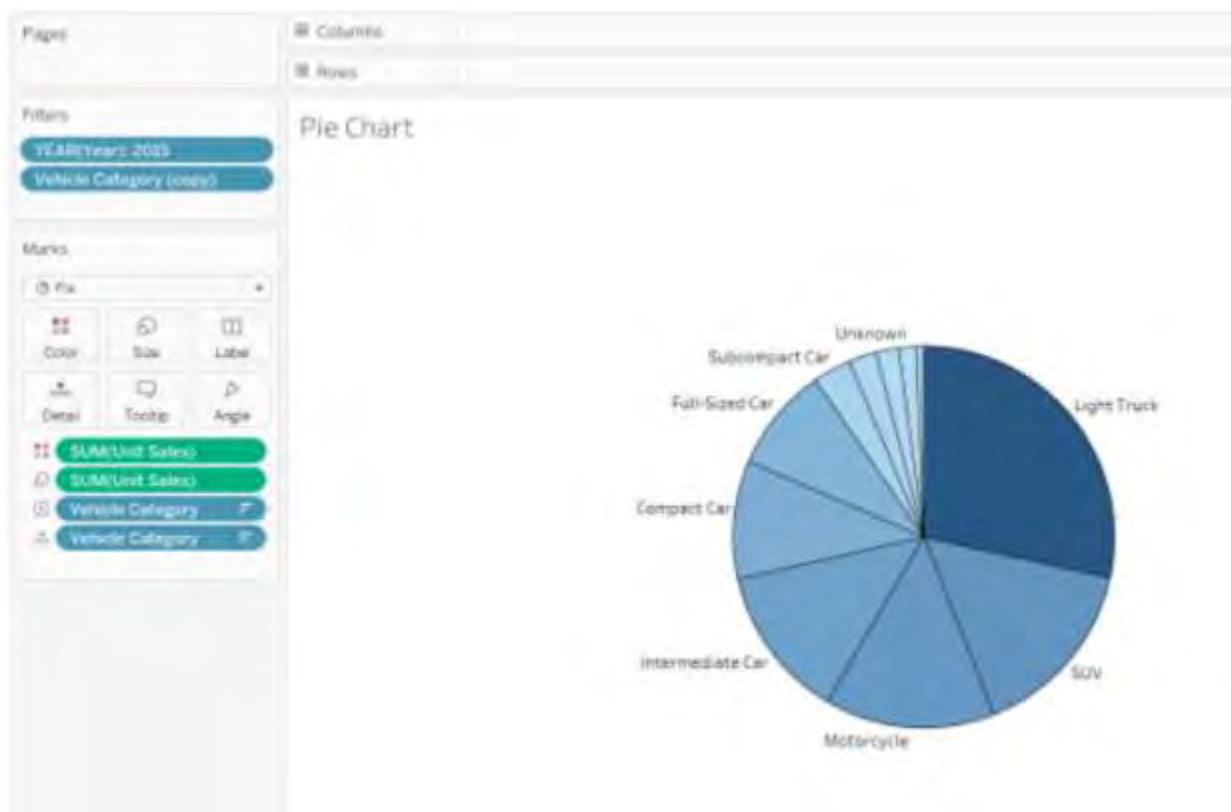
### Create a Pie Chart

1. Change the **Marks** card type to **Pie Chart**.
2. Drag the measure with which you wish to size the chart slices to the **Angle** card. Using the **Size** card would also work the same.
3. If desired, drag a dimension (if few member values) or measure (aggregated in a desired fashion, such as sum or average) to the **Color** card.
4. If desired, drag that dimension and/or measure to the **Label** card.
5. If no labels or if color is by a measure, drag a desired dimension to the **Detail** card.
6. If desired, select the **Size** card and drag the slider to make the chart larger or smaller.

#### NOTES:

- Neither the **Columns** nor **Rows** shelves are used.
- The sample below is sliced by 11 vehicle categories, which makes users' assessment and comparisons of relative sizes difficult. Coloring by so many member values is not recommended.

## Tableau for the Business User



Alternatively, when you have numerous slices and you want to see the part of each slice relative to the whole, a better option would be to use a tree map.

### Create a Tree Map

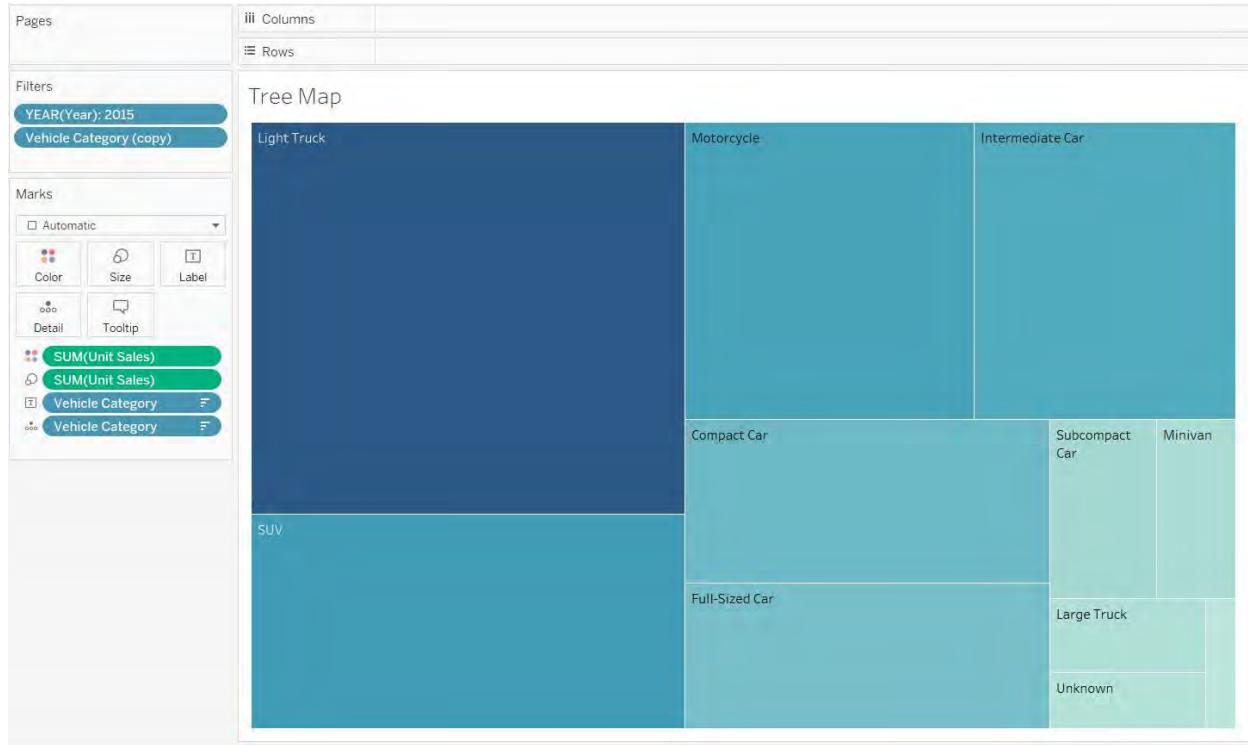
1. Drag the measure with which you wish to size the chart to the **Size** card.
2. If desired, drag a dimension (if few member values) or measure (aggregated in a desired fashion, such as sum or average) to the **Color** card.
3. If desired, drag that dimension and/or measure to the **Label** card.
4. If no labels or if color is by a measure, drag a desired dimension to the **Detail** card.
5. If desired, right-click on the dimensions on the marks card to **Show Highlighter**. This enables users to quickly view specific data points.

#### NOTES:

- Neither the **Columns** nor **Rows** shelves are used.

## Tableau for the Business User

- The human mind can more easily discern differences in the relative sizes of shapes with right (90 degree) angles as in the tree map below.
- Additional dimensions can be added to detail for further granularity in the view.



## Quick Reference Guide

### CREATE PIE CHARTS

1. Select **Pie Chart** in **Marks** card type menu.
2. Drag desired measure to **Angle** card.
3. Drag desired dimension or measure to **Color** card, if desired.
4. Drag those dimensions and/or measures to the **Label** card, if desired.
5. If no dimensional color or label, drag a desired dimension to **Detail**.

### CREATE TREE MAPS

1. Drag desired measure to **Size** card.
2. Drag dimension or measure to **Color** card, if desired.
3. Drag dimension and/or measure to **Label** card, if desired.
4. If no dimensional color or label, drag one or more desired dimensions to **Detail**.
5. Use the **Show Highlighter** function, if desired.

# CREATING AND USING PARAMETERS

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This module contains the following:

- Using Parameters
- Using Parameters with Reference Lines
- Parameters and Filters
- Quick Reference Guide

# Tableau for the Business User

## Using Parameters

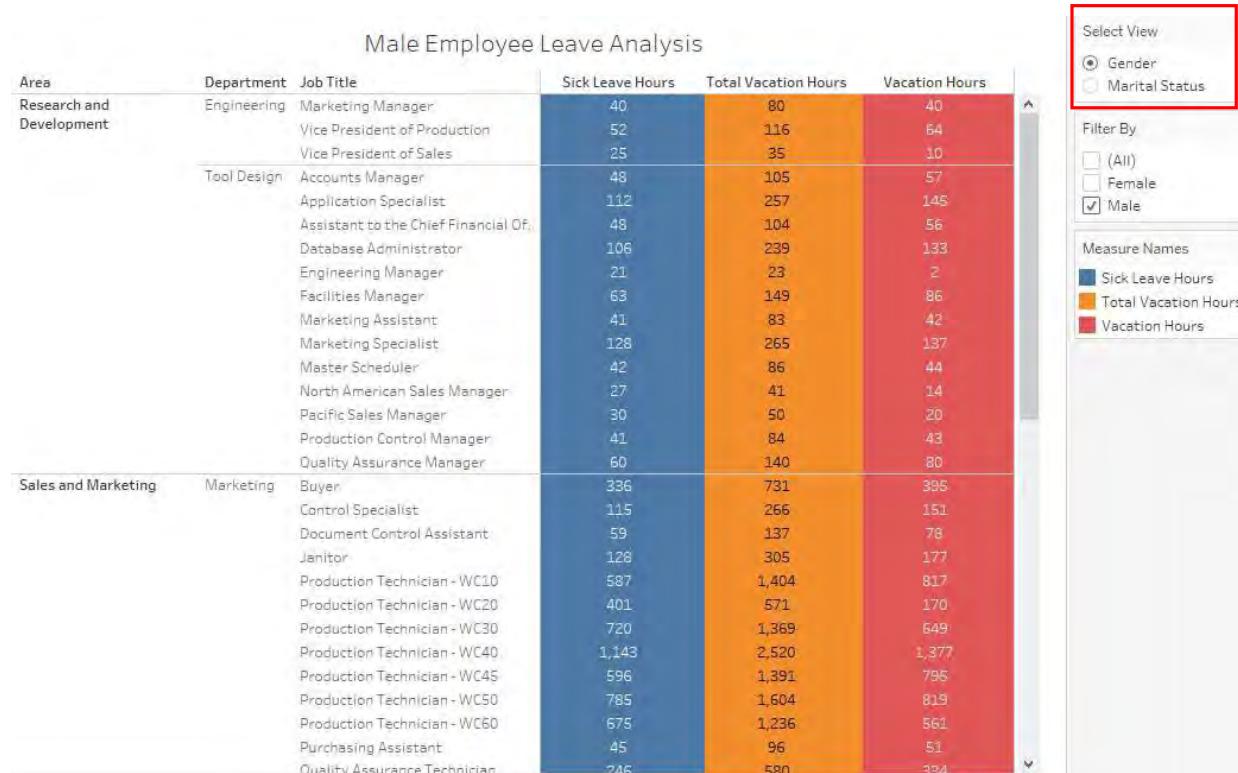
A parameter is a user-defined value to interact with a view. It provides more flexibility to your user and allows them to have more control over the visualization. Parameters are stored with the workbook, not a specific data source or worksheet, so the defined value can be used across the entire workbook and across disparate sources.

Users change parameter values with parameter controls that you can add to the view. To display a parameter control, right-click the parameter in the **Data pane** and select **Show Parameter Control**.

You can place parameter controls on worksheets and dashboards, so they are included when you save to the web or publish to Tableau Server.

Some of the many uses of parameters include:

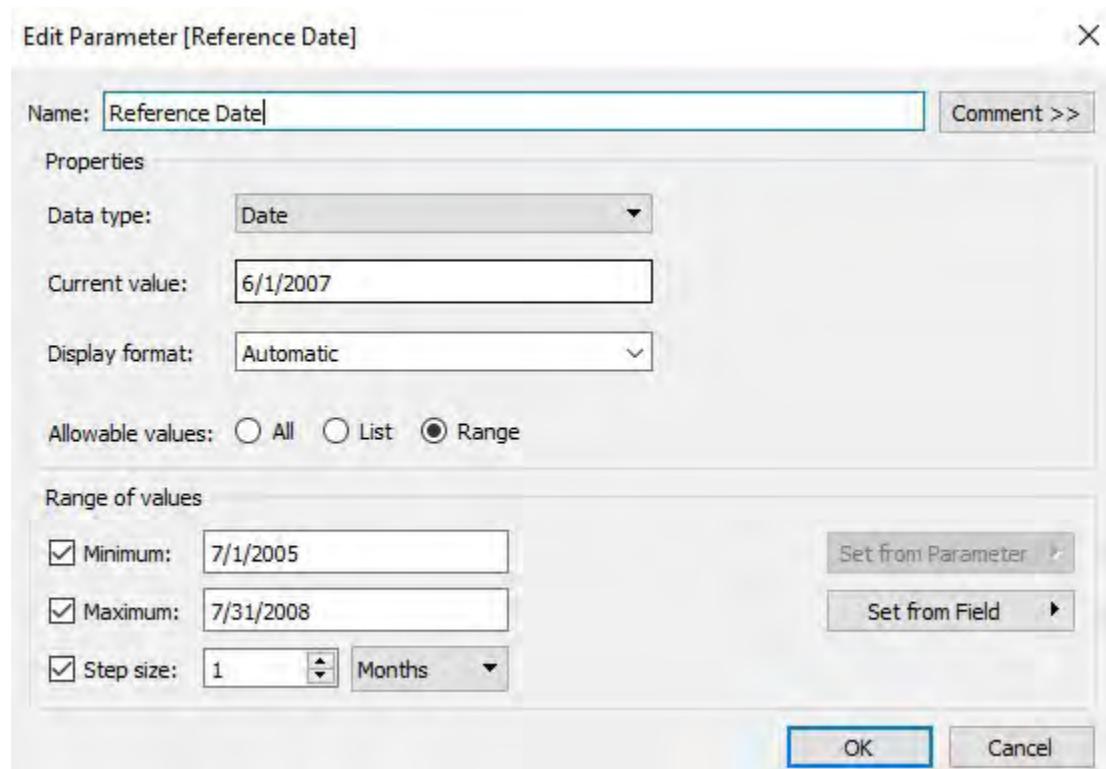
- Capturing values for filters
- User-controlled thresholds
- What-if analysis
- Dynamic fields, axes, titles, and so forth
- Filtering across disparate sources
- Top N



# Tableau for the Business User

## Creating Parameters

New parameters can be created either directly from the Data Pane or based on a selected field. They can also be created in any location where you can use a parameter, such as reference lines or filters.



## How To: Add a Parameter Directly

1. Right-click in the **Data pane** point to **Create**, and then click **Parameter**.
2. Name the parameter.
3. Specify the data type and then follow the corresponding steps for defining the parameter:

Specify the data type	...and then define the parameter
<b>Float</b>	<ul style="list-style-type: none"><li>• Set Current value (the default value).</li><li>• Set the Display format.</li><li>• Set allowable values. If you select List, enter the values in the List of values table. For Range, define the minimum, maximum, and step size.</li></ul>
<b>Integer</b>	<ul style="list-style-type: none"><li>• Use the same steps as Float.</li></ul>
<b>String</b>	<ul style="list-style-type: none"><li>• Set Current value (the default value).</li><li>• Set allowable values: All or List.</li><li>• If you select List, enter the values in the List of values table</li></ul>
<b>Boolean</b>	<ul style="list-style-type: none"><li>• Set Current value to True or False.</li><li>• Set Aliases values for True and False (optional).</li></ul>

## Tableau for the Business User

Date	<ul style="list-style-type: none"><li>Select the Display format from the drop-down list. Set allowable values. If you select List, enter the values in the List of values table.</li><li>For Range, define the minimum and maximum date for the range, and define the step size.</li></ul>
Date & Time	<ul style="list-style-type: none"><li>Use the same steps as Date.</li></ul>

### Using Parameters in Calculations

Parameters can be used in calculations to allow the resulting value to vary based on user input. Changing the value of the parameter changes all calculations using that parameter.

To use a parameter in a calculation, drag the parameter from the Data pane and drop it in the calculation editor (or add it manually by typing the parameter name), either at a new location in the formula or to replace a part of the current formula:



*Note: Parameters are shown in purple in calculations.*

### Editing Parameters

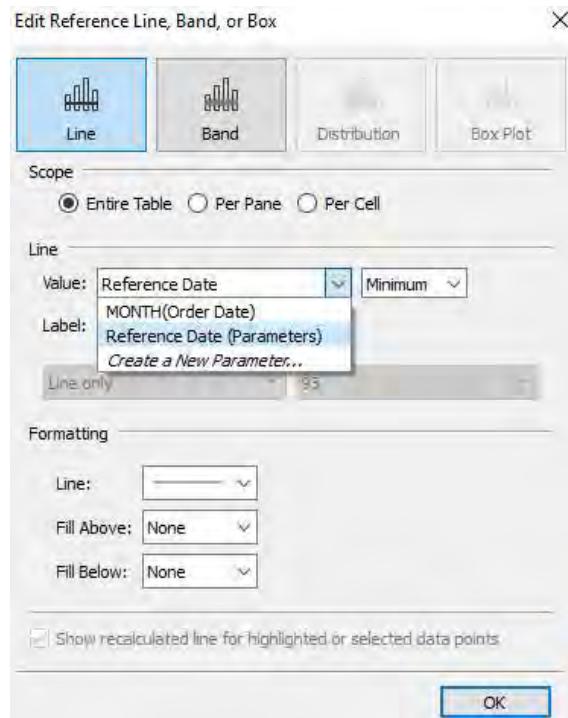
You can edit parameters from the Data pane or the parameter control.

#### How To: Edit a Parameter Directly

- Do one of the following:
  - Right-click the parameter in the **Data pane** and select **Edit**.
  - Select **Edit Parameter** on the parameter control card menu.
- In the Edit Parameter dialog box, make the modifications as necessary.
- When finished, click **OK**. The parameter is updated along with any calculations that use it.

## Using Parameter with Reference Lines

Parameters can be incorporated into reference lines to allow users to change the value shown by the reference line. This can be useful if you want your users to be able to move the reference line relative to the value shown by the parameter.

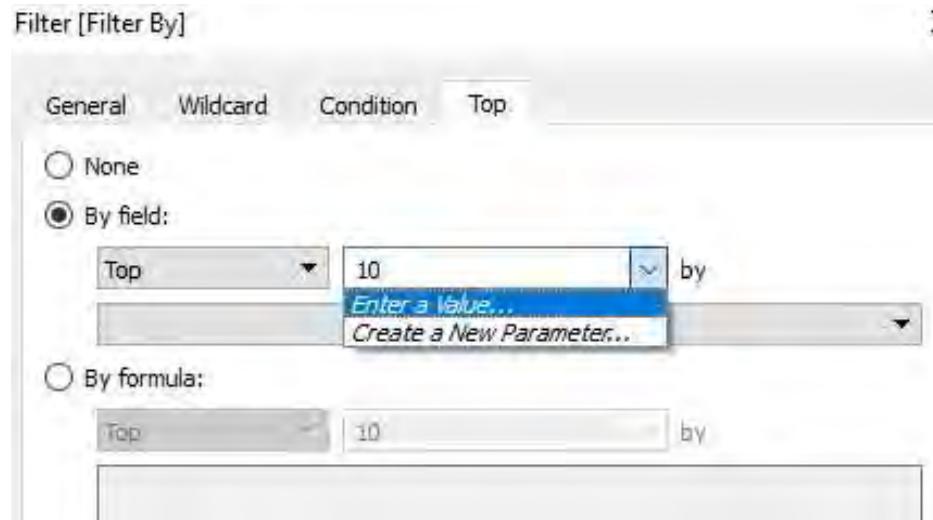


### How To: Add a Reference Line with a Parameter

1. Create and save the parameter you want to use.
2. Right-click in your worksheet to add the reference line.  
*NOTE: Alternatively, from the Reference Line dialog box under **Line**, select **Create a New Parameter**. If choosing this option, skip steps 3-4 and follow the steps to create a new parameter outlined earlier in this module.*
3. In the Reference Line, Band, or Box dialog box, choose the type and scope of the reference you want to use.
4. Under **Line**, select the parameter you created from the **Value** drop-down list.
5. Edit the other options as desired and click **OK**.
6. Right-click the parameter to show the control in your worksheet and test the reference line.

## Parameters and Filters

Parameters give you a way to dynamically modify values in a Top N filter. Rather than manually setting the number of values you want to show in the filter, you can use a parameter.



### How To: Add a Top N Filter with a Parameter

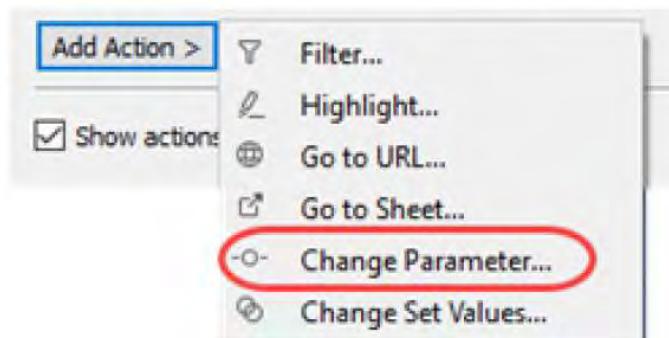
1. Create and save an integer parameter you want to use.
2. From the filter dialog menu and the Top pane, select the parameter from the drop-down menu for **By Field**.

*NOTE: Alternatively, from the Filter dialog box and Top pane under **By field**, select **Create a New Parameter**. If choosing this option, follow the steps to create a new parameter outlined earlier in this module.*

3. Edit the other options as desired and click **OK**.

### Parameter Actions

Parameter actions allow users to adjust a parameter's view dynamically through interacting with a view. The parameter is updated based on the selection of the marks. This feature can be used to interactively update reference lines, display summary data, and display selective hierarchies. Parameter actions require the creation of a parameter first, but calculations using the parameter may not be needed, depending on the available behavior. Parameter actions are available on both worksheets and dashboards.



## Quick Reference Guide

### HOW TO CREATE PARAMETER

1. Right-click in the **Data pane**, select **Create**, and then click **Parameter**.
2. **Name** the parameter.
3. Specify the **data type**
4. Based on the data type, specify additional characteristics:

#### Float or Integer:

- Set **Current** value (the default value).
- Set the **Display** format.
- Set allowable values. If you select **List**, enter the values in the List of values table. For **Range**, define the minimum, maximum, and step size.

#### String:

- Set **Current** value (the default value).
- Set allowable values: All or List.
- If you select **List**, enter the values in the List of values table.

#### Boolean:

- Set **Current** value to True or False.
- Set **Aliases** values for True and False (optional).

#### Date or Date/Time:

- Select the **Display** format from the drop-down list.
- Set allowable values. If you select **List**, enter the values in the **List** of values table. For **Range**, define the minimum and maximum date for the range, and define the step size.

### HOW TO ADD A REFERENCE LINE WITH A PARAMETER

1. Create and save the parameter you want to use.
2. Right-click in your worksheet to add the reference line.
3. In the Reference Line, Band, or Box dialog box, choose the type and scope of the reference you want to use.
4. Under **Line**, select the parameter you created from the **Value** drop-down list.
5. Edit the other options as desired and click **OK**.
6. Right-click the parameter to show the control in your worksheet and test the reference line.

# CREATING MAPS

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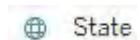
This module contains the following:

- Mapping in Tableau
- Navigation and Selection in Maps
- Background Maps and Layers
- Modifying Geocode Locations within Tableau
- Creating Geographic Groups
- Using Background Images for Spatial Analysis
- Using Spatial Files for Mapping
- Quick Reference Guide

### Mapping in Tableau

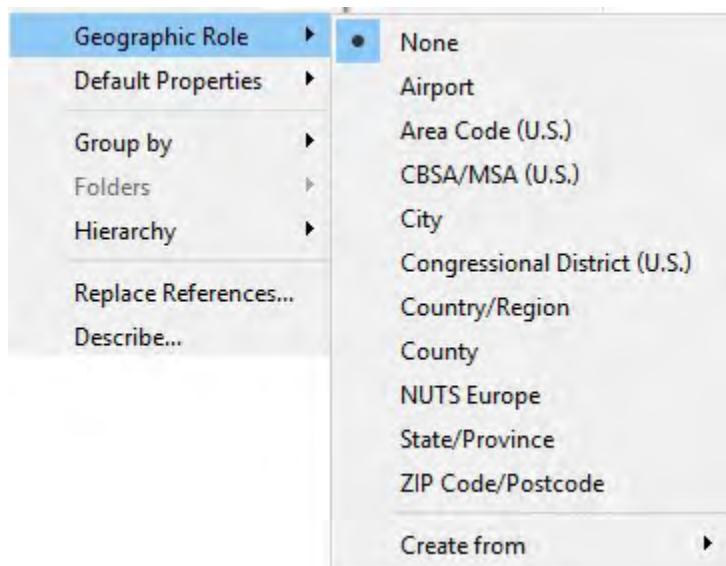
Tableau allows you to make the most of geographical data, so you can get to the “where” as well as the “why.” With instant geocoding, Tableau automatically turns the location information you already have into interactive maps.

Tableau uses logic to recognize geographic fields within your data, and displays them in the Data pane with a globe icon:



Based on these geographic areas, Tableau automatically creates **Latitude** and **Longitude** fields to plot these areas on a coordinate map for spatial analysis. These fields appear as **Measures** in the Data pane, with italicized font indicating they are Tableau-generated. Tableau can automatically encode latitude and longitude for numerous geographic types, including zip codes, area codes, airport codes, congressional districts along with country, state, and city.

If your data is not automatically recognized by Tableau as a geographic field, you can manually assign the geographic role to that field. Right-click on the field to change and select the appropriate geographic role.



### Create a Simple Map

1. In the **Data** pane, under **Dimensions**, select a field with a globe icon, and drag it to **Detail** on the **Marks** card or inside the view where it says **Drop Fields Here**.
2. In the Data pane, under Measures, select the field you want to show on the map and drag it to the generated map.

## Tableau for the Business User

3. Use the **Marks** card to change the marks on the map. You can have **Filled Map** to show an area filled in, like for a state. Or perhaps you want to show points for each state. Simply select **Circle** as the **Marks**.
4. If desired, add **Labels** and edit the **Tooltips** of the map.
5. Change the **Size** or **Color** of the data points.

## Navigation and Selection in Maps

As with most maps we are familiar with on the web, maps within Tableau Desktop include a variety of navigation, search, and selection options in a view toolbar.



By default, the rectangular selection tool is selected when you first create a map. The table below lists the available options. Any tool will remain active until you choose another tool. **NOTE:** The last active tool will be remembered when you save, package or publish a workbook and will be used when you first reopen that workbook.

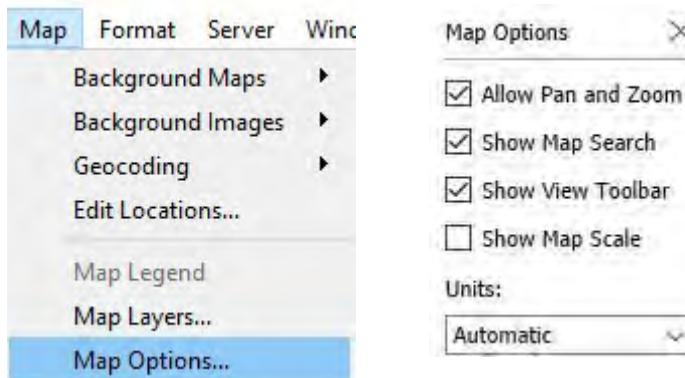
Icon	Feature	How to Use
	Map Search	Click the <b>Map Search</b> icon, type a geographic search term into the text box and press <b>ENTER</b> to start the search. The map will zoom to the searched area.
	Zoom	Click on the zoom icons to zoom in (+) or out (-) or scroll using a mouse wheel.
	Reset Area	Click on the pushpin icon to reset the map back to the original view.
	Zoom Area	Drag a box around the desired area and zoom the map to that selected area.
	Pan	To pan across the map, click and drag the mouse pointer across the map. If using another feature, press <b>SHIFT+ click and drag</b> to pan across the map.
	Rectangular Selection	Drag a box around a desired area to select all marks within the area. This option is selected by default when a map is first created.
	Radial Selection	Drag a circular range around an area. Click on the <b>Radial Selection</b> icon, and then click+drag the cursor around the area you want to select. All points within that area will be selected.

## Tableau for the Business User

	Lasso Selection	Click the <b>Lasso Selection</b> icon, and then click+drag the cursor around the area you want to select. All points within that area will be selected.
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## Map Options

You can choose to show or hide the above-mentioned navigation and search options in a worksheet. From the **Map** menu, select **Map Options**. Check or clear the options you want to include or exclude. Excluding options will disable them and they will not appear visible to the users of the workbook.



Check **Show Map Scale** to add a scale to your map in the bottom right corner. Then set the **Units** of measurement. The scale updates as you zoom in and out of the map.

## Background Maps and Layers

The following features can add insight and visual appeal to your map-based visualizations.

Features	Description
<b>Background Maps</b>	Maps automatically generated by Tableau when you use geographic data, or connections to maps generated by other map service providers.
<b>Map Layers</b>	Additional geographic details that can be layered onto your map from the Map Layers window, such as area code boundaries, streets and highways, and prominent place names.
<b>Data Layers</b>	Layers that show U.S. census information for the regions on your map, such as per capita income, median age, and average household size.

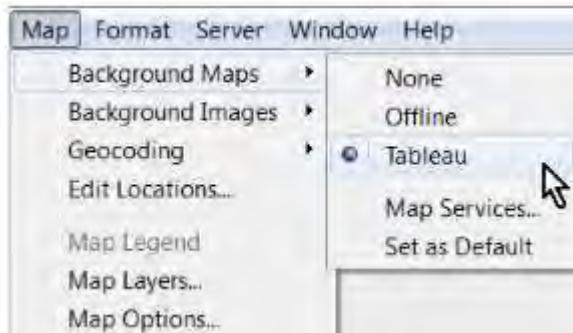
By default, Desktop uses the Tableau background map, which is generated using an Internet connection. If you're working offline, you can use the Offline background map. Tableau stores copies of maps you're using, but turning layers on and off, zooming in or out, and panning may require online updates to the map.

## Tableau for the Business User

You can also connect to other background map services, such as a Web Map Service (WMS) server that you have access to, or background maps available through Mapbox.

### Change the Background Map

On the **Map** menu, select **Background Maps**, and then choose a background map.



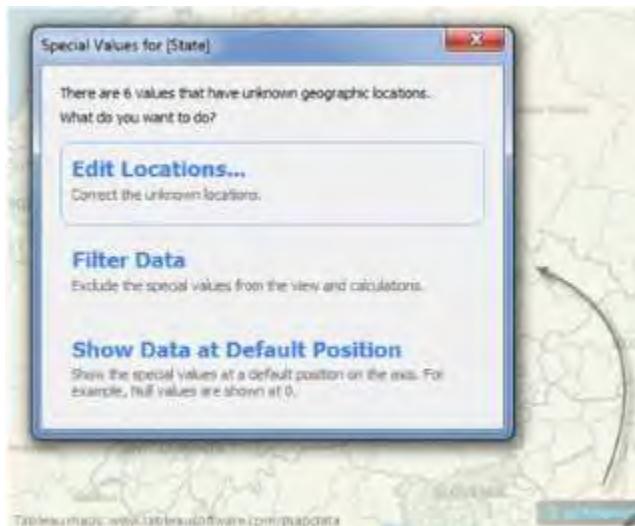
To connect to a different map service, click **Map Services** and then add connection information to Mapbox or a WMS server. For more information, see "Background Maps" in Tableau Online Help.

### Add a Map Layer and Data Layer

1. On the **Map** menu, click **Map Layers** to open the Map Layers window on the left.
2. In the **Map Layers** window, under **Map Layers**, click the check box next to the map layers you want.
3. To use a data layer, make sure the background map is set to Tableau and that you are online. On the **Map** menu, click **Background Maps**, and then click **Tableau** if not already selected.
4. In the **Map Layers** window, under **Data Layer**, click the Layer drop-down menu, and then choose a data layer.
5. In the **Map Layers** window, click the X in the top right corner to close the window.

### Modifying Geocode Locations within Tableau

You can correct geographic data that does not match or is incorrect. Modifying the geocoding of locations can be used when there are mismatches in your underlying data, either due to errors in member name or missing members. Assign the locations from your data source to match with locations known within Tableau.



### Creating Geographic Groups

Any geographic field can be used to create a geographic group. Geographic groups can be used to show custom territories or to explore your data regionally.

#### Create Geographic Groups on a Map

Custom geographic groups can be created visually from a map view.

1. In a map view, use any of the map selection tools or CTRL+click to select several geographic locations.
2. Select the Group icon from the toolbar or the tooltip to group the selected locations together.  
REMINDER: The group icon is a paperclip: 
3. Select the level of detail for the grouped locations, for example **State**.
4. Continue visually grouping geographic locations until you have created all your custom geographic groups/territories.
5. You can edit the name of the groups or edit which members are in a group by clicking on **Edit Group** and making the desired changes in the **Edit Group** dialog box.

## Tableau for the Business User

6. To only see the custom geographic groups on the map, remove the field from the view that was used to originally create the group, for example State.

### Create Geographic Groups from the Data Pane

Custom geographic groups can be also created manually from within the Data pane, just like any other group.

1. Right-click on the geographic field in the **Data** pane and choose **Create** and then **Group**.
2. Select the members to group and click **Group** in the **Create Group** dialog box.
3. Continue grouping members until all groups are completed.
4. Drag this new group into the view.

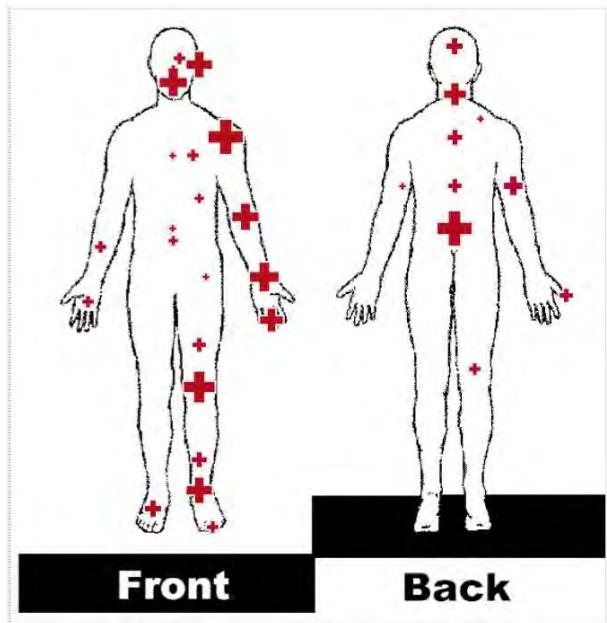
### Create Nested Geographic Groups

Groups of groups, or nested groups, can also be created.

1. Right-click on a previously created group in the **Data** pane and choose **Create** and then **Group**.
2. Remove the old group from the view and replace it with the new group.

## Using Background Images for Spatial Analysis

Background images display underneath your data to add more context to the marks in the view. A common use of background images is adding custom maps that correspond to a coordinate system in your data. For example, you may have data that corresponds to several floors in a building. You can use background images to overlay that data on the actual floor plan of the building to give more context. In the example below, an analysis of workplace injuries uses a background image of the human body to plot locations and amount of injuries.



Your data may already be structured with x and y coordinates OR there might be no logical coordinate data at all. In that case, you can use Tableau's annotation feature to capture x and y values to use to plot non-geographical data on the desired image.

**BEST PRACTICE TIP** When mapping coordinates, use a table for position values (x, y) and join or blend to data based on a position ID dimension field.

## Using Spatial Files for Mapping

Spatial files contain geographic data which identifies the physical location and boundaries of natural or man-made features on the Earth. You can use the geographic information in a spatial file directly in Tableau after connecting to the file. Spatial files are usually created by geographic information system (GIS) or mapping software. Depending on the software, the data is saved in different formats, such as ESRI Shapefiles, MapInfo, KML (Keyhole Markup Language), and GeoJSON files.

### Finding Spatial Files

You may already have access to spatial files within your company or organization. Spatial files can also be found in many open data portals. Government websites for cities, countries, or other geographic regions may have spatial files available that you can download. Some two-dimensional mapping services and three-dimensional Earth browsers allow users to create maps with custom features or locations, and then download the information as a spatial file.

### Mapping Data from a Spatial File

Spatial files encode geographic features as geometrical shapes. Different types of geographic features are expressed by different types of geometry, such as points or polygons. Mapping with a spatial file allows you to use your geographic data to perform spatial analysis, such as looking for geographic trends and answering questions using a map. You can connect to a spatial file just as you would connect to any data source in Tableau. When you connect to a spatial file, Tableau reads the geographic information and transforms the data into latitude and longitude coordinates. You can then create point or polygon maps using the data in those files. Any other attributes included in the spatial file are listed as dimensions and measures. Tableau

## Tableau for the Business User

automatically creates a new field called **Geometry**. This measure describes the specific locations or polygon points using the geographic data in your file. As with any measure, the geographic points are aggregated, in this case using the **COLLECT** aggregation.

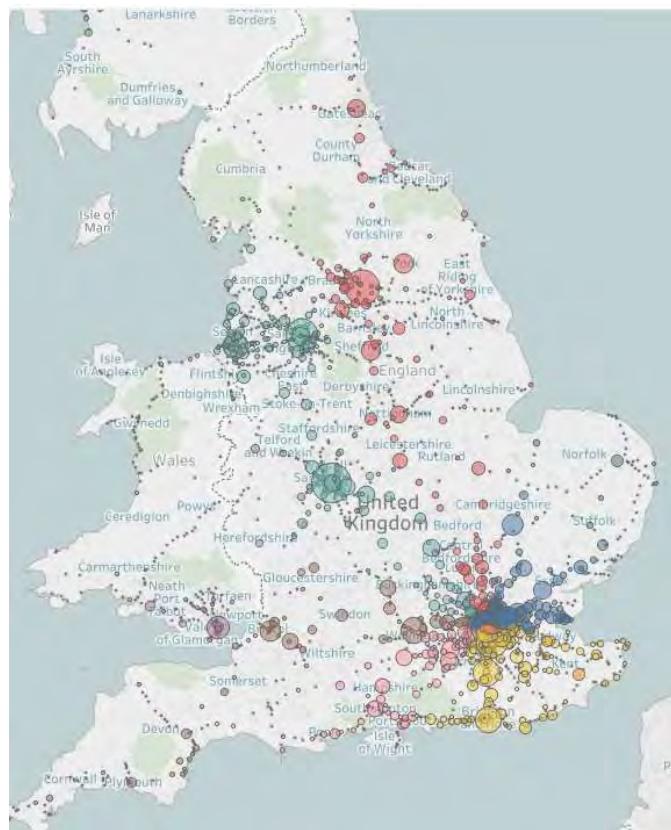
### Create a Map using a Spatial File

1. In the **Data** pane, under **Measures**, select the **Geometry** field and drag it to **Detail** on the Marks card.
2. Add additional levels of detail to the view by doing any of the following:
  - Click the **Analysis** menu and select **Aggregate Measures** to disaggregate the measures
  - In the **Data** pane, under **Dimensions**, drag one or more fields to **Detail** on the Marks card.
  - If you have a hierarchy of dimensions, drag the top level of the hierarchy to **Detail** and expand the hierarchy to bring in different levels of detail.
3. Use the **Marks** card to change the appearance of the marks on the map. Encode color and/or size variation based on other measures.

## Tableau for the Business User

### Adding Information for Analysis

Sometimes your spatial data includes only the geometry information and does not include any other relevant dimensions or measures. In this case, you can join a spatial data source with another data source, based on a common join key. The second data source can be a different file type or another spatial file.



In this example, a spatial file with geographic information about railroads in the United Kingdom is joined with a file that contains information about the station usage.

## Quick Reference Guide

### CREATE A MAP

1. In the **Data** pane, under **Dimensions**, select a field with a globe icon, and drag it to **Detail** on the **Marks** card or inside the view where it says **Drop Fields Here**.
2. In the Data pane, under Measures, select the field you want to show on the map and drag it to the generated map.
3. Use the **Marks** card to change the marks on the map, if desired.
4. If desired, add **Labels** and edit the **Tooltips** of the map.
5. Change the **Size** or **Color** of the data points.

### HOW TO ADD A MAP LAYER AND DATA LAYER

1. On the **Map** menu, click **Map Layers** to open the Map Layers window on the left.
2. In the **Map Layers** window, under **Map Layers**, click the check box next to the map layers you want.
3. To use a data layer, make sure the background map is set to Tableau and that you are online. On the **Map** menu, click **Background Maps**, and then click **Tableau** if not already selected.
4. In the **Map Layers** window, under **Data Layer**, click the Layer drop-down menu, and then choose a data layer.
5. In the **Map Layers** window, click the **X** in the top right corner to close the window.

### CREATE GEOGRAPHIC GROUPS FROM A MAP

1. In a map view, use any of the map selection tools or CTRL+click to select several geographic locations.
2. Select the Group icon from the toolbar or the tooltip to group the selected locations together.
3. Select the level of detail for the grouped locations, for example **State**.
4. Continue visually grouping geographic locations until you have created all your custom geographic groups/territories.
5. You can edit the name of the groups or edit which members are in a group by clicking on **Edit Group** and making the desired changes in the **Edit Group** dialog box.
6. To only see the custom geographic groups on the map, remove the field from the view that was used to originally create the group, for example State.

### CREATE GEOGRAPHIC GROUPS FROM THE DATA PANE

1. Right-click on the geographic field in the **Data** pane and choose **Create** and then **Group**.
2. Select the members to group and click **Group** in the **Create Group** dialog box.
3. Continue grouping members until all groups are completed.
4. Drag this new group into the view.

## CREATE NESTED GEOGRAPHIC GROUPS

1. Right-click on a previously created group in the **Data** pane and choose **Create** and then **Group**.
2. Remove the old group from the view and replace it with the new group.

## HOW TO CREATE A MAP USING A BACKGROUND IMAGE

1. From the **Map** menu, select **Background Images**, and select the data source.
2. From the Background Images dialog box, click **Add Image** to add the background image.
3. Define the background image and the scale to be used by setting the following
  - **Name**
  - **File**
  - **X Field**
  - **Left**
  - **Right**
  - **Y Field**
  - **Bottom**
  - **Top**
4. Drag the X and Y fields to Columns and Rows to use the background image.

## HOW TO CREATE A MAP USING A SPATIAL FILE

1. In the **Data** pane, under **Measures**, select the **Geometry** field and drag it to **Detail** on the Marks card.
2. Add additional levels of detail to the view by doing any of the following:
  - Click the **Analysis** menu and select **Aggregate Measures** to disaggregate the measures
  - In the **Data** pane, under **Dimensions**, drag one or more fields to **Detail** on the Marks card.
  - If you have a hierarchy of dimensions, drag the top level of the hierarchy to **Detail** and expand the hierarchy to bring in different levels of detail.
3. Use the **Marks** card to change the appearance of the marks on the map. Encode color and/or size variation based on other measures.

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# COMPARING MULTIPLE MEASURES

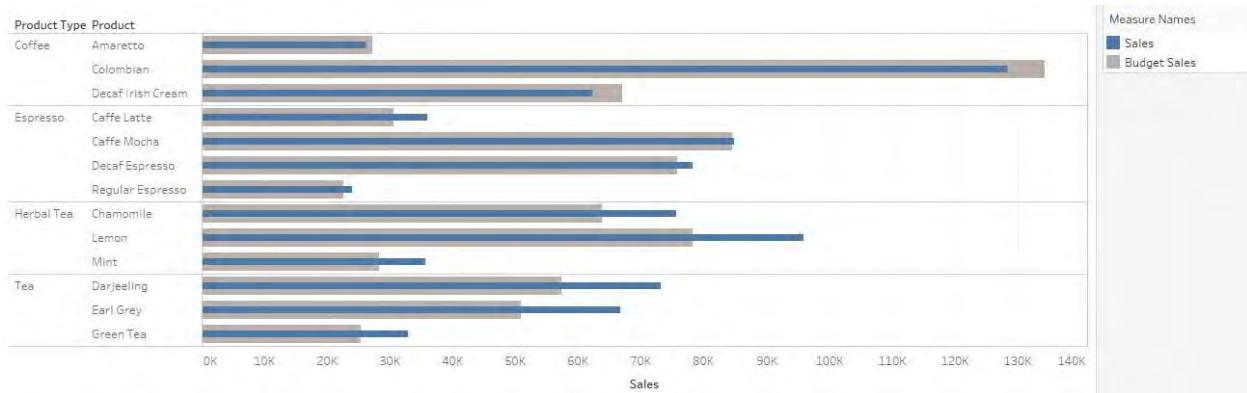
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This module contains the following:

- Comparing Two Measures - Creating A Bar-in-Bar Chart
- Comparing Progress Towards a Goal - Creating a Bullet Chart
- Quick Reference Guide

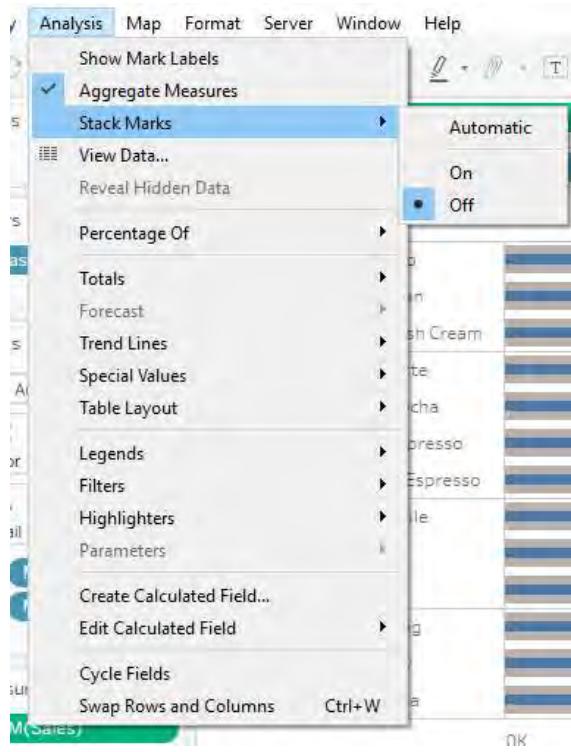
## Comparing Two Measures (Bar in Bar Chart)

The Bar in Bar chart is useful when you want to evaluate two measures without stacking marks or expanding the axis. For example, you might use a Bar in Bar chart if you needed to see the Sum of Sales compared to Target Sales for a set of products and wanted each mark to start at zero and end at the appropriate dollar amount. Or, you may be interested in comparing Sum of Sales from two different years. Using a Bar in Bar chart provides a quick visual comparison of the two measures.



To create a Bar in Bar Chart, **Measure Names** and **Measure Values** must be invoked. By default, Tableau will add **Measure Names** to either the Columns or Rows shelf depending on the layout of your view. Drag **Measure Names** from the shelf to Color. Bring another copy of **Measure Names** to size. The bars will now be color coded and sized based on the **Measure Names**.

## Tableau for the Business User



The **Measure Values** are stacked on top of each other such that the bars are not both starting at 0. To change this, the **Stack Marks** option on the **Analysis** tool bar must be set to Off.

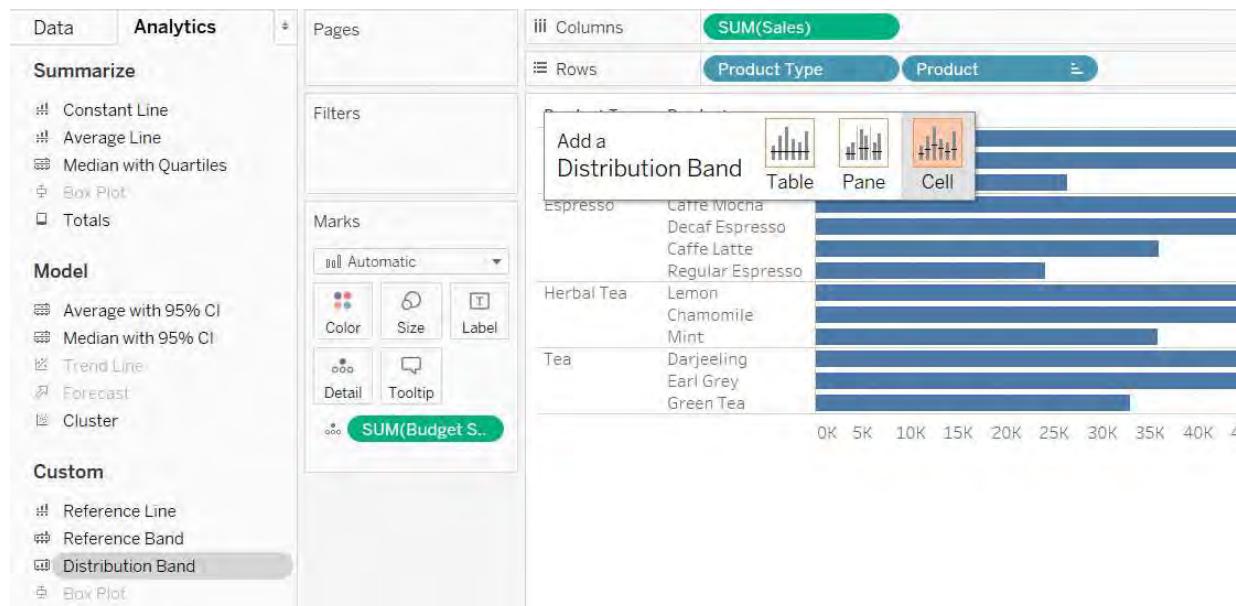
Changing this option removes the stacking and forces the measures to start at the same value of 0.

## Comparing Progress Toward a Goal (Bullet Graph)

A bullet graph is a variation of a bar graph and was developed by Stephen Few to replace dashboard gauges and meters. The bullet graph is generally used to compare a primary measure to one or more other measures in the context of qualitative ranges of performance metrics. Occasionally, bullet graphs are used to compare the same measure across multiple categories, such as using the data from one region as the threshold for other regions.

Rather than share the same axis, a bullet graph uses a **Distribution Band** to show the progress towards a goal. Specific percentiles, percentages, quantiles, and standard deviations can be calculated from the secondary measure.

A distribution band is created similarly to a reference line. From the **Analytics Pane**, select **Reference Band** and drag to the view. As the goals are set for each product within a product type, the distribution band must be across each **Cell**.



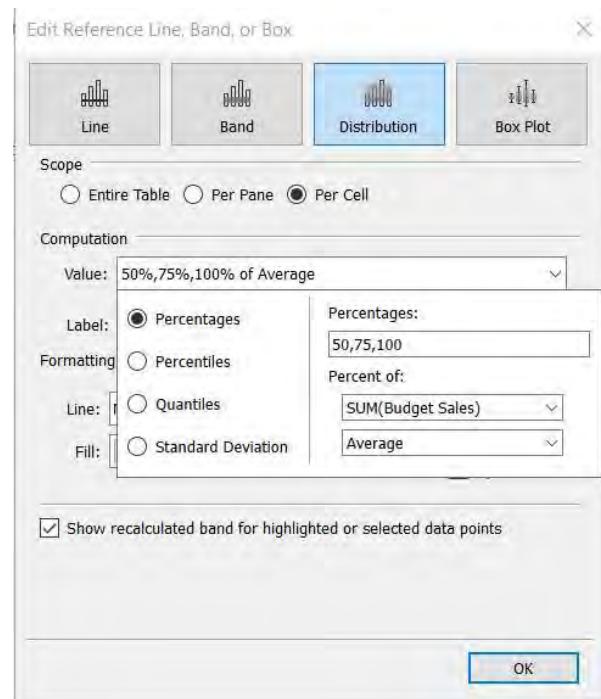
# Tableau for the Business User

## Settings of the Reference Band

The distribution can be custom set to use Percentages, Percentiles, Quantiles, or Standard Deviation based on the percent of a specific measure, in this case **SUM(Budget Sales)**.

Additional formatting of the distribution band includes labels, line color, fill color and fill location.

For a bullet graph, comparing the **SUM(Sales)** to the **SUM(Budget Sales)** allows to determine how far along Sales are compared to the Budget Sales by noting where the Sales bar extends against the different colored bands of the Budget Sales.



## Quick Reference Guide

### HOW TO CREATE A BAR-IN-BAR CHART

1. Create a graph with dimensions and a single measure
2. To add a secondary measure that shares the same axis as the first measure, drag the secondary measure to the axis until a green double ruler appears.
3. Drop the measure on the axis to activate **Measure Names** and **Measure Values**
4. Drag **Measure Names** from the column or rows shelf to **Color** on the **Marks** card.
5. Drag another copy of **Measure Names** to **Size** on the **Marks** card.
6. From the **Analysis** tool bar, select the **Stack Marks** option and set to **Off**.
7. Modify the colors on the marks card as desired for the two measures.
8. Modify the size of the bars on the marks card as desired for the two measures.

### HOW TO CREATE A BULLET GRAPH

1. Create a graph using dimensions and a single measure.
2. Add a secondary measure to detail to compare the progress of first measure to the second measure.
3. From the **Analytics Pane**, drag a **Reference Band** to the view and select **Cell**.
4. In the **Computation**, set the values for the distributions for comparison and choose either Percentages, Percentiles, Quantiles or Standard Deviation.
5. Set the Percent of to the secondary measure.
6. Format the distribution line and fill properties.

# DEFINING SUBSETS OF YOUR DATA

---

This module contains the following:

- Using Sets
- Showing the Biggest and the Smallest
- Quick Reference Guide

## Using Sets

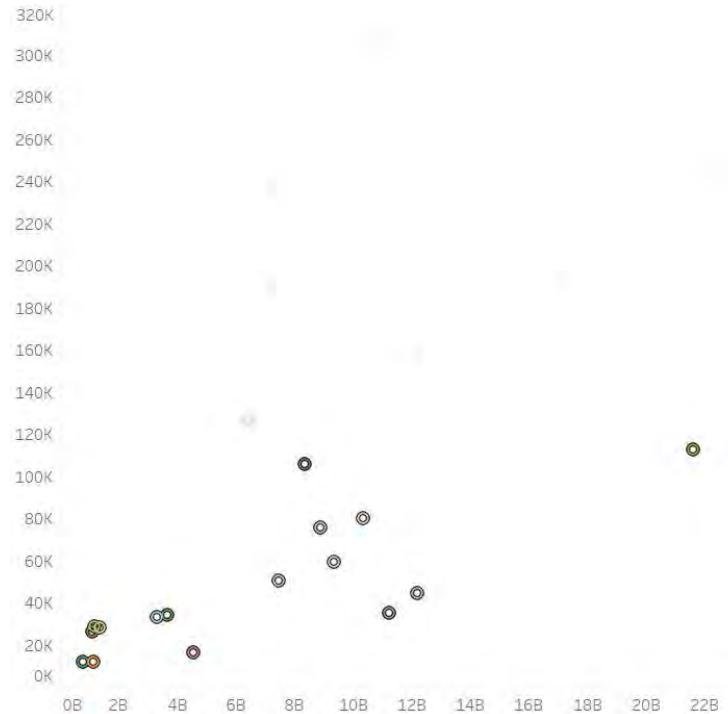
Sets are saved filters that you create based on existing dimensions. They represent subsets of your data that meet certain conditions. Tableau Desktop displays sets in the **Sets** area of the **Data** pane and labels them with the sets  icon.

### Use sets to:

- View or highlight data meeting a specific computed condition, for example, a set that contains only customers with sales over a certain threshold.
- Monitor key data points, for example, high- or low-performing sales regions.
- Combined fields. Create sets containing multiple, specific fields you want to view together.

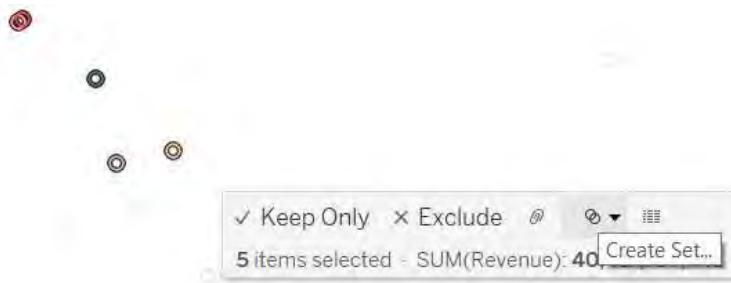
### How to Create a Subset of the Data

1. Select one or more dimension members to include in a set



2. Click the **Set** icon on the tooltip and select **Create Set**.

# Tableau for the Business User

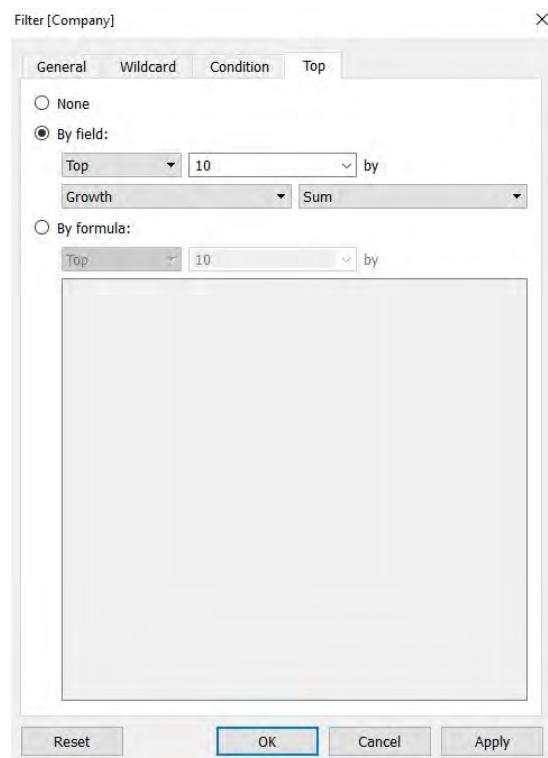


3. In the **Create Set** dialog box, name the set and then click **OK**.

## Create a Set to Use as a Filter

You can save any filters you create as a set and use them in all worksheets in a workbook.

1. Right-click the dimension you want to filter on, then click **Create** and select **Set**.
2. In the **Create Set** dialog box, select checkboxes of members to keep, and then click **OK**.  
(Alternatively, you can also select members conditionally, for example, Top 10 Companies by Growth.)



# Tableau for the Business User

## Combined Sets

Combined sets allow you to compare multiple sets to one another to determine intersections or differences across the sets. There are several options for combined sets:

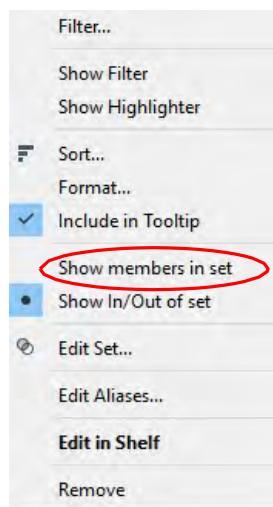
Combined set option	Description
All Members in Both Sets	Combines all members of both sets.
Shared Members in Both Sets	Combines only the members from both sets that have common data points. For example, customers that are the top 50 most profitable AND who waited longer than 5 days for shipment.
<Set Name> except shared members	Keeps all members of the selected set EXCEPT those shared with the unselected set.

1. In the **Sets** section of the **Data** pane, multi-select 2 sets, and right click to select **Create Combined Set**.  
*NOTE This option will not be available if the sets were created from different dimensions.*
2. Select how you want to combine the sets, for example, Shared Members in Both Sets, and then click **OK**.
3. Use the new set in the view to highlight or filter the members of your new set (for example, you can drag the set to Color on the Marks card).

## In and Out Sets

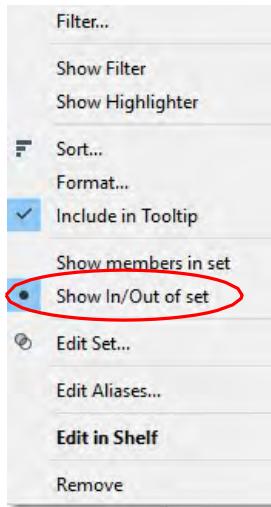
Instead of looking at individual members of a set, you can compare members in a set to members not in the set. Select **Show In/Out of Set** on the field menu to use this option.

1. Right-click a field in the view and select one of the following:
  - **Show Members in Set** to show only the set members.



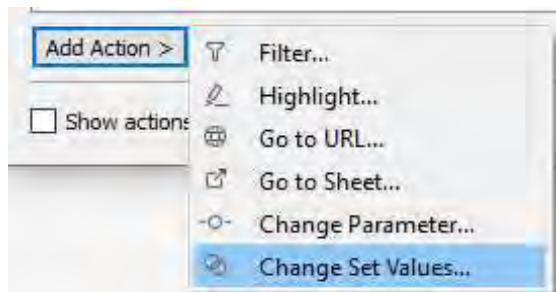
## Tableau for the Business User

- **Show In/Out of Set** to show data both in and out of the set. Data in and out are shown in different colors



### Set Actions

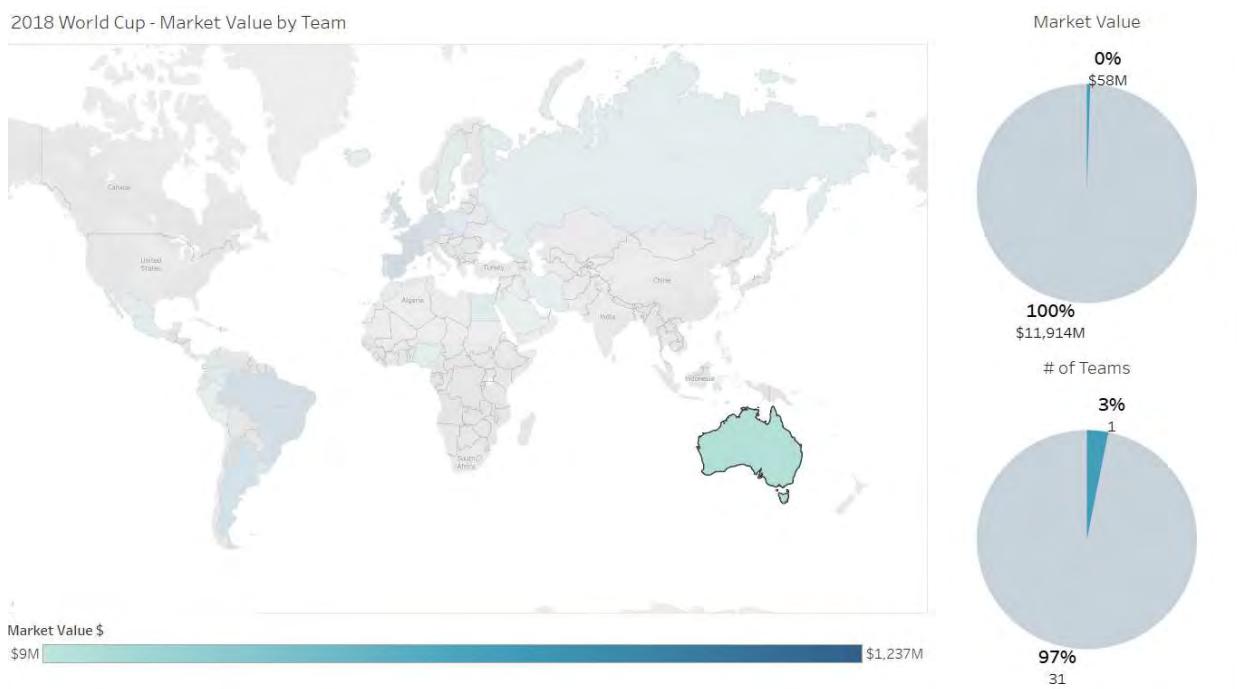
Set actions allow the user to adjust the values in the set based on user interaction, such as selecting the marks in a view. A set action updates the view to reflect these selected marks. Set actions are available on both worksheet views and dashboards.



Set actions can show how a selection in one view contributes to a whole in a separate view, referred to often as proportional brushing. You can also use set actions to adjust color scaling in a view.

Set actions require a placeholder to be created that will vary based on a user selection or action. A set action ties the relevant source sheet to this target set and its data source. The set must also be used in the view for the set action to work.

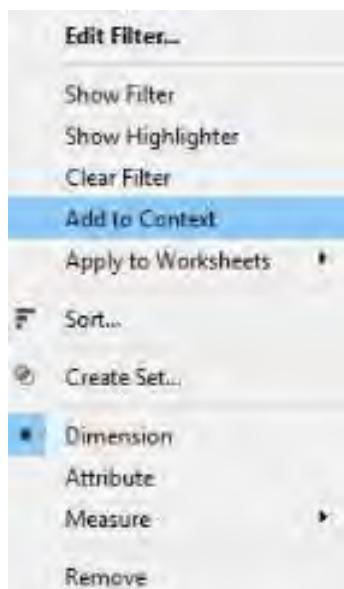
## Tableau for the Business User



In the example above, a set was created based on the country. This set was then used in a set action and added to color on the pie charts. Selecting a country, in this example Australia, updates the pie charts to show the relative values for Australia compared to all other countries.

## Showing the Biggest and the Smallest

Tableau has several built-in features that can determine the Top N within a category, but because of how nested sorting works, the visual display may vary. Context filters are an effective tool for analyzing Top N data for subsets of the data set.



If you are applying filters to a large data source, you can improve performance by setting up context filters. First, use a context filter on the data source, and then apply other filters to just the resulting records. This sequence avoids applying each filter to each record in the data source.

Adding a filter to context creates a temporary table that limits what Tableau queries before all other queries for your view are run. You can add multiple filters to the context to limit the size of the temporary table. Add to context can be effective for performance considerations or advanced filtering when the filter doesn't change often, AND the resulting data reduces to 1/10th or less of the number of records.

## Quick Reference Guide

### HOW TO CREATE SET

6. Select one or more dimension members to include in a set.
7. Click the Set icon on the tooltip and select **Create Set**.
8. In the **Create Set** dialog box, name the set and then click **OK**.

### HOW TO CREATE A COMBINED SET

1. Select a set from which to create the combined set and select **Create Combined Set**.
2. Name the combined set.
3. Specify how you want to combine the two sets:
  - All members in both sets
  - Shared members in both sets
  - All members from the first set except shared members
  - All members from the second set except shared members.
4. Click **OK**.

### HOW TO MAKE A FILTER ACTION BEFORE OTHER FILTERS – ADD TO CONTEXT

1. From the filter you want to occur first, right click and select **Add to Context**.
2. The underlying data will be filtered first by this context filter and then any other filters. This filter will remain and all other resulting values will come from this filtered data table.

# VIEWING DISTRIBUTIONS

---

This module contains the following:

- Bins and Histograms
- Box and Whisker Plots
- Quick Reference Guide

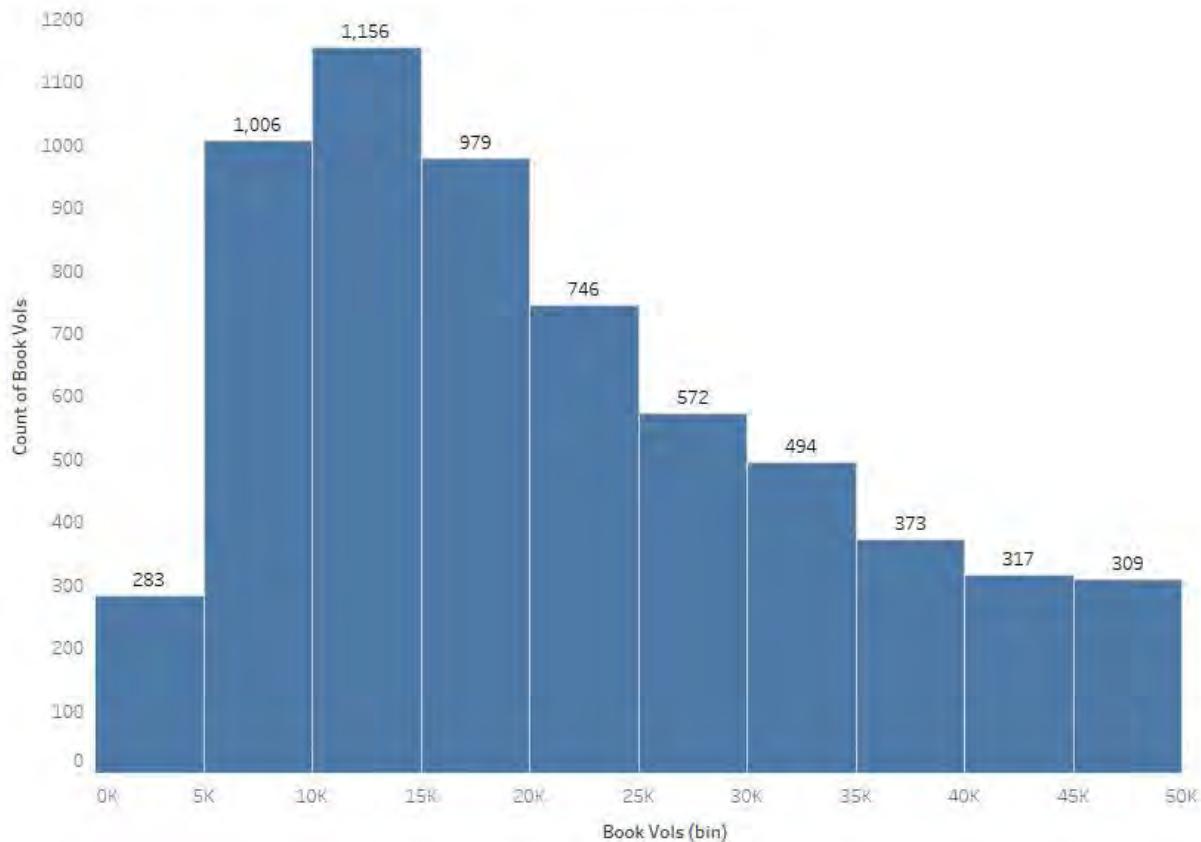
## Tableau for the Business User

### Bins and Histograms

A histogram is a chart that displays the shape of a frequency distribution. A histogram looks like a bar chart, but groups values for a continuous measure into ranges, or bins. For example, if you have a measure containing Book material held in US Public libraries ranging from 0 to 50,000 book materials, and you wanted to analyze how the break down into different bins, you would create a bin for the book volume measure and use the histogram view to see how the data is organized.

In this example, each bin is defined by a 5000 range, such as 0-5k, 5k-10k, 10k-15k and so forth. Each data point is placed in the relevant bin, which is up to but not including the lower limit of the next bin, and the bin is represented by a column. Each column represents the count of items that meet the criteria of the bin.

Number of U.S. Public Libraries by Printing Material Held



### Creating Histograms and Bins

There are two ways to create histograms in Tableau:

- Use Show Me
- Use the Measure Context menu

# Tableau for the Business User

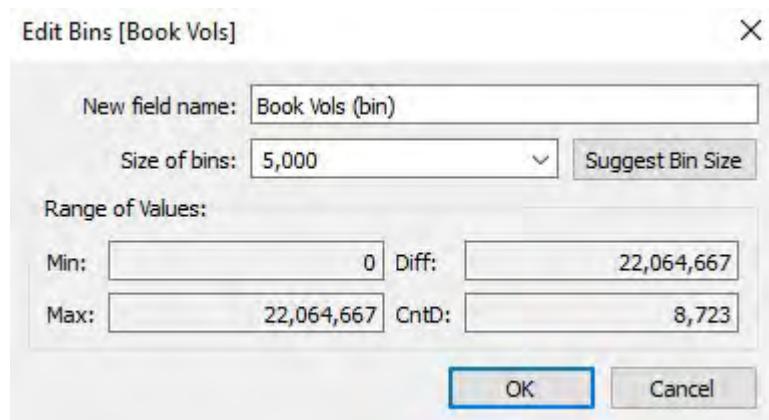
## Create a Histogram using Show Me

1. Put a measure on **Rows**.
2. On **Show Me**, click the **Histogram** icon.



A histogram is created, and a new bin is created and placed on the Columns shelf. If you would like to change the size of the bins that Tableau automatically creates:

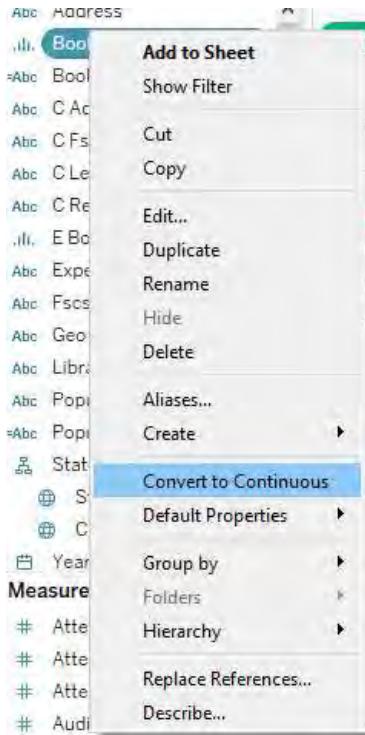
3. Right-click the newly created bin in the **Dimensions** area of the **Data** pane and click **Edit**.
4. In the Edit Bins dialog box, adjust the size of the bins. The dialog shows the range of values, including the minimum and maximum values as well as the difference between the two.



## Create a Histogram using the Context Menu

1. In the **Measures** area of the **Data** pane, right-click the measure that you want to use, select **Create**, and then click **Bins**.
2. In the **Create Bins** dialog box, enter a name for the field and the size to use for the bins. The dialog shows the range of values, including the minimum and maximum values as well as the difference between the two.
3. In the **Dimensions** area of the **Data** pane, right-click the newly created bin field, and click **Convert to Continuous**. You can also convert the dimension to continuous from the **Columns** shelf.

## Tableau for the Business User



4. Drag the measure from step 1 to **Rows** and the newly created bin field from the **Dimensions** area to **Columns**.

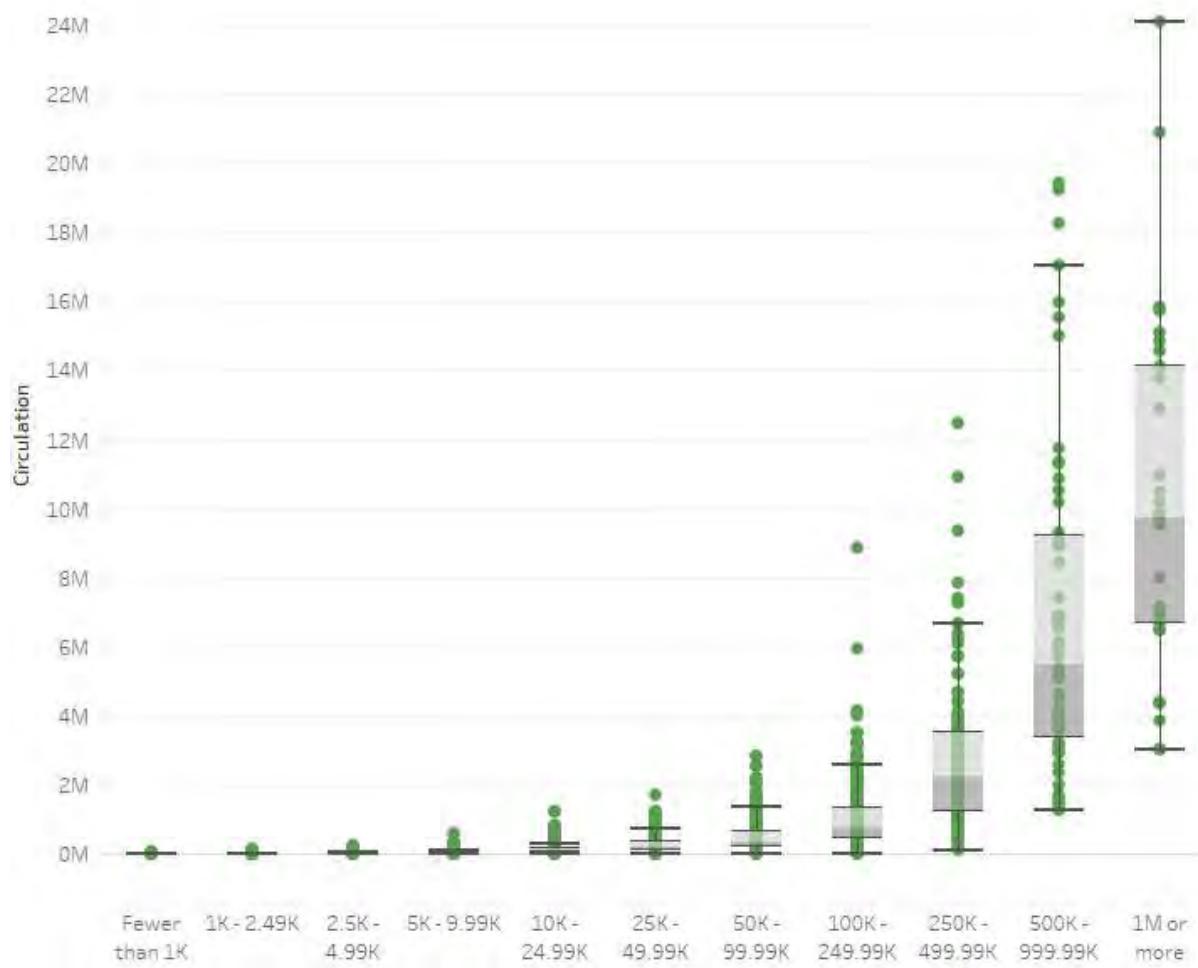
5. Right-click the measure on **Rows**, select **Measure (Sum)**, and click **Count**.

Note that the axis tick marks for the binned dimension are based on the width of the window and the view.

To change the axis to use fixed tick marks:

1. Right-click the X (horizontal axis) and select **Edit Axis**.
2. In the **Edit Axis** dialog, click the **Tick Marks** tab.
3. Under **Major** tick marks, click **Fixed**, and in the box next to **Every:** type the desired number.

## Box and Whisker Plots



Box plots are a visually concise way of seeing and contrasting distributions of data. The boxes show the middle 50% of the data (or in other words, the middle two quartiles of data). Whiskers are added to box plots to show further information about the distribution of the data. In Desktop, whiskers can be configured to show either the full extent of the data or 1.5 times the interquartile range (the length of the box). Use the latter to help identify potential outliers.

To create a Box and whisker plot, use Show Me. Select a measure and at least one dimension to create the box and whisker plot. This visualization will show the distribution of values for the selected dimensions, noting the median, inner and upper quartile ranges, as well as any outliers. The format of the box and whisker plot can be modified.

## Quick Reference Guide

### HOW TO CREATE A HISTOGRAM

1. Put a measure on **Rows**.
2. On **Show Me**, click the **Histogram** icon.  

3. A histogram is displayed, and a new bin is created and placed on the **Columns** shelf.
4. Right-click the newly created bin in the **Dimensions** area of the **Data** pane and click **Edit**.
5. In the Edit Bins dialog box, adjust the **size** of the bins. The dialog shows the range of values, including the minimum and maximum values as well as the difference between the two.

OR

1. In the **Measures** area of the **Data** pane, right-click the measure that you want to use, select **Create**, and then click **Bins**.
2. In the **Create Bins** dialog box, enter a name for the field and the size to use for the bins. The dialog shows the range of values, including the minimum and maximum values as well as the difference between the two.
3. In the **Dimensions** area of the **Data** pane, right-click the newly created bin field, and click **Convert to Continuous**. You can also convert the dimension to continuous from the **Columns** shelf.
4. Drag the measure from step 1 to **Rows** and the newly created bin field from the **Dimensions** area to **Columns**.

5. Right-click the measure on **Rows**, select **Measure (Sum)**, and click **Count**.

### HOW TO CREATE A BOX AND WHISKER PLOT

1. Select at least one measure and one dimension, use **Show me** and choose **box and whisker plot**.
2. Add desired dimension to detail shelf and columns and measure on the row shelf to show the distribution.

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# STATISTICS AND FORECASTING

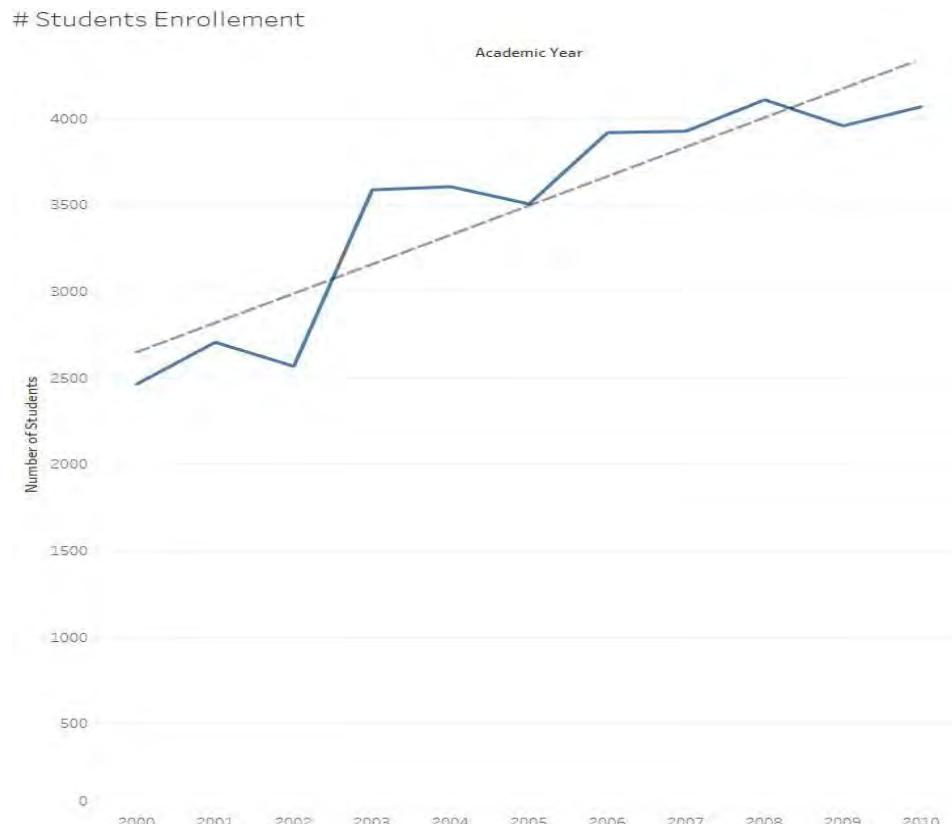
---

This module contains the following:

- Trend Lines
- Using the Analytics Pane
- Forecasting
- Forecast Field Results
- Forecast Options
- Quick Reference Guide

## Trend Lines

You can use Tableau's trend line feature to display data trends using lines of best fit based on statistical models. Trend lines can thus be used to make predictions about your data. For example, you can answer questions like whether profit is predicted by time, or whether average delays at an airport are significantly correlated with the month of the year. For example, would you expect to wait longer at the airport in December than you would in September?

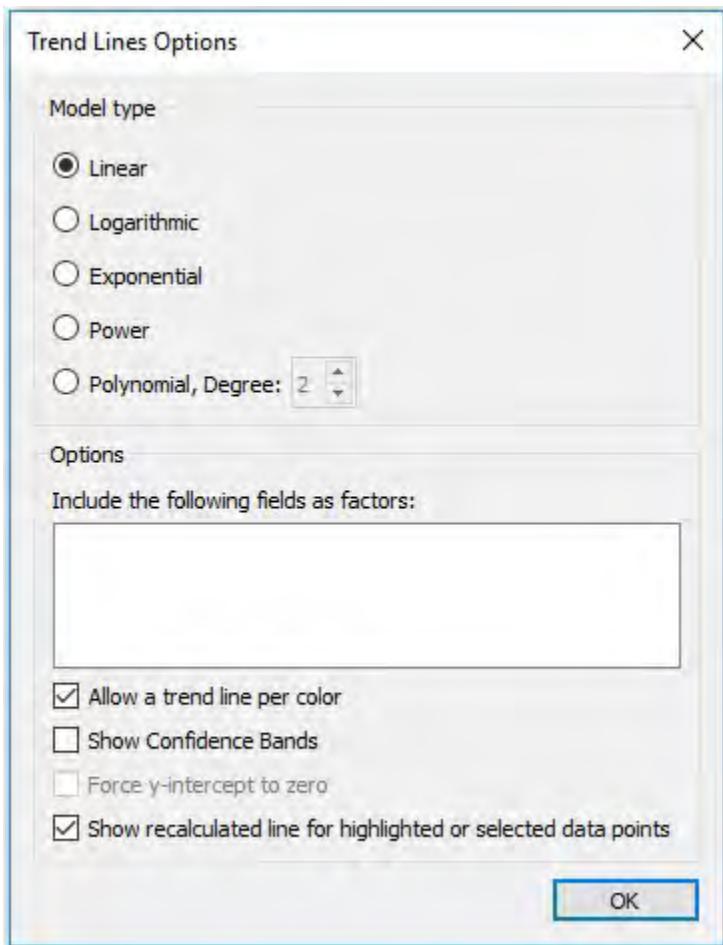


Sample Trend Line of Students over Time

To add trend lines to a view, both axes must contain a field that can be interpreted as a number. This can also be a date / time field, because Tableau can interpret time as numeric values.

### How to add a Trend Line

1. Right-click in the view, select **Trend Lines**, and then click **Show Trend Lines**. NOTE This command adds a linear trend line and adds a trend line for each color if there is a discrete field on the **Color** shelf.
2. Right-click in the view again, select **Trend Lines**, and then click **Edit Trend Lines**.
3. In the **Trend Lines Options** dialog box, specify the trend line model type and any options:



You can also use the **Analytics** pane to add a trend line:

- From the **Analytics** pane, under **Model**, drag **Trend Line** to the view and drop it on a trend line option (Linear, Polynomial, and so forth).

## Trend Model

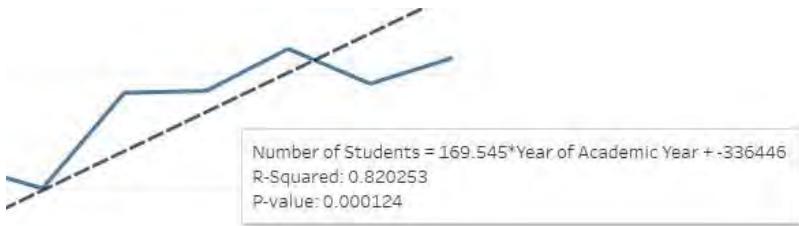
When you add a trend line to your view, you are building a statistical model and answering the question of whether the factors in your view predict a specific value (measure).

### View Summary Data

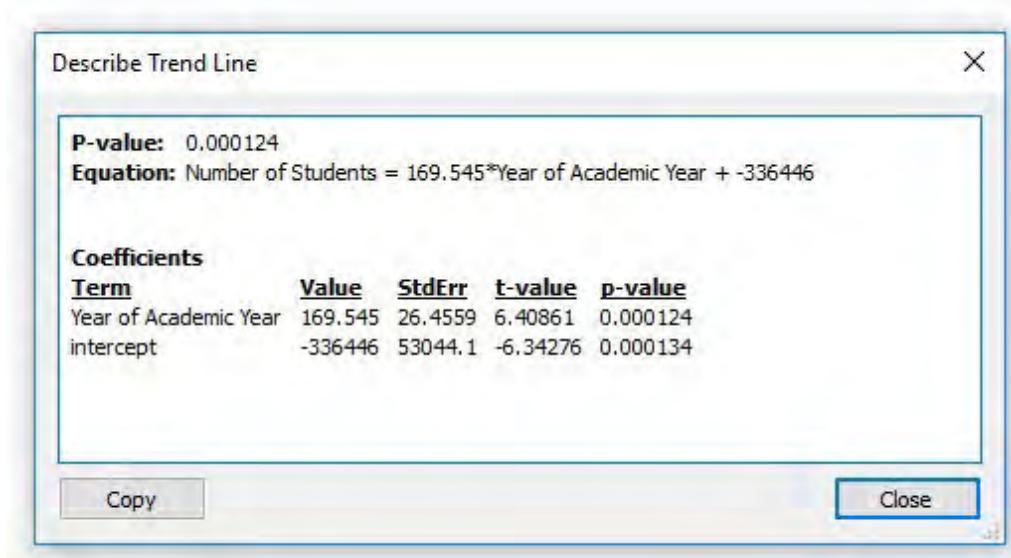
You can view summary data for a trend line in two ways:

- Hover over a trend line to display its tooltip.

## Tableau for the Business User



- Right-click a trend line, and then click **Describe** trend line.



### View the Trend Model

You can view the trend line model for individual trend lines in two ways:

- Right-click a specific trend line in the view and choose **Describe Trend Model**.
- On the **Analysis** menu, select **Trend Lines**, and choose **Describe Trend Model**.

The table in the **Describe Trend Model** dialog box lists all the trend lines in your view along with their p-value and formula.

# Tableau for the Business User

Describe Trend Model

**Trend Lines Model**

A linear trend model is computed for sum of Number of Students given Academic Year Year. The model may be significant at p <= 0.05.

**Model formula:** (Year of Academic Year + intercept)

**Number of modeled observations:** 11

**Number of filtered observations:** 0

**Model degrees of freedom:** 2

**Residual degrees of freedom (DF):** 9

**SSE (sum squared error):** 692914

**MSE (mean squared error):** 76990.4

**R-Squared:** 0.820253

**Standard error:** 277.471

**p-value (significance):** 0.000124

**Individual trend lines:**

Panes	Line	Coefficients						
Row	Column	p-value	DF	Term	Value	StdErr	t-value	p-value
Number of Students	Year of Academic Year	0.000124	9	Year of Academic Year	169.545	26.4559	6.40861	0.000124
				intercept	-336446	53044.1	-6.34276	0.000134

**Copy** **Close**

## Add the Statistical Summary Card to Your Worksheet

On the **Worksheet** menu, choose **Show Summary**.

NOTE You can also right click on any gray portion of the view workspace to access Summary.

## Export the Trend Data

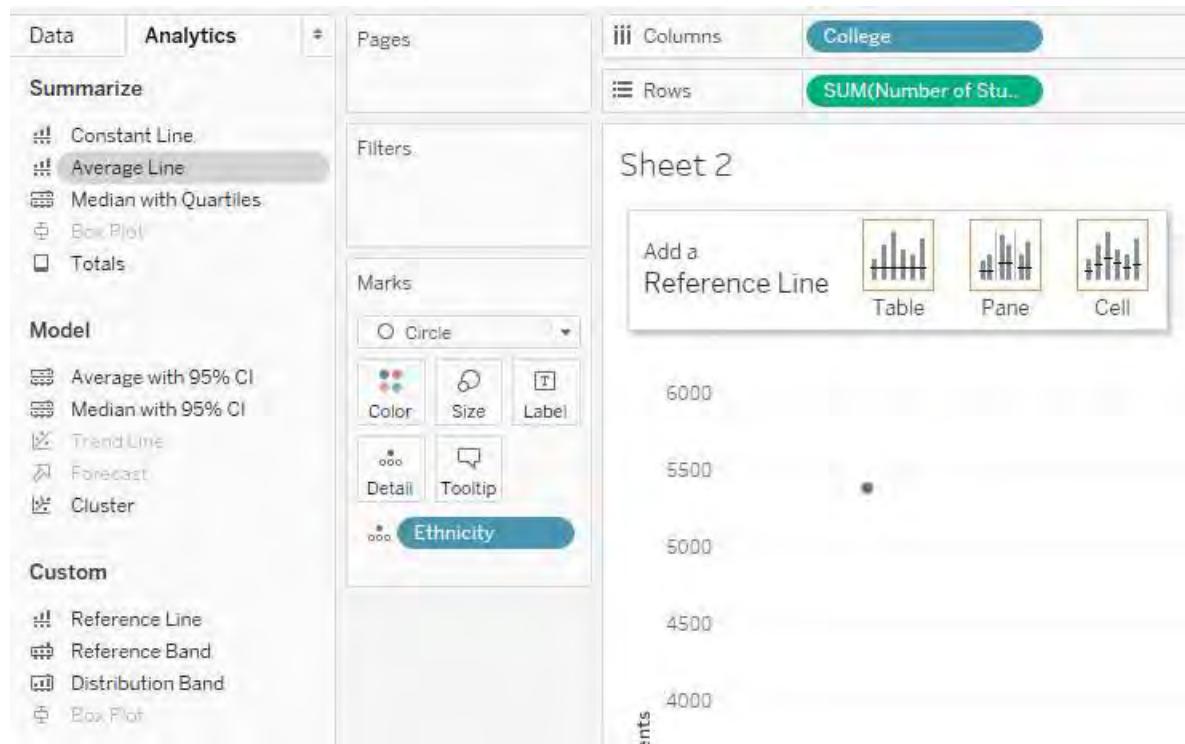
Exporting trend data when Trend Lines are used also exports the Predictions and Residuals, allowing for analysis on the chosen model to make sure it represents the data accurately.

On the **Worksheet** menu, select **Export** and choose **Data**. This method creates an Access database file that can be used within Tableau Desktop following export.

# Tableau for the Business User

## Using the Analytics Pane

You can access common data analysis tools from the **Analytics** pane. The Analytics pane allows you to add any of these options quickly with a simple drag and drop action, with no further formatting required.



To add data analysis to your view, drag the object you want to add to the worksheet and drop it on a scope or calculation option.

When you drag the analysis object to the view, you see the available scope or other options for the type. For example, reference lines and bands can be applied to tables, panes, or cells, depending on the type. A constant reference line can only be applied to a whole table, and box plots are only applied to cells.

Analysis type	Options
<b>Constant Reference Line</b>	You can only add a constant value to an entire table  Add a Reference Line Table
<b>Average Line Reference Line</b>	You can add these types of lines to Tables, Panes, or Cells.

## Tableau for the Business User

	<p>Add a Reference Line</p> <p>Table      Pane      Cell</p>
<b>Bands</b>	You can add bands to Tables, Panes, or Cells <p>Add a Distribution Band</p> <p>Table      Pane      Cell</p>
<b>Trend Lines</b>	You can select Linear, Logarithmic, Exponential, or Polynomial calculations for the trend line. <p>Add a Trend Line</p> <p>Linear      Logarithmic      Exponential      Polynomial      Power</p>
<b>Forecast</b>	There is only one option for adding a Forecast. <p>Add a Forecast</p> <p>Forecast</p>

## Forecasting

You can forecast quantitative time-series data using exponential smoothing models in Tableau Desktop. With exponential smoothing, recent observations are given relatively more weight than older observations. These models capture the evolving trend or seasonality of your data and extrapolate them into the future.

Forecasting is fully automatic, yet configurable. Many forecast results can become fields in your visualizations.

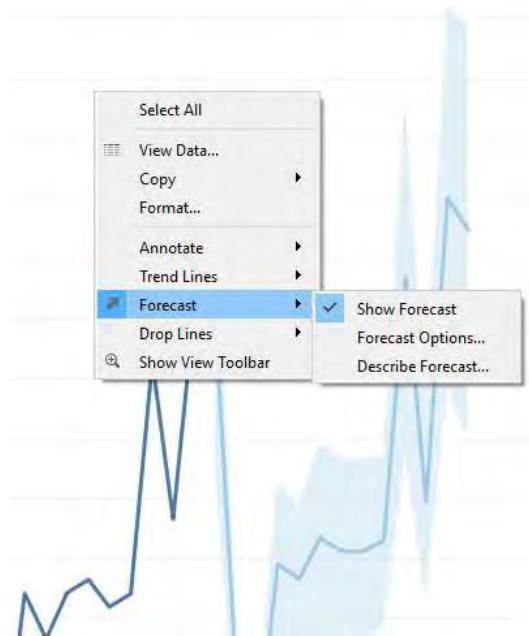
Forecasting is not supported for multidimensional data sources. Additionally, the view cannot contain any of the following:

- Table calculations on Disaggregated measures
- Percent calculations
- Grand Totals or Subtotals
- Date values with aggregation set to Exact Date

### Turn on Forecasting

To add forecasting to a view, there must be at least one date dimension or a dimension field that has integer values and one measure in the view.

Right-click in the view, select **Forecast**, and choose Show Forecast.



The forecast is shown projecting into the future as a lighter line with a shaded prediction interval.

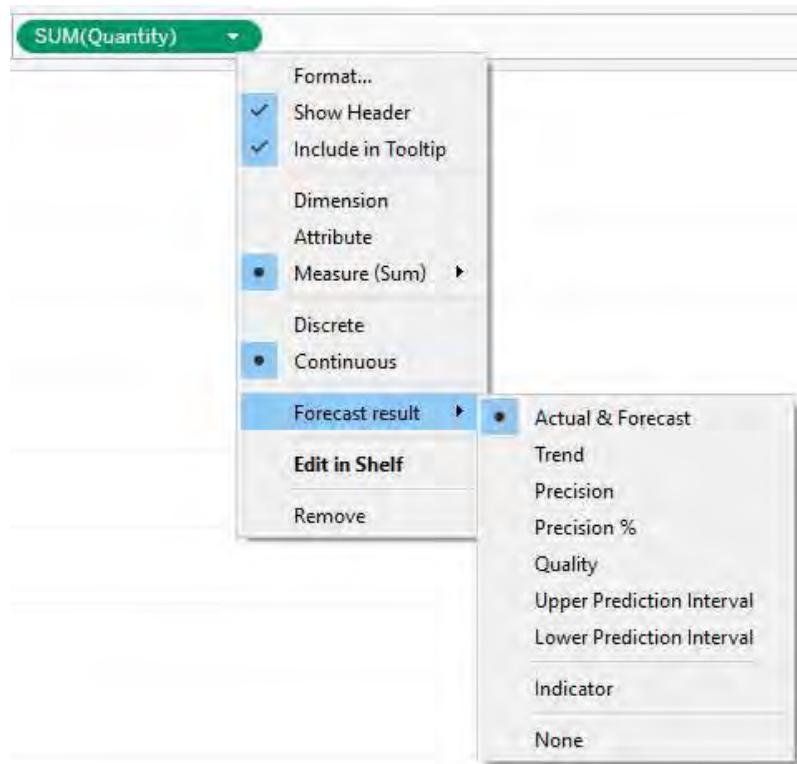
You can also use the **Analytics** pane to add a forecast to your view.

From the **Analytics** pane, under **Model**, drag and drop **Forecast** into the view.

# Tableau for the Business User

## Forecast Field Results

Tableau provides several types of forecast results. To view these result types in the view, right-click on the measure field, choose **Forecast Result**, and then choose one of the options.



Option	Description
Actual & Forecast	Show the actual data extended by forecasted data.
Trend	Show the forecast value with the seasonal component removed.
Precision	Show the prediction interval distance from the forecast value for the configured confidence level.
Precision %	Show precision as a percentage of the forecast value.
Quality	Show the quality of the forecast, on a scale of 0 (worst) to 100 (best). This metric is scaled MASE, based on the MASE (Mean Absolute Scaled Error) of the forecast.
Upper Prediction interval	Shows the value above which the true future value will lie confidence level percent of the time assuming a high-quality model. The confidence level percentage is controlled by the Prediction Interval setting in the Forecast Options dialog box
Lower Prediction interval	Shows 90, 95, or 99 confidence level below the forecast value. The actual interval is controlled by the Prediction Interval setting in the Forecast Options dialog box.
Indicator	Show the string Actual for rows that were already on the worksheet when forecasting was inactive and Estimate for rows that were added when forecasting was activated
None	Do not show forecast data for this measure.

# Tableau for the Business User

## Forecast Options

Right-click in a view and select **Forecast**, then click **Describe Forecast** to view the options used to create the forecast.

The screenshot shows the 'Describe Forecast' dialog box. At the top, there are tabs for 'Summary' and 'Models'. The 'Summary' tab is active. Below the tabs, the title 'Options Used to Create Forecasts' is displayed. Under this title, several parameters are listed: 'Time series: Month of Order Date', 'Measures: Sum of Quantity', 'Forecast forward: 13 months (Dec 2017 – Dec 2018)', 'Forecast based on: Jan 2014 – Nov 2017', 'Ignore last: 1 month (Dec 2017)', and 'Seasonal pattern: 12 month cycle'. Below this section, a table titled 'Sum of Quantity' is shown:

Initial Dec 2017	Change From Initial Dec 2017 – Dec 2018	Seasonal Effect	Contribution			
		High Nov 2018	Low Feb 2018	Trend 0	Season 0.0%	Quality Good
1,789 ± 493	306					

At the bottom of the dialog, there are buttons for 'Copy to Clipboard' and 'Learn more about the forecast summary'. On the right side, there is a checkbox labeled 'Show values as percentages' and a 'Close' button.

The **Describe Forecast** dialog shows the options used on the **Summary** tab. The **Models** tab shows the models used, quality metrics, and the smoothing coefficients.

# Tableau for the Business User

## Configure Forecast Options

You can configure forecast options by right-clicking in a view, selecting **Forecast**, and then clicking **Forecast Options**.



Option	Description
<b>Forecast Length</b>	Determines how far into the future the forecast extends. <b>Automatic:</b> Tableau determines the forecast length based on the data. <b>Exactly:</b> Extends the forecast for the specified number of units. <b>Until:</b> Extends the forecast to the specified point in the future.
<b>Source Data</b>	Use the Source Data section to specify. <b>Aggregate by:</b> Specifies the temporal granularity of the time series. <b>Ignore last:</b> Specifies the number of periods at the end of the actual data that should be ignored in estimating the forecast model. <b>Fill in missing values with zeros.</b>
<b>Forecast Model</b>	Specifies how the forecast model is to be produced. <b>Automatic:</b> Tableau selects the best model. <b>Automatic without seasonality:</b> Tableau selects the best model with no seasonal component. <b>Custom:</b> you specify the trend and season characteristics for your model.
<b>Prediction Interval</b>	You can set the prediction interval to 90, 95, or 99 percent, or enter a custom value. This value is used for the prediction bands and prediction intervals.
<b>Forecast Summary</b>	The text box at the bottom of the dialog box provides a description of the current forecast, or an error message that may help you resolve problems.

## Quick Reference Guide

### HOW TO CREATE A TREND LINE

1. Right-click in the view, point to **Trend Lines**, and then click **Show Trend Lines**.  
OR
  2. From the Analytics Pane, under **Model**, drag **Trend Line** into the view, selecting the model.
- NOTE: This command adds a linear trend line and adds a trend line for each color if there is a discrete field on the Color shelf.*
3. Right-click in the view again, point to **Trend Lines**, and then click **Edit Trend Lines**.
  4. In the **Trend Lines Options** dialog box, specify the trend line model type and any options.

### HOW TO CREATE A FORECAST

1. Right-click in the view, select **Forecast**, and choose **Show Forecast**  
OR
2. From the **Analytics** pane, under **Model**, drag and drop **Forecast** into the view.
3. From the measure, select the desired **Forecast Result**.
4. Right-click in the view and select **Forecast**, then click **Forecast Options** to modify the forecast length, source data, or model.
5. Right-click in the view and select **Forecast**, then click **Describe Forecast** to view the Summary and Model information for the forecast.

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# INTRODUCTION TO DASHBOARDS

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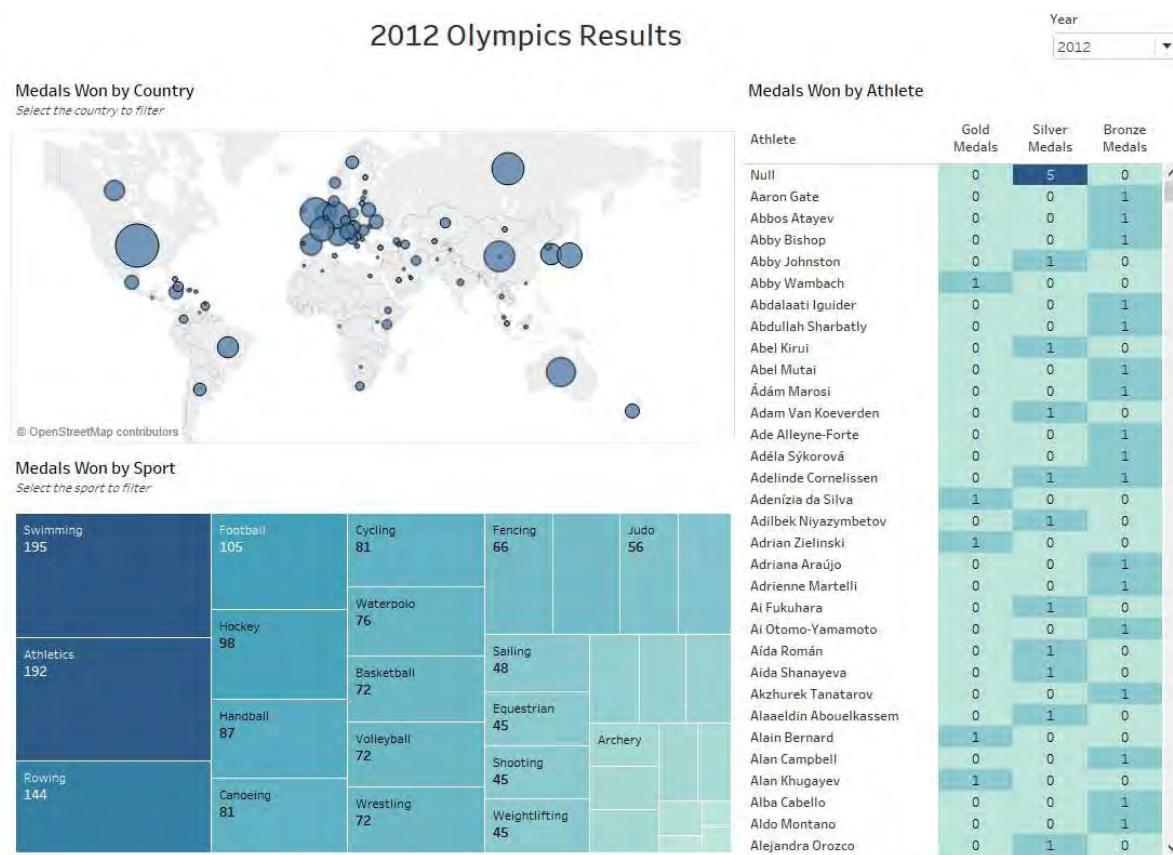
This module contains the following:

- Dashboards
- Planning Your Dashboard
- Viz in Tooltips
- Applying Visual Best Practice
- Dashboard Actions
- Dashboard Device Layouts
- Quick Reference Guide

# Tableau for the Business User

## Fundamentals of Dashboards

A dashboard is a collection of worksheets and supporting information shown in a single view, so you can compare and monitor a variety of data simultaneously. A dashboard allows you to display all views at once.



Like worksheets, dashboards are shown as tabs at the bottom of a workbook and update with the most recent data from the data source. When you create a dashboard, you can add views from any worksheet in the workbook. From the dashboard, you can format, annotate, drill-down, edit axes, and more. You can also add a variety of supporting objects to your dashboard, such as text areas, web pages, blank spaces and images.

## Understanding the Connections between Dashboards and Worksheets

The views in a dashboard are connected to the worksheets they represent. Any changes made to the view, either on the worksheet directly or through the dashboard, will result in those changes in both locations. This interaction is important to remember when configuring the views in your dashboard.

## Planning Your Dashboard

According to Stephen Few, “A dashboard is a visual display of the **most important** information needed to achieve one or more objectives; **consolidated and arranged** on a single screen so that the information can be **monitored at a glance.**”

It is important to plan your dashboard and understand the purpose, components and interactivity to achieve this.

Use these steps to guide your dashboard planning:

1. Define your purpose and audience
2. Sketch your plan
3. Build and test your dashboard
4. Add interactivity
5. Apply visual best practices

### Define Purpose and Audience

There are three main types of dashboards illustrated below:

- Strategic
  - Quick overview for decision makers to monitor health and opportunities for business
  - Focus on high level measures of performance to guide future actions
- Operational
  - Monitoring operations
  - Dynamic and immediate in nature
- Analytical
  - Require additional context (comparisons, historical, evaluations)
  - Highly interactive
  - Self-service

Why are you building this dashboard?

I need to	For example...
Share data for discovery	Create a dashboard that gives users access to data in a consumable and interactive format that allows them to ask their own data questions.
Provide an overview of information	Develop a monthly sales dashboard that has filters, so users can select which data to view.

## Tableau for the Business User

Draw attention to specific insights about the data	Use dashboards to tell a specific data story about a scientific discovery.
--	--

Who is your audience?

My audience includes	For example...
Users looking for specific information (more interactive)	Trainers viewing evaluation scores over time to track performance.
Information consumers (more passive)	Managers and directors who want to know why sales are down in the East region.

## Sketch Your Plan

Draw out your dashboard to visualize all aspects of the dashboard.

- Which views will be used?
- Will you allow your user to drill down in granularity?
- Will you have filters, actions or parameters to add interactivity?
- Will you need to filter across multiple data sources?
- Will you link to multiple dashboards?
- Would it help/hurt to use a visualization within the tooltip?

When building a dashboard, consider how the users will view the dashboard.

- Will they be viewing on different device types? If so, consider using device specific layouts.
- If viewed on a smaller device, consider the design that will look best on a smaller screen.
- If printing, will you use a printer friendly dashboard size?

If your audience uses...	Keep in mind that...
<b>Tableau Server</b>	Automatic play for motion charts is unavailable for playback on Server. Users can manually click through the pages.
<b>Tableau Reader</b>	Users cannot change much in the dashboard. They cannot view underlying data. Data will be static until a new .twbx file is provided.

You may also want to consider the following:

- If using an exported PDF or image, the visualizations will need to work in static mode.

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- Packaged workbooks (.twbx) can be opened in Reader or Desktop. Sending a .twbx file allows you to share custom images and shapes and is better for preserving data blending. However, data will be static until a new .twbx file is provided.

### Build and Test Your Dashboard

Build out and test your views. Within five seconds are you able to clearly understand the story of the dashboard? If not, you may want to consider redesigning your dashboard. Share your initial dashboards with targeted users to get feedback and if possible, watch them interact with your dashboard to view how they innately use the dashboard.

Create device specific layouts, if needed, to provide different views for use on tablets, phones, or desktops.

### Add Interactivity

Providing interactivity to your users will help them to engage further with the views and data on your dashboard. Use interactivity through filters, actions, and/or parameters to enhance the flexibility of the dashboard to meet additional needs. If using multiple dashboards, consider adding actions between each dashboard to allow the user to jump from one dashboard to another. This can be especially beneficial if moving from a high-level overview dashboard to a more detailed view.

### Use Visual Best Practices

There are many simple changes you can make to a dashboard to improve their appearance and readability. Users are more likely to use dashboards that are visually appealing to them. Be sure to take a step back from your dashboard and review the overall look and feel of the dashboard. Is it too busy, with too many marks and details, or does the data clearly stand out on its own?

#### Color, Sizing and Fonts

Review these items carefully:

##### Color

- Limit the total number of colors
- Use color for emphasis. Reserve the brightest colors, or any color, for the most relevant data points.
- If a relationship exists, use two shades of the same hue (such as light blue and dark blue)
- Consider whether adding borders or background colors to views, containers, and objects help focus attention or increase visual clutter.

##### Sizing

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- Keep screen size (if using Tableau Server) or paper size (if printing) in mind when developing your dashboard.
- The bottom-left size is set to automatic.
- Fit is independent for worksheet and dashboard.
- When using crosstabs, don't use fit entire view – use either fit width or fit height and a scrollbar unless you have tested out all possible views of the crosstab
- To resize elements, use Shift-Drag
- To resize individual worksheets, use CTRL and the arrow keys rather than manually dragging.

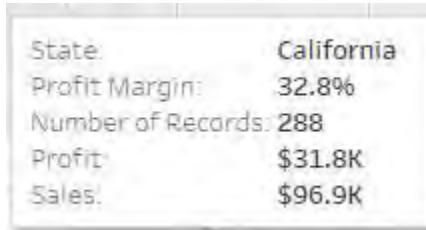
### Fonts

- Are your fonts readable?
- Sized appropriately?
- Appropriate for the use case?

### Tooltips

Edit the tooltips. By default, Tableau automatically includes the field names and values within the tooltip. Customize these tooltips to enhance the users' experience. When users hover over the marks, what do you want them to see?

Instead of this:



Consider this:

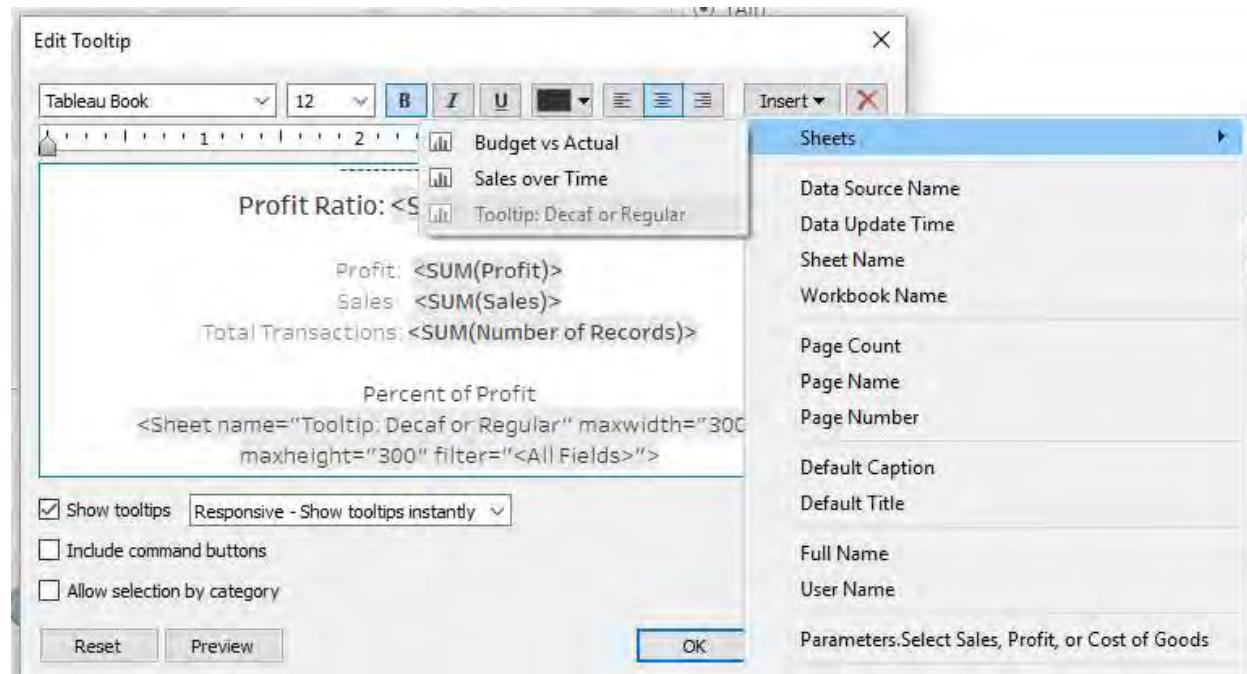


You can edit the tooltip and modify fonts, colors and alignment. You can also change how tooltips are displayed, include or exclude the command buttons, and enable or disable tooltip selection.

# Tableau for the Business User

## Visualizations in Tooltips

Consider using a view within the tooltip to give the user more information without having that view on the dashboard. You can insert a sheet in the tooltip like this:



Making the tooltip looks like this:



## Remove Chart Extras

- Consider removing tick marks, drop lines and grid lines unless necessary.
- Do you need every field label or header?
- Can you remove any legends?

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- Consider modifying axis labels and formatting.
- Choose appropriate filters.
- Use “cascading filters” to help guide your user through your filter options.
- Don’t overcrowd your dashboard. You can always build additional dashboards with actions connecting them.
- Edit and/or remove unnecessary titles.

### Edit the Original Worksheet

From the dashboard, you can easily return to a worksheet by clicking on its tab at the bottom of the workbook, or by clicking the **Go to Sheet** button that appears in the upper right corner of any view when you hover over it.



The screenshot shows a Tableau dashboard with a worksheet titled "Medals Won by Athlete". The worksheet displays a table of medal counts for various athletes. The columns are "Athlete", "Gold Medals", "Silver Medals", and "Bronze Medals". The data includes rows for Null, Aaron Gate, Abbos Atayev, Abby Bishop, Abby Johnston, Abby Wambach, Abdalaati Iguider, Abdullah Sharbatly, Abel Kirui, Abel Mutai, Ádám Marosi, Adam Van Koeverden, and Ade Alleyne-Forte. The "Silver Medals" column for Aaron Gate is highlighted in blue, indicating it is selected. A context menu is open over the first row, with the "Go to Sheet" option highlighted.

Athlete	Gold Medals	Silver Medals	Bronze Medals
Null	0	5	0
Aaron Gate	0	0	1
Abbos Atayev	0	0	1
Abby Bishop	0	0	1
Abby Johnston	0	1	0
Abby Wambach	1	0	0
Abdalaati Iguider	0	0	1
Abdullah Sharbatly	0	0	1
Abel Kirui	0	1	0
Abel Mutai	0	0	1
Ádám Marosi	0	0	1
Adam Van Koeverden	0	1	0
Ade Alleyne-Forte	0	0	1

You can also access the **Go to Sheet** option in a view's drop-down menu. Simply click a view in the dashboard to select it, click the small gray drop-down arrow in its upper-right corner, and then click **Go to Sheet** on the menu.

# Tableau for the Business User

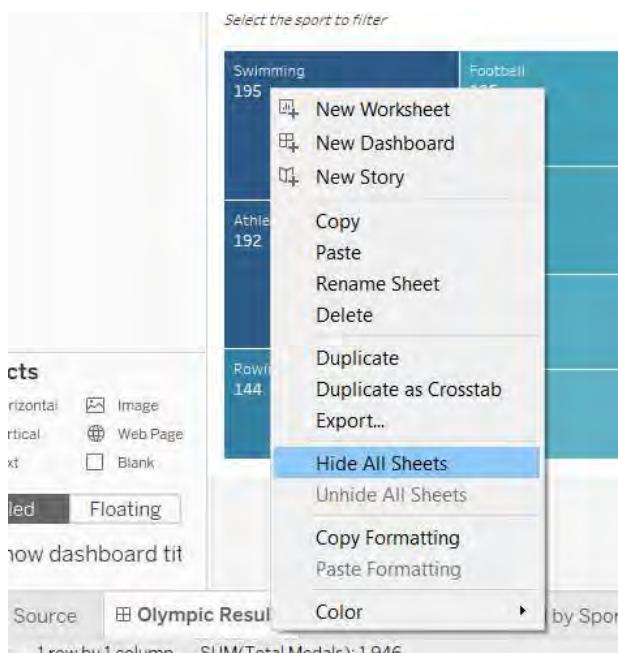


## Hide and Unhide Dashboard Worksheets

You can hide one or more of a dashboard's worksheets so that they are not shown in the filmstrip, sheet sorter, or in the tabs along the bottom of the workbook. This is very useful when you have numerous worksheets with a workbook and you only want users to view the final dashboards.

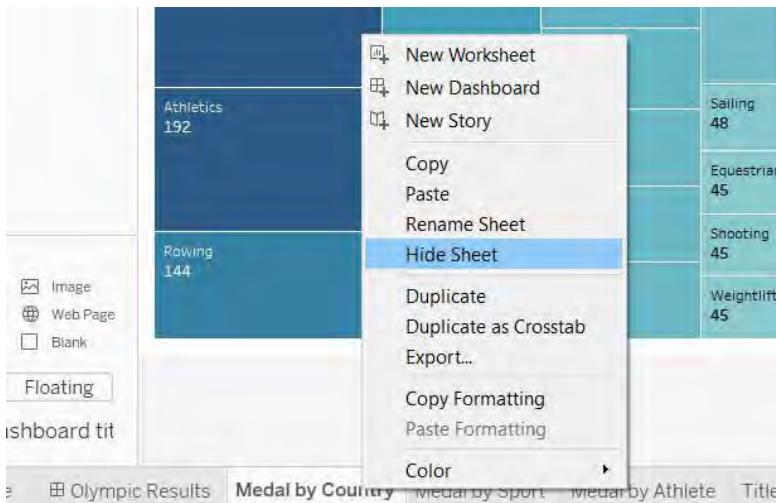
**NOTE:** A worksheet must be used in a dashboard before it can be hidden. Hiding a worksheet does not affect its display in the dashboard itself.

To hide all of a dashboard's worksheets, right-click the dashboard's tab, and then click **Hide All Sheets**.



# Tableau for the Business User

To hide an individual sheet, right-click the worksheet tab, and then click **Hide Sheet**.



To unhide all of a dashboard's worksheets, right click the dashboard's tab, and then click **Unhide All Sheets**.

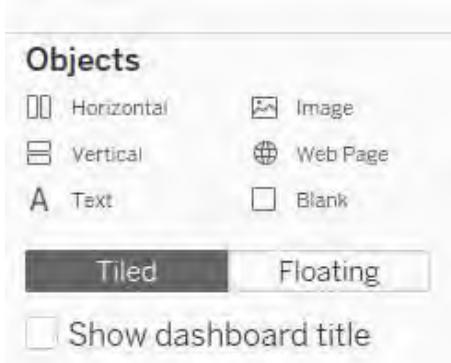
To unhide an individual sheet, use the **Go to Sheet** button to return to the sheet, right click its now-visible tab at the bottom of the workbook, and click **Unhide Sheet**.

## Set Components to Tiled or Floating

When objects or sheets are added to a dashboard, you can specify if you want these to be tiled or floating. Tiled components are arranged in a grid using layout containers. Alternatively, floating items can be layered on top of other items.

## Add a Tiled Component

1. In the **Dashboard** pane, select the **Tiled** option.



2. Drag a sheet or object to the view. The sheet or object is added to a layout container and sized appropriately.

## Fitting a View to its Container

Each item within a layout container can be positioned to **Standard**, **Fit Width**, **Fit Height**, or **Entire View**. Click the small gray drop-down arrow in the upper right corner of the view's border, select **Fit**, and then click the desired fit on the menu.

## Tableau for the Business User

A screenshot of the Tableau interface showing a context menu for a floating component. The menu is open over a dashboard titled "Medals Won by Sport". The menu items include: Go to Sheet, Duplicate Sheet, Fit, Title, Caption, Legends, Filters, Highlighters, Show Page Control, View Toolbar, Use as Filter (which is checked), Ignore Actions, Floating, Select Layout Container, Deselect, and Remove from Dashboard. The "Entire View" option under the "Fit" section is highlighted with a blue selection bar.

Sport	Medals Won
Swimming	195
Athletics	192
Rowing	144
Football	105
Hockey	98
Handball	87
Cycling	81
Waterpolo	76
Basketball	72
Volleyball	72
Canoeing	81
Wrestling	72

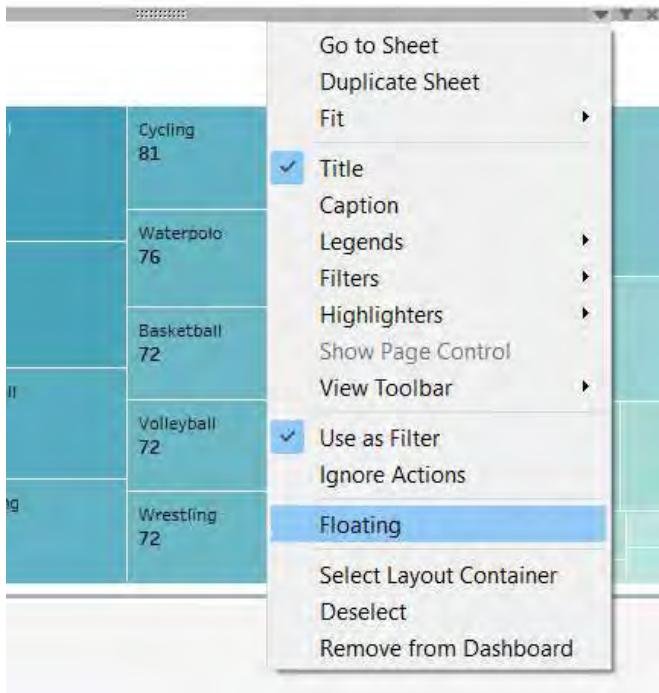
### Add Floating Components

1. In the **Dashboard** pane, select **Floating** instead of **Tiled**.
2. Drag a sheet or object to the view.
3. Resize the floating component by dragging its margins.
4. Move the floating component by dragging it.



You can also toggle individual components in a dashboard to **Floating** after they've been placed on the dashboard. Use the selected component's drop-down menu to toggle the option.

## Tableau for the Business User

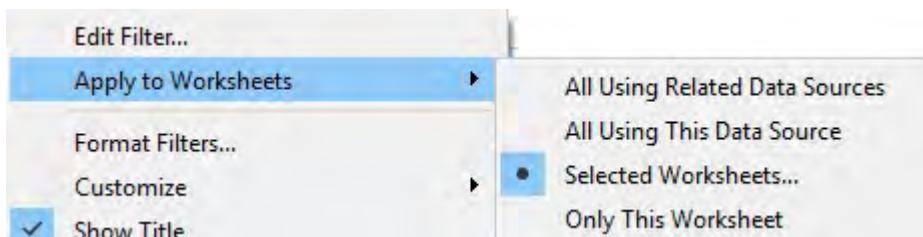


The order of floating components can be changed using the **Objects** section of the **Layout** pane. Drag and drop a component to the desired order. Floating components can be resized. First select it from the dashboard or in the **Object** section of the **Layout** pane. Using the **Layout** pane, adjust the **Position** (offset in pixels from top left corner of the dashboard) and **Size** properties (width and height).

## Worksheets and Filters

Adding worksheets to a dashboard, also adds their filters and legends by default. Duplicate or unnecessary filters and legends can be deleted from the dashboard by clicking the small gray x in the upper right corner of the selected item or by dragging them off the dashboard.

Filters can be extended to apply to other worksheets in the dashboard. To set the scope of a filter, right-click on the filter, select **Apply to Worksheets** and select the desired scope.



### Using Worksheets as Filters

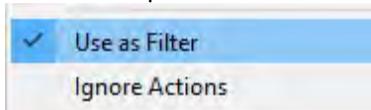
## Tableau for the Business User

You can also use the worksheets in the dashboard as filters for the other views in the dashboard. There are two ways to use a worksheet as a filter:

- Click the filter button on the top right of the view.



- Click the drop-down arrow and choose **Use as Filter**.



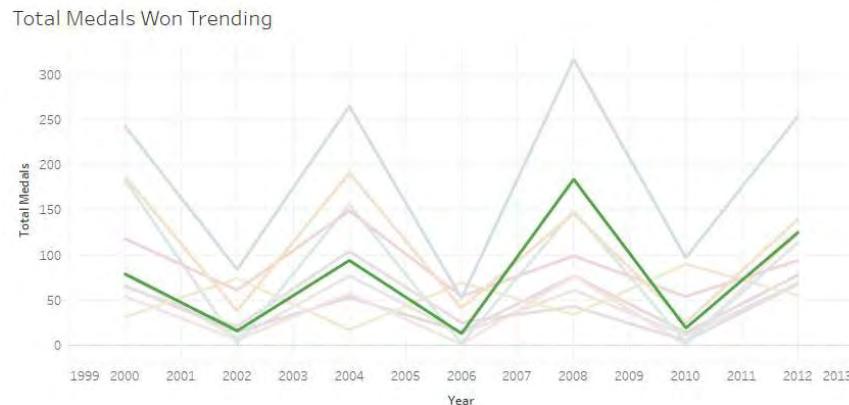
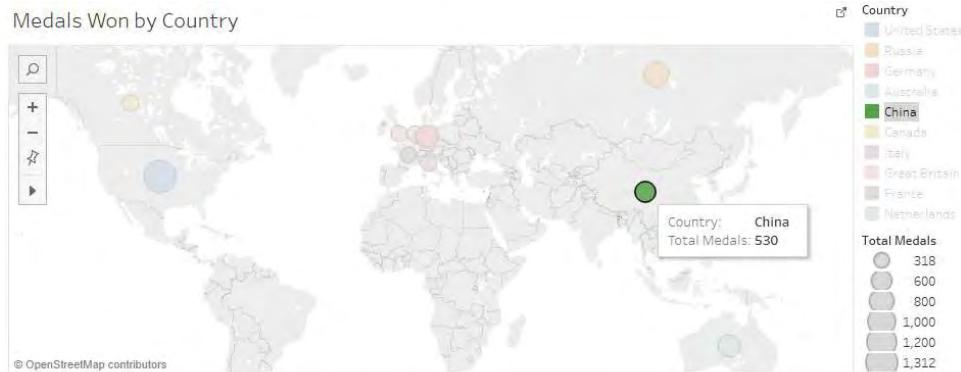
# Tableau for the Business User

## Dashboard Actions

Tableau offers six kinds of dashboard actions: **Highlight, Filter, URL, Go to Sheet, Change Set Values, and Change Parameter Values**. These actions allow for interaction between the views on the dashboard.

### Highlight Actions

Use highlight actions to call attention to marks of interest by coloring relevant marks and dimming all others. You can highlight marks in the view by selecting the marks you want to highlight, using the color legend to select related marks, or creating a highlight action.



1. On the **Dashboard** menu, click **Actions**.
2. In the **Actions** dialog, click the **Add Action** button, and then select **Highlight**.
3. Use the following settings for the highlight:

For this field	Enter
Name	Give the <b>Highlight</b> action a meaningful name
Source sheets	Select the sheets(s) containing the marks you are using to initiate highlighting
Run action on	Select <b>Hover, Select, or Menu</b>
Target Sheets	Select the sheet(s) to be highlighted by the source sheet(s)
Target Highlighting	Select the items that will be highlighted by the source sheet action.

**NOTE:** Best practice suggests you run highlight actions on **Hover**.

Click **OK**

# Tableau for the Business User

## Filter Actions

Use filter actions to send information between worksheets, typically from a selected mark to another sheet showing related information. For example, by selecting the mark for a country on a dashboard map view, the related worksheets showing medals won would be filtered to show only data related to that country.



1. On the **Dashboard** menu, click **Actions**.
2. In the **Actions** dialog, click the **Add Action** button, and then select **Filter**.
3. Use the following settings for the filter:

For this field	Enter
Name	Give the Filter action a meaningful name.
Source Sheets	Select the sheet(s) containing the marks you are using to initiate filtering.
Run action on	Select <b>Hover</b> , <b>Select</b> , or <b>Menu</b>
Target Sheets	Select the sheet(s) to be filtered by the source sheet(s).
Clearing the selection will	Select how the values display after the filter is cleared: Leave the filter continues filtering based on last selection. Show all values removes the filter. Exclude all values removes the filter and hides the view until the next selection is made.

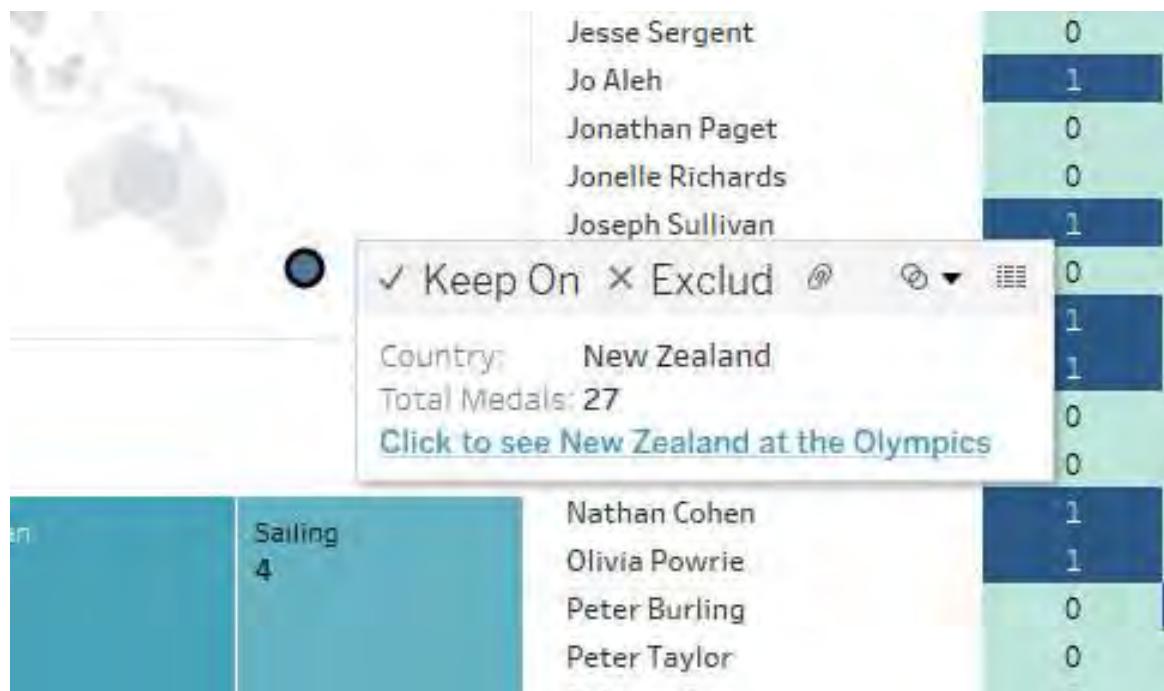
**NOTE:** Best practice suggests you run filter actions on **Select**.

4. Click **OK**.

## Tableau for the Business User

### URL Actions

A URL action is a hyperlink that points to a web page, file or other web-based resource outside of Tableau. Use URL actions to link to more information about your data. To make the link relevant to your data, you can substitute field values of a selection into the link text and URL as parameters.



1. On the **Dashboard** menu, click **Actions**.
2. In the **Actions** dialog, click the **Add Action** button, and then select **URL**.
3. Use the following settings to create the URL action:

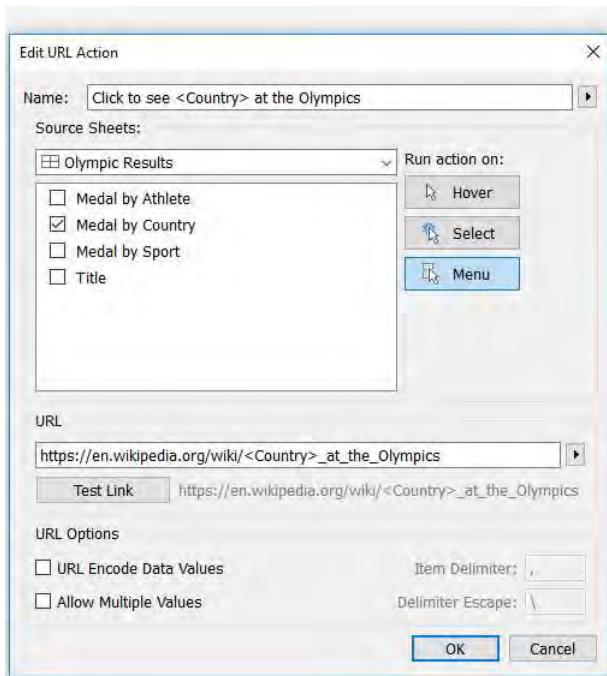
For this field	Enter
Name	Name the <b>URL</b> action. This will also be the link text.
Source Sheets	Select the sheet(s) to use as the source.
Run action on	Select <b>Hover</b> , <b>Select</b> , or <b>Menu</b>
URL	Enter the URL link, starting with the <code>http://</code> or <code>https://</code> prefix, of the outside data source you want to use.
URL Encode Data Values	If you have values in your data that are not allowable in a URL, select this option so those values are translated to URL-encoded characters.
Allow Multiple Values	Select if you are linking to a website that can take lists of values as parameters in the link. You must also indicate the item delimiter, which defaults to <code>,</code> and the delimiter escape, which defaults to <code>\</code> .

**NOTE:** Best practice suggests you run URL actions on **Menu**. They will appear in the tooltip.

4. Click **OK**.

## Tableau for the Business User

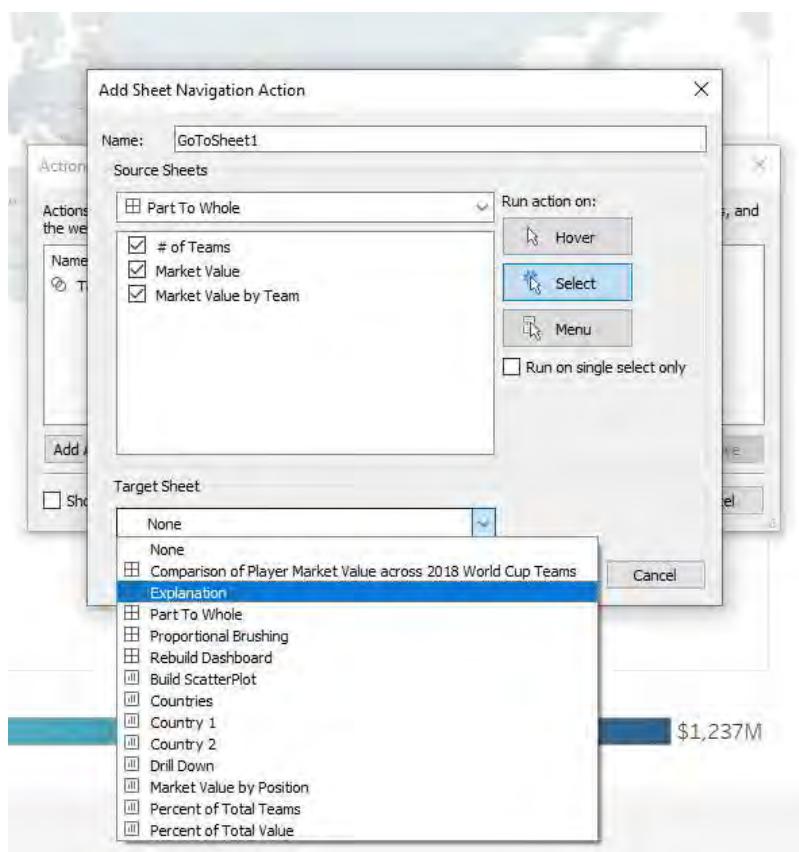
For the URL action shown in the previous dashboard, the following options were selected. Note the use of **Country**, one of the **Dimensions** from the source worksheet, in the URL text (Name)and link (URL).



### Go to Sheet

The Go to Sheet action allows users to navigate to another sheet or dashboard by selecting a mark.

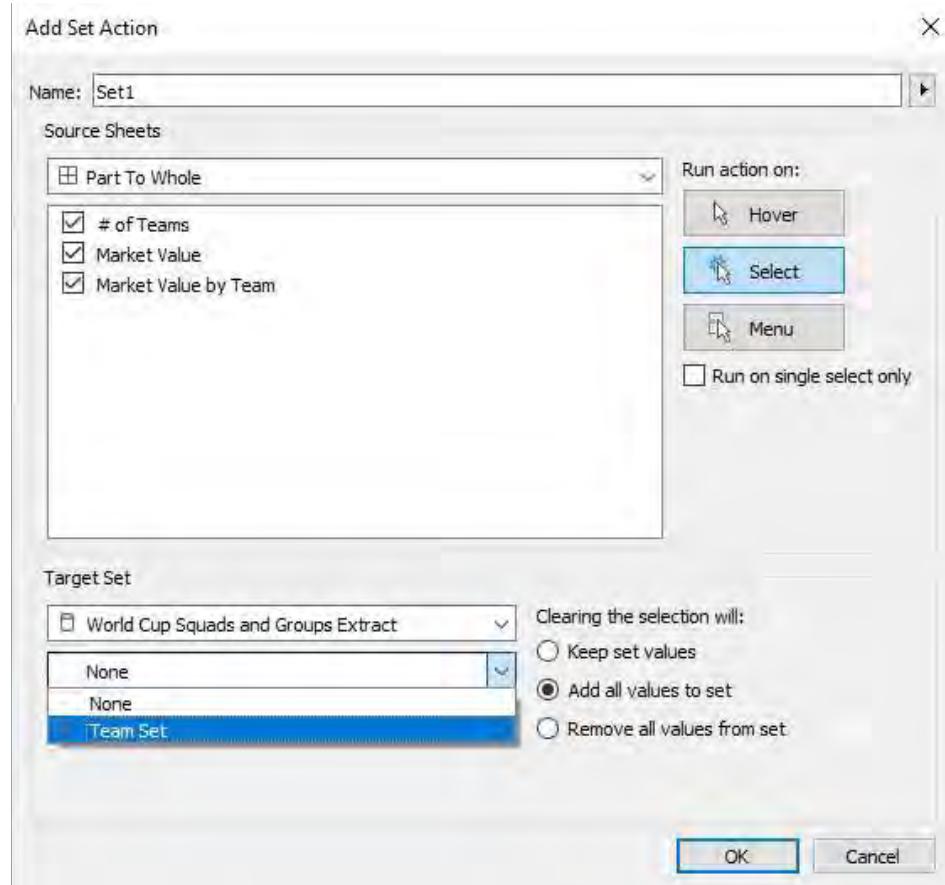
Select the Source Sheet(s) and the Target Sheet to create the action from one sheet to another.



## Tableau for the Business User

### Change Set Values

The Change Set Values action allows users to change the values of an existing set by interacting with marks in a view.

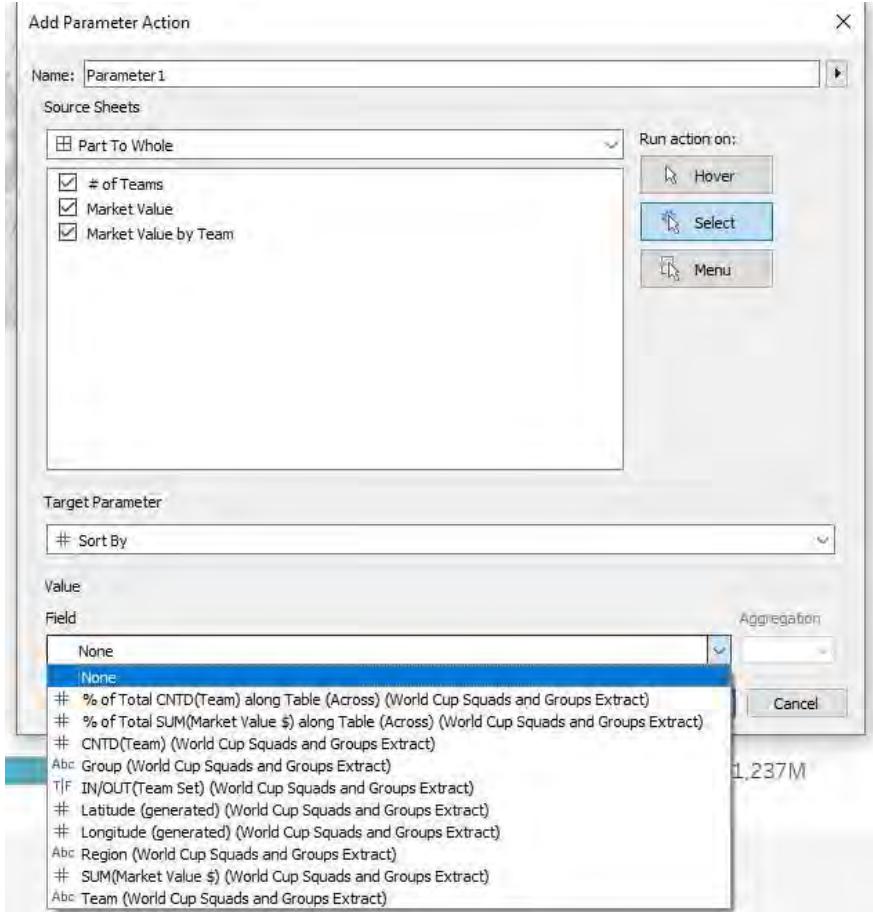


Specify the source sheet(s) and the Target Set to be changed based on the selection. Additionally, set the behavior of what happens when the selection is cleared.

# Tableau for the Business User

## Change Parameter Values

The Change Parameters Values action allows users to change the values of an existing parameter by interacting with marks in a view.



Specify the source sheet(s), the Target Parameter to be changed, and the field to use based on the selection.

## Options for Running Actions

Actions run in one of three ways: **Hover**, **Select**, or **Menu**.

For this field	Action
Hover	Rest the pointer over a mark in the view to run the action. This option works well for Highlight and Filter actions.
Select	Click on a mark in the view to run the action. This option works well for all types of actions.
Menu	Click a mark in the view, and then select an option on the tooltip context menu. This option works well for Filter and URL actions.

### Best Practice for Dashboard Actions

- For **filter** actions, use **Select**.
- For **Highlight** actions, use **Hover**.
- For **URL** actions, use **Menu**.
- For **Go to Sheet** actions, use **Select** or **Menu**.
- For **Change Set Values** actions, use **Select**.
- For **Change Parameter Values** actions, use **Select**.

## Dashboard Device Layouts

Once you have built your dashboard, you can create different layouts specific to particular devices. The composition and content can be modified to fit best based on the screen size for phones, tablet or desktop.

### Preview Different Devices

1. In the **Dashboard** pane, click **Device Preview**.



2. Once in **Device Preview** mode, select a **Device** type and, if desired, a specific **Model** for the selected device.



Tableau will draw a box around the area of the layout that would be visible based on the screen size of the selected model. A dashboard designed for a desktop often will not look good on a phone. As a result, you can add and customize a layout for a specific device.

### Add and Customize a Device Layout

1. After selecting the **Device** type and **Model**, click **Add <Device type> Layout**.

## Tableau for the Business User

2. When the device is added, you will see it on the **Dashboard** tab, listed under the **Default** dashboard layout.
3. To customize the new layout, under **Layout - <Device type>**, click the **Custom** button.

Objects can be rearranged or removed. Changes are specific to each layout. The default dashboard will remain the same. New sheets cannot be added independently for each layout. All worksheets must be present on the default layout to appear on any of the device specific layouts.



## Quick Reference Guide

### CREATE A DASHBOARD

1. Add a new Dashboard tab
2. Name the Dashboard.
3. Drag the worksheets onto the dashboard space in a way that is visually appealing.
4. Adjust the fit of the views

### CREATE A HIGHLIGHT ACTION

1. From the **Dashboard** menu, click **Actions**.
2. Add a **Highlight** action.
3. Give the **Highlight** action a meaningful name.
4. Select the **Source** sheet(s) containing the marks you are using to initiate highlighting.
5. Select how to initiate the highlighting: by **Hover, Select, or Menu**.
6. Select the **Target** sheet(s) to be highlighted by the source sheet(s).
7. Select the items that will be highlighted by the source sheet action.

### CREATE A FILTER ACTION

1. From the **Dashboard** menu, click **Actions**.
2. Add a **Filter** action.
3. Give the **Filter** action a meaningful name.
4. Select the **Source** sheet(s) containing the marks you are using to initiate filtering.
5. Select how to initiate the filter: by **Hover, Select, or Menu**.
6. Select the **Target** sheet(s) to be filtered by the source sheet(s).
7. Select how the values display after the filter is cleared:
  - Leave the filter
  - Show all values
  - Exclude all values

### CREATE A URL ACTION

1. From the **Dashboard** menu, click **Actions**.
2. Add a **URL** action.
3. Name the **URL** action. This name will be used as the link text.
4. Select the **Source** sheet(s) to initiate the URL action.
5. Select how to initiate the URL action: by **Hover, Select, or Menu** Select Hover, Select, or Menu. Most URL actions use Menu.
6. Enter the URL link.

### ADD A VIZ IN TOOLTIP

1. Create the view to add in the tooltip.
2. From the tooltip in the desired worksheet, select **Insert** from the drop-down menu.
3. From **Sheets**, select the sheet to include.
4. Customize the link to modify size or filters.
5. Hover over mark to view the visualization.

### ADD A DEVICE SPECIFIC LAYOUT

1. From the **Dashboard** menu, click **Device Preview**.
2. Select the **Device type** to add: **Desktop, Tablet or Phone**.
3. Select the **Model**, if applicable.
4. Select the Mode: **Portrait** or **Landscape**
5. Set the **Size** for the device.
  - **Default:** Sized as is
  - **Fit all:** Fits all objects on existing dashboard into size of device
  - **Fit Width:** Fits all objects by width
  - **Height:** Specifies the pixel height of the dashboard on the selected device.
6. Modify the contents of the device specific layout as desired.
7. Remove any unnecessary views, legends, filters, and text.

# STORY POINTS

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This module contains the following:

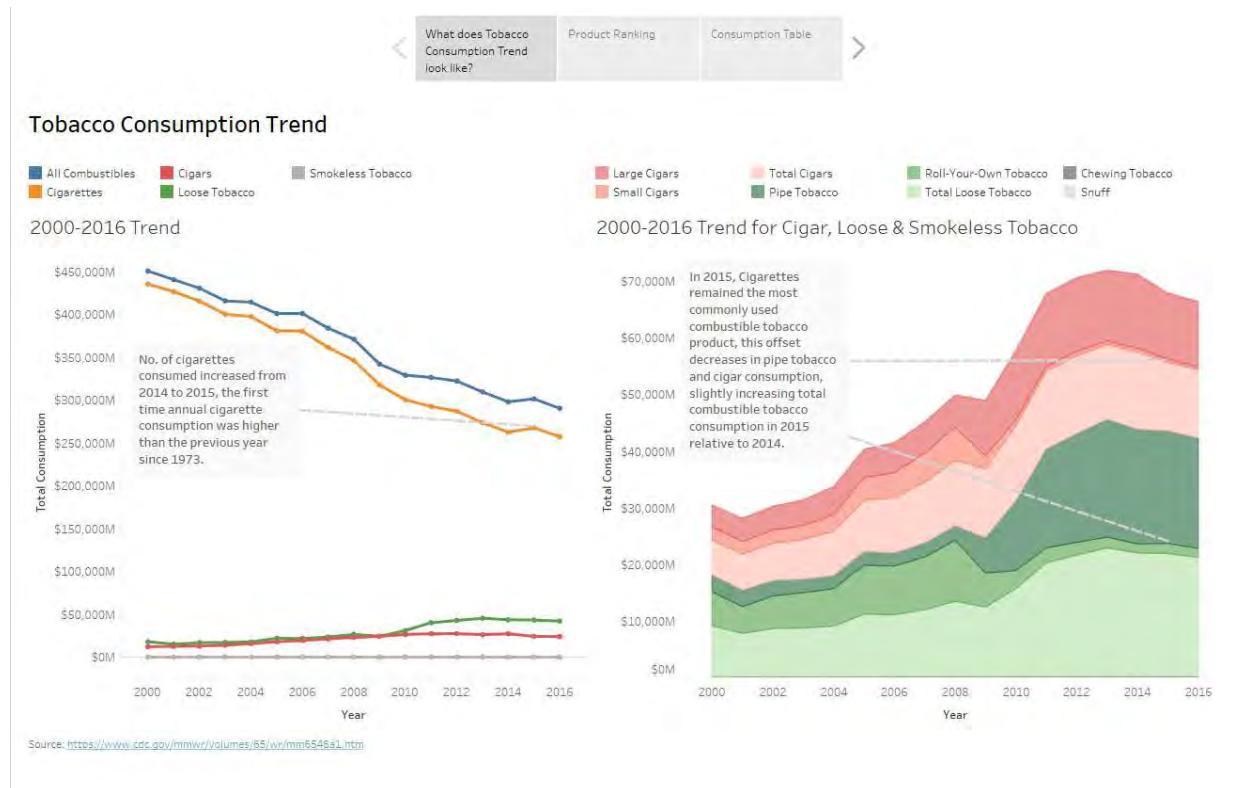
- Telling Stories with Data
- Practice – Creating Stories
- Quick Reference Guide

# Tableau for the Business User

## Telling Stories with Data

A story is a sequential presentation. Each item in the presentation is called a story point, and may display a visualization, or an entire dashboard. The visualization or dashboard can be set to highlight specific insights, for example by using filters, selections, captions and annotations. A story maintains the state of its contained visualizations independently of their stand-alone instances in a workbook.

The story has a step-by-step format which lets you move your audience through time, framing your story to your desired end result.



## Best Practices for Telling Great Stories

A good data story brings the data and facts to life. Use story points guides your users through your data to provide them with the insights you want to highlight. To build a great story, follow the best practices outlined below:

- Determine your story's purpose – Decide if you want to present data points that lead up to a conclusion at the end or start with a conclusion and then show the supporting data points.
- Sketch your story first – Identifying the steps in your story will help you identify any problems in sequence of your story. Are you making logical leaps from each story point?
- Understand the seven types of data stores:

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Data Story Type	Description
Change Over Time	<b>What it Does:</b> Uses chronology to illustrate a trend. <b>Discussion it Starts:</b> Why did this happen or why does it keep happening?
Drill Down	<b>What it Does:</b> Sets context so your audience better understands what's going on in a category. <b>Discussion it Starts:</b> Why is this person, place or thing different?
Zoom Out	<b>What it Does:</b> Describes how something your audience cares about relates to the bigger picture. <b>Discussion it Starts:</b> What affect does one area have on the bigger picture?
Contrast	<b>What it Does:</b> Show how two or more subjects differ. <b>Discussion it Starts:</b> Why are these things different?
Intersections	<b>What it Does:</b> Highlights importance changes when one category takes over another. <b>Discussion it Starts:</b> What causes these changes? Are they good or bad? How do they impact other aspects of our plan?
Factors	<b>What it Does:</b> Explains a topic by dividing it into types or categories <b>Discussion it Starts:</b> Is there a category we should focus on more? How much do these items affect the metric we care about?
Outliers	<b>What it Does:</b> Shows anomalies or where things are different <b>Discussion it Starts:</b> Why is this item different?

- Keep it simple – Keep each story point clear and concise. Every element should serve a purpose. Do not include more than you need to tell your story.
- Use ‘Fit to’ in your dashboards – If using dashboards in your story, use the **Fit To** option under **Size** on the **Dashboard** pane to resize the dashboard to the right size for use in a **Story**.
- Build the story to load quickly – Do not use excess filters and try to limit filters to **Keep Only** instead of **Exclude** as **Exclude** is slower to load. Understand Tableau’s Order of Operations to help reduce load times.

# Tableau for the Business User

## Dashboards Versus Stories

The window you use for story points looks like the dashboard window, but these two features serve different purposes.

- In general, dashboards support data exploration. Dashboards allow users to compare and monitor a variety of data simultaneously.
- Stories are better for sharing specific data insights to tell a data story. Stories contain a sequence of worksheets or dashboards that work together to convey information.

Here are some of the key similarities and differences between dashboards and story points:

Features	Dashboard	Story Points
Has a tab on the bottom of the screen to create a new one	Yes	Yes
Allows editing of sheet items such as titles, filters, and other view elements	Yes	No
Changes you make are saved as you go	Yes	Yes
Worksheet titles appear	Yes	No
"Look and feel" edits	Yes	Somewhat limited
User interactivity with items in the view such as filters, highlight, and so forth.	Yes	Yes
Publish to Server	Yes	Yes
Publish to Reader	Yes	Yes
Edits to worksheets show after they have been added to a Dashboard or Story	Yes	Yes

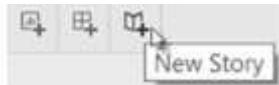
## How to Build a Story

Each story point captures a visualization or dashboard as you have set it in that instance. This could be a filter setting or selected mark. Users can still interact with your story, but when they refresh the view, it reverts to the original setting as you built it.

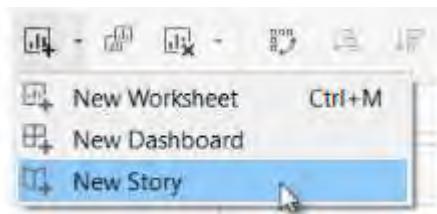
### Start a Story

There are several common ways to start a story:

- On the bottom toolbar, click the **New Story** button.



- On the toolbar, click the new worksheet icon's drop-down arrow, and select **New Story**.



- On the **Story** menu, select **New Story**

## Add a Sheet or Dashboard to a Story Point

To add a visualization or dashboard to a story point, drag it from the **Story** pane.

## Capture your Insight or “State”

Next, you can set and capture the desired state:

- In the navigator above the story point, add text to the caption box.
- In the visualization or dashboard, make selections, filter, highlight, and so forth to set the desired state of the story point.
- On the story toolbar above the navigator box, click **Update** to save the story point in the state you want to use.

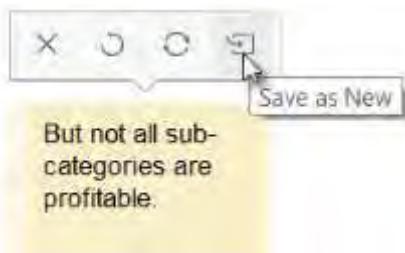
## Add Descriptions to a Story

You can add descriptive annotations to a story point by dragging **A Drag to add text** from the **Story** pane. Use the **Edit Description** dialog box that appears to enter and format your description, and then click **OK**.

## Add a New Story Point

There are several ways to add new story points:

- Drag and drop a sheet to the navigator in the place where you want it to display in the story sequence.
- In the **Story** pane, under **New Story** point, click **Blank** or **Duplicate** to add a new point.
- Change the state of an existing story point, and then, on the story toolbar above the navigator box, click **Save as New** to save it as a new story point.



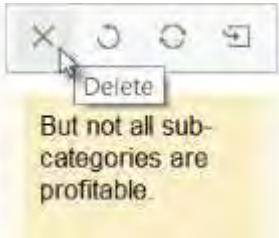
## Rearrange the Order of the Story Points

# Tableau for the Business User

In the navigator, drag and drop a story point caption box to where you want it.

## Delete a Story Point

On the story toolbar above the navigator box, click the X just above the box.



## Set the Navigator Style

You can set the navigator to one of three styles and show or hide the navigation arrows.

- In the **Layout** pane, select the radio button for the desired style: **Caption boxes**, **Numbers**, or **Dots**.
- You can toggle the display of the previous and next arrows using the **Show arrows** check box.

## Format a Story

1. On the Story menu, select **Format**.
2. Use the **Format Story** pane to format the story. You can alter the formatting for the title, navigator, and text objects.  
**NOTE** To reset all formatting to the default state, on the **Format Story** pane, click the **Clear** button at the bottom of the pane. To reset an individual format option, right-click the option, and then click the **Clear** button for that option.
3. Change the size of navigator caption boxes by clicking and dragging an edge of a box.

## Quick Reference Guide

### HOW TO CREATE A STORY

1. Start a Story:
  - On the bottom toolbar, click the **New Story** button.
  - On the toolbar, click the new worksheet icon's drop-down arrow, and **select New Story**.
  - On the Story menu, select **New Story**
2. To add a visualization or dashboard to a story point, drag it from the **Story** pane.
3. Capture your Insight or "State"
4. Add **Descriptions** to a Story
5. Add a **New Story Point**
6. Rearrange the Order of the Story Points

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# PUBLISHING A WORKBOOK

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This module contains the following:

- The Online Publishing Process
- Publishing Data Sources
- Publishing Workbooks
- Differences Between Tableau Server, Tableau Online and Tableau Public
- Quick Reference Guide

### The Online Publishing Process

When you want to allow multiple people to access your data sources and workbooks within or even outside of your organization, you will want to publish them to one of Tableau's three online areas: Tableau Server, Tableau Online, or Tableau Public.

By publishing you can begin to do the following:

- Collaborate and share with others
- Centralize data and database management
- Support mobility

If your server or site administrator has granted you a site role of Publisher on the site you are publishing to, and given you View and Save capabilities on the project into which you want to publish, you will be able to publish to Tableau Server or Tableau Online.

Tableau Public differs from Tableau Server and Tableau Online in that it is a community-based sharing platform. Using Tableau Public makes your workbook visible to anyone with a free account on Tableau Public. Data sources are published as extracts with the workbook and are not able to be connected to by other users.

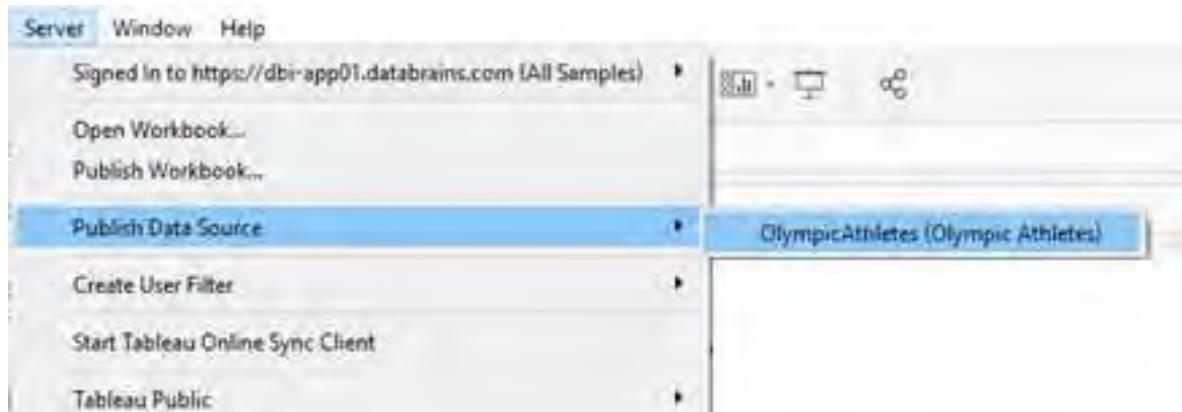
### Publishing Data Sources

To securely share the data source with others, it can be published on Tableau Server or Tableau Online. Once published it can be used by anyone with permissions. All the workbooks that use published data source will get updated when the data is refreshed or changed, maintaining a single source of truth.

No matter what the data source, the following steps are used to publish a data source to Tableau Server or Tableau Online.

1. From the **Server** menu, select **Publish Data Source**.

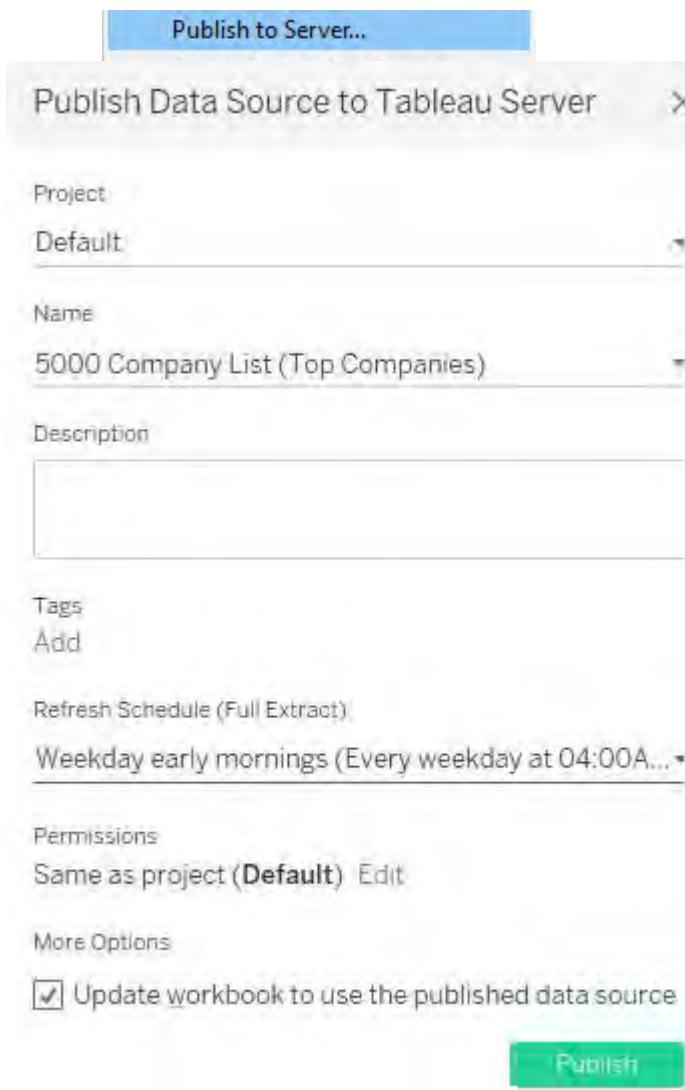
If your workbook is connected to multiple data sources, select the one you want from the submenu.



## Tableau for the Business User

2. If you are already signed into Tableau Server or Tableau Online, proceed to step 3. If you are not signed in, follow the prompt to sign into your desired Tableau Server or Tableau Online site.

Alternatively, you can right-click on the data source to publish from the Data Pane and select Publish to Server.



- Select the **Project** you want to publish to and enter the data source **Name**.
- Add a **Description** and **Tags** that will help you and other users find it.
- Set the **Permissions**. By default, you should accept the project settings. Generally, a site administrator manages permissions on the server. You should not differ from the site's permissions unless you know this is an exception.
- If you are publishing a data source that requires **Authentication**, you will need to provide credentials to access your data.
- If you are publishing an extract, you will want to set a **Refresh Schedule** and allow access to the data source.
- By default, during the publishing process, Tableau updates the workbook connection to use the new published data source. You can choose to not do this automatically by unchecking the **Update workbook to use the publish data source option**.
- Click **Publish**.

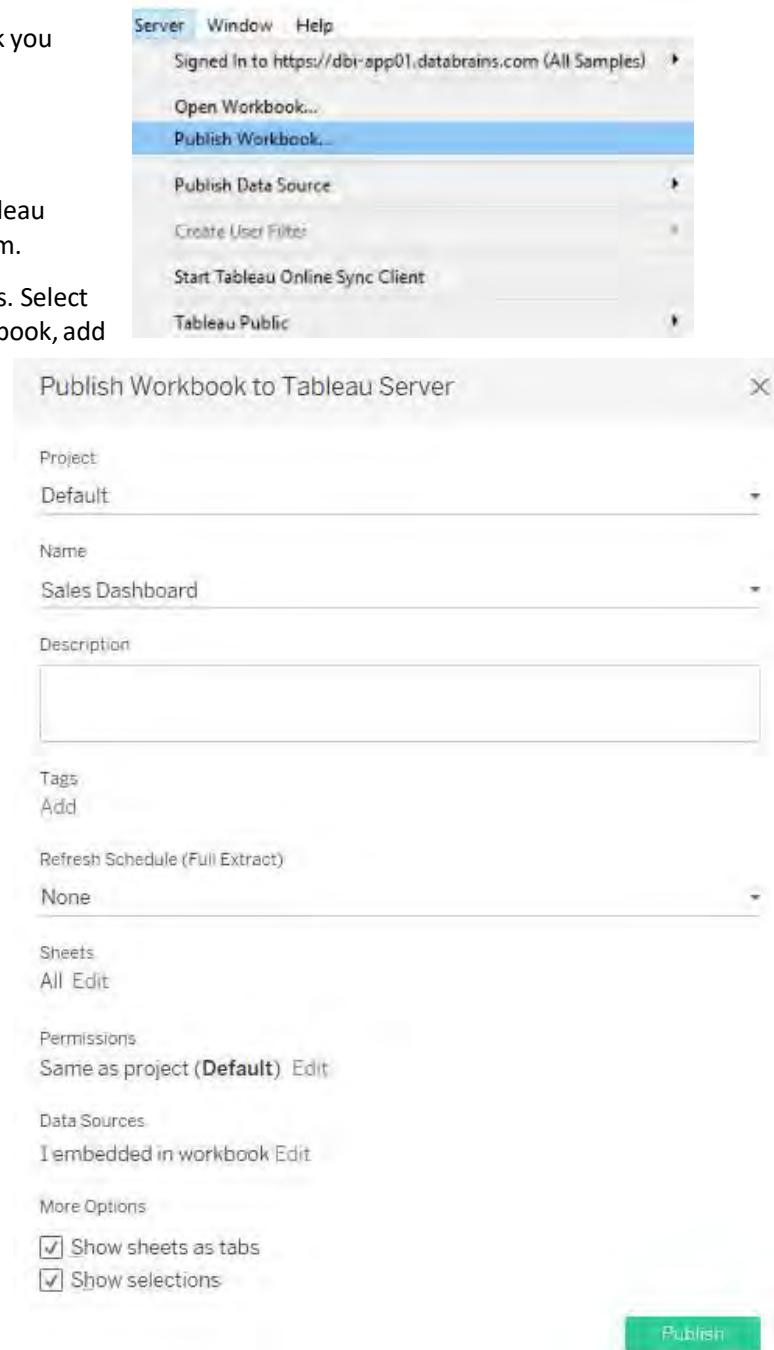
The data source will now be published on Tableau Server or Tableau Online. Anyone who has access to the published location and data connection will now be able to connect to the data source and create their own workbooks with this data source.

## Publishing Workbooks

Publishing the workbook means taking a file created in Tableau Desktop and sharing it with others via Tableau Server or Tableau Online. To securely publish the workbook, you need to first have access to either Tableau Server or Tableau Online, and more specifically have access to the project to which you wish to publish.

The steps below describe the general publishing process

1. In Tableau Desktop, open the workbook you want to publish.
2. From the **Server** menu, select **Publish Workbook**.  
If necessary, sign into a server. For Tableau Online, enter <https://online.tableau.com>.
3. A **Publish Workbook** dialog box appears. Select the **Project**, enter a **Name** for the workbook, add a **Description**, and add search **Tags**.
4. For **Permissions**, accept the default project settings unless you know that this workbook will be an exception from the site managed permissions.
5. For **Data Sources**, select **Edit** to change the method for how people to access the underlying data your workbook connects to, or to change how the data is published.
  - o If publishing an extract, you may want to set up a **Refresh Schedule**. If so, you must select **Embed Password** or **Allow Refresh Access**, depending on whether your underlying data is on-premises or in the cloud. If you connect to a Tableau data source, it is recommended to embed the password.
6. Configure other settings that are available for this workbook like **Show sheets as tabs**.
7. Click **Publish**.



# Differences between Tableau Server, Tableau Online and Tableau Public

### Tableau Server

Tableau Server is an application used to share and interact with visualizations securely across an organization. It is managed by the client (or someone hired by the client to manage) on their server. Used in conjunction with Tableau Desktop, data sources and workbooks are published to Tableau Server and licensed users can access them online through a web browser. There are no limitations to the data sources – all connections from Tableau Desktop are accessible from Tableau Server if the permissions and access are set properly.

### Tableau Online

Tableau Online has the same functionality of Tableau Server but it is hosted by Tableau in their cloud. Not all server data connections are available through Tableau Online.

### Tableau Public

Tableau Public is a free hosting tool available to the Tableau Community. Data source connections are limited to extracts and there are also size restrictions. Workbooks are visible by anyone with a Tableau Public login making it an option for those who don't care about sharing their data/visualizations with everyone. Restrictions can be placed on Tableau Public to prevent the download of workbooks and data.

## Quick Reference Guide

### PUBLISH A DATA SOURCE

1. From the **Server** menu, select **Publish Data Source**
2. If you are already signed into Tableau Server or Tableau Online, proceed to step 3. If you are not signed in, follow the prompt to sign into your desired Tableau Server or Tableau Online site. Alternatively, you can right-click on the data source to publish from the Data Pane and select Publish to Server.
3. Select the **Project** you want to publish to and enter the data source **Name** in the **Publish Data Source** dialog box. Add a **Description** and **Tags** that will help you and other users find it.
4. Set the **Permissions**. By default, you should accept the project settings.
5. If you are publishing a data source that requires **Authentication**, you will need to provide credentials to access your data.
6. If you are publishing an extract, you will want to set a **Refresh Schedule** and allow access to the data source.
7. By default, during the publishing process, Tableau updates the workbook connection to use the new published data source. You can choose to not do this automatically by unchecking the **Update workbook to use the publish data source option**.
8. Click **Publish**.

### PUBLISH A WORKBOOK

1. In Tableau Desktop, open the workbook you want to publish.
2. From the **Server** menu, select **Publish Workbook**.
3. Select the **Project**, enter a **Name** for the workbook, add a **Description**, and add search **Tags** from the **Publish Workbook** dialog box.
4. For **Permissions**, accept the default project settings unless you know that this workbook will be an exception from the site managed permissions.
5. For **Data Sources**, select **Edit** to change the method for how people to access the underlying data your workbook connects to, or to change how the data is published.
6. If publishing an extract, you may want to set up a **Refresh Schedule**. If so, you must select **Embed Password** or **Allow Refresh Access**, depending on whether your underlying data is on-premises or in the cloud. If you connect to a Tableau data source, it is recommended to embed the password.
7. Configure other settings that are available for this workbook like **Show sheets as tabs**.
8. Click **Publish**.