



UP & RUNNING WITH

TABLEAU DESKTOP

★★★★★ *With Award-Winning Tableau Expert Dustin Cabral*



Course Structure



This is a **project-based** course, for students looking for a practical, hands-on, and highly engaging approach to learning business intelligence with Tableau Desktop

Additional resources include:

-  **Downloadable Ebook** to serve as a helpful reference when you're offline or on the go
-  **Quizzes & Homework Exercises** to reinforce key concepts, with step-by-step solutions
-  **Bonus Projects** to test your abilities and apply the skills developed throughout the course

Course Outline

1

Introducing Tableau Desktop

Download Tableau (Public or Desktop), explore the Tableau workflow, and discover community features

2

Connecting & Blending Data

Connect to source data, join data sources, edit column metadata, compare extracts vs. live connections, filter data sources, etc.

3

Sorting, Grouping & Filtering

Explore the desktop workspace, including field types and pills, row, column and filter shelves, grouping and filtering tools, etc.

4

The Marks Card

Understand each element of the marks card, including colors, sizes, labels, tooltips, shapes and level of detail

5

Calculations & Parameters

Create custom calculations using calculated fields, table calculations and parameters

6

Dashboards & Stories

Combine visualizations to create dashboards and stories that bring your data to life!

Introducing the Course Project

THE **SITUATION**

You've just been hired by **Maven Supplies**, a cutting-edge office supply store looking to bring the sizzle back to copy paper and sticky notes. Your role? Design and build an executive-level BI solution, from scratch.

THE **BRIEF**

Your client needs a way to track KPIs (*sales, profit, units, returns*), compare performance across markets, analyze category profitability, and identify high-value customers. All you've been given is a folder of excel files containing information about orders, returns, products, customers and territories.

THE **OBJECTIVE**

Use Tableau Desktop to:

- Connect & transform raw data
- Apply sorting & filtering tools
- Create custom calculations & parameters
- Design interactive reports & dashboards



Setting Expectations

1

What you see on your screen **may not always match mine**

- Tableau desktop updates on a *monthly* basis for minor releases and *quarterly/yearly* for major releases, so features and functionality may change over time

2

This course is designed to get you **up & running** with Tableau Desktop

- The goal is to provide a *deep foundational understanding* of Tableau Desktop; we won't cover database connections or some advanced tools (LOD calculations, set & parameter actions, advanced blending, etc.)

3

This course is primarily geared towards **data analysis** and **visualization**

- *Data preparation* is another key component of the analytics and business intelligence workflow, but we will cover this topic in depth in a separate course (*Tableau Prep*)

4

We will not cover **Tableau Server/Online** as part of this course

- This course will focus on *Tableau Desktop* specifically; online sharing and collaboration features will be covered in depth in a separate course (*Tableau Server*)

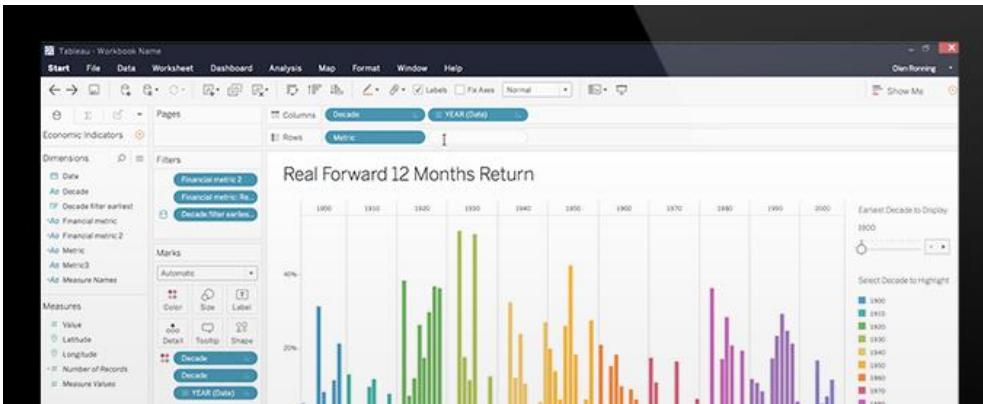
Introducing Tableau Desktop

Meet Tableau Desktop



Tableau Desktop is part of the **Tableau Creator** business intelligence role, which includes desktop data connection and visualization capabilities as well as online sharing.

More information at tableausoftware.com



Why Tableau?



Connect, join, and analyze **billions** of records

- Connect to any data source with 60+ built-in connectors (flat files, databases, cloud sources, APIs, etc.)



Understand your data by sorting, grouping, and filtering

- Use Tableau's intuitive drag-and-drop no-code interface to easily manipulate data for analysis



Define robust, custom calculations using intuitive “Excel-like” functions

- Enhance and refine data sources with powerful calculated fields



Visualize insights with powerful dashboards and stories

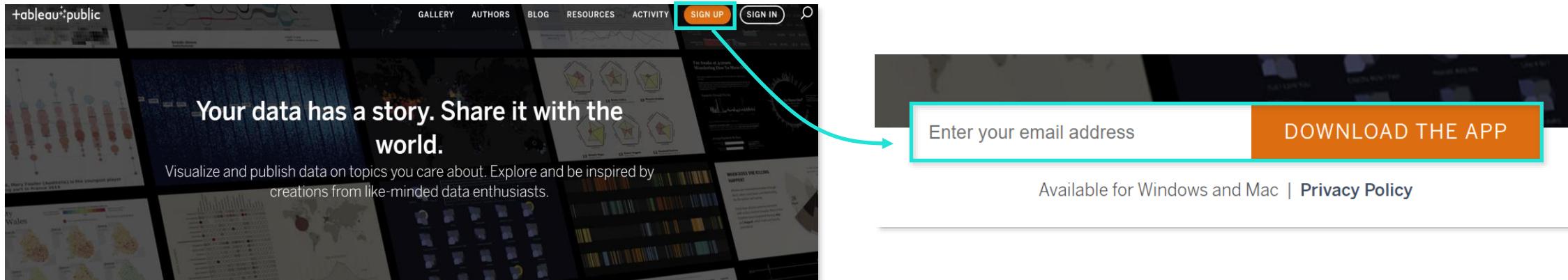
- Transform flat data into actionable insights with app-like business intelligence products



Engage with experts through an industry-leading user community

- Join Tableau's rich, engaging, and results-driven user community that supports its members like no other

Downloading Tableau Public [Free]



IMPORTANT: If you don't already have a Tableau Desktop subscription, we recommend using the **Tableau Public App** to follow along with this course

This course is compatible with either version, but keep in mind that:

- Tableau Public is a *free* version of Tableau Desktop / Server, available at **public.tableau.com**
- Tableau Public offers limited data connections (*flat files only*) and can only save files to a public server
- Tableau Public should **NOT** be used with sensitive data or for work-related tasks (*everything published is public!*)



Tableau Public Installation Guide (Mac)

1) Go to **public.tableau.com** and enter an email address to start your download

Your data has a story. Share it with the world.
Visualize and publish data on topics you care about. Explore and be inspired by
creations from like-minded data enthusiasts.

Enter your email address DOWNLOAD THE APP

Available for Windows and Mac | Privacy Policy

2) Double click the **dmg** file
to create the Tableau Public
package file (.pkg)



Tableau Public.pkg

3) Launch the **pkg** file to install the software,
and follow the steps (*default settings are OK*)

Welcome to the Tableau Public Installer

You will be guided through the steps necessary to install Tableau.
To change the installation options, such as adding a desktop shortcut,
click the "Customize" button at the bottom of the Installation Type screen.

Tableau collects product feature usage
and handles data according to our
usage data reporting on the Custom Info
page. For more information about how to install
Tableau, see the Desktop Deployment Guide.

Software License Agreement

TABLEAU SOFTWARE

PUBLIC SOFTWARE END USER LICENSE AGREEMENT ("EULA")
BY CHECKING THE ACCEPTANCE BOX OR INSTALLING OR USING ALL OR
ANY PORTION OF THE PUBLIC SOFTWARE, YOU ARE ACCEPTING ALL OF
THE TERMS AND CONDITIONS OF THIS AGREEMENT AS PUBLISHED ON
TABLEAU'S WEBSITE AT WWW.TABLEAU.COM (AS MAY BE RELOCATED BY
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YOU AGREE THAT YOUR USE IS SUBJECT TO ANY TERMS POSTED
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(WWW.TABLEAU.COM/TOS), DATA POLICIES (WWW.TABLEAU.COM/DATA-
POLICY) AND PRIVACY POLICIES (WWW.TABLEAU.COM/PRIVACY).

Standard Install on "Macintosh HD"

This will take 1.67 GB of space on your computer.
Click Install to perform a standard installation of this software
on the disk "Macintosh HD".

The installation was completed successfully.

The software was installed.

Tableau Public Installation Guide (Windows)



1) Go to **public.tableau.com** and enter an email address to start your download

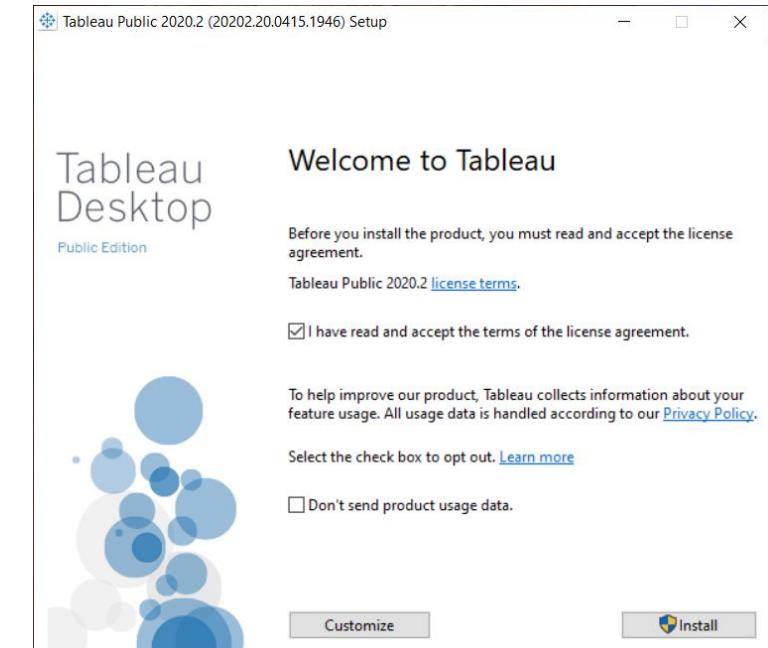
The screenshot shows the Tableau Public homepage. At the bottom center, there is a white call-to-action box containing a text input field labeled "Enter your email address" and a red "DOWNLOAD THE APP" button. A red curved arrow points from this box down to a file icon.

2) Double click the downloaded Tableau Public Desktop **exe** file



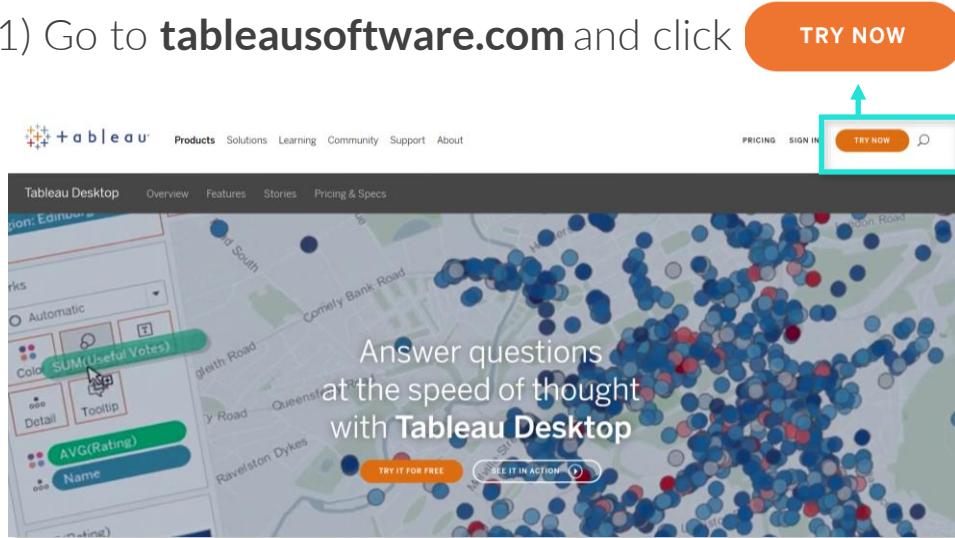
TableauPublicDes
ktop-64bit-2020-
2-0

3) Launch the **pkg** file to install the software, and follow the steps (*default settings are OK*)

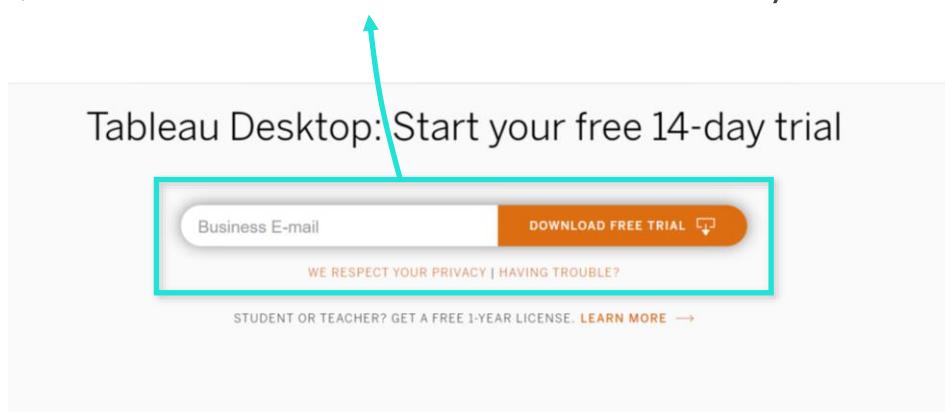


Downloading Tableau Desktop [Trial/Paid]

1) Go to [tableausoftware.com](https://www.tableausoftware.com) and click



2) Enter an **email address** to start a 14-day free trial



By downloading a trial version of **Tableau Desktop** (via a “Tableau Creator” subscription), you’ll get **14 days free** before starting a paid monthly subscription

- If you start a Desktop subscription, we recommend the **Tableau Creator [For Individuals]** option



REMINDER: If you are working with Tableau for the first time, we recommend using **Tableau Public** to follow along with this course for free (*no subscription required!*)

The Tableau Desktop Interface

The Tableau Desktop interface consists of **three key layers**:

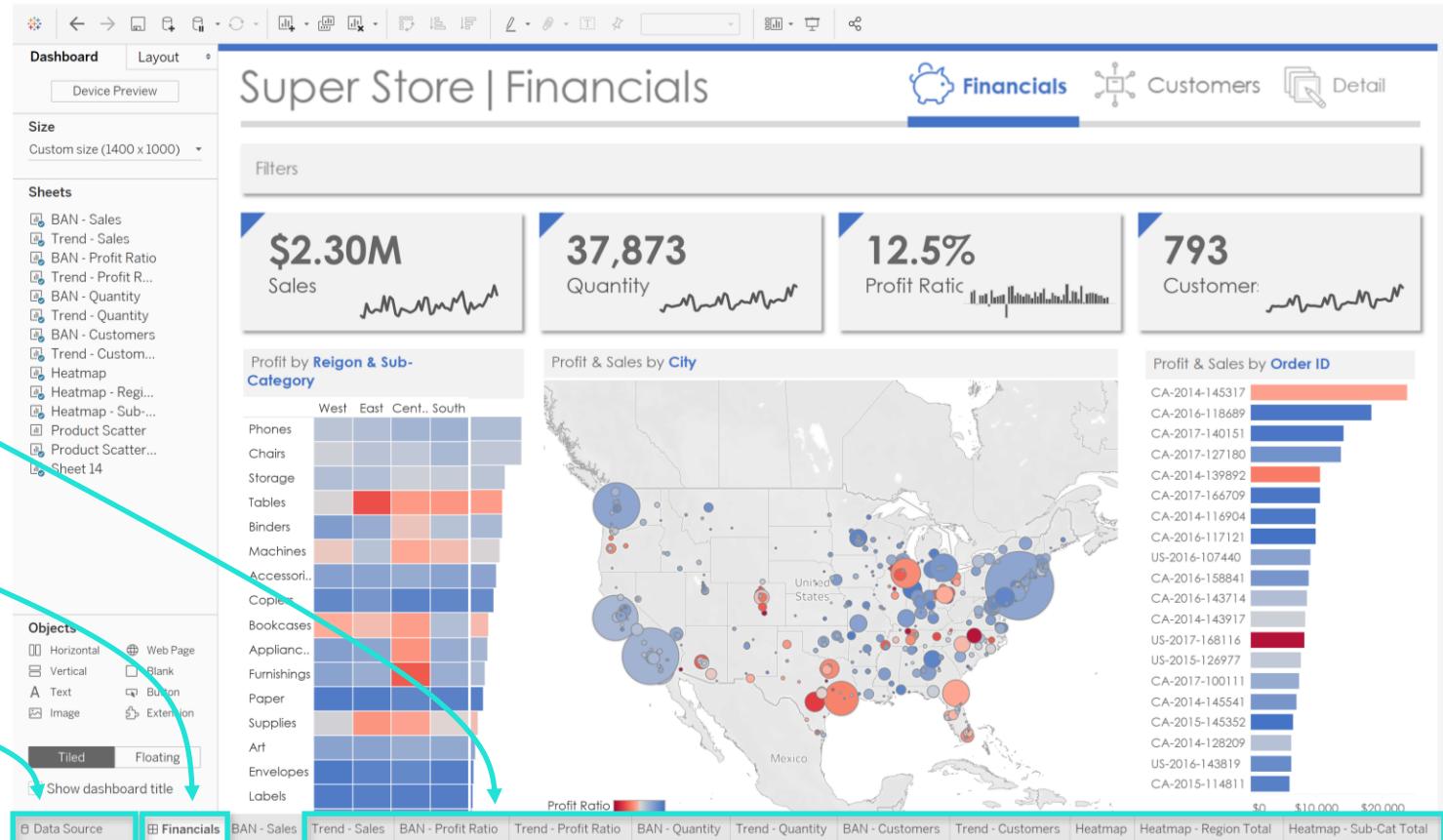
Sheets



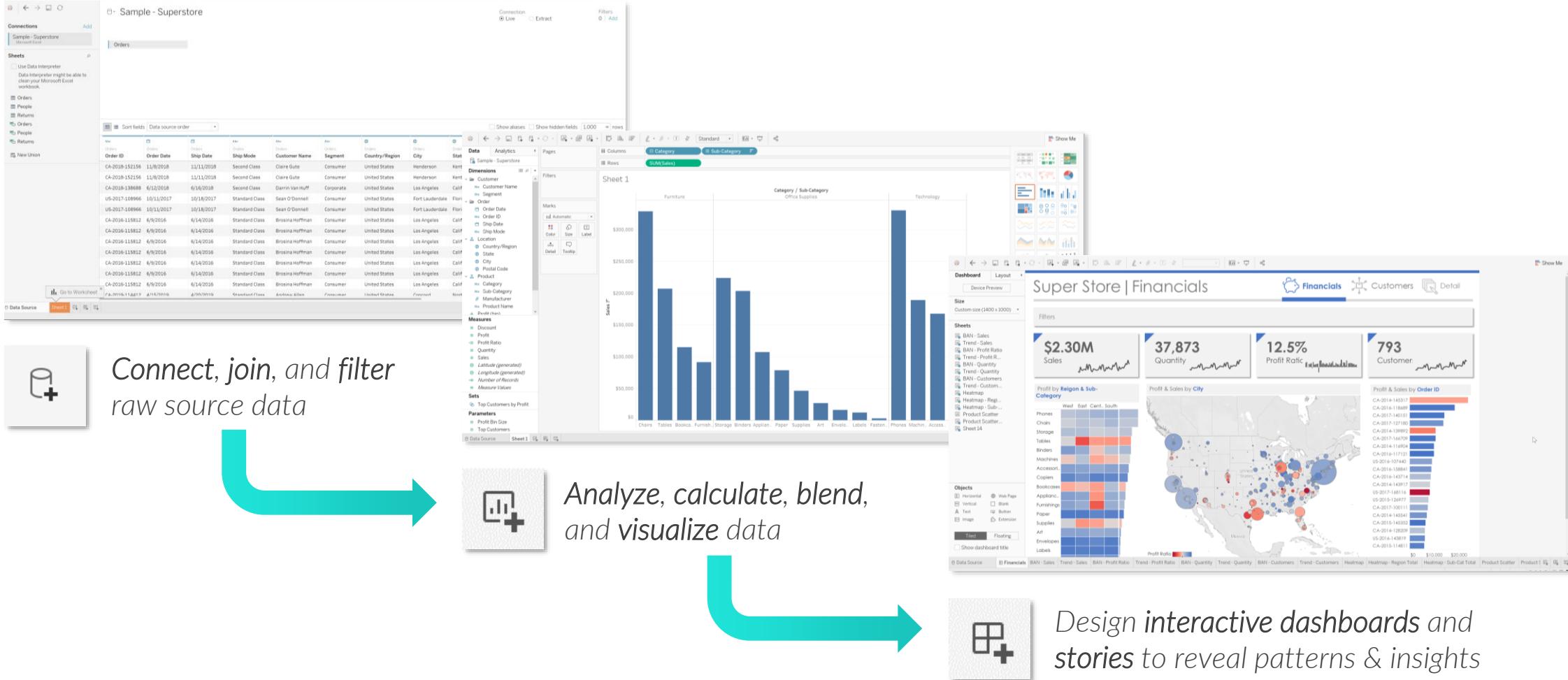
Dashboards



Data Sources



The Tableau Desktop Workflow



The Tableau Platform

USER ROLES



Creator



Explorer



Viewer

PRODUCTS



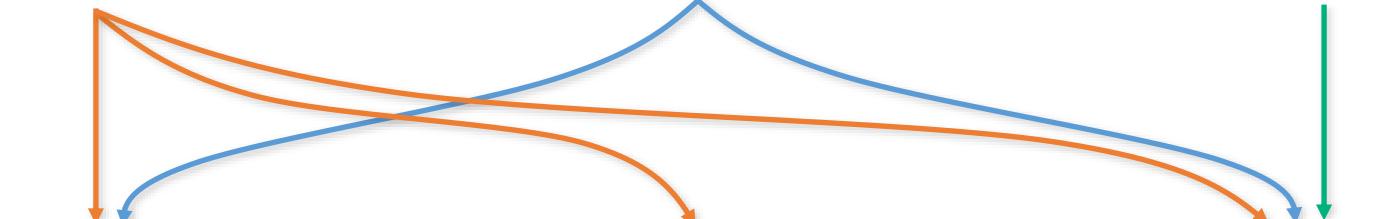
Desktop



Prep



Server



The Tableau Community



Social Media



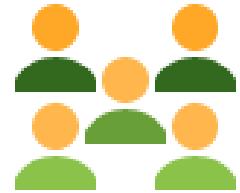
Blogs



Forums



Contests



User Groups



Zen Masters



Conferences

Helpful Resources

Discover

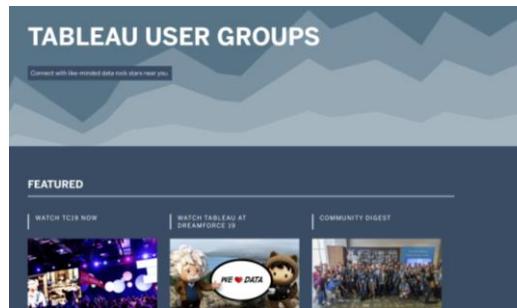
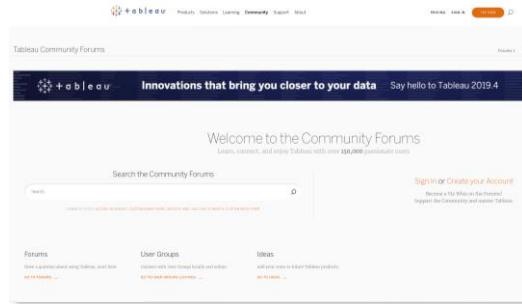
- Training
- Getting Started
- Connecting to Data
- Visual Analytics
- Understanding Tableau
- More training videos...

- Resources
- Get Tableau Prep
- Blog - New Year, new updates:
Analytics Extensions API, Hyper
API, JavaScript API, and...
- Forums

Craving some viz inspiration?

Explore stunning examples from Tableau Public with Viz of the Day →

The **Discover** section of the home screen includes helpful links for documentation, training, downloads, and inspiration from Tableau Public users



The **Tableau Community Forums** provide a great space to ask questions, search topics, and learn about new features

<https://community.tableau.com/welcome>

The **Tableau Zen Masters** are the best in the world, and an invaluable resource for blogs, tutorials, and outside-the-box solutions

<https://www.tableau.com/zen-masters>

Connect with other Tableau users in person at your local **Tableau User Group (TUG)**

<https://usergroups.tableau.com/>

Connecting & Blending Data

Data Connection Types

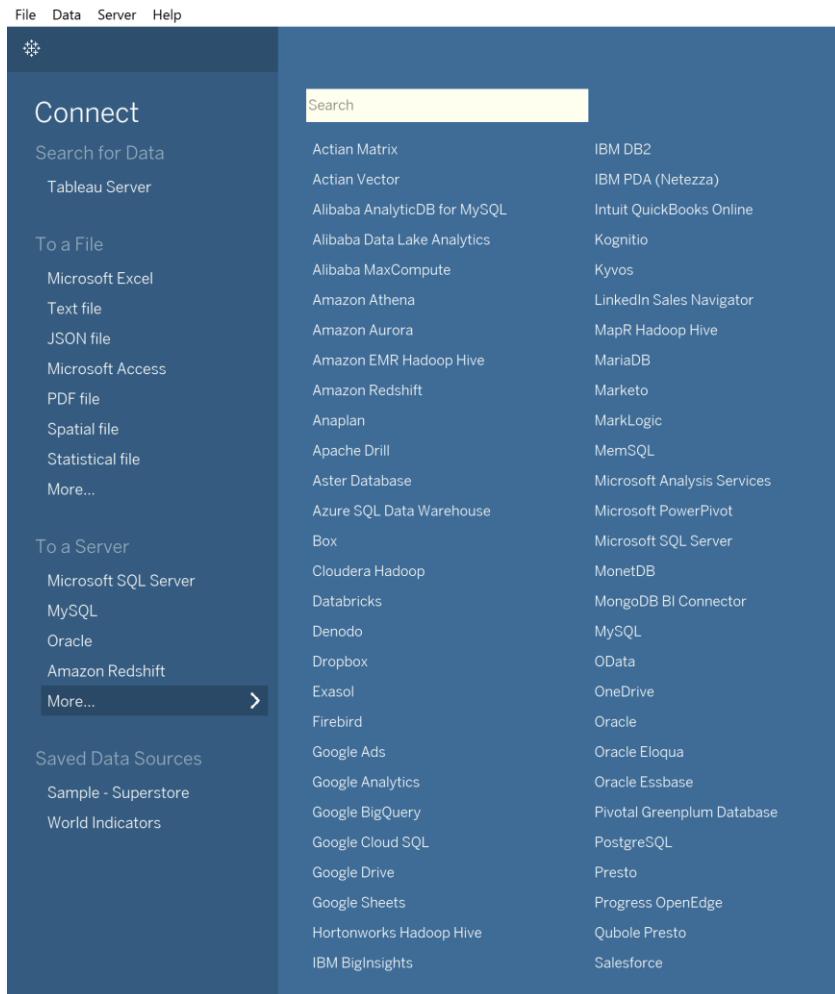
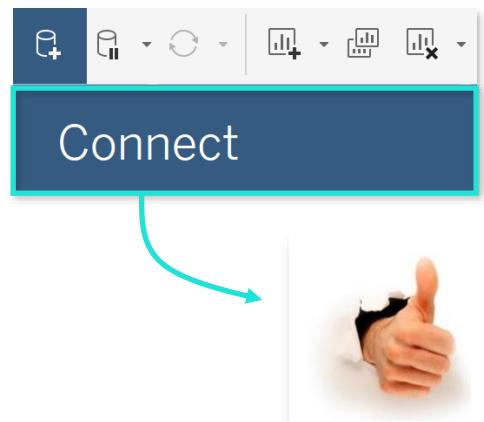


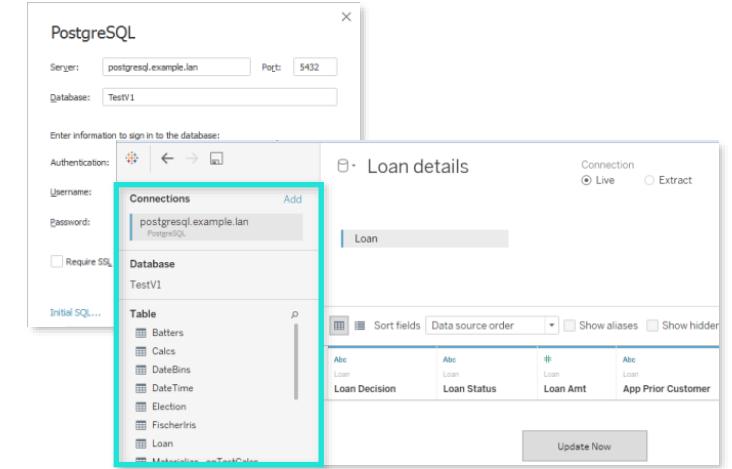
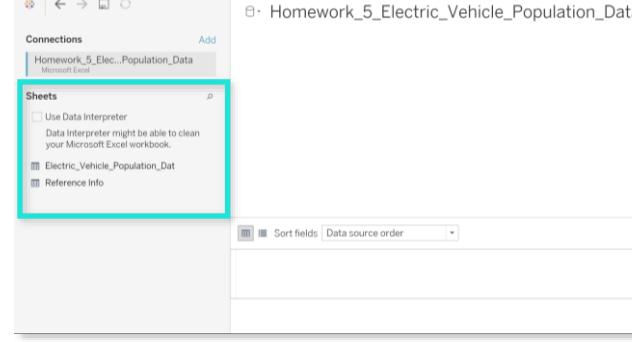
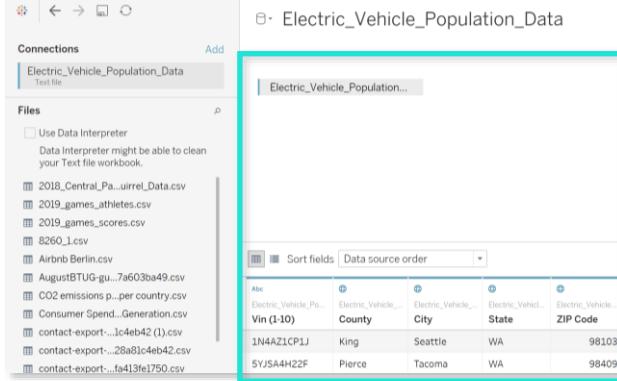
Tableau Desktop allows enables users to connect to virtually *any* data source or platform, including:

- **Flat Files** (xlsx, csv, access, pdf, tdsx, etc.)
- **Servers** (SQL, Oracle, Hadoop, Redshift, Tableau Server, etc.)
- **Saved Data Sources** (Bookmarked sources for easy access)



PRO TIP: Don't go back to the main menu to add a new source, use the **New Data Source** menu!

Data Connection Examples



Text Files

When you connect to a simple CSV/txt file, Tableau will populate the data pane automatically since it's a single table

NOTE: Data Interpreter is available for text/csv files

Excel Files

When you connect to an **Excel** file, Tableau will display a list of tabs and named ranges contained within the workbook

NOTE: Data Interpreter is available for Excel files

Databases

When you connect to a **database**, you must enter credentials in order to access the schemas, tables and views available

NOTE: Data Interpreter is NOT available for database connections

The Data Source Interface

Connections Pane

View connections, sheets, schemas, tables & views

The screenshot illustrates the Tableau Data Source Interface with various components highlighted by cyan boxes and arrows:

- Connections Pane**: Located on the left, it shows a list of connections, sheets, and tables. A cyan box highlights the "Orders" sheet under "Sample - Superstore".
- Canvas**: Visually represents joins or unions applied to source data. It shows a tree structure for the "Orders" sheet.
- Connection Type**: Shows options for "Live" or "Extract". A cyan box highlights "Live". Note: Extract only in Tableau Public App.
- Filters**: Shows 0 filters added. A cyan box highlights the "Filters" button.
- Data Grid**: Displays a preview of the rows and columns in your source data. A cyan box highlights the grid area.
- Metadata Grid**: Provides basic data source attributes (field names, tables, etc.). A cyan box highlights the grid area.

Filters

Allow you to filter down your data source

Data Grid

Displays a preview of the rows and columns in your source data

*Copyright Maven Analytics, LLC

PRO TIP: The Data Interpreter

The screenshot shows the Tableau interface with the following components:

- Top Left:** Tableau - Book2 window title.
- Top Bar:** File, Data, Server, Window, Help menu.
- Connections:** SuperStore Raw Microsoft Excel connection selected.
- Sheets:** Orders (SuperS) sheet selected. A green arrow points from the "Use Data Interpreter" checkbox in the sidebar to the "Orders" sheet tab.
- Sidebar:** Sheets list with "Use Data Interpreter" checkbox checked, indicating it can clean the workbook.
- Table View:** A table with columns: #, Orders, Order ID, null, null, Order Date (DMY), Ship Date (DMY), Ship, and Order. A green box highlights the first four columns.
- Bottom:** Key for the Data Interpreter table:

 - Data is interpreted as column headers (field names).
 - Data is interpreted as values in your data source.
 - Data derived from an Excel merged cell is interpreted as value in your data source.
 - Data is ignored and not included as part of your data source.
 - Data has been excluded from your data source.
 - Note: To search for all excluded data, use CRTL+F on Windows or Command F on the Mac, and then type '***DATA REMOVED***'.

The **Data Interpreter** dynamically cleans poorly formatted Excel workbooks (extra rows, merged cells, etc.) with a **single click**.

NOTE: Data Interpreter is only available for Excel workbooks

A	B	C	D	E	F
1	SuperStore Report 1-1-2019				
2					
3					
4	Row ID	Order ID	Order Date	Ship Date (Order Date
5	1	CA-2017-1	11/8/2017	#####	8/11/2017
6	2	CA-2017-1	11/8/2017	#####	8/11/2017
7	3	CA-2017-1	6/12/2017	6/16/2017	12/6/2017
8	4	US-2016-1	#####	#####	11/10/2016
					18/10/2016

Key for the Data Interpreter

Orders Orders_subtables Orders_Orders

A	B	C	D	E	F
1	SuperStore	SuperStore	SuperStore	Report 1-1-2019	
2					
3					
4	Row ID	Order ID	Order Date	Ship Date (Order Date
5	1	CA-2017-1	#####	#####	8/11/2017
6	2	CA-2017-1	#####	#####	8/11/2017
7	3	CA-2017-1	#####	#####	12/6/2017
8	4	US-2016-1	#####	#####	11/10/2018/10/201
9	5	US-2016-1	#####	#####	11/10/2018/10/201
10	6	CA-2015-1	6/9/2015	#####	9/6/2015

A	B	C	D	E	F
1	Row ID	Order ID	Order Date	Ship Date (Order Date
2	1	CA-2017-1	#####	#####	8/11/2017
3	2	CA-2017-1	#####	#####	8/11/2017
4	3	CA-2017-1	#####	#####	12/6/2017
5	4	US-2016-1	#####	#####	11/10/2018/10/201
6	5	US-2016-1	#####	#####	11/10/2018/10/201
7	6	CA-2015-1	6/9/2015	#####	9/6/2015
8	7	CA-2015-1	6/9/2015	#####	9/6/2015
9	8	CA-2015-1	6/9/2015	#####	9/6/2015
10	9	CA-2015-1	6/9/2015	#####	9/6/2015

Transforming Data

The screenshot shows the Tableau Data Editor interface with a data source containing two sheets: 'Orders' and 'Customers'. A context menu is open over the 'Order Date (M...)' field in the 'Orders' sheet, and another context menu is open over the 'Customer ID' field in the 'Customers' sheet. Both menus are highlighted with teal boxes and arrows point from descriptive text below them to the respective menu items.

#	Abc	Orders+	Abc	Orders+	Abc	Orders+	Abc	Orders+	Abc	Orders+	Abc	Orders+	Abc	Orders+	Abc	Orders+	Abc	Orders+	Abc	Orders+	Abc	Orders+		
Row ID	Order ID	Order Date (M...	Order Date (M...	Order Date (M...	Customer ID	Customer Name	Segment	Country	City	Customer ID	Customer Name	Segment	Country	City	Customer ID	Customer Name	Segment	Country	City	Customer ID	Customer Name	Segment	Country	City
1	CA-2017-152156	11/8/2017			CG-12520	Claire Gute	Consumer	United States	Henderson	CG-12520	Claire Gute	Consumer	United States	Henderson										
2	CA-2017-152156	11/8/2017																						

Change Field Types or Geographic Roles
Number (decimal, whole)
Date/Time, String, etc.)

Rename fields (can also double-click the header)

- Fields are only renamed in the workbook, not the raw source

Hide unneeded columns from end-users

- Fields are only hidden in Tableau, not the raw source

Group entries in fields together

- A new field will be created, and original values will not change

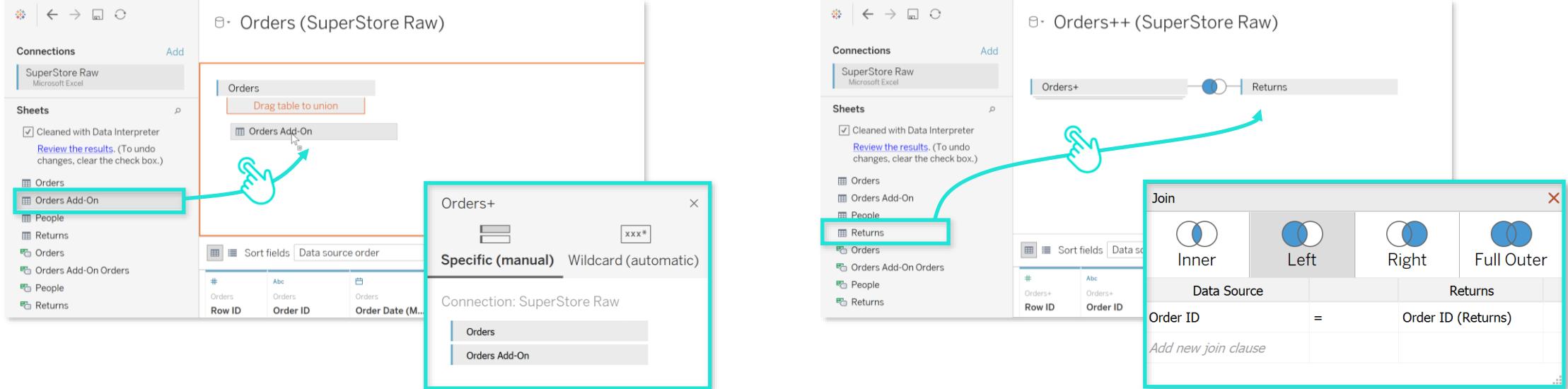
Pivot multiple fields from columns to rows

- Tip: Use **CTRL** or **Command** keyboard shortcuts

Split fields using automatic or custom delimiters

- This works like Excel's **text-to-column** functionality

Unions & Joins



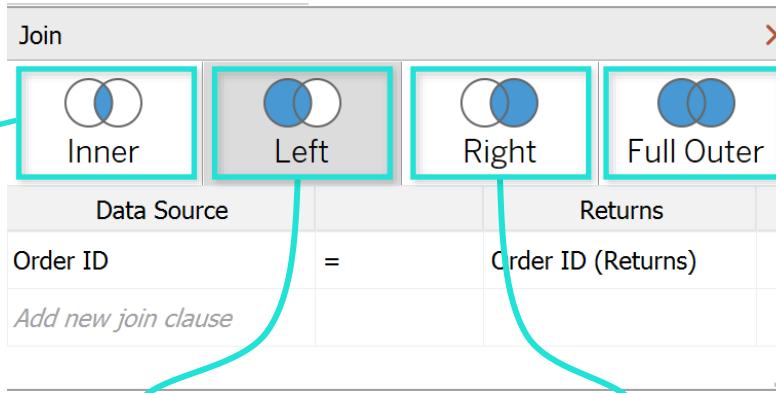
Unions append (or “stack”) rows of data from one table into another (not available for all connectors)

Joins combine data sources using keys; depending on the source, you can perform **inner**, **left**, **right**, or **full outer** joins



PRO TIP: When connecting to a database you will see an additional “Use Custom SQL” option, which can convert visual joins to SQL code

Common Join Types



Inner Join

Combines data from two tables but only returns the matching records

Left Join

Combines all data from the **left table** and only matching records from the right table

Right Join

Combines all data from the **right table** and only matching records from the left table

Full Outer Join

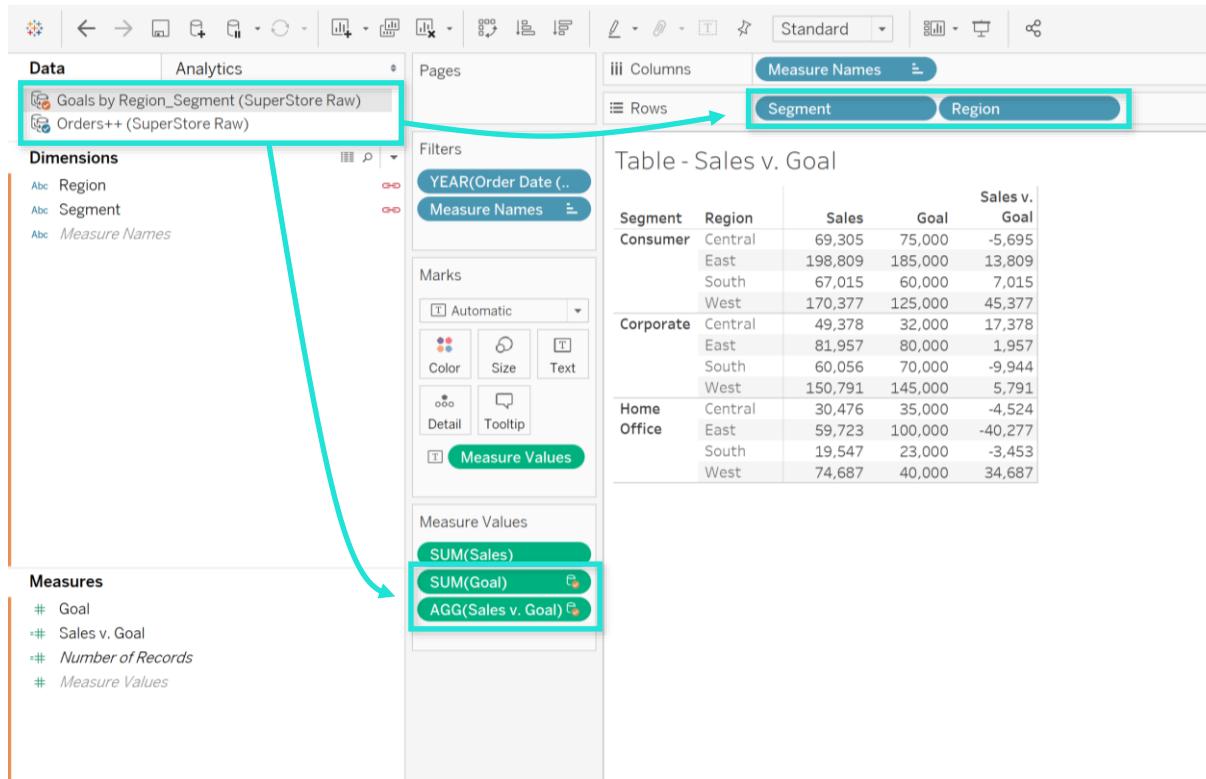
Combines all data from two tables, including matching and non-matching records (results in null records)



Make sure that your join key(s) are **unique** to avoid duplicating records; this can distort the data and skew your analysis!

Data Blending

Blending is a method for combining data from multiple sources into a single view at the **sheet-level**, while keeping the sources fundamentally separate (unlike unions or joins)



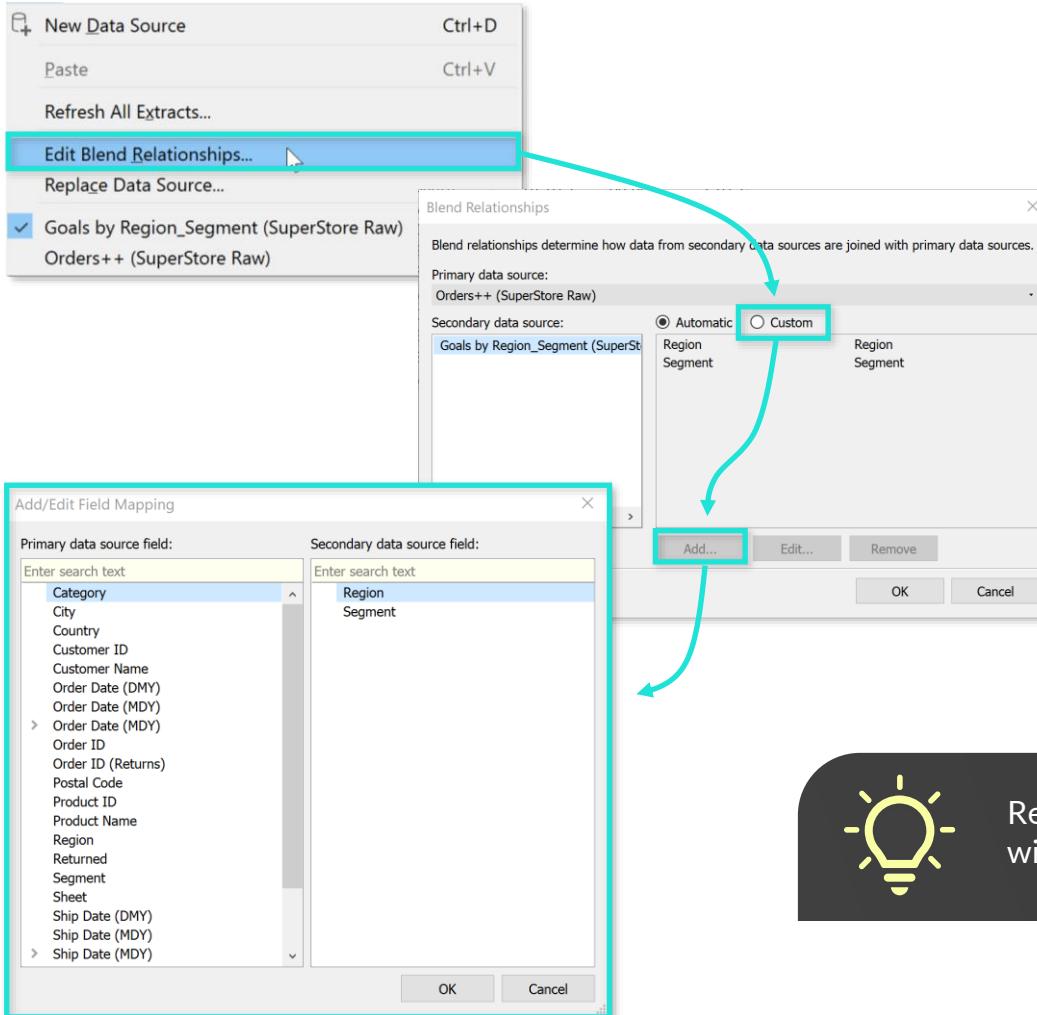
✓ **Primary Source** is determined by the first field pulled (*Super Store sales*), and gets a *Blue Check*

✓ **Secondary Sources** are any other sources that a field is pulled from, and gets an *Orange Check*



Dimensions are based on the **Primary Source**; any dimensions that don't exist in the primary table will not be available in the list

Data Blending



- Fields which share the same **name** and **data type** across primary and secondary sources will automatically become available for blending
- To manually define how specific fields map between sources, you can **Edit Blend Relationships** and select the **Custom** option (*helpful when your field names aren't identical*)

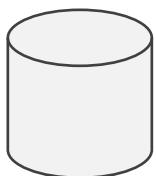
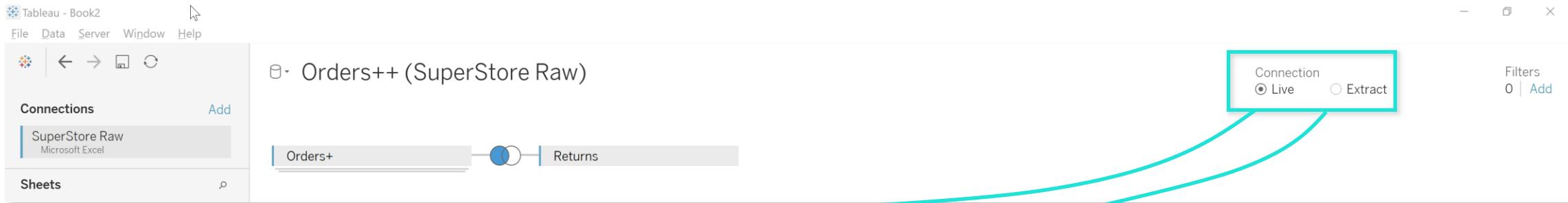
Region: West
Segment: Home Office
Customer Name: *
Sales v. Goal: 34,687

NOTE: If you see an **asterisk (*)**, it means that you're trying to display multiple dimensions (which isn't possible using blending); **make sure your display grain is correct!**

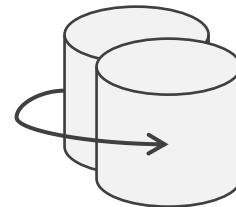


Remember that blending applies **per sheet**, and your primary source **can't be changed** without reconstructing your sheet or starting a new one!

Live Connections vs. Extracts



Live Connections query the underlying database / flat file each time a field is used (filter, chart, action, etc.)



Extracts pull data from the underlying source and into Tableau's **Hyper Extract** file format, allowing you to refresh data on regular basis

NOTE: Automatic refresh requires Tableau Server/Online

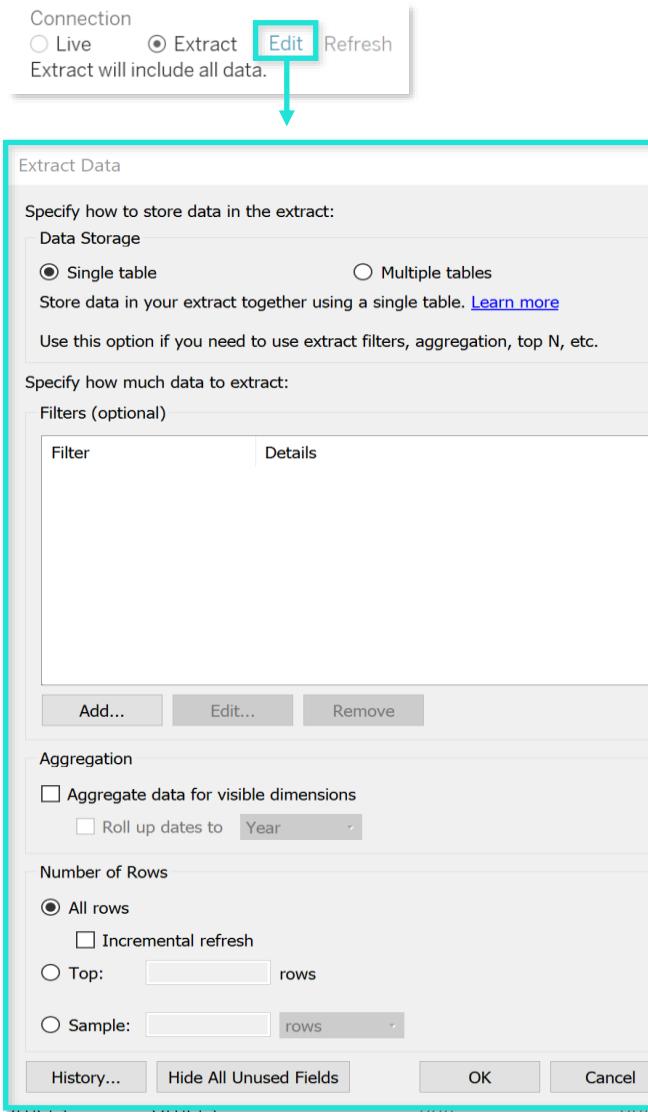
Why Use Extracts?

- Can improve performance (better performance than most database sources)
- Additional functionality (exposes additional features that may be limited with live connections)
- Offline access (work without a connection to the network or database)
- Supports very large datasets (into the billions of rows)
- Fast to create (quick extract times)



NOTE: Live connections are NOT supported in the **Tableau Public App**

Extract Options [Trial/Paid Version Only]



Single Table combines all data into one table (rather than preserving table joins)

Multiple Table stores extracts in separate tables, and can be used to improve efficiency and leverage row-level security without multiplying data size

Filters are used to limit the amount of data pulled into an extract

- *NOTE: Extract filters cannot be removed or changed outside of the data connection page*

Aggregate rolls up the level of granularity based on visible dimensions (or a specified date field), and is commonly used to reduce data size

- *NOTE: This can impact your calculations, so test thoroughly before publishing!*

All Rows will pull a full data extract each time a refresh is triggered

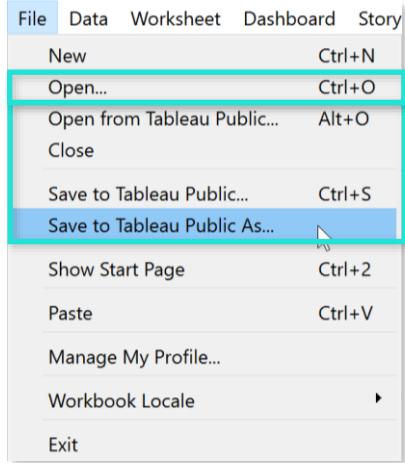
- *NOTE: Use this option if historical data can change or if data size is not a concern*

Incremental Refresh only pulls “new” records into the extract (based on a specified date field)

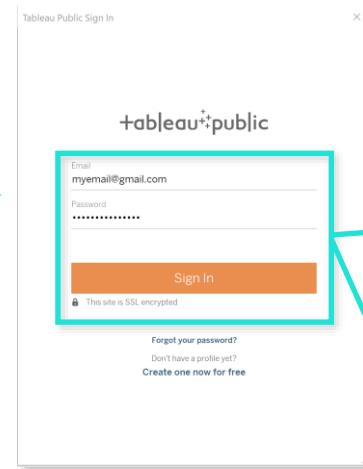
- *NOTE: Use this option for large data sets where historical records do not change*

Top / Sample pulls a specific number of rows from the source (Top N or random)

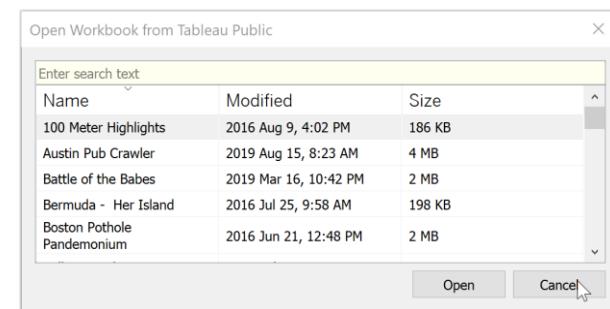
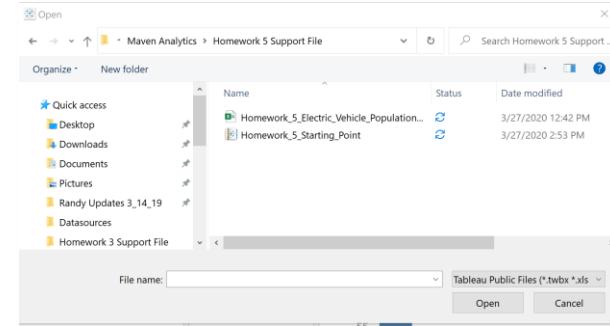
Opening & Saving [Tableau Public]



Sign In
to your profile



Open Workbooks
from your local computer



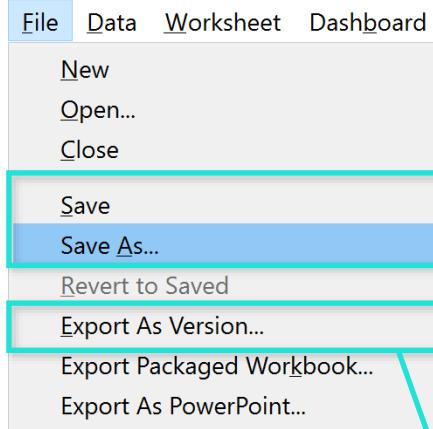
Open Workbooks
from your Public profile



PRO TIP: To get a local version of your file,
save to Tableau Public and download.

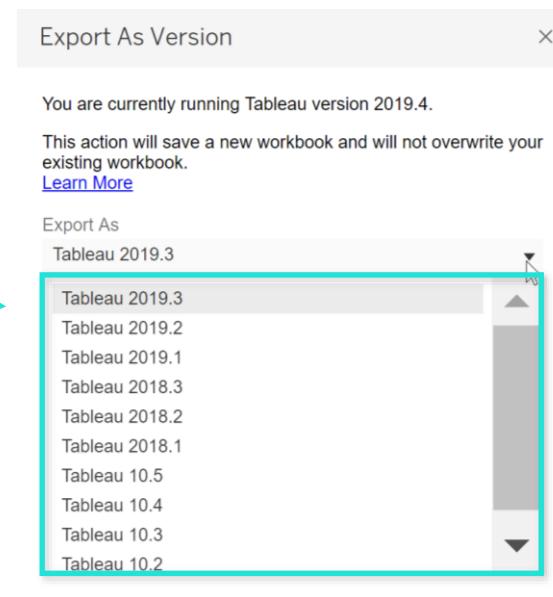


Desktop File Types [Trial/Paid Version Only]



.twb files are Tableau workbooks that can hold sheets, dashboards and stories, but not data

.twbx files contain everything included in a **.twb** file plus raw data, and are typically used when sharing Tableau files with other users



PRO TIP: Use **Export As Version** to share files with users running different versions of Tableau Desktop

HOMEWORK: Connecting to Data

THE **SITUATION**

As a proud member of the most extreme CrossFit gym in Canada, you've been tasked with gathering stats from the annual CrossFit Games to help your team -- **The Maple Beasts** -- size up the competition.

THE **BRIEF**

In order to gather valuable intel and give The Maple Beasts a shot at gold in 2020, you must collect and blend raw data from the 2019 Games for the gym to review, including competitor stats and event-specific results.

You've been given a raw Excel file with **multiple tabs of data** to start your analysis.

THE **OBJECTIVE**

Use Tableau Desktop to:

- Connect to multiple data sets
- Clean and transform the raw data
- Extract the data and save your work



Sorting, Grouping & Filtering

Sorting, Grouping & Filtering

Tableau Desktop provides a host of tools to **organize, combine, explore and restructure** your data

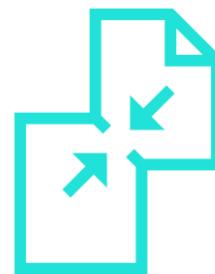
Data & Field Types



Analyze virtually any type of data, from **Dimensions and Measures** to **Discrete and Continuous** fields

Understanding these core data types is **CRITICAL** for effective analytics!

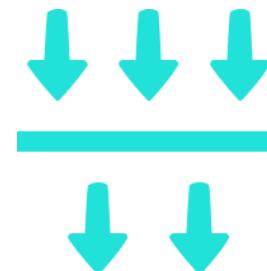
Organize & Combine



Combine and organize your data in Tableau using tools like **Sorting, Grouping, Sets & Hierarchies**

These tools allow you to shape and enhance your raw data for deeper analysis!

Dynamic Drill-Down



Explore and analyze your data using filtering tools like **dynamic drill-down** and **context filters**

Filtering is a great way to expose hidden patterns and insights from raw data!

The Sheet Interface

Dimensions
Qualitative/descriptive fields (i.e. City, Category, Date)

Measures
Quantitative/numerical fields that can be aggregated (Sales, Units, Profit, etc.)

Quick Access Toolbar Provides single-click access to fundamental features (save, new data source, new sheet, etc.)

Pages Shelf Displays data in a linear time-progression (controlled by the end user)

Filters Shelf Allows users to filter data by specific fields

Marks Card provides options for customizing visuals (color, size, labels, level of detail, tooltips, etc.)

View / Canvas Visual representation of the fields in the Rows & Columns shelves

Show Me Auto-generates visual ideas and templates based on selected fields

Lower Toolbar Provides quick access to the current data source, existing sheets/dashboards, and options to add new sheets, dashboards, or stories

Dimensions & Measures

Dimensions

- Orders+
 - Category
 - City
 - Country
 - Customer ID
 - Customer Name
 - Order Date (DMY)
 - Order Date (MDY)
 - Order ID

Dimensions are qualitative fields that contain information used to categorize, segment or filter your data. Common examples include:



Names / IDs



Geographic Fields



Dates / Times

Measures

- # Discount
- # Profit
- # Quantity
- # Sales
- Latitude (generated)
- Longitude (generated)
- # Number of Records
- # Measure Values

Measures are quantitative, numerical fields that can be counted or aggregated (sum, average, median, max, etc.). Common examples include:



Sales & Profit



Ratios / Percentages



Quantities

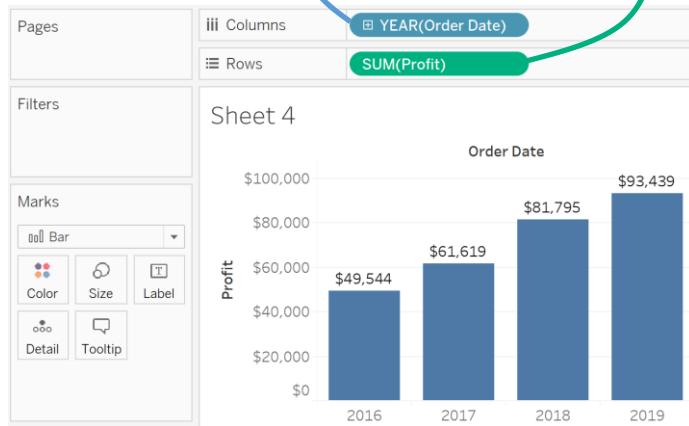
Discrete vs. Continuous

In mathematical terms, data fields can be described as either **discrete** or **continuous**

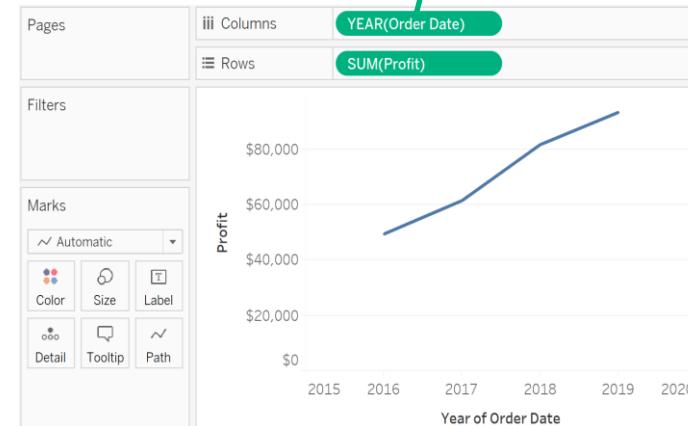
- **Discrete** fields contain a *finite* set of distinct values (Year, Category, Country, etc.)
- **Continuous** fields can contain an *infinite* range of values (Age, Temperature, Profit, etc.)

In Tableau, discrete fields add a new **header** to a view; continuous field add a new **axis** to a view:

1. Discrete Dimension*

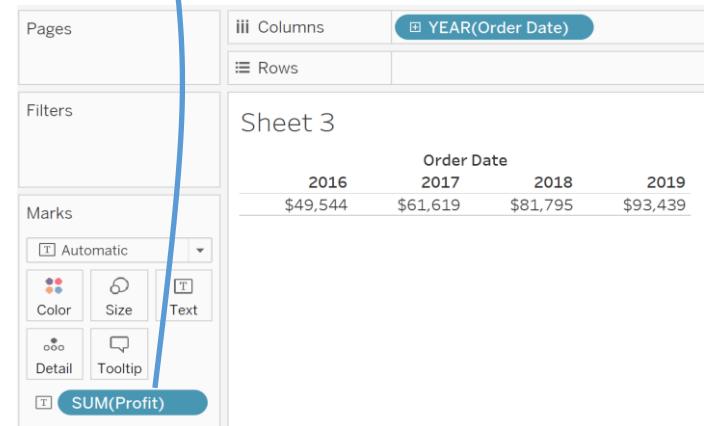


2. Continuous Measure*



3. Continuous Dimension

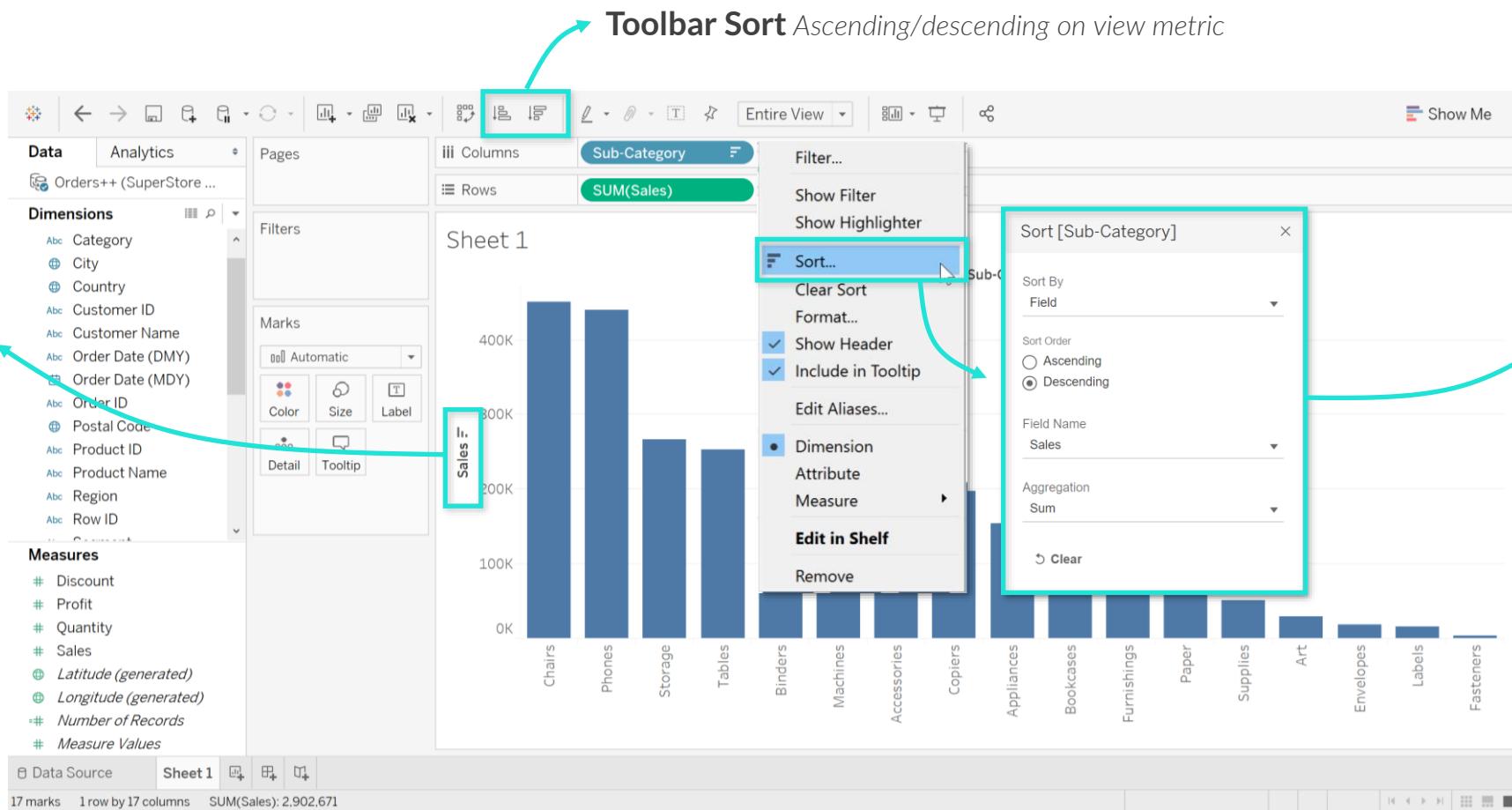
4. Discrete Measure



* These are most common

Sorting Data

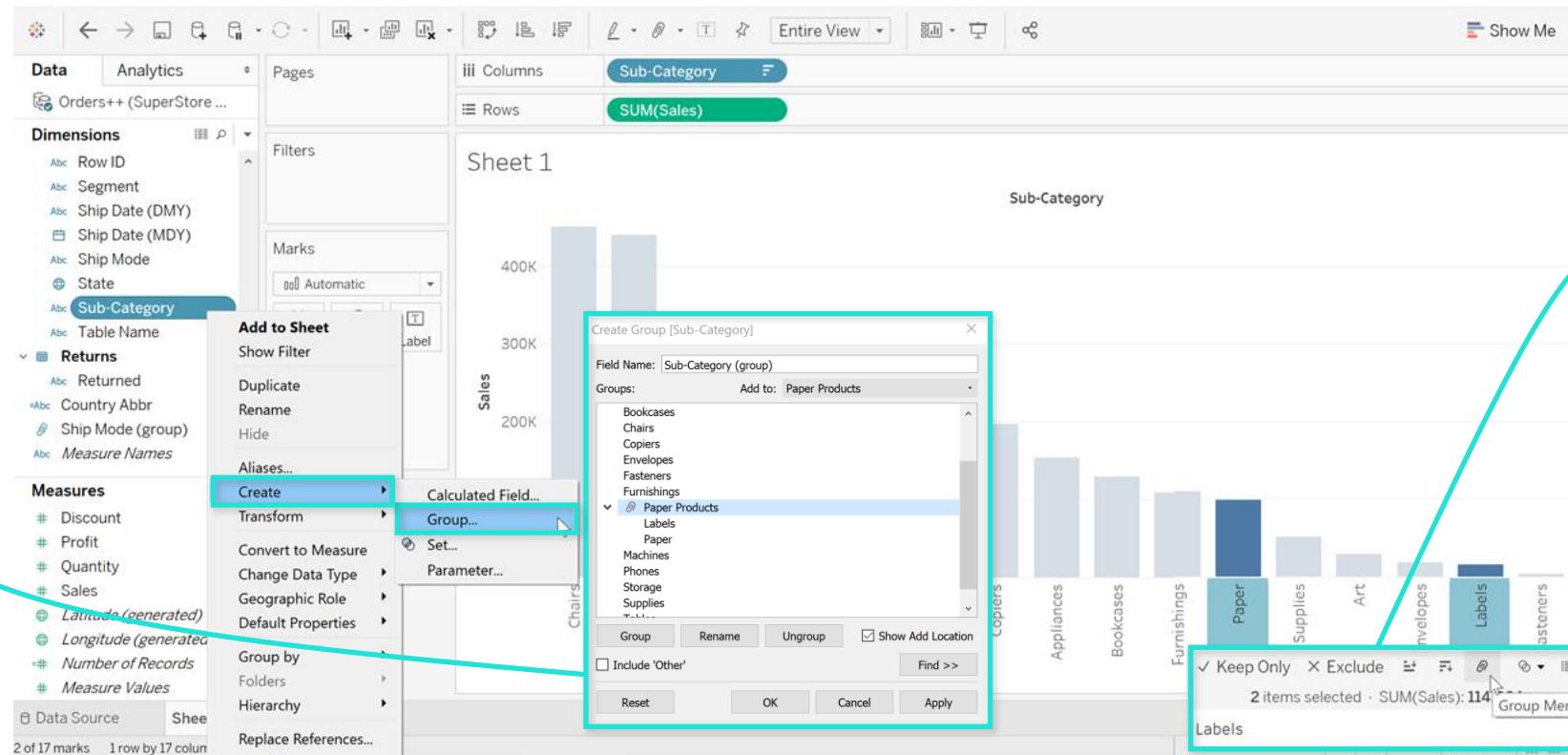
Sorting enables users to quickly scan visualizations for patterns, points of interest and key insights



Grouping Data

Grouping allows you to combine related members of a given field, and is commonly used to:

- Roll up data to a different level of detail (i.e. Product Category vs. Product Name)
- Correct data inconsistencies (i.e. MA, Mass, Massachusetts)
- Explore “What-If” scenarios (i.e. “What if we combined North and East Regions?”)



Field Grouping
Right-click any dimension
and click *create>group* to
access grouping options

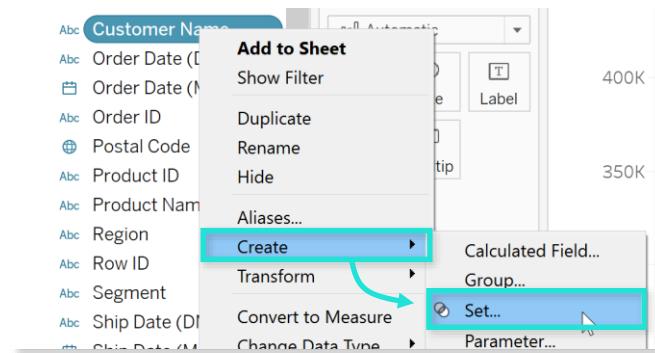
View Grouping
Ctrl + click two or
more dimensions and
click the paperclip icon
to group selected items

Creating Sets

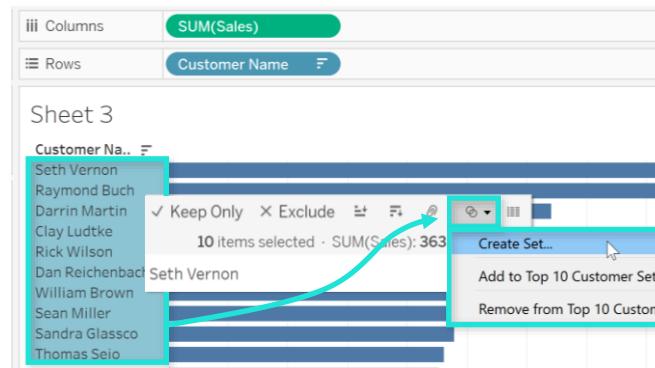
Sets are custom fields that define a subset of data based on some conditions

- Sets can be **Constant** or **Computed**, and can be made more dynamic using **set actions**

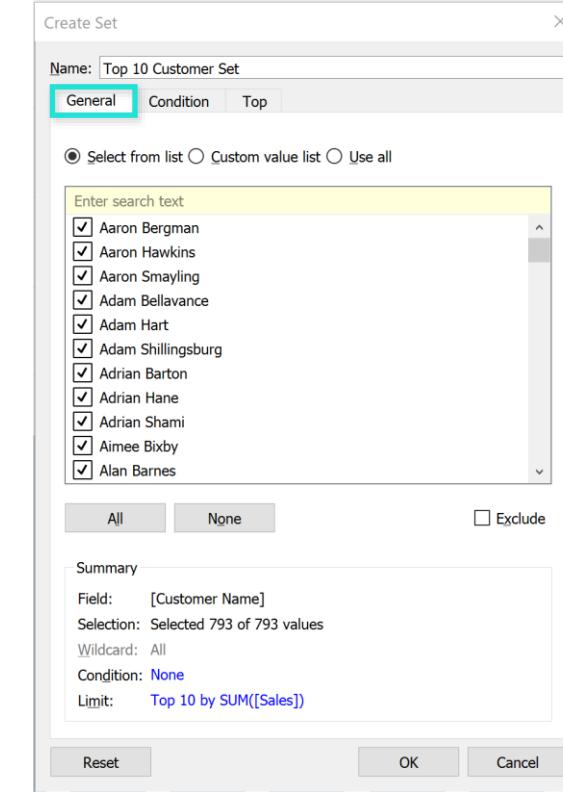
Create sets from the field:



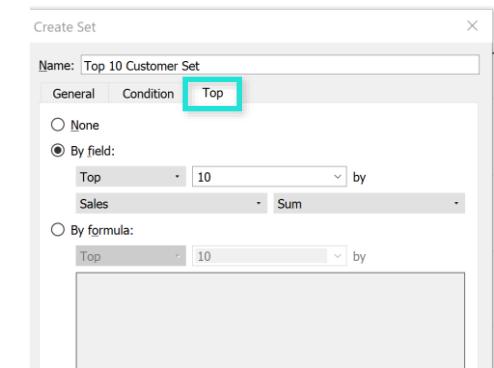
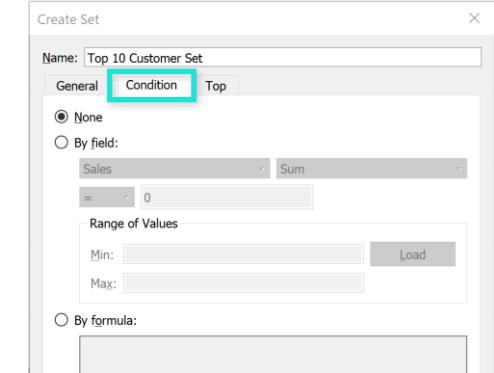
Create sets from the view:



Constant Sets
(Manual definition)



Computed Sets
(Rule-based definition)



Defining Hierarchies

Hierarchies allow users to define custom levels of detail, and create drill-down functionality

- Dates create automatic hierarchies (*year > quarter > month > week > day*), but you can create custom hierarchies as well

Drag fields to create new hierarchies:

=Abc Country Abbr
Ship Mode (group)
Sub-Category (group)

Dimensions

Orders+
Abc Category
City

Sub-Category (group)

Product

Category

Sub-Category (group)

Click the Expand (+) icon to drill down:

+ Category

Category / Sub-Category (group)

Category

SUM(Sales)

SUM(Sales)

Sheet 3

Sheet 3

Sales

Sales

Category	Sales
Furniture	~950K
Office...	~850K
Technology	~1100K

Category / Sub-Category (group)	Sales
Furniture	~450K
Office Supplies	~250K
Technology	~450K
Bookca...	~120K
Chairs	~100K
Furnish...	~100K
Tables	~550K
Applian...	~150K
Art	~50K
Binders	~250K
Envelo...	~20K
Fasten...	~10K
Paper P...	~120K
Storage	~280K
Supplies	~50K
Access...	~200K
Copiers	~200K
Machin...	~250K
Phones	~450K

Tableau's Order of Operations

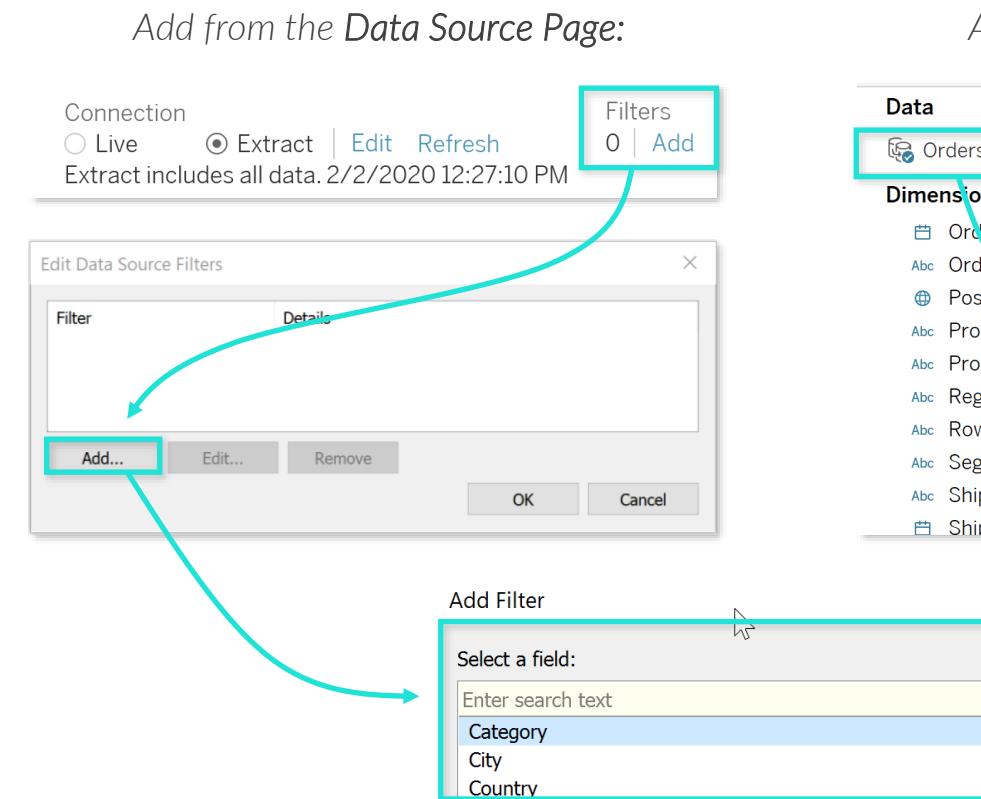
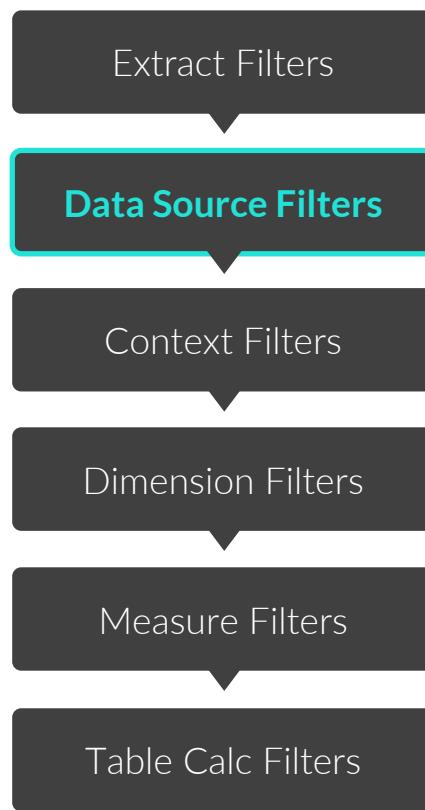
Order of Operations controls the sequence in which all computations, actions or filters are executed

This diagram covers most (but not all) parts of the Tableau Order of Operations



Data Source Filters

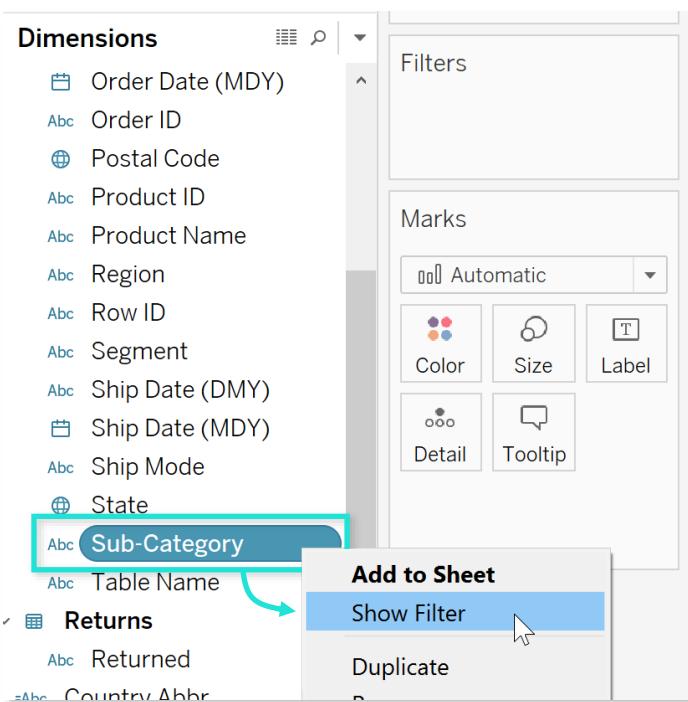
Data Source Filters are the highest-level filters (aside from extract filters) in the Order of Operations; when data source filters are applied, **all sheets** created from the chosen source inherit those filters



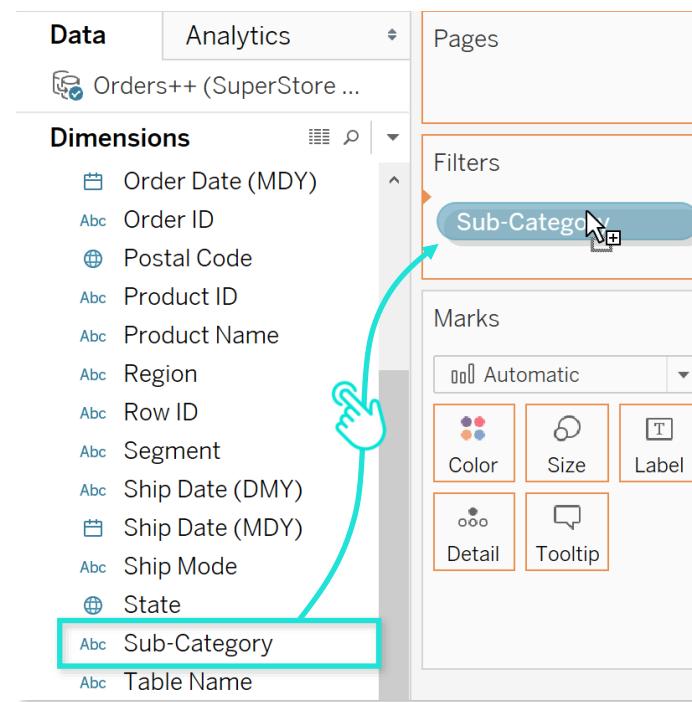
The Filter Shelf

The **Filter Shelf** shows all filters applied to a sheet or workbook, except data source and extract filters

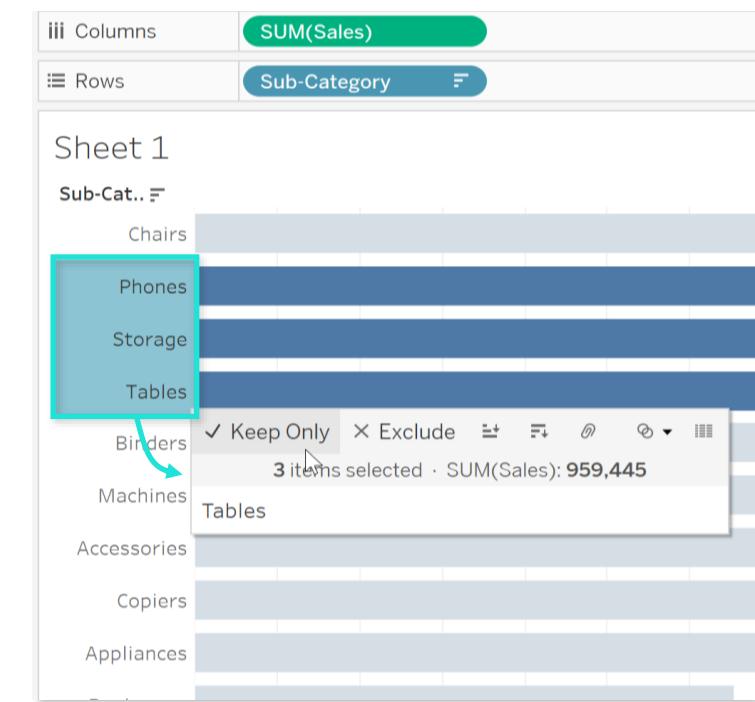
Right-Click & Show Filter:



Drag to Shelf:



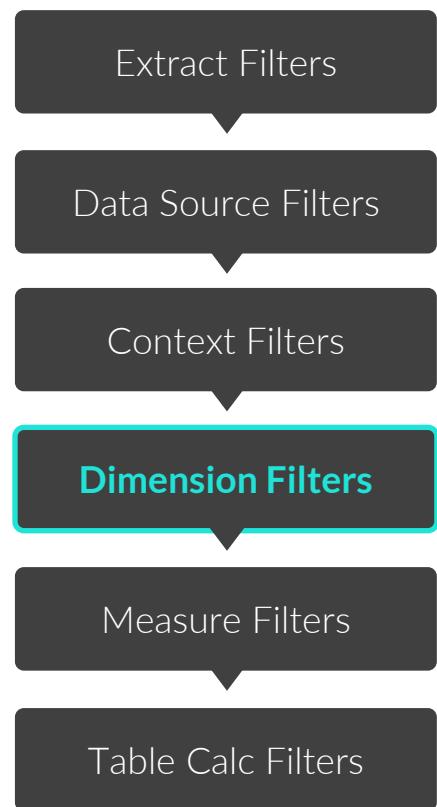
Viz Filter (Command Buttons):



Dimension Filters

Dimension Filters contain discrete categorical data that can be included or excluded using either manual selection or conditional logic

- Dimension filters have four distinct filtering menus: **General**, **Wildcard**, **Condition** and **Top**



General: Shows a list of items with checkboxes. A yellow box highlights the 'Enter search text' input field. Below is a summary section with fields like Field: [Sub-Category], Selection: Selected 17 of 17 values, Wildcard: All, Condition: None, and Limit: None.

Wildcard: Shows match value dropdowns for Contains, Starts with, Ends with, and Exactly matches, along with an 'Exclude' checkbox and an 'Include all values when empty' checkbox.

Condition: Shows two sections: 'By field:' (Sales Sum = 0) and 'By formula:' (Top 10 Sales by Sum).

Top: Shows a 'Top' dropdown set to 10, with a 'by' dropdown next to it.

Select specific items for
manual filtering

Use wildcards to **define a pattern** to filter (@gmail.com will return all gmail addresses)

Use the condition tab to
define rules to filter by

Use the top tab to define a
top or bottom formula to
filter your data.

Dimension Filter Card Modes

Dimension Filters can be configured using several different types of **card modes**:

The diagram illustrates seven different modes for dimension filters, each represented by a card. A central card lists these modes, with arrows pointing from it to each corresponding example card.

- Single Value (List)**: Radio button single select, best for small lists. Example: A list of Sub-Categories including (All), Accessories, Appliances, Art, and Binders.
- Single Value (Dropdown)**: Single select, conserves more space than lists. Example: A dropdown menu showing (All) selected, followed by a search bar and a list of Sub-Categories: Accessories, Appliances, Art, and Binders.
- Single Value (Slider)**: Dimension slider, only recommended for dates. Example: A slider input set to Accessories.
- Single Value (list)**
- Single Value (dropdown)**
- Single Value (slider)**
- Multiple Values (list)**
- Multiple Values (dropdown)**
- Multiple Values (custom list)**
- Wildcard Match**: Non case-sensitive pattern matching (can be difficult to tell what values are selected). Example: A search bar labeled "Sub-Category" with a placeholder "chairs".

Multiple Values (List): Check boxes for multiple selection, calcs evaluate as new selections are made. Example: A list of Sub-Categories with checkboxes: (All), Accessories (checked), Appliances, Art, and Binders.

Multiple Values (Custom List): List of multiple dimensions with search capabilities. Example: A search bar labeled "Sub-Category" with a placeholder "Accessories".

Multiple Values (Dropdown): Same as MV list, but conserves space (Apply button recommended!). Example: A dropdown menu showing Accessories selected, followed by a search bar and a list of Sub-Categories: (All), Accessories, Appliances, Art, and Binders.

Filter Customization Options

Filters can be customized in terms of appearance, functionality, sheet application, and filter relativity

The screenshot shows the 'Dimension Filter Card' with various customization options highlighted by cyan arrows:

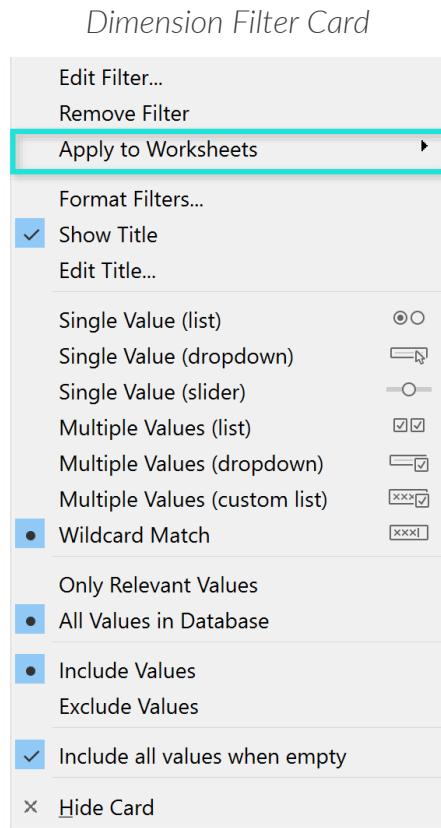
- Edit Filter**: Bring up the main filter menu.
- Format Filters**: Change font, color, etc.
- Show Title**: Show/hide the filter title (can be tricky, use text boxes as an alternative).
- Edit Title**: Change the title of the filter.
- Only Relevant Values**: Filter options expand/reduced based on other filters.
- All Values in Database**: Filter will show ALL distinct values from the data source.
- Include/Exclude Values**: Filter will INCLUDE or EXCLUDE selections made by the user (don't recommend using exclude).
- Include All Values When Empty**: Filter will show null/empty records in data source.
- Hide Card**: Hides the filter from view but keeps it on the shelf.

Dimension Filter Card

- Edit Filter...
- Remove Filter
- Apply to Worksheets
- Format Filters...
- Show Title
- Edit Title...
- Single Value (list)
- Single Value (dropdown)
- Single Value (slider)
- Multiple Values (list)
- Multiple Values (dropdown)
- Multiple Values (custom list)
- Wildcard Match
- Only Relevant Values
- All Values in Database
- Include Values
- Exclude Values
- Include all values when empty
- Hide Card

Applying Filters to Sheets

Filters can be customized to impact specific **specific sheets** in the workbook, including individual sheets, multiple selected sheets, or sheets using shared or related source data



Apply to Worksheets: Which sheets are impacted by the filter?

Only this Worksheet

Filter impacts sheet where filter was made

Selected Worksheets

Filter impacts multiple sheets (from checklist)

All Using this Data Source

Filter applies to all sheets using the same data source (automatically adds when new sheet is created)

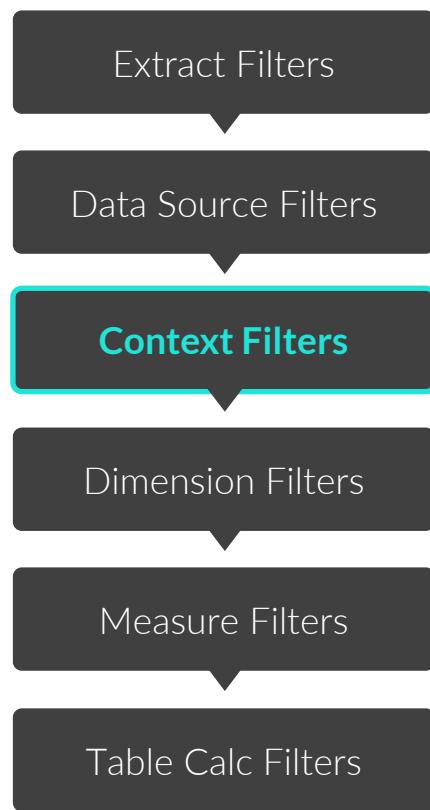
All Using Related Data Sources

Filter applies to all sheets using data sources that have the same field (same name, type, contents)

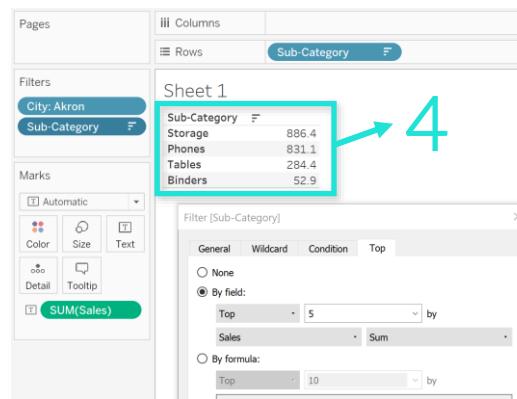
Context Filters

Context Filters are dimension filters that supersede their normal order of operations

- One of the most common uses of Context Filters is to create **Dependent Top N Filters**
- **NOTE:** Measures and other aggregated fields **cannot** be placed in context filters

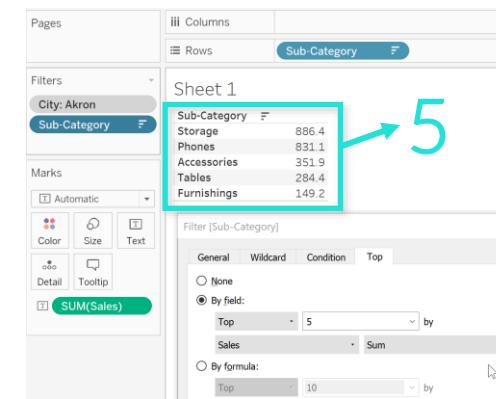


Standard Top N Filter:



Subcategories are **filtered first** (before city), so results are based on the top 5 subcategories **overall** (only 4 of which were sold in Akron)

Dependent Top N Filter:



Subcategories are **filtered after** city (since it's a context filter), so results show sales for the top 5 subcategories **within Akron specifically**

VS.

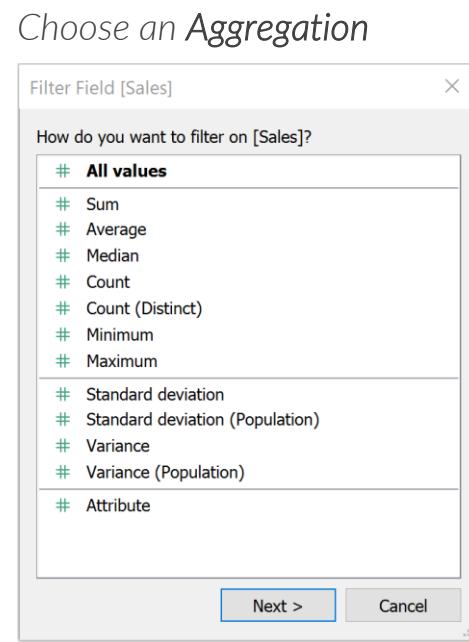
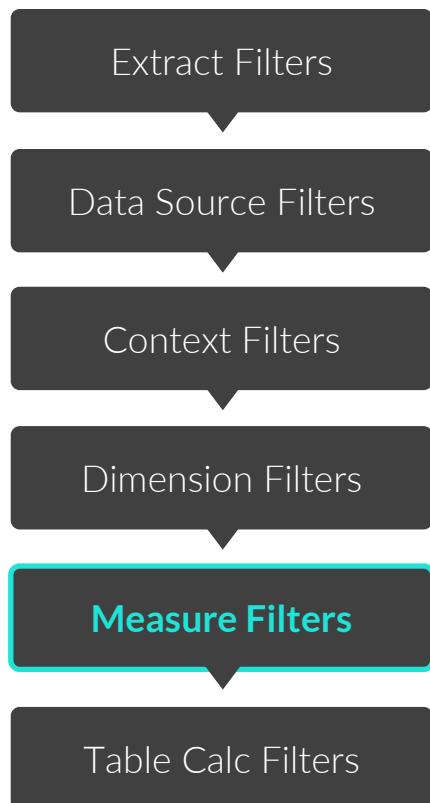
PRO TIP: Use Context Filters to improve performance by filtering out large chunks of data that you don't need to include in your visuals or dashboards



Measure Filters

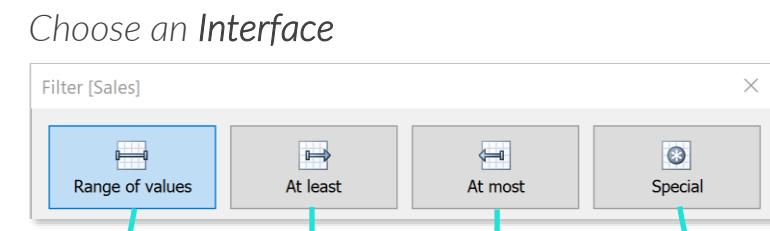
Measure Filters work with quantitative data, and allow users to select a range of values

- Users first select an **aggregation type** for their filter, followed by an **interface** for selection.



Aggregation allows you to apply a mathematical function to summarize your measure

NOTE: aggregation is not available for calculated fields with aggregation already built in



Range:
Upper and lower limit

At Least:
Lower limit

At Most:
Upper limit

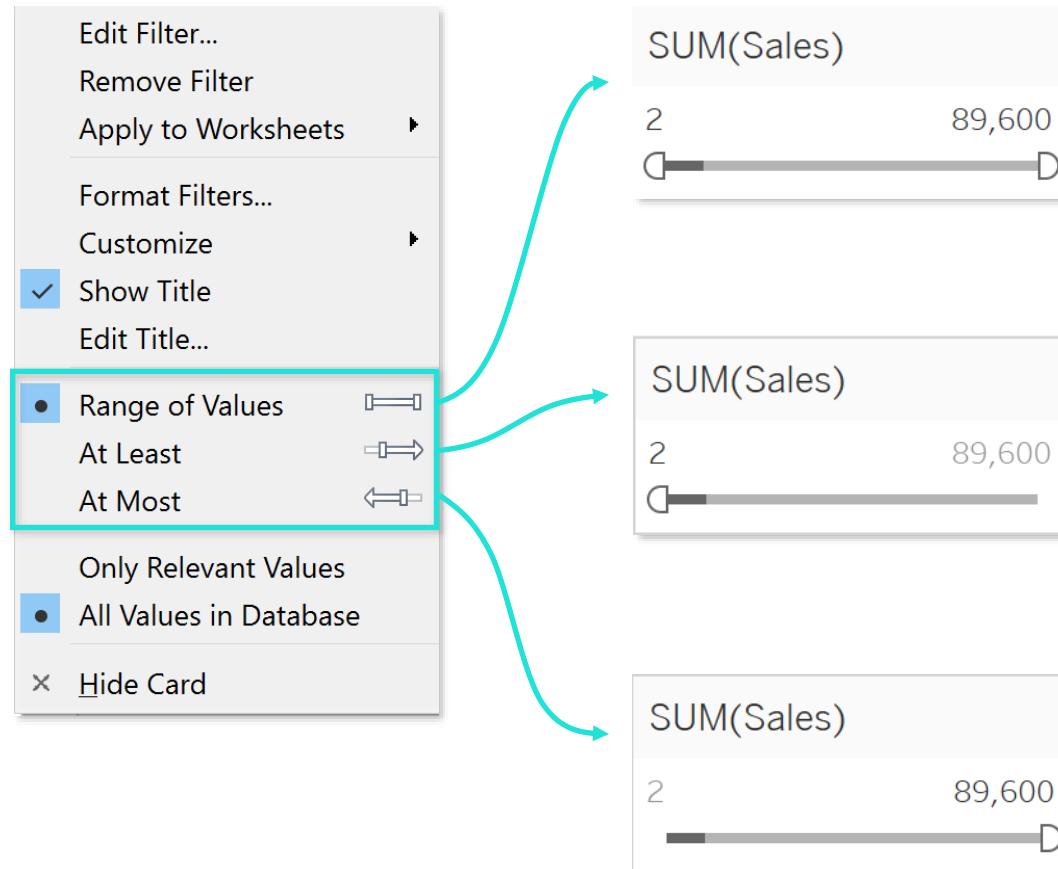
Special:
Null, Non-Null, All Values



PRO TIP: Use conditional sets in place of measure filters to speed up performance!

Measure Filter Card Modes

Measure Filters can be configured using several different types of **card modes**:



Range of Values

A pair of sliders that determine the *range of values* or dates for the measure chosen

At Least

A single left slider that impacts the *minimum value* (great for starting dates open-ended max ranges)

At Most

A single right slider that impacts the *maximum value* (great for ending dates or open-ended min ranges)

Date Filters

Date Filters can be either **continuous** or **discrete**, and include their own set of date-specific options

Relative dates
2/2/2020 to 2/2/2020
Years Quarters Months Weeks Days
Yesterday Last 3 days Today Next 3 days Tomorrow
Anchor relative to Today Include null values
Reset OK Cancel Apply

Relative Dates

Various intervals (last N days, weeks, months, etc.)

Starting date
1/3/2015 12/30/2018
Show: Only Relevant Values Include Null Values
Reset OK Cancel Apply

Starting Date

Single left slider to set a starting date

Special
Null dates Non-null dates All dates
Reset OK Cancel Apply

Special

Null, non-null, or all dates

Range of dates
1/3/2015 12/30/2018
Show: Only Relevant Values Include Null Values
Reset OK Cancel Apply

Range of Dates

Pair of sliders to determine a date range

Ending date
1/3/2015 12/30/2018
Show: Only Relevant Values Include Null Values
Reset OK Cancel Apply

Ending Date

Single right slider to set an ending date

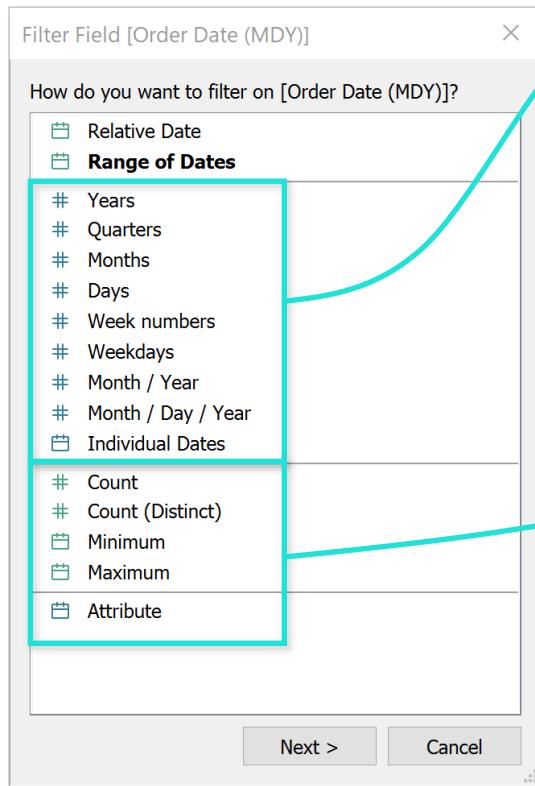


PRO TIP:

Right-click and drag into the filter shelf to choose **discrete** or **continuous** dates

Discrete Date Filters

Discrete date filters provide similar options to regular discrete fields, but can also be aggregated with count, countd, min, max, or attribute



Discrete Date Filters:

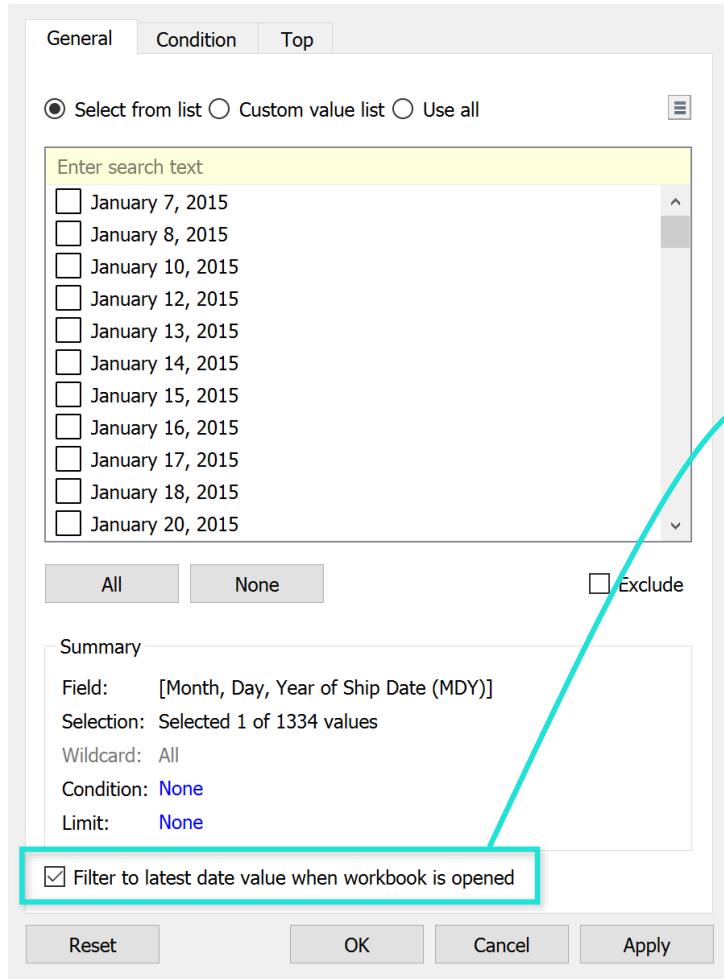
- Years
- Quarters
- Months
- Days
- Etc.

Date Aggregation:

- Count
- Count (Distinct)
- Minimum
- Maximum
- Attribute

NOTE: These are rarely used – most often these calculations are done in calculated fields (not filters)

PRO TIP: Filter to Latest Date



Filter to Latest Date Value When Workbook is Opened:

When applied, the latest date in the selected field will be automatically be pre-filtered when the workbook is opened

NOTE: This option overrules dimension and context filters and chooses the max date in the entire data source

HOMEWORK: Sorting, Grouping & Filtering

THE **SITUATION**

Your good friend Allie just launched a career as a real estate agent in **King County, Washington**, and is looking for an edge over the competition. She's hoping that you can use your data skills to help give her a leg up on the competition – and FAST!

THE **BRIEF**

While researching the market, you come across a partially complete dashboard that you may be able to quickly modify to suit Allie's needs.

You'll need to download the workbook, modify and filter the source data, and use your Tableau skills to help Allie land her first big sale.

THE **OBJECTIVE**

Use Tableau Desktop to:

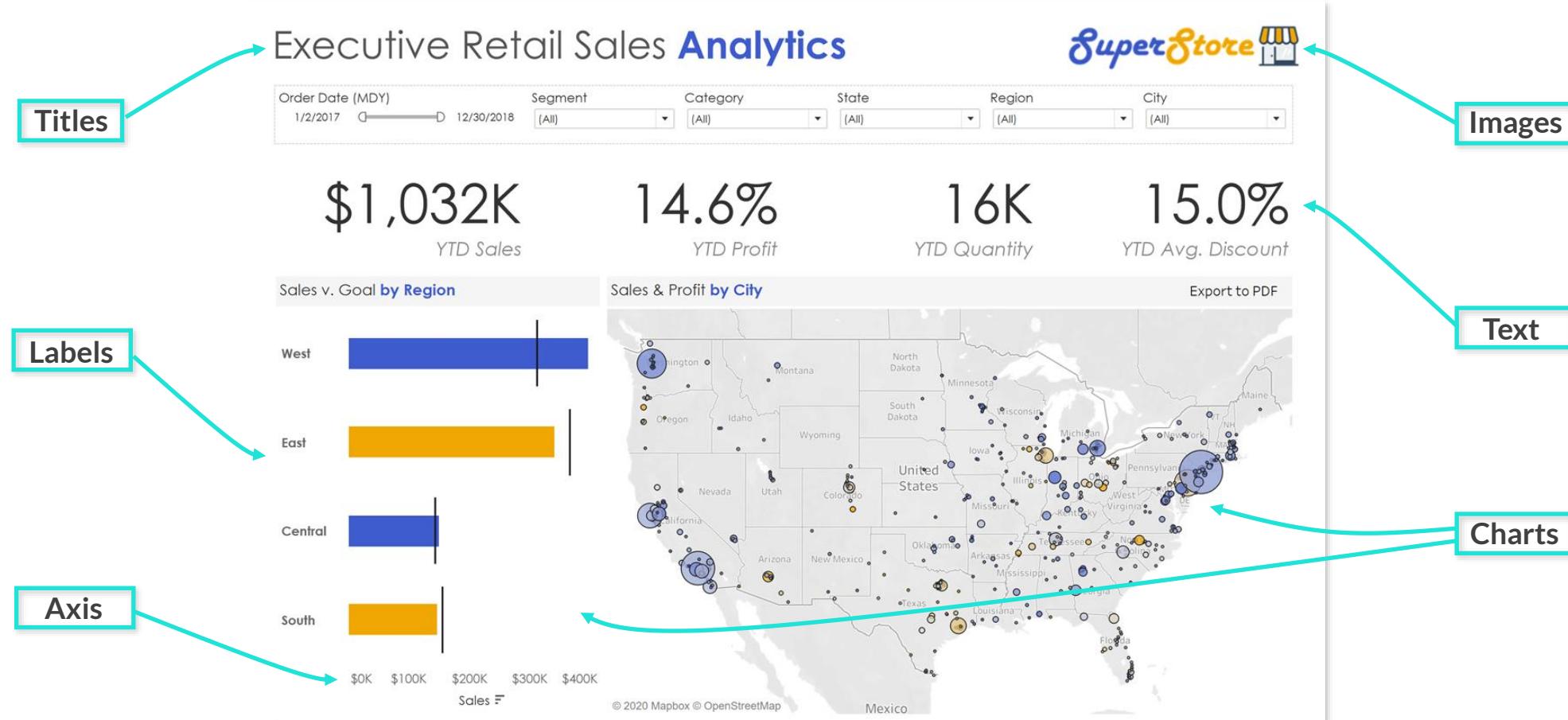
- Modify field types
- Sort & Group your data
- Filter to the relevant info you need



The Marks Card

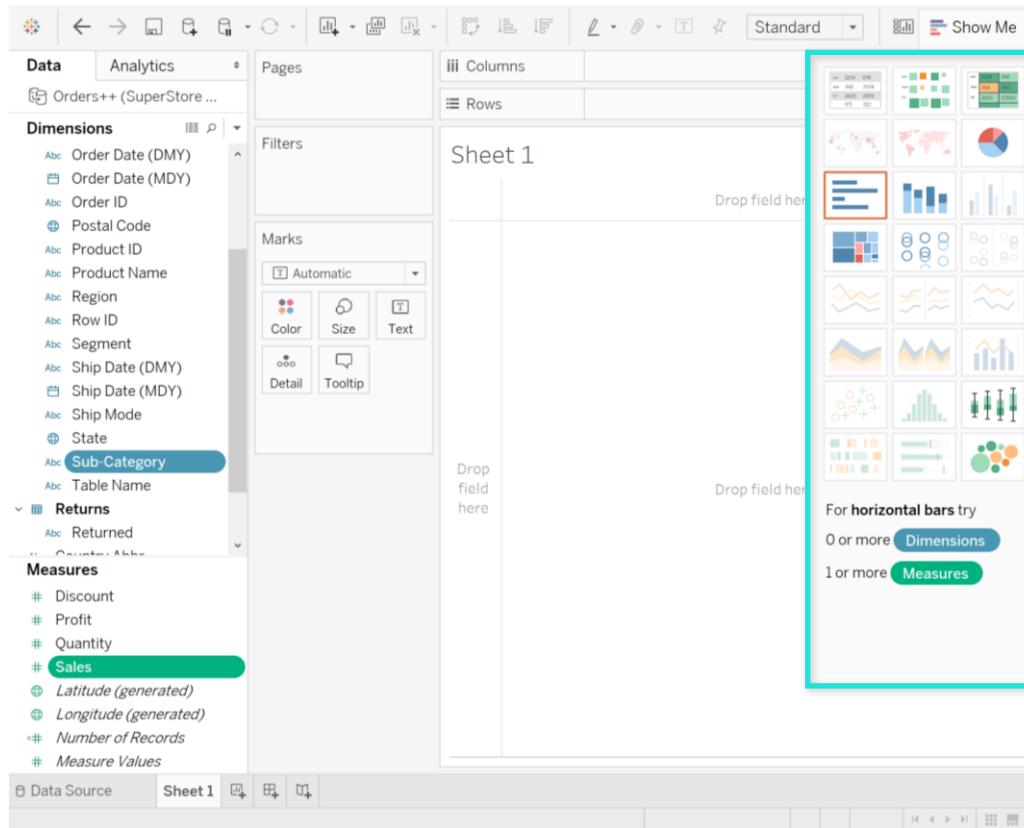
What's a “Mark”?

Marks represent any visual element (or “ink”) that Tableau Desktop renders in a user-constructed view, including **Charts**, **Labels**, **Legends**, **Sheets**, **Shapes**, etc.

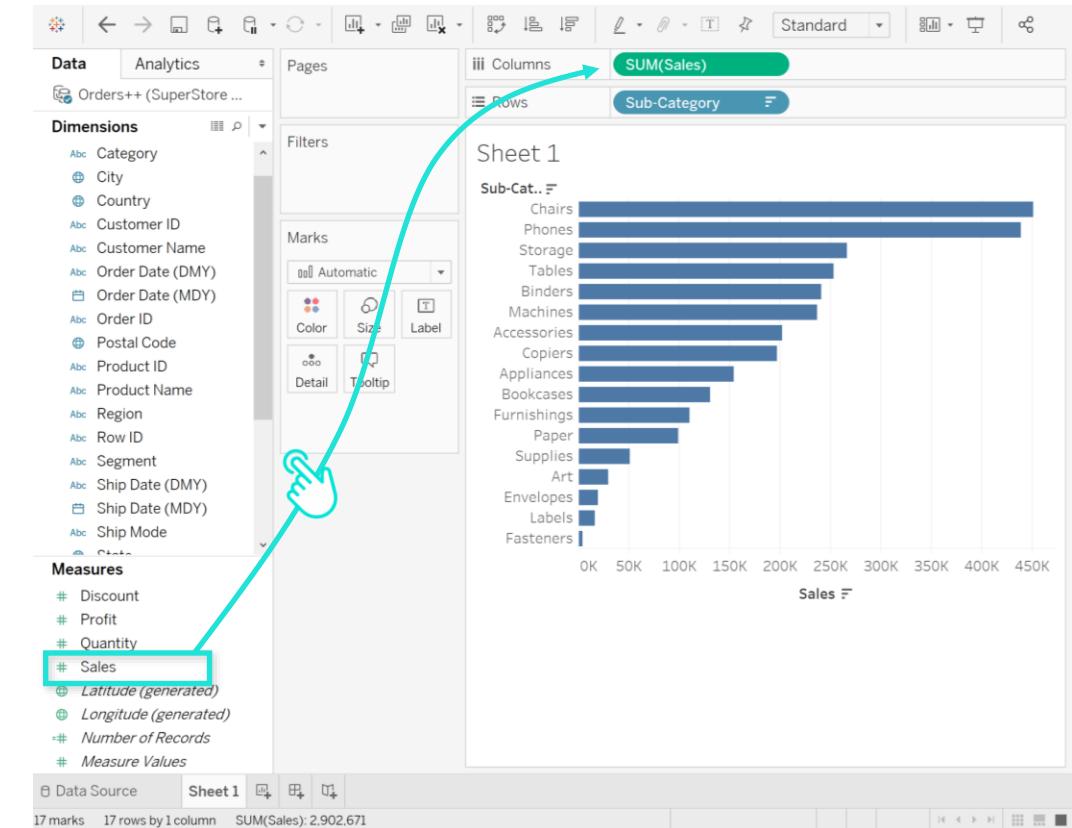


Adding Quick Visuals (Two Ways)

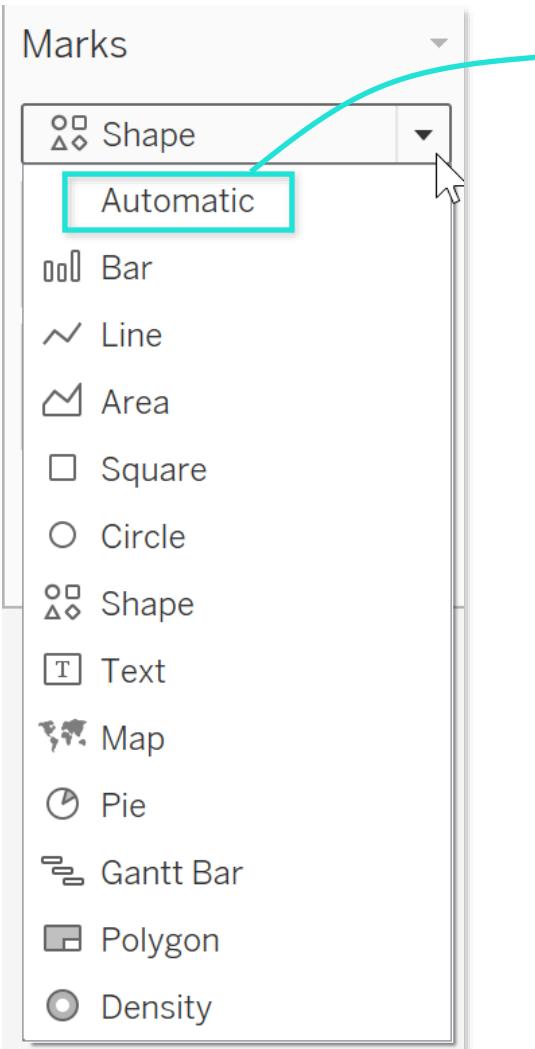
1. Use the **Show Me** gallery to quickly browse and create new visuals (options will “light up” based on the specific fields selected)



2. Drag or **double click** fields to Columns or Rows to create visuals on the fly (Tableau will default to the “best fit” visualization)

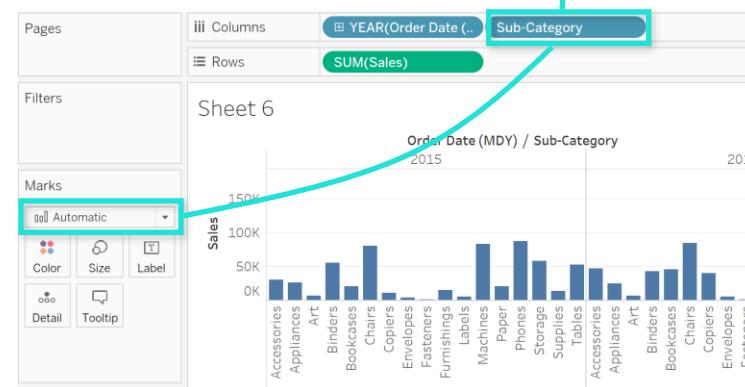


Mark Types

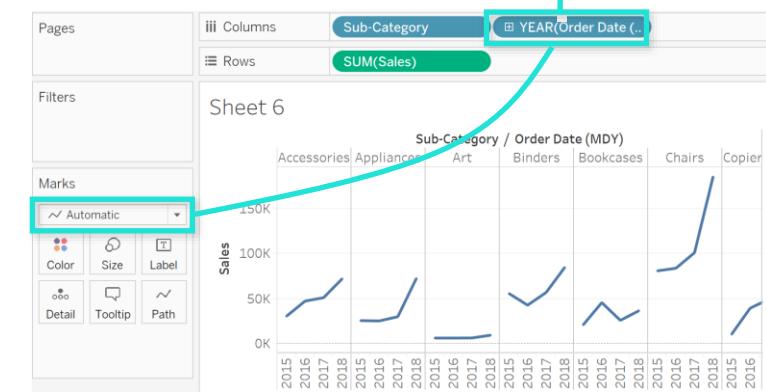


Automatic is the default mark type; Tableau will choose the best visual based on your **field types** and their **position** on rows & columns

Inner-Most Field: **String**



Inner-Most Field: **Date**



The automatic chart generated is determined by the **inner-most (right-side)** dimension on the rows & columns shelves; if the dimension is a **date** field, Tableau will default to a **line chart**, if it's a **string** field, Tableau will default to a **bar chart**, etc.

Marks Card Properties

The **marks card properties** provide users with the ability to control the context and detail of the marks in the view; including Color, Size, Label, Detail, Tooltip, Shape and Line

The diagram illustrates the Tableau Marks card properties interface. At the top center is the 'Marks' card, which includes tabs for Shape, Color, Size, and Label. Three curved arrows point from descriptive text below to these respective tabs: one arrow points to the 'Color' tab, another to the 'Size' tab, and a third to the 'Label' tab.

Color can be applied to both dimensions and measures, along with opacity, border lines, and halo effects

Size is typically applied to measures, and can be customized using sliders

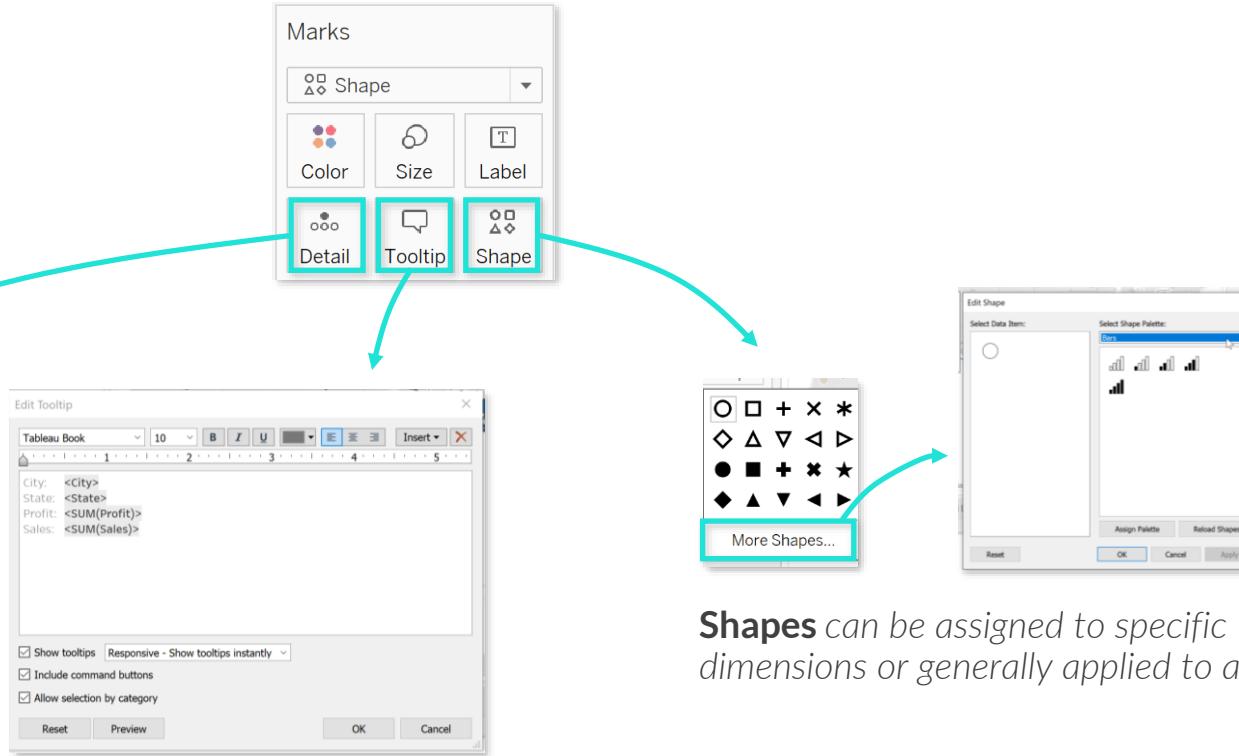
Labels allow you to add custom text to marks, which can be a combination of field labels and flat text

Marks Card Properties



Detail is determined by the dimensions in the view

Adding dimensions **increases** level of detail, and removing dimensions **decreases** level of detail



Tooltips can display flat text, field values/names, or visualizations

Note: Tooltip dimensions at a lower grain than the view will display as * in tooltips

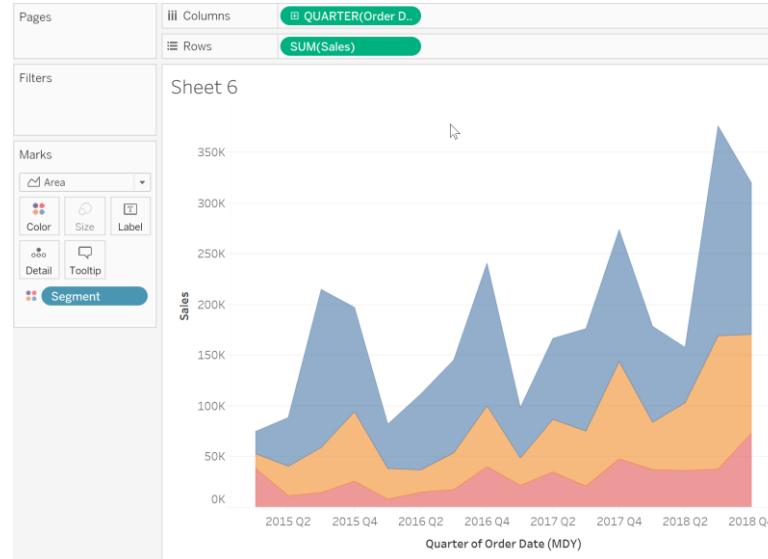
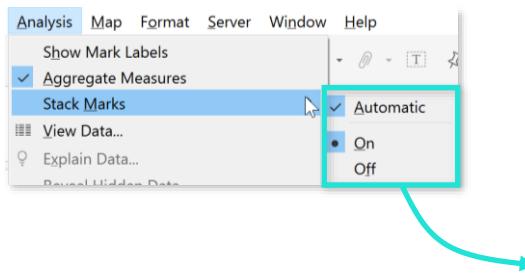


PRO TIP:
Custom shapes can be uploaded in
Documents > My Tableau Repository > Shapes

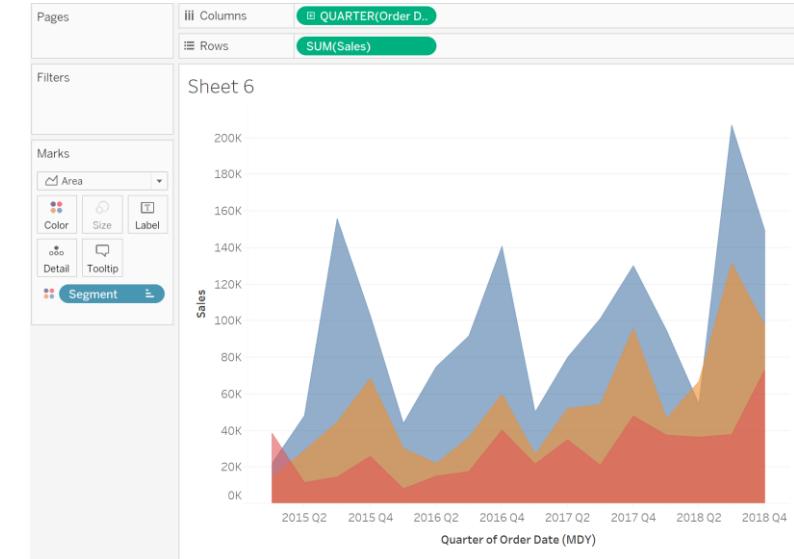
Stacking Marks

The **Stack Marks** option allows you to either **stack** or **overlap** dimensions along a continuous axis

Stack Marks Menu



Stacking Marks **ON**

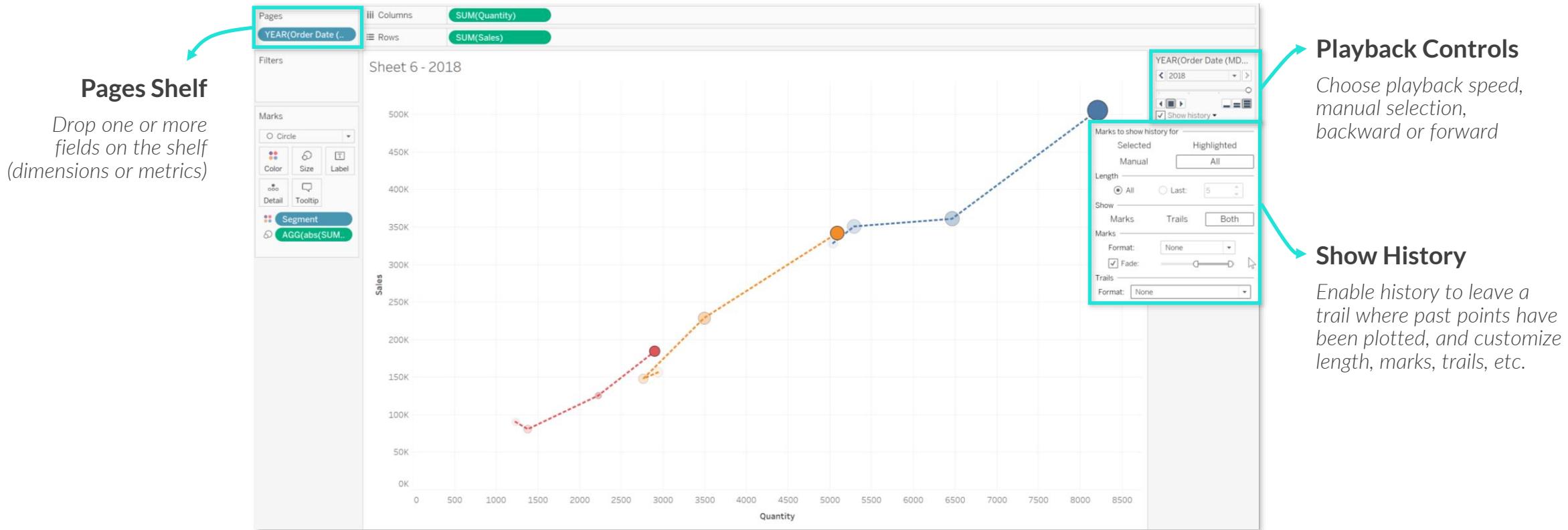


Stacking Marks **OFF**

Pages Shelf

The **Pages Shelf** allows you to create separate filtered views (pages) that can be animated to show trending or changes over time

- Both **measures** & **dimensions** can be used, but each will default to a discrete field that breaks the data into pages



The Analytics Pane

The **analytics pane** includes helpful drag-and-drop analytics tools, including reference lines, totals, forecasts, clusters, box plots, and more

- NOTE: Some analytics tools may only be available for specific views or configurations

The screenshot shows the Tableau interface with the Analytics pane open. The pane includes sections for Summarize (Constant Line, Average Line, Median with Quartiles, Box Plot, Totals) and Model (All). A callout from the Average Line section points to a tooltip 'Add a Reference Line' and three options: Table, Pane, and Cell. Three arrows point from these options to three separate bar charts below, each demonstrating a different application of an average line:

- Applies across the entire table (all panes):** This chart shows a single average line across all categories.
- Applies to each individual pane (all cells):** This chart shows a separate average line for each category.
- Applies to each individual data point/cell:** This chart shows a separate average line for each individual bar.

Summarize Options:

- Constant Line
- Average Line (selected)
- Median with Quartiles
- Box Plot
- Totals

Model Options:

- All

Analytics Tools:

- Pages
- Columns: Category, Sub-Category
- Rows: SUM(Sales), SUM(Quartile)

Chart 1 (Entire Table): Shows Sales (\$K) for various categories. An average line is drawn across all categories.

Category	Sales (\$K)
Chairs	450
Tables	250
Bookcases	150
Furnishings	100
Storage	280
Binders	250
Appliances	180
Paper Products	120
Supplies	80
Envelopes	40
Fasteners	20
Phones	420
Machines	240
Accessories	190
Cables	210

Chart 2 (Individual Panes): Shows Sales (\$K) for various categories. An average line is drawn for each category.

Category	Sales (\$K)
Chairs	450
Tables	250
Bookcases	150
Furnishings	100
Storage	280
Binders	250
Appliances	180
Paper Products	120
Supplies	80
Envelopes	40
Fasteners	20
Phones	420
Machines	240
Accessories	190
Cables	210

Chart 3 (Individual Data Points): Shows Sales (\$K) for various categories. An average line is drawn for each individual bar.

Category	Sales (\$K)
Chairs	450
Tables	250
Bookcases	150
Furnishings	100
Storage	280
Binders	250
Appliances	180
Paper Products	120
Supplies	80
Envelopes	40
Fasteners	20
Phones	420
Machines	240
Accessories	190
Cables	210

PRO TIP: Getting the Viz You Want

To create the visual you want, work through the options below until to reach the desired result:

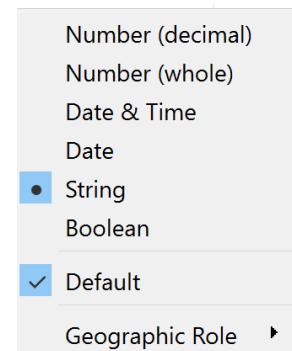
1 Show Me

Create an initial visual



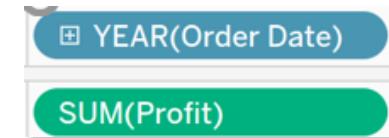
2 Field Type

Determine the field type



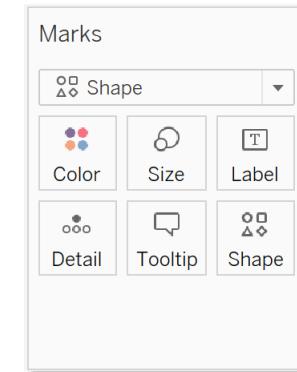
3 Field Properties

Determine field properties
(discrete or continuous)



4 Mark Properties

Customize Color, Shape,
Size, Labels, Detail, etc.



HOMEWORK: The Marks Card

THE **SITUATION**

You've been approached by **Jimmy "UFO" Johnson**, a prominent internet conspiracy blogger with a bone to pick with the US government. He's convinced that they've been hiding UFO evidence for 70 years, and needs your help using data to expose the truth!

THE **BRIEF**

On a cold October night, Jimmy handed you a notebook containing records of ~80,000 UFO sightings between 1949 and 2014, before silently slipping into the cloak of darkness.

You'll need to use his data to create a **compelling visual analysis** before the start of UFO-CON 2020, where Jimmy plans to deliver his shocking findings to the world.

THE **OBJECTIVE**

Use Tableau Desktop to:

- Create charts using Show Me templates
- Enhance visuals using the Marks Card features
- Showcase dynamic data using Pages



Calculated Fields, Table Calcs & Parameters

Calculated Fields

Calculated fields enable users to create new data in columns

Calculations can be used to:

- Segment data
- Convert field types
- Aggregate data
- Filter results
- Calculate new metrics



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

Profit Ratio
`{ FIXED [State]: SUM([Sales]) }`

Profit Ratio
`RUNNING_AVG(SUM([Sales]))`

Basic Calculations

Used to solve most regular calculation use cases (aggregation, filtering, etc.)

Note: These calculations are *Excel-like in nature* and should feel very familiar to most analysts

Level of Detail (LOD) Expressions

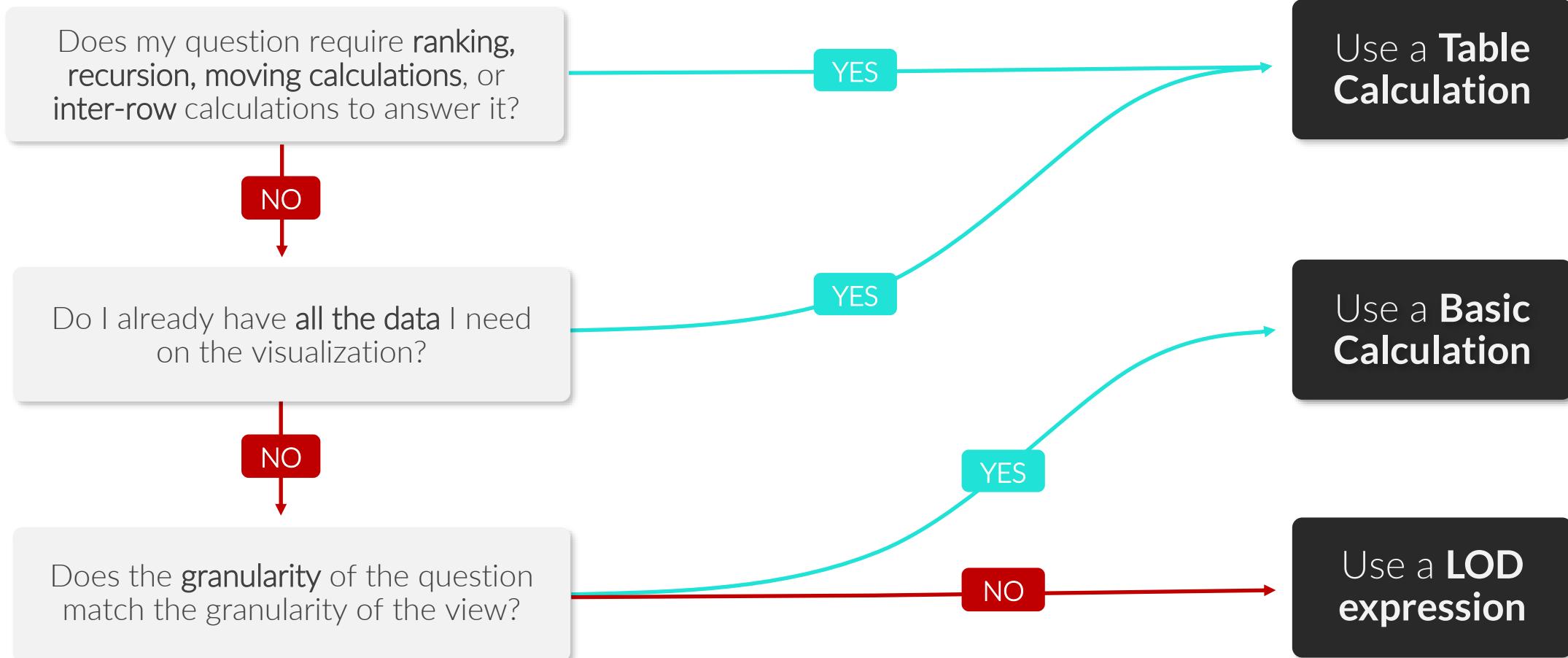
Computations that support aggregation at dimensionalities other than the view-level

Note: These are considered “advanced” calculations and will be covered in-depth in a separate advanced-level course

Table Calculations

Computations that are applied to the values within a view, and **computed in Tableau** rather than in the data source (like other calculation types)

PRO TIP: Selecting a Calculation Type



Calculation Syntax

Sales / Profit Multi

```
//This is a dynamic metric selector!
```

```
IF [Metric Selector] = "Sales" THEN SUM([Sales]) ELSE SUM([Profit]) END
```

Comments

Notes used for documentation or providing additional context

Parameters

Dynamic driving fields that can materially impact calculations, filters, etc.

Operators

Numeric or logical symbols used in calculations, including:

+, -, *, /, %, ==, =, >, <, >=, <=, !=, <>, ^, AND, OR, NOT, ()

Literal Expressions

Constant values, which can be represented as numbers, strings, dates, etc.

Fields

Raw or calculated columns used for dimensional or aggregated values

Functions

Numerical, string, type, date, logical, aggregate, user, table calc, or spatial calculation functions

Creating Calculated Fields

The screenshot shows the Tableau Data pane with various fields listed under Dimensions, Measures, Sets, and Parameters. A context menu is open over the 'Discount' field in the Measures section. The menu path 'Create > Calculated Field...' is highlighted with a red arrow. The 'Calculated Field...' dialog box is open, showing the formula '(Discount)' and a list of available functions like ABS, ACOS, AND, etc. A red box highlights the 'Discount' field in the formula bar.

Create in view

Double-click the columns, rows, or detail shelf and start typing a calculation

Note: These calculations are **temporary** and are not stored with the workbook / data source

Create from field

Right-click on any field and choose **Create > Calculated field**

Note: If no field is selected, the calculation window will open with no field chosen

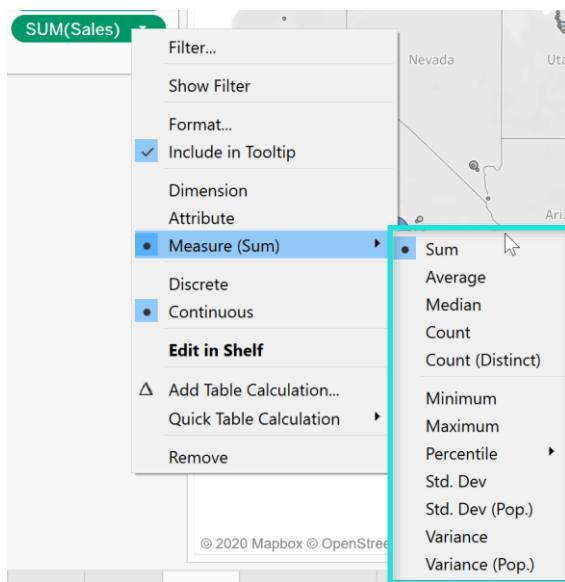


PRO TIP: Drag a calculation that you've created "in view" to the data pane (dimensions/measures) to save it as a permanent field

Aggregation

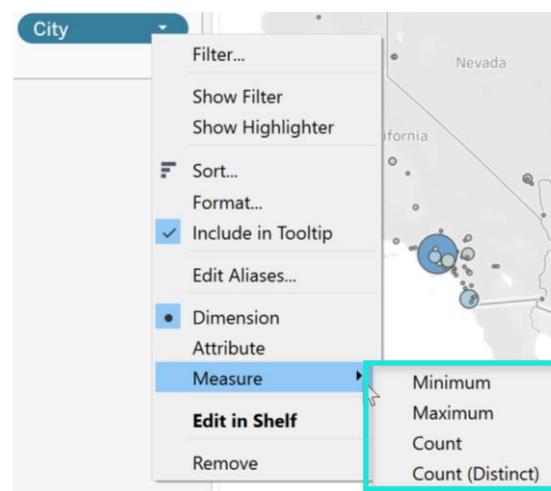
Aggregation is the process of combining or summarizing data into a single representative value

- Both **dimensions** and **measures** can be aggregated, but use different methods (see below)
- Aggregation level is controlled by the **dimensions** in the **view** and the **type of calculation** used



Common **MEASURE** aggregations:

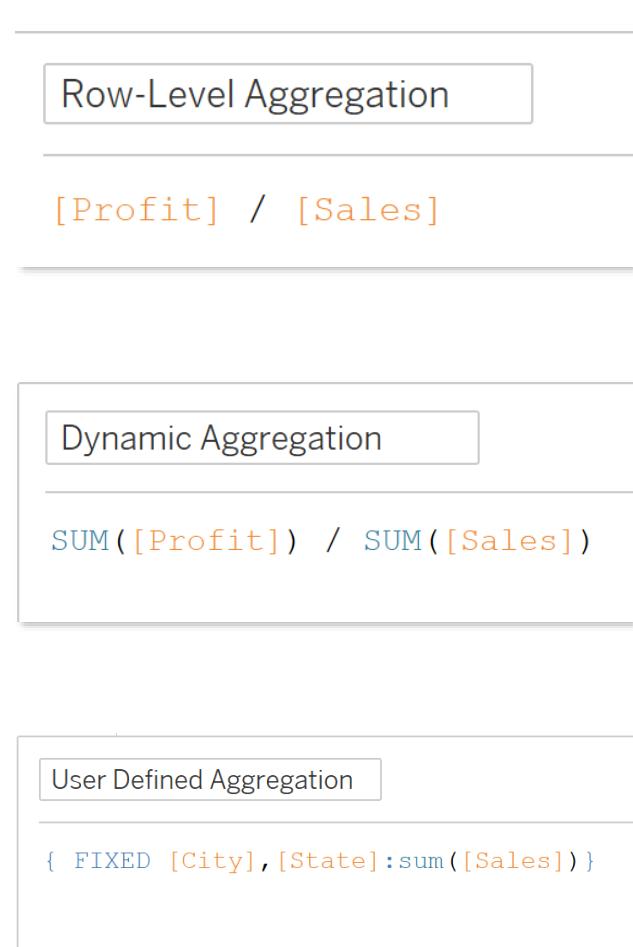
Sum, Avg, Median, Count, Min/Max, Standard Deviation, Variance, etc.



Common **DIMENSION** aggregations:

Min/Max (A-Z), Count, Distinct Count

Aggregation Types

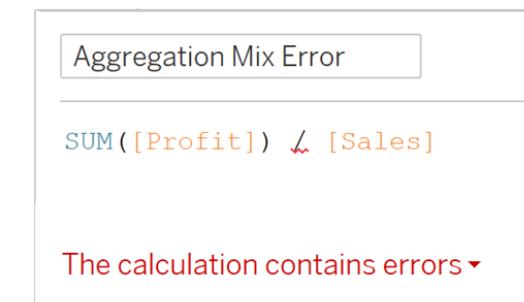


- Row-level aggregation
Performed at the lowest level (or grain) of the data set (no aggregation defined)
- Dynamic aggregation
Aggregated at the level of detail in the view
- User-Defined Aggregation
Aggregated at the level of detail explicitly defined in the LOD expression(s)



HEADS UP!

If you try to use both aggregated and non-aggregated fields within the same calculation, you'll get an **Aggregation Mix Error**



Common Calculation Functions

Aggregate

Summarize or change the level of granularity of your data

Common Examples:

- SUM
- AVG
- MIN
- MAX
- MEDIAN
- COUNT
- COUNTD
- ATTR
- PERCENTILE
- STDEV

LOD Expressions:

- INCLUDE
- EXCLUDE
- FIXED

String

Allow for the manipulation of text-based data

Common Examples:

- CONTAINS
- LEFT/MID/RIGHT
- LEN
- REPLACE
- SPLIT
- LTRIM/RTRIM/TRIM
- UPPER/LOWER
- REGEX_REPLACE
- REGEX_MATCH

Logical

Determine if a conditional statement is true or false

Common Examples:

- IF/IIF
- CASE
- AND
- ELSE
- ELSEIF
- IFNULL/ISNULL
- NOT
- ZN
- OR
- WHEN

Date

Create, modify, and calculate date/time fields

Common Examples:

- DAY
- WEEK
- MONTH
- QUARTER
- YEAR
- TODAY
- DATEADD
- DATEDIFF
- DATENAME
- DATEPARSE
- DATEPART
- DATETRUNC

Type Conversion

Convert fields from one data type to another

Common Examples:

- DATE
- DATETIME
- FLOAT
- INT
- STR

Basic Aggregate Functions

SUM

Returns the sum of all values in the expression (only numeric, nulls are ignored)

=SUM ([Field Name])

AVG

Returns the average of all values in the expression (only numeric, nulls are ignored)

=AVG ([Field Name])

MAX

Returns the maximum of a single expression across all records

=MAX ([Field Name])

MIN

Returns the minimum of a single expression across all records

=MIN ([Field Name])

COUNT

Returns the number of items in a group (null values are ignored)

=COUNT ([Field Name])

COUNTD

Returns the number of distinct or unique items in a group (null values are ignored)

=COUNTD ([Field Name])

String Functions

CONTAINS

Returns TRUE if the field contains the defined text

=**CONTAINS**([Field Name], "Text")

LEN

Returns the number of characters in the given field

=**LEN**([Field Name])

REPLACE

Replaces all instances of "Old Text" with "New Text" in a text field

=**REPLACE**([Field Name], "Old Text", "New Text")

SPLIT

Returns a text string based on a given delimiter and starting position

=**SPLIT**([Field Name], "-", -2)

TRIM

Removes both leading and trailing spaces from a field

=**TRIM**([Field Name])

UPPER/LOWER

Converts a text string to all uppercase/lowercase letters

=**UPPER/LOWER**([Field Name])

Logical Functions

IF

Evaluates a single logical test; if true the **THEN** result is shown, otherwise the **ELSE** result is shown

=**IF** Logical Test **THEN** Result-if-True **ELSE** Result-if-False
END

ELSEIF

Evaluates multiple logical tests; if true the **THEN** result is shown, otherwise the **ELSE** result is shown

=**IF** Logical Test1 **THEN** Result-if-True1 **ELSEIF** Logical Test2
THEN Result-if-True2 **ELSE** Result-if-False **END**

CASE

Finds and returns values based on each corresponding **WHEN** condition

NOTE: Case subject can be either a **Parameter** or **Field Name**

=**CASE** [Parameter] **WHEN** Value1 **THEN** Result1
WHEN Value2 **THEN** Result2 **ELSE** Value3 **END**

ZN

Converts NULL values to 0 (zero), if not NULL will return value

=**ZN** ([Field Name])

Date Functions

**DAY/ WEEK/
MONTH/YEAR**

Returns the integer value of the Day, Week, Month, or Year of a given date field

=**DAY/WEEK/MONTH/YEAR** ([Date Field])

TODAY/NOW

Returns the current date or current date and time

=**TODAY/NOW** ()

DATEADD

Adds a defined increment to the date referenced, defined by the interval specified in the calculation

=**DATEADD** ('Date Interval', 2, [Date Field])

DATEDIFF

Takes the difference between the defined Start Date and End Date, expressed in units of the date interval

=**DATEDIFF** ('Date Interval', [End Date], [Start Date], 'Start of Week')

DATENAME

Returns a part of the given date as a string, with units defined by the date interval

=**DATENAME** ('Date Interval', [Date Field])

DATETRUNC

Truncates the date field to the defined date interval and returns the new date

=**DATETRUNC** ('Date Interval', [Date Field])

Type Conversion Functions

**DATE/
DATETIME**

Returns a date or datetime given a specified number, string, or date expression

=DATE/DATETIME ("YYYY-MM-DD HH:MM")

FLOAT

Returns a numeric field with decimals (float) given any expression or field (requires no format i.e. \$)

=FLOAT ("0.00")

INT

Returns an integer field given any expression (truncates results to the closest integer to zero)

=INT (0.0)

STR

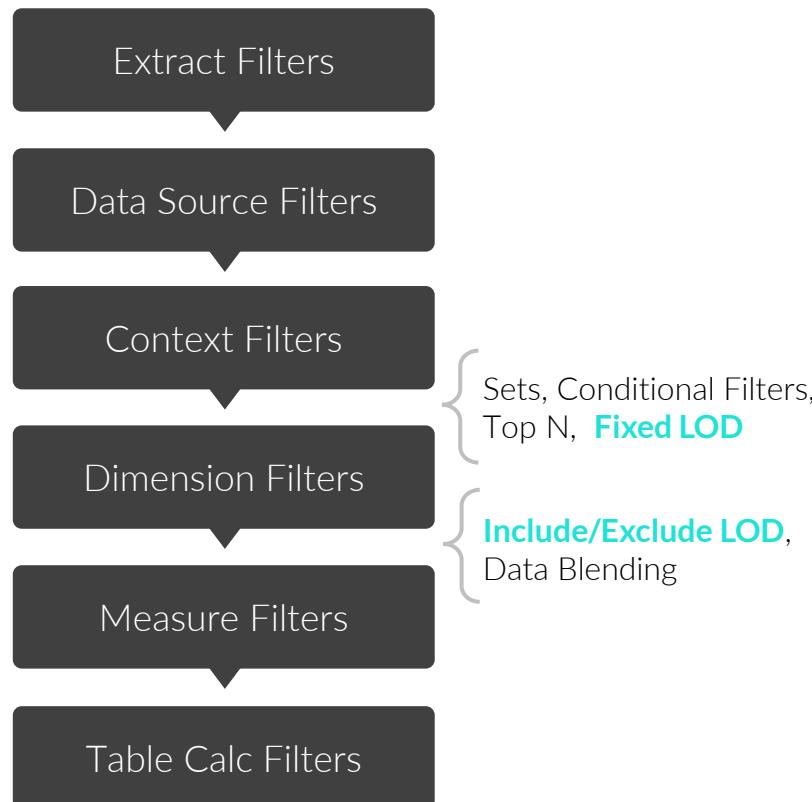
Returns a string given any expression

=STR ([Field Name])

Level of Detail Expressions

LOD Expressions allow users to control the granularity at which a calculation is computed

- Unless LOD expressions are used, calculations will always compute at the level of detail shown in the view



Calculation Syntax:

Fixed LOD Expression

```
{ FIXED [State] : SUM( [Sales] ) }
```

Level of Detail Element

Specified LOD types are
Include, Exclude and Fixed

Dimension Declaration

Defines the grain at which
the data is aggregated

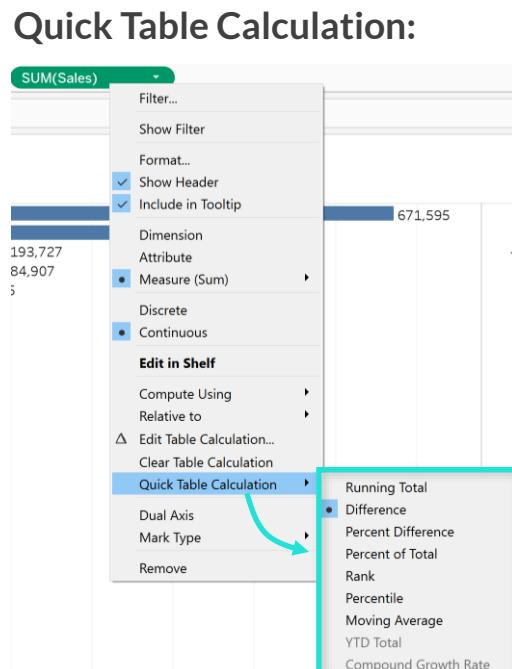
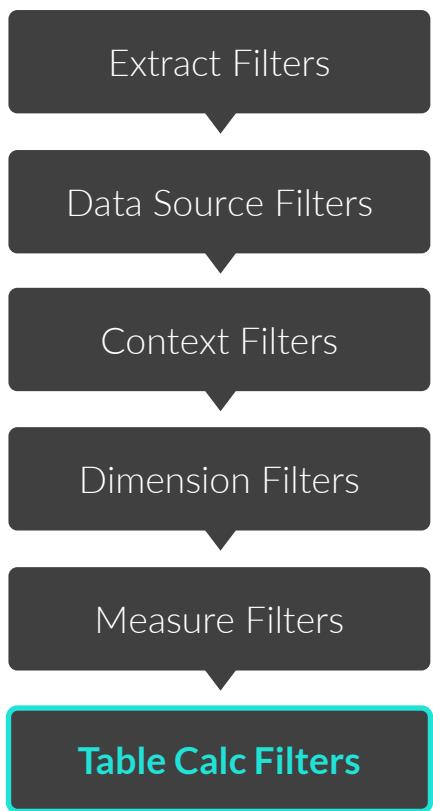
Aggregate Expression

Calculation to be performed
at the grain defined

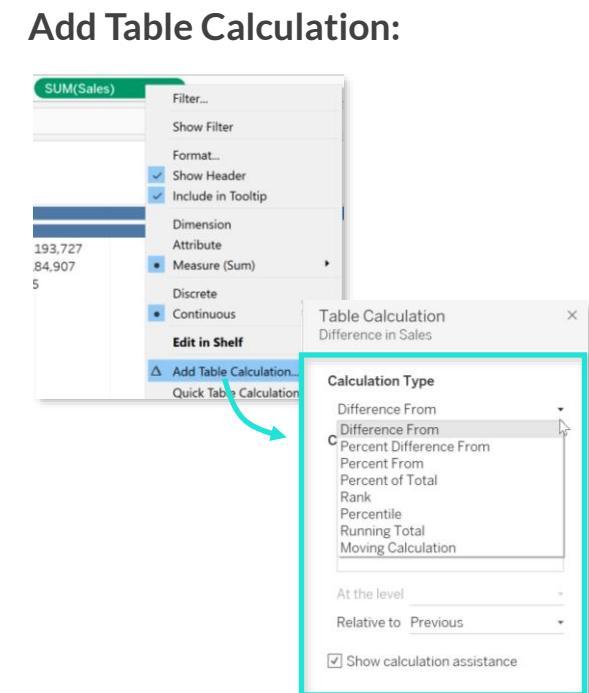
Table Calculations

Table calculations are sheet-based computations that only evaluate within a visualization

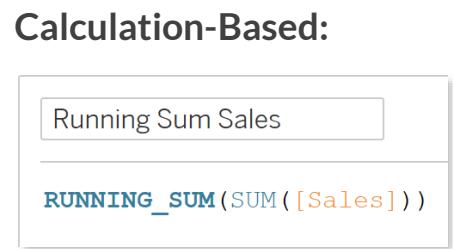
- Table Calculations affect how values are computed within a visual, but *do not* change the underlying data
- Table Calcs can be created from the **Quick Table Calculation** or **Add Table Calculation** menus, or defined as a formula



Quick access to common table calculation options, based on fields in the view



Includes more options than Quick Table Calculations



Created in the calculation pane and then pulled into the view

Table Calculation Types

Difference From

Computes the difference between each value and another relative value (i.e. previous) within a table

Percent Difference From

Computes the difference between each value and another value in the table, calculated as a percentage

Percent From

Computes a value as a percentage of another value in the table

Percent of Total

Computes a value as a percentage of the overall total, based on the current view/partition

Rank

Computes each value as a rank among all values in a table

Percentile

Computes the percentile rank of each value among all values in a table

Running Total

Aggregates values cumulatively within a partition (SUM, AVG, MIN, MAX)

Moving Calculation

Determines the value for a mark by performing an aggregation across a specified number of values before/after the current value.

Table Calculation
Difference in Sales

Calculation Type

- Difference From
- Difference From
- Percent Difference From
- Percent From
- Percent of Total
- Rank
- Percentile
- Running Total
- Moving Calculation

At the level _____

Relative to Previous

Show calculation assistance



Table calculations in Tableau work just like **Show Values As** calculations in Excel pivots!

X



Table Calculation Computation

Table calculation **compute options** allow you to specify the “direction” of a calculation

- For example, a Percent of Total calculation could be computed as a percentage of an entire row in a table (**Table (across)**), a row within a pane (**Pane (across)**), an individual data point (**Cell**), etc.

The screenshot shows a Tableau interface with a tooltip for a sales value and a context menu for 'Compute Using'. The tooltip displays 'Table Calculation % of Total Sales' with 'Calculation Type' set to 'Percent of Total' and 'Compute Using' set to 'Table (down)'. The context menu for 'Compute Using' lists various options: Table (across), Table (down), Table, Pane (across), Pane, Cell, Specific Dimensions, Edit Table Calculation..., Clear Table Calculation, Quick Table Calculation, and Remove. The 'Table (down)' option is highlighted with a blue box and a cursor. A cyan bracket on the right side groups the 'Compute Using' section and the tooltip.

Compute Using Options:

- Table (across)
- Table (down)
- Table (across then down)
- Table (down then across)
- Pane (down)
- Pane (across then down)
- Pane (down then across)
- Cell
- Specific Dimensions

Addressing & Partitioning

When adding table calculations, you must use all dimensions in the level of detail for either **partitioning** (scoping) or for **addressing** (direction)

Table Calculation
% of Total Sales

Calculation Type
Percent of Total

Compute total across all pages

Compute Using

- Table (across)
- Table (down)
- Table
- Cell
- Specific Dimensions**

Year of Order Date (MDY)

State

At the level

Sort order Specific Dimensions

Show calculation assistance

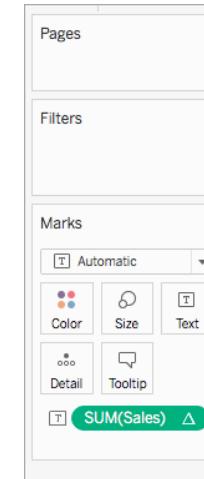
Addressing Fields

Define the *direction* in which a calculation is evaluated (i.e down, across, across then down)

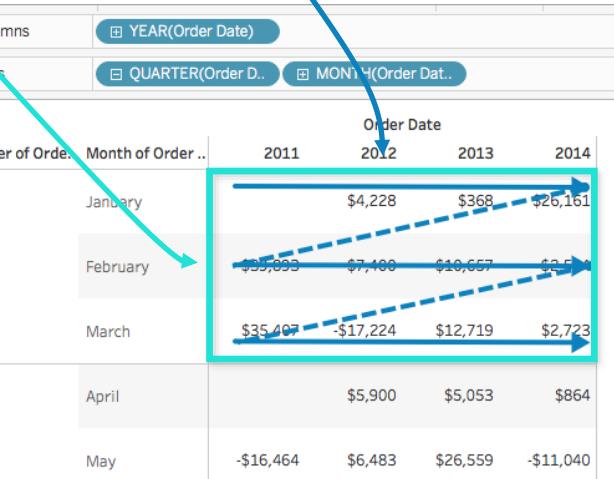
Partitioning Fields

Define the *level or group* at which table calcs are evaluated (i.e cells, tables, panes)

Pane / Partition



Across then down



PRO TIP: Re-order the addressing fields to change the direction of the calculation

Addressing & Partitioning Examples

Table (across)

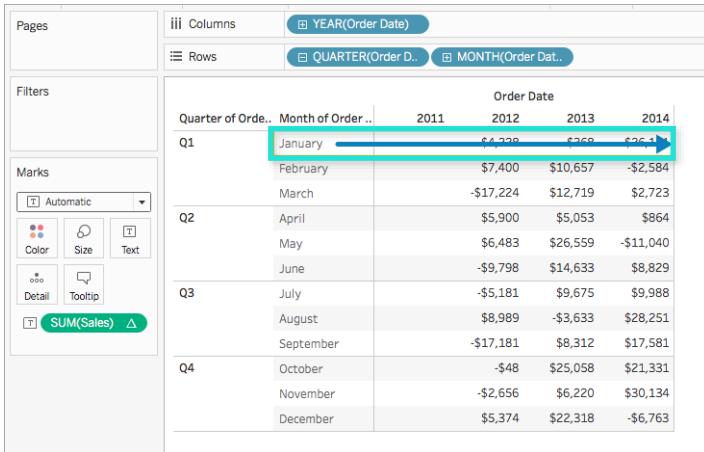


Table (down)

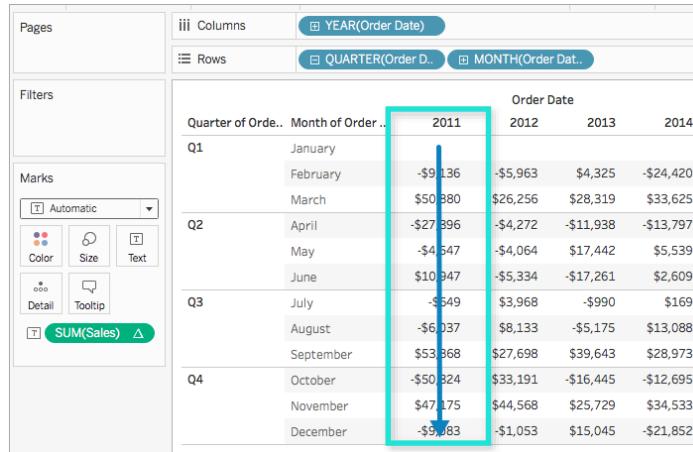
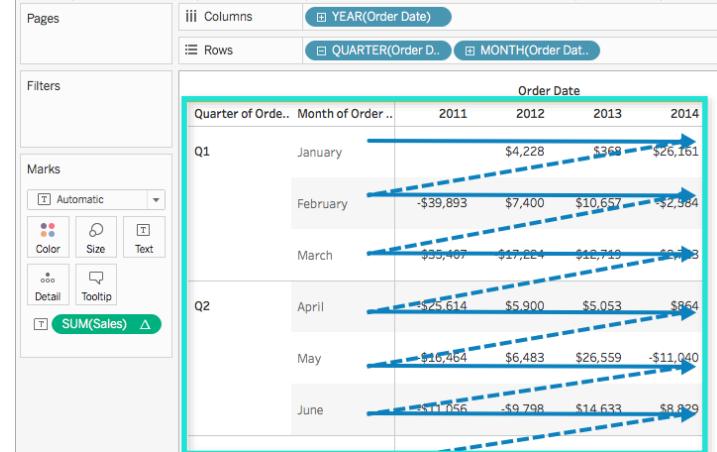
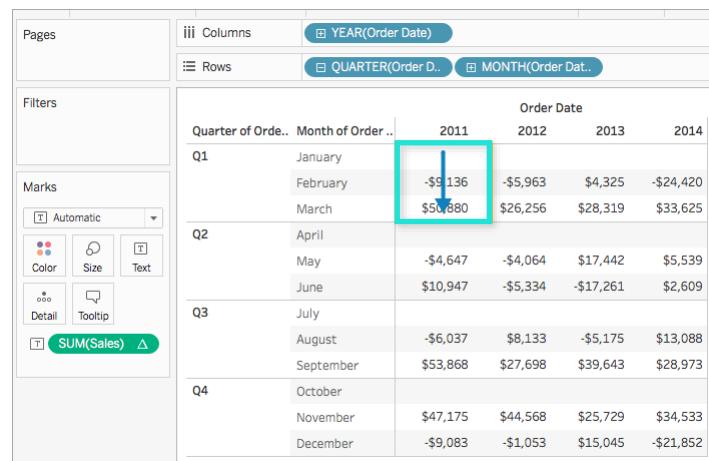


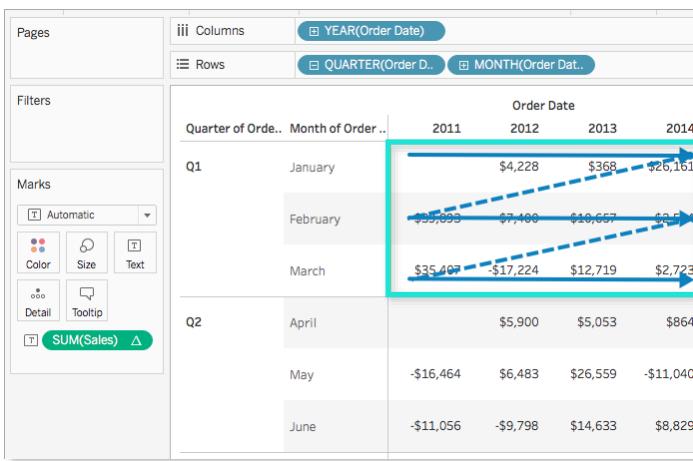
Table (across then down)



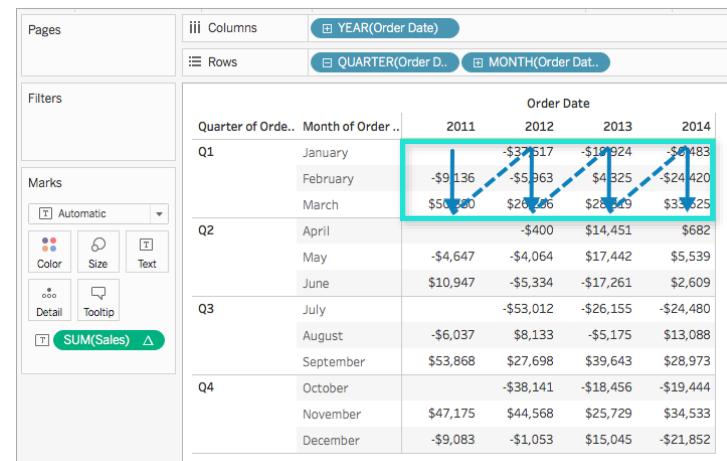
Pane (down)



Pane (across then down)



Pane (down then across)



Parameters

Parameters are dynamic values that can replace constants in calculations, filters, or reference lines



Benefits:

- Independent of data source
- Faster than filters
- Dynamically update (2020.1 and above)
- Work with Parameter Actions
- Can apply across Data Sources / Sheets
- Pass to/from other applications (on web)



Limitations:

- Single Select Only
- No logic embedding
- Missing “All” Option (*can be added with calc field*)



Parameter actions add powerful functionality and dynamic capabilities to parameters (*this will be covered in depth in a separate, advanced Tableau course*)

Creating Parameters

The screenshot shows the Tableau desktop interface with a data source named "Orders++ (SuperStore ...)" loaded. A bar chart titled "Sheet 11 (2)" displays "Customer Name" on the Y-axis and "SUM(Sales)" on the X-axis (ranging from 0K to 45K). The chart shows sales for various customers, with the top 10 highlighted in blue. A filter dialog titled "Filter [Customer Name]" is open, showing the "Top" tab selected. The "By field:" section has "Top N Parameter" selected, with a dropdown menu open showing options like "Enter a Value...", "Create a New Parameter...", "Sales Threshold", and "Top N Parameter". The "By formula:" section shows "Top" with a value of "10".

On the left side of the interface, there is a context menu for a field named "Customer Name". The menu items include "Create Calculated Field...", "Create Parameter...", "Create Folder (use group by folder)", "Group by Folder", "Group by Data Source Table", "Sort by Name", "Sort by Data Source Order", "Hide All Unused Fields", and "Show Hidden Fields". The "Create Parameter..." option is highlighted.

A second context menu is shown in a separate window titled "Create Parameter". It allows setting a name ("Test Parameter"), data type ("String"), current value, display format, and allowable values ("All", "List", "Range"). Below this is a "List of values" table with columns "Value" and "Display As", which currently contains the placeholder "Click to add new value". Buttons for "Add from Parameter", "Add from Field", and "Paste from Clipboard" are available, along with "OK" and "Cancel" buttons at the bottom.

Create from Filter

Edit a **Top** filter to create new parameters on the fly

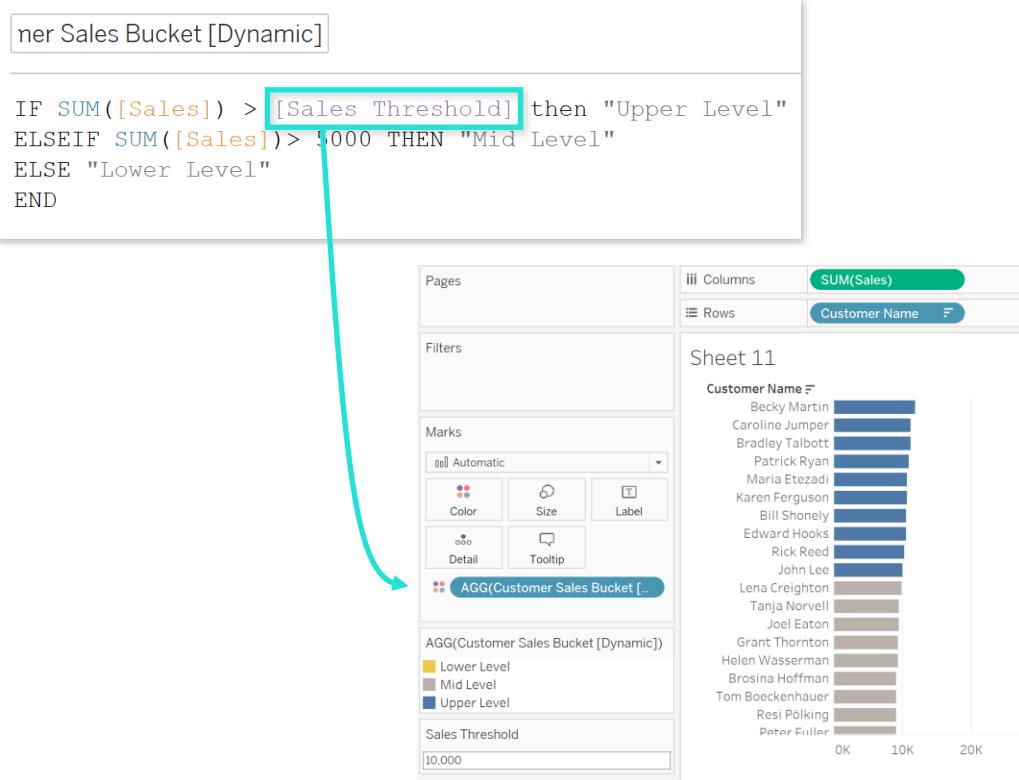
Create from Field

Right-click a field and choose **Create > Calculated Parameter**

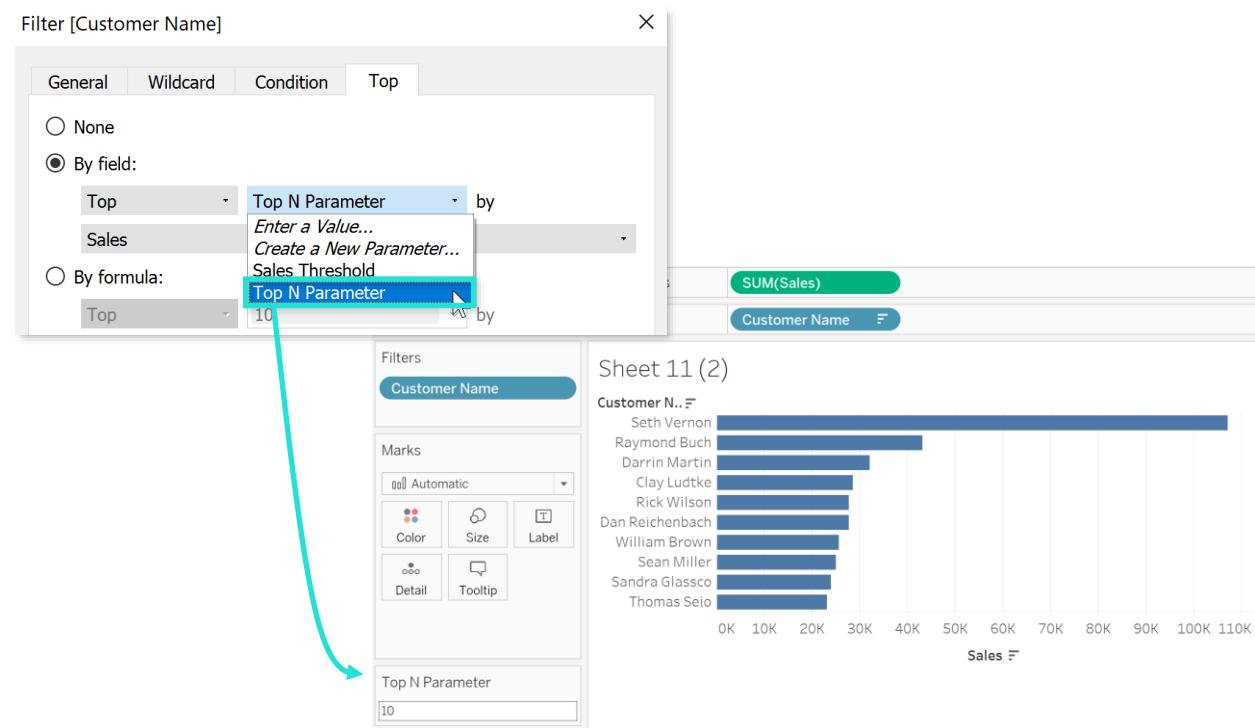
NOTE: If no field is selected, the window will open with no field chosen

Common Uses for Parameters

Custom Thresholds:

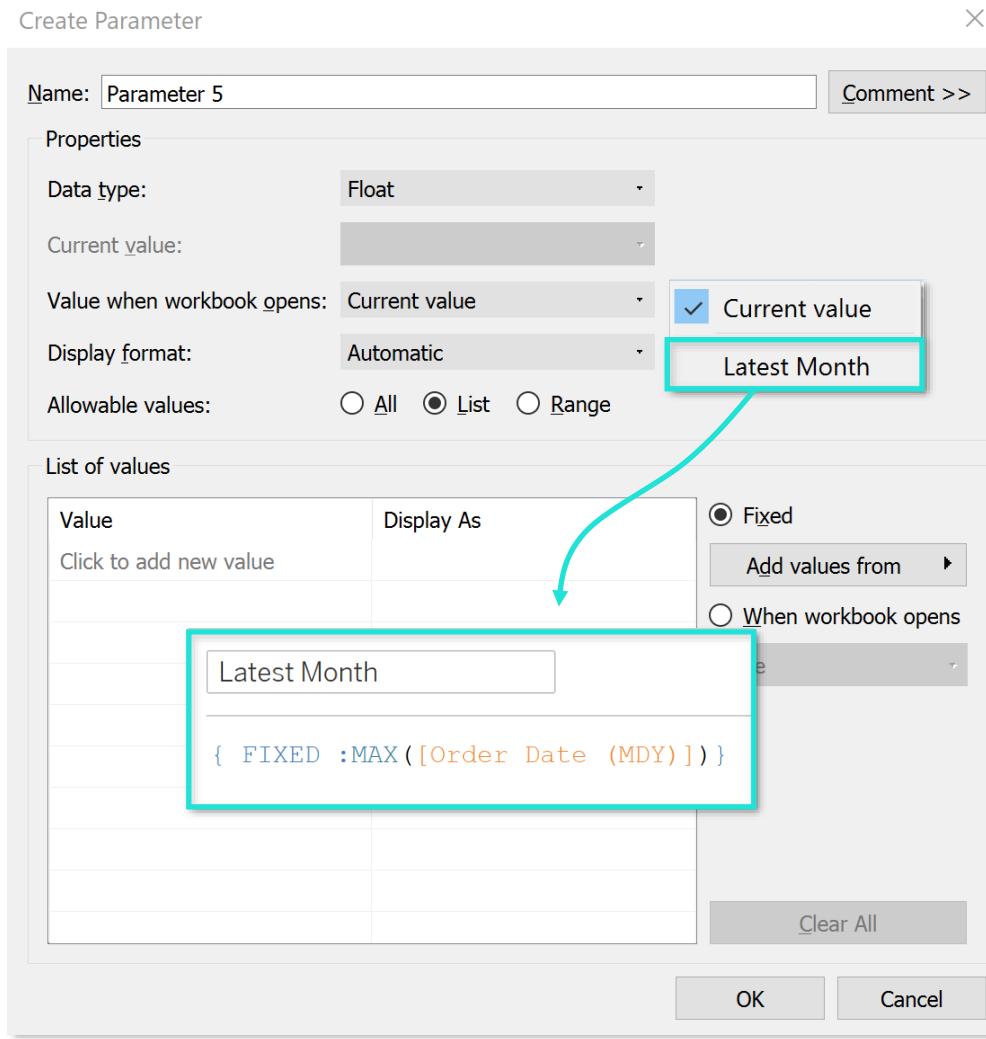


Dynamic Top N Filters:



PRO TIP: Parameters can impact data source-level filters (other field types can't!)

Customizing Parameters



Name

Assign a name to your parameter (make sure it's intuitive and easy to find!)

Data Type

Select Float, Integer, String, Boolean, Date, Date & Time, etc.

Value When Workbook Opens

Allows your parameter to dynamically update when a workbook is opened

Current Value

Default value to be selected in the parameter

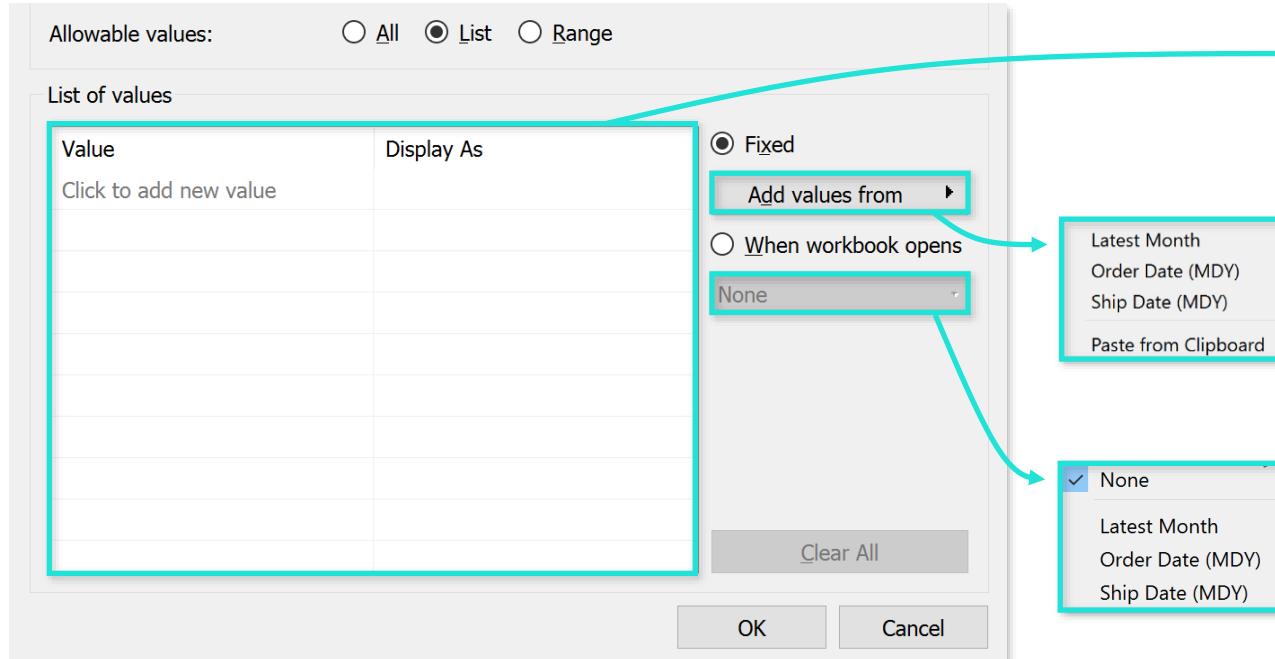
Display format

Control how parameters appear (not how the raw data is formatted)

Allowable Values:

- **All:** No restriction within data type
- **List:** Only those specified in a list
- **Range:** Only values within a specified range

Customizing Parameters



List

Includes a list of *Values* (raw fields) and *Display As* (aliases)

Fixed

Adds values from an existing field, parameter or from the clipboard, which will **NOT** change or update without manual intervention

When Workbook Opens

Automatically updates the parameter value based on specified fields

- **NOTE:** Parameter values will not update under the following conditions:
 - Data in field is *not compatible*
 - Data in field returns *multiple values*
 - Data in field is *null*
 - Field is *not present* in data source (removed)

HOMEWORK: Calculated Fields, Table Calcs & Parameters

THE **SITUATION**

You've begun to develop quite a reputation around town for your analytics skills, and just landed a contract with **Risky Business Insurance Co.** to help shore up the team's business intelligence capabilities.

THE **BRIEF**

For your first project, you've been asked to analyze customer data from a recent acquisition. You'll need to calculate new KPIs, create dynamic views, and visualize the data to effectively highlight key patterns and trends.

THE **OBJECTIVE**

Use Tableau Desktop to:

- Create calculations, table calcs & LOD calculations
- Leverage parameters for dynamic views
- Use the analytics pane to highlight trends



Dashboards & Stories

Tableau Dashboards

Dashboards are a collection of **views** (sheets) and **objects** (images, containers, web content, etc.) which together provide a holistic view across sources

- When designing dashboards, it's important to consider the **purpose**, **audience**, and **consumption** mode

Purpose



- What's the **end goal** or **intention** of your analysis?
- Are you presenting a **conclusion** or a **question**?

Audience



- Who will be using the dashboard (analysts, execs, general public)?
- How recent must the data be?
- How much data needs to be included in the dashboard?

Consumption



- How will users **access** your dashboards (laptop, desktop, phone)?
- Where will users **interact** with the dashboard (local file, Tableau Server)?

Dashboard Layout

Dashboard Pane

The Dashboard pane is the primary workspace for creating dashboards. It includes:

- Device Preview:** Allows you to view your dashboard on different devices.
- Size:** Set the size of the dashboard (e.g., Desktop Browser (1000 x 8...)).
- Sheets:** Preview workbook sheets (e.g., Table - Sales v. ... and Bars - Sales by ...).
- Objects:** Organize dashboard objects (e.g., Horizontal, Vertical, Text, Image, Web Page) using Tiled or Floating methods.

Layout Pane

The Layout pane provides detailed control over individual sheets:

- Selected item:** Subcategory Sales (with checkboxes for Show title and Floating).
- Position:** Set the position (x, y), width (w), and height (h) of the sheet.
- Border:** Define the border style and color.
- Background:** Set the background color.
- Outer Padding:** Customize padding around the outer edges.
- Inner Padding:** Customize padding around the inner content.
- Item hierarchy:** Sales Dashboard > Tiled > Horizontal > Tiled > Subcategory Sales > Vertical > Profit.

Use **device preview** to view dashboards on different device types

Dashboard size can be either fixed, automatic, or range

Preview workbook sheets before bringing them into the dashboard

Dashboard objects enable organization, extensibility, and design

Sheets and Objects can be positioned using either **Tiled** or **Floating** methods

Control **title display** and **tiled/floating** options for the selected sheet

Control **sheet size (W,H)** and **position (X,Y)**

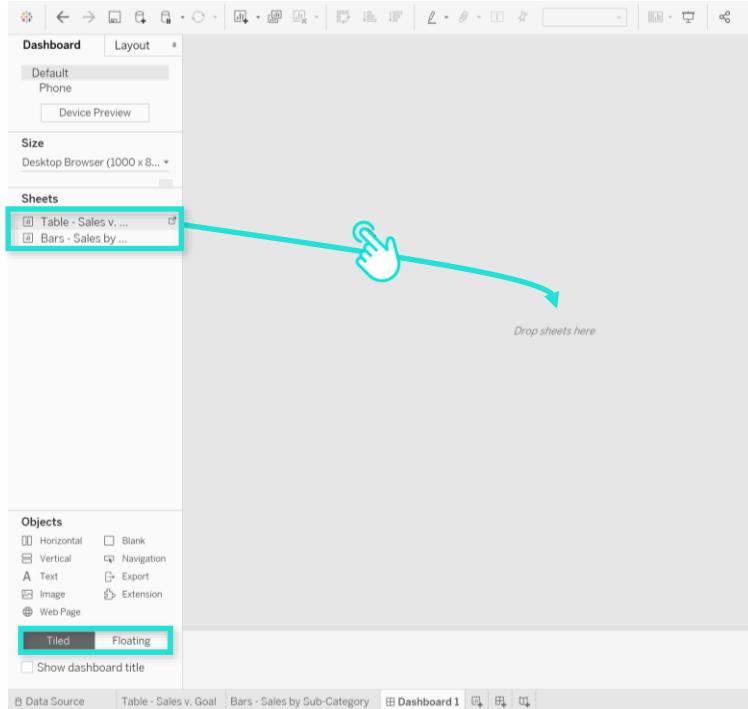
Control **sheet border color/style** and **background color**

Customize **padding** (white space) on inner and outer portions of the sheet

Determine **sheet/object hierarchy** within the dashboard

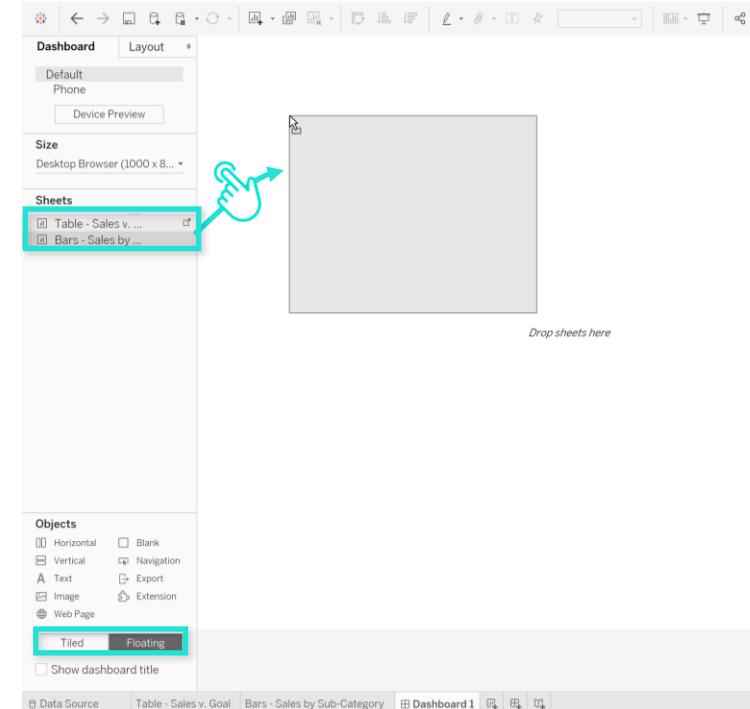
Tiled vs. Floating

Tiled Objects



Tiled mode allows you to snap objects to the dashboard “grid”

Floating Objects



Floating mode allows you to place objects exactly where they are dropped



PRO TIP: Use **tiled** mode when designing for mobile, and **floating** when you need pixel-level precision

Dashboard Sizing

Fixed size
Desktop Browser (1000 x 800)

Width	Height
1000 px	800 px

- Generic Desktop (1366 x 768)
- Desktop Browser (1000 x 800)
- Full Screen (1024 x 768)
- Laptop Browser (800 x 600)
- Web Page Embedded (800 x 800)
- Blog Embedded (650 x 860)
- Small Blog Embedded (420 x 650)
- Column (550 x 1000)
- PowerPoint (1600 x 900)
- Story (1016 x 964)
- Letter Portrait (850 x 1100)
- Letter Landscape (1100 x 850)
- Legal Landscape (1150 x 700)
- A3 Portrait (1169 x 1654)
- A3 Landscape (1654 x 1169)
- A4 Portrait (827 x 1169)
- A4 Landscape (1169 x 827)
- Custom

Fixed Size

Defined width and height, either manually defined or assigned by pre-defined templates

Automatic

The dashboard will resize to fit any screen it is displayed on

Size

min 1624x883 - max 1724x983

Range

Minimum size

Width Height

1624 px 883 px

Maximum size

Width Height

1724 px 983 px

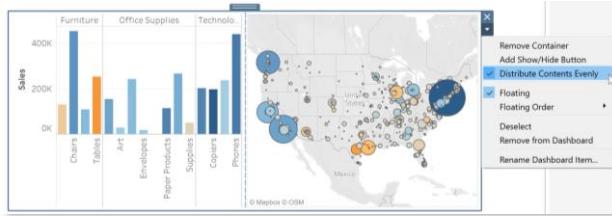
Range

Min and max limit for dashboard sizes.
(this option is not recommended)



PRO TIP: Automatic and range sizing can negatively impact performance and cause unintended formatting issues; **recommend using Fixed Size and Device Designer for optimal dashboard design**

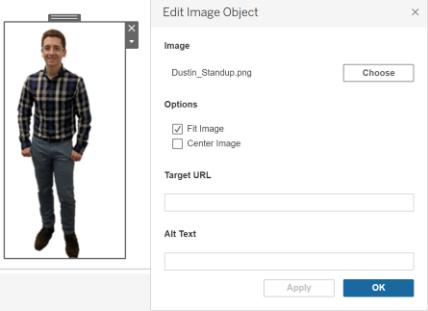
Dashboard Objects



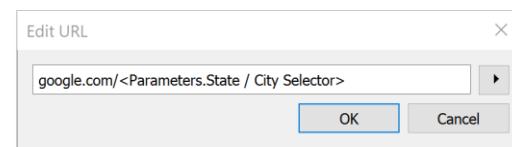
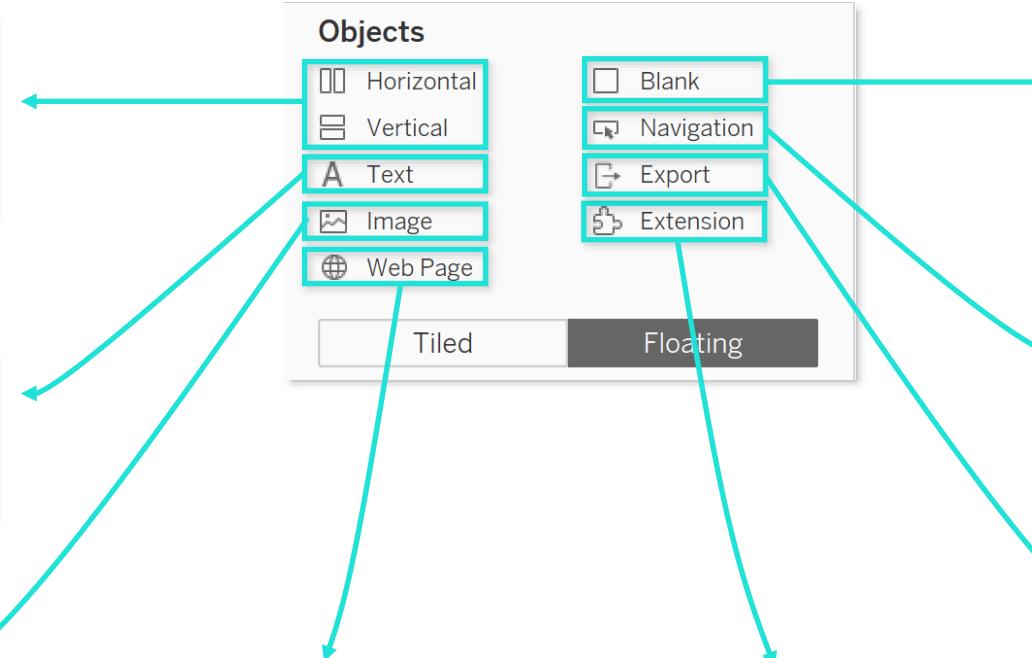
Containers help to organize and distribute objects within defined spaces



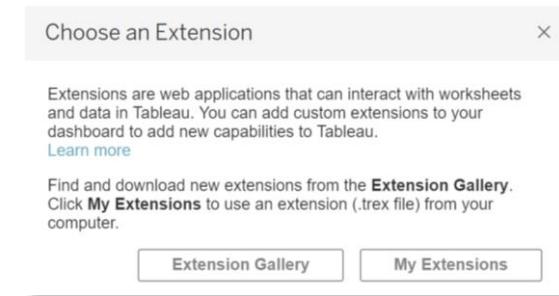
Text boxes can display flat text or parameters



Images can be embedded with tooltip and URL link options



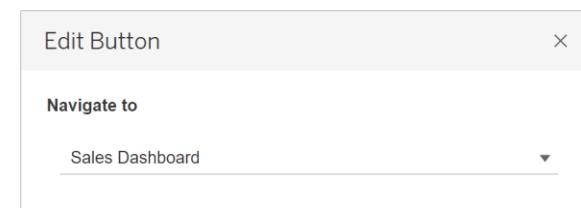
Web Page objects embed websites into the dashboard



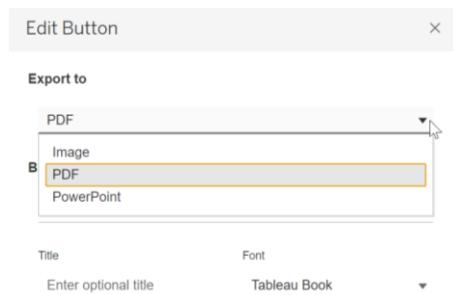
Extensions bring web application functionality to dashboards



Blank objects can create space and cover objects not to be selected



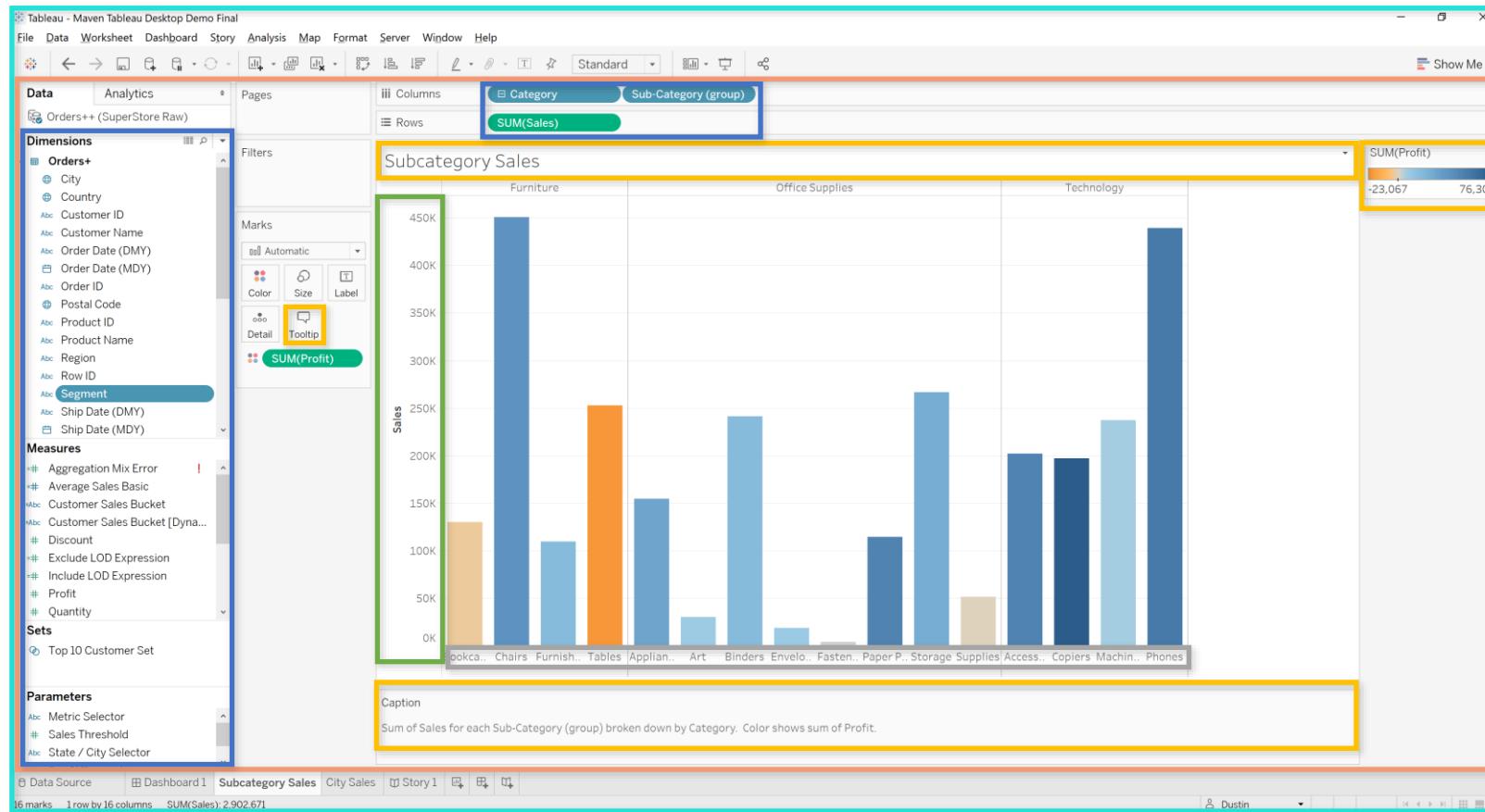
Navigation Buttons enable streamlined navigation between dashboard pages



Export Buttons enable export to image, pdf, and PowerPoint

Formatting Options

Tableau features a variety of **formatting** tools (fonts, shading, alignment, borders, etc.), which can be applied at **various levels** within a workbook



- Workbook
- Worksheet
- Titles, Captions, Tooltips, Legends
- Fields & Field Labels
- Numbers & Null Values
- Text

Workbook-Level Formatting

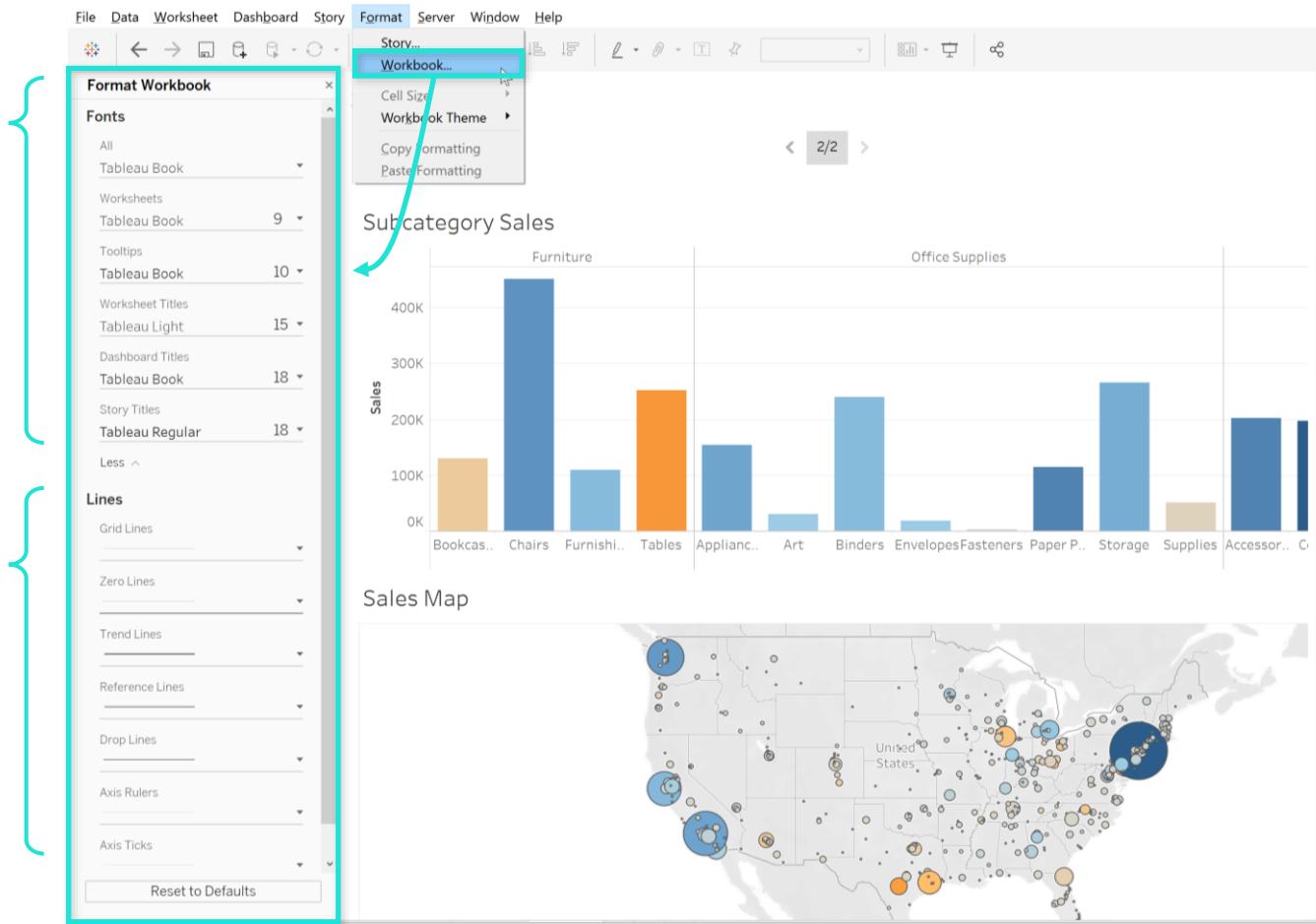
Workbook-level formatting tools (fonts and lines) apply to **every sheet** in the current workbook

Workbook-Level Fonts:

- All
- Worksheets
- Tooltips
- Worksheet Titles
- Dashboard Titles
- Story Titles

Workbook-Level Lines:

- Grid Lines
- Zero Lines
- Trend Lines
- Reference Lines
- Drop Lines
- Axis Rulers
- Axis Lines



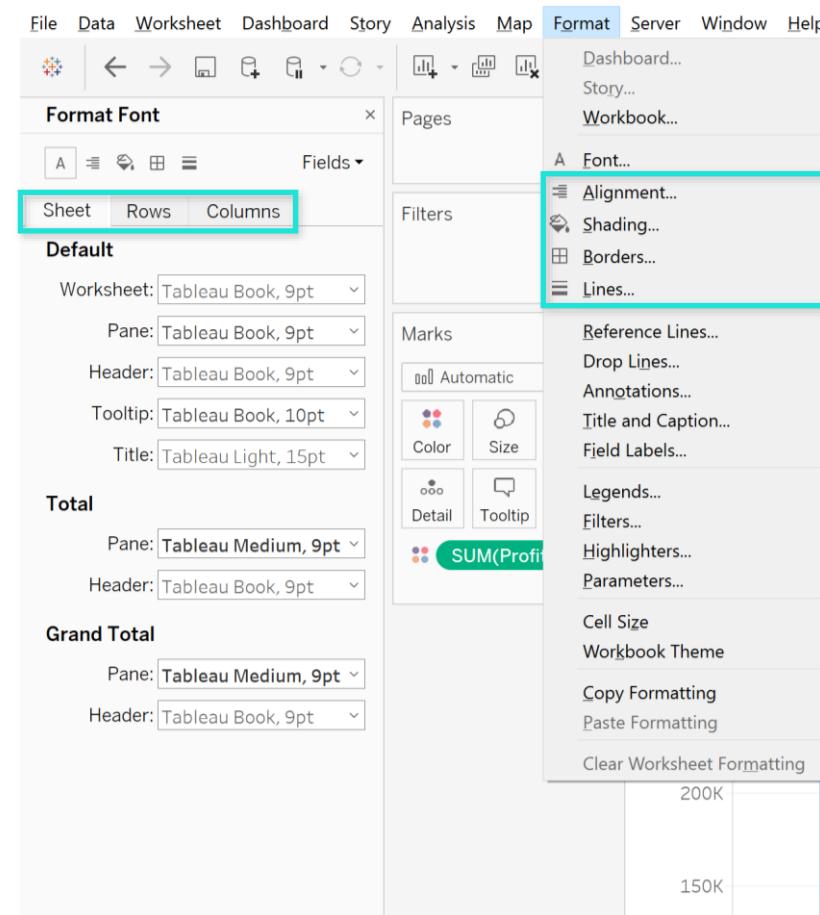
Worksheet-Level Formatting

Worksheet-level formatting tools (font, borders, shading, etc.) apply to a single sheet in the workbook

Sheet
Formatting applies to all fields on the **rows & columns shelves**

Rows
Formatting applies only to fields on the **rows shelf**

Columns
Formatting applies only to fields on the **columns shelf**



Font
Adjust font sizing, underline, bold, color

Alignment
Adjust alignment vertical & horizontal

Shading
Adjust color and banding

Borders
Adjust border color, thickness

Lines
Adjust axis lines, drop lines, zero lines, etc.

Worksheet-Level Formatting Tools

Font

Format Font

Sheet Rows Columns Fields

Default

Worksheet: Tableau Book, 9pt
Pane: Tableau Book, 9pt
Header: Tableau Book, 9pt
Tooltip: Tableau Book, 10pt
Title: Tableau Light, 15pt

Total

Pane: Tableau Medium, 9pt
Header: Tableau Book, 9pt

Grand Total

Pane: Tableau Medium, 9pt
Header: Tableau Book, 9pt

Clear

Alignment

Format Alignment

Sheet Rows Columns Fields

Default

Pane: Automatic
Header: Automatic

Total

Pane: Automatic
Header: Automatic

Grand Total

Pane: Automatic
Header: Automatic

Clear

Shading

Format Shading

Sheet Rows Columns Fields

Default

Worksheet: []
Pane: None
Header: None

Total

Pane: None
Header: None

Grand Total

Pane: None
Header: None

Row Banding

Pane: []
Header: []
Band Size: []
Level: []

Column Banding

Pane: []
Header: []
Band Size: []
Level: []

Clear

Borders

Format Borders

Sheet Rows Columns Fields

Default

Cell: None
Pane: None
Header: None

Total

Pane: None
Header: None

Grand Total

Pane: []
Header: []

Row Divider

Pane: []
Header: []
Level: []

Column Divider

Pane: []
Header: []
Level: []

Clear

Lines

Format Lines

Sheet Rows Columns Fields

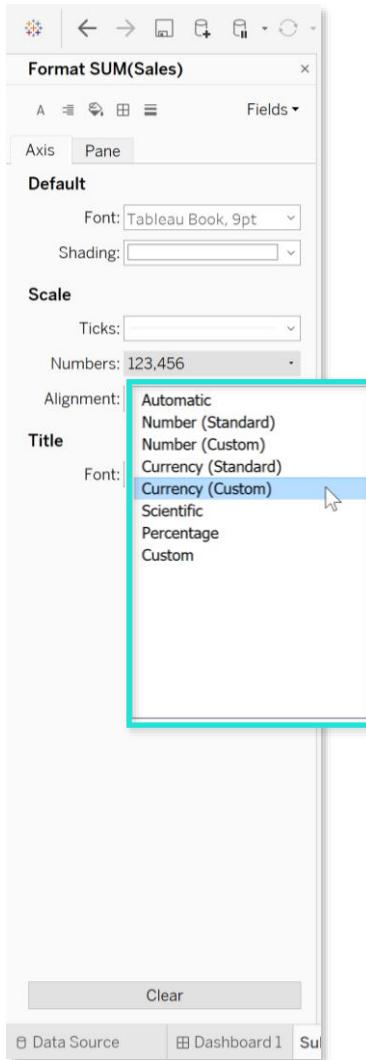
Lines

Grid Lines: None
Zero Lines: []
Trend Lines: []
Ref Lines: []
Drop Lines: []
Axis Rulers: None
Axis Ticks: []

Clear

Number Formatting

Axis Tab



Automatic

Format decided by the field type

Number (Standard)

Format based on locale selected

Number (Custom)

Custom options for decimals, suffix, units, negatives, thousand separators, etc.

Currency (Standard)

Currency format based on locale selected

Currency (Custom)

Custom options for decimals, suffix, units, negatives, thousand separators, etc.

Scientific

Format displayed in scientific notation

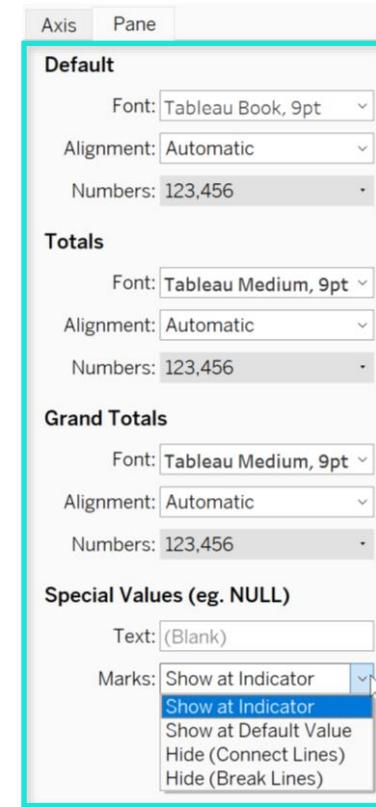
Percentage

Format as a percentage

Custom

Additional custom formatting options

Pane Tab



Default

Specify default number format & alignment

Totals

Customize format for Total values

Grand Totals

Customize format for Grand Total values

Special/NULL

Specify how to handle NULL values (connect lines, break lines, show at default value, etc.)

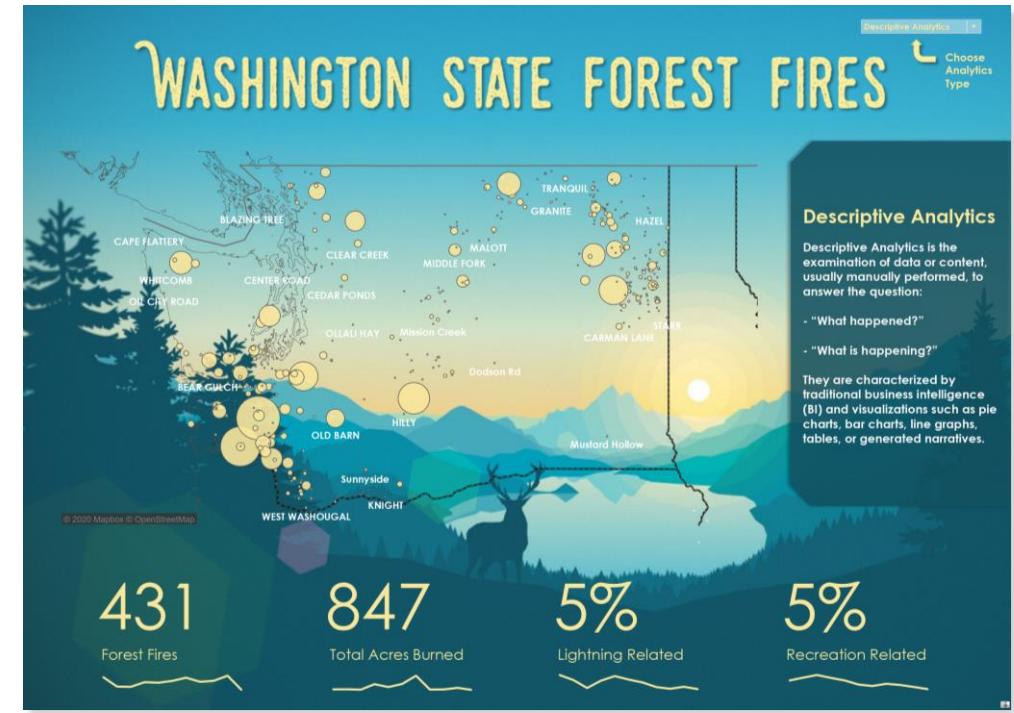
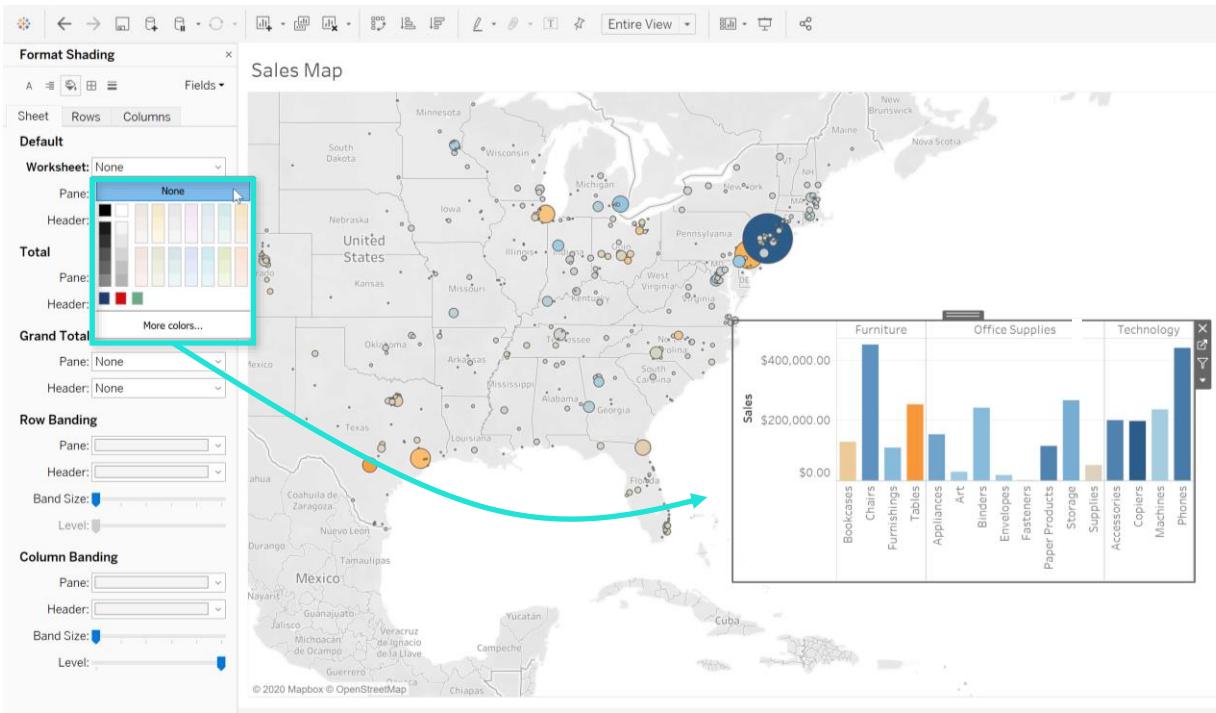


PRO TIP: Use the Default field properties to apply consistent formatting throughout a workbook

PRO TIP: Transparent Sheets

Transparent sheets allow you to creatively layer or “stack” objects and visuals on a dashboard

- This technique is particularly useful for layering visualizations on top of images to create custom designs



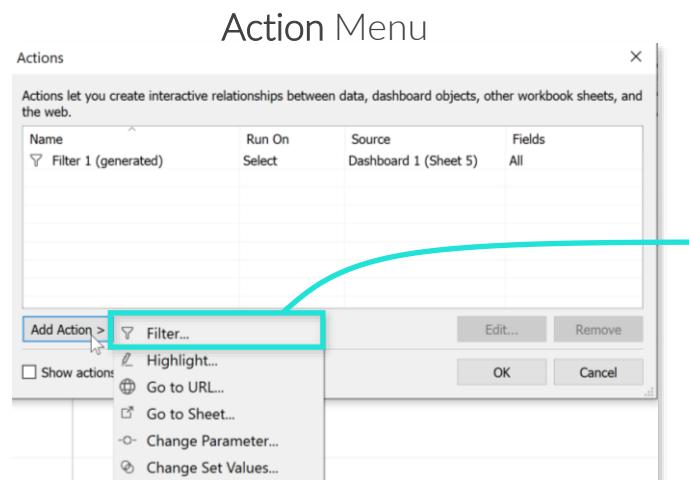
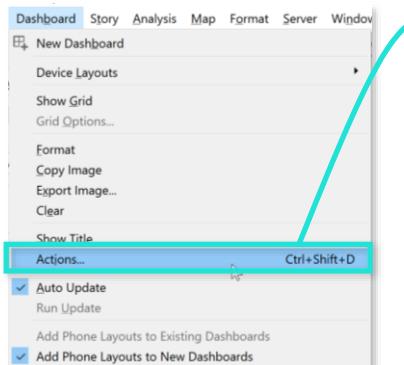
Action Filters

Action Filters allow end-users to apply dashboard filters by directly selecting visual components

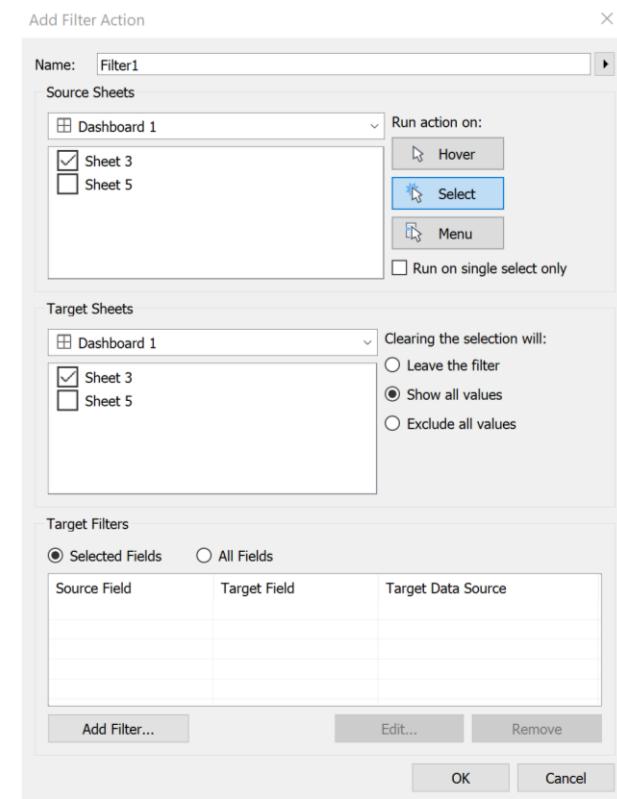
Use as Filter



Dashboard > Actions



Edit Filter Action Menu



Source Sheets:

Select dashboards/sheets to push the action from

Run Action On:

Choose to action on Hover, Select, or Menu

Target Sheets:

Select sheets that will be impacted by the action

Clearing the Selection:

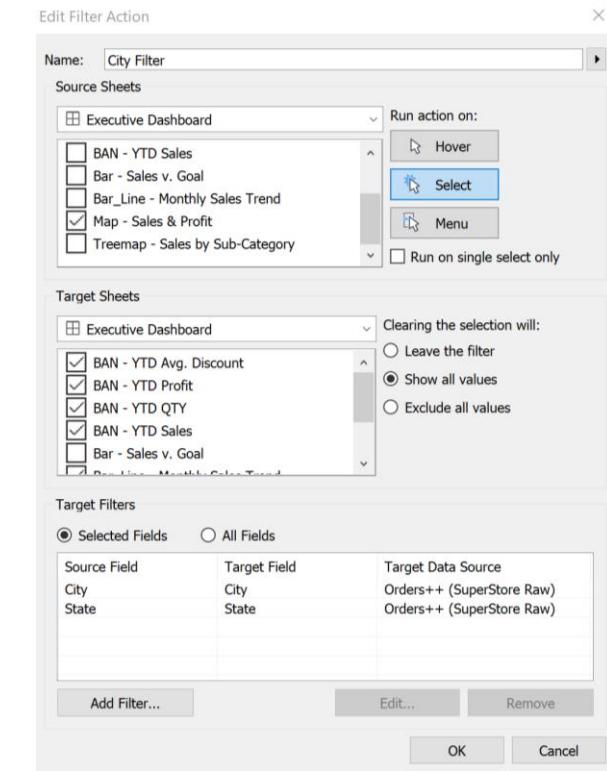
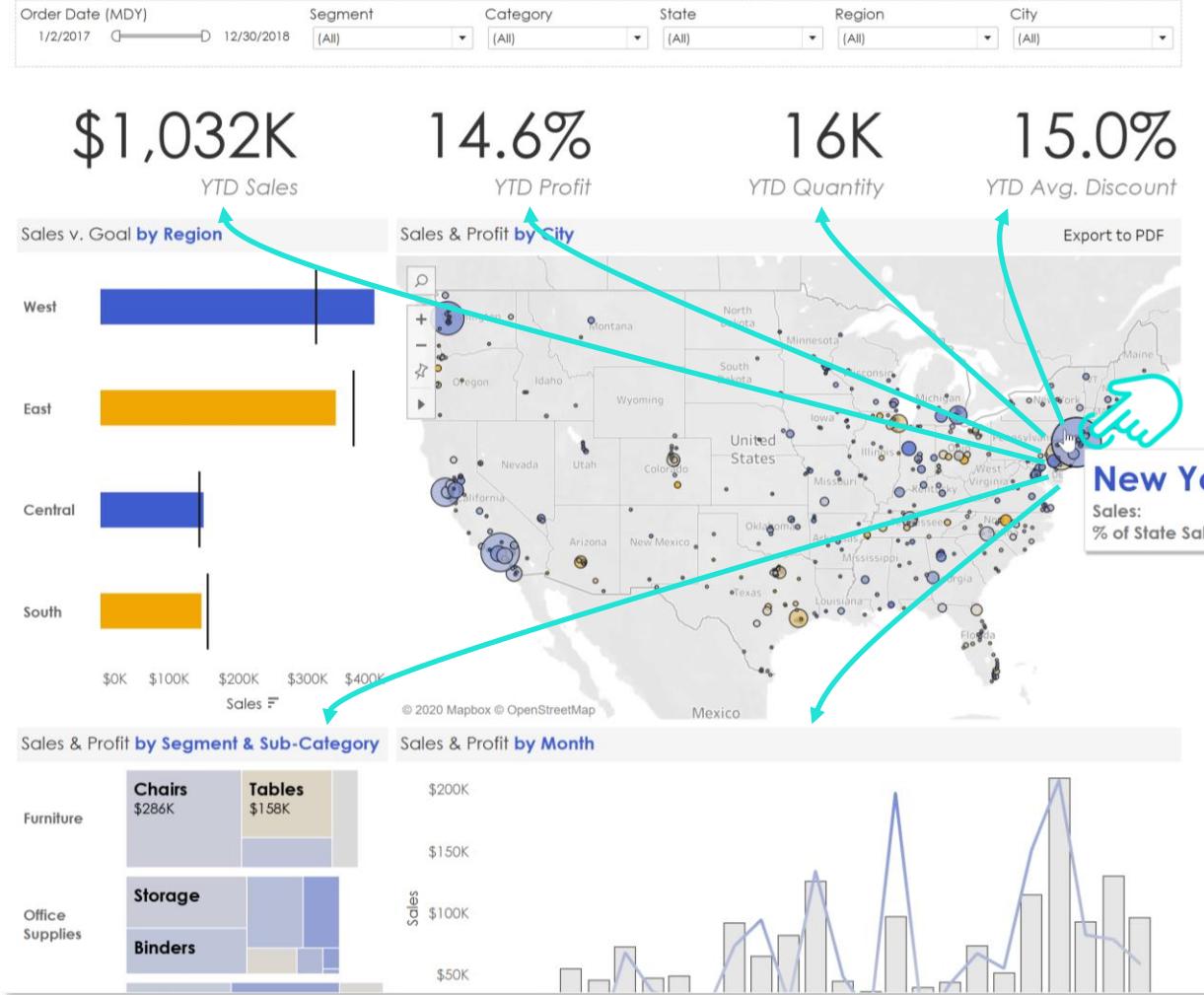
Define what happens when the selection is cleared

Target Filters:

Define which field is used to filter and which field it impacts

Action Filters Example

Executive Retail Sales Analytics

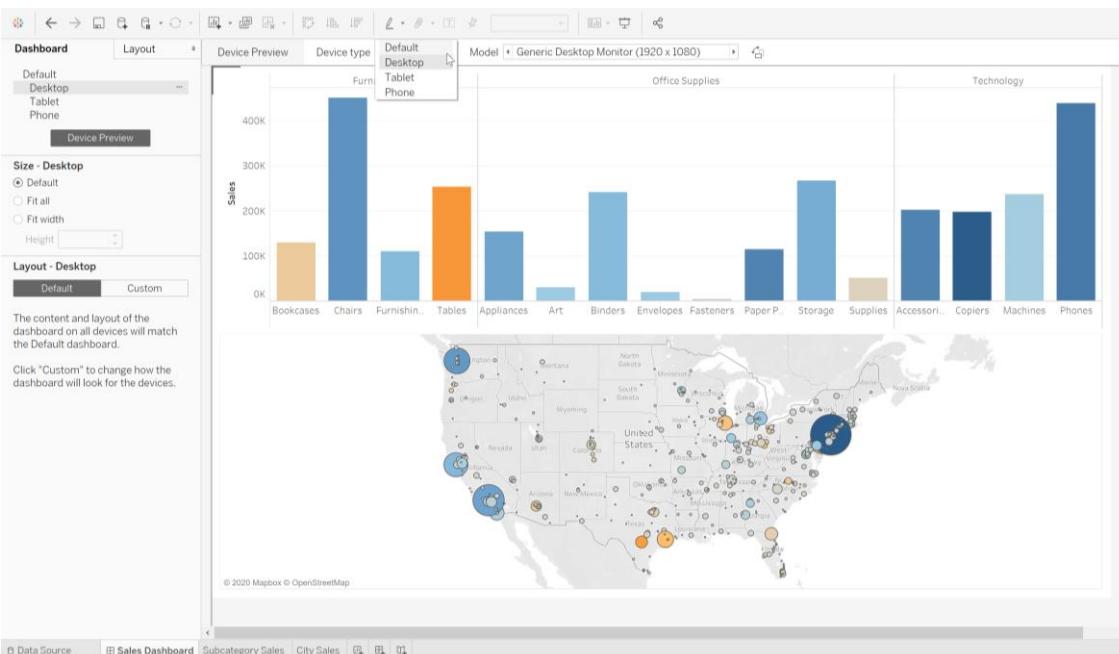


Device Designer

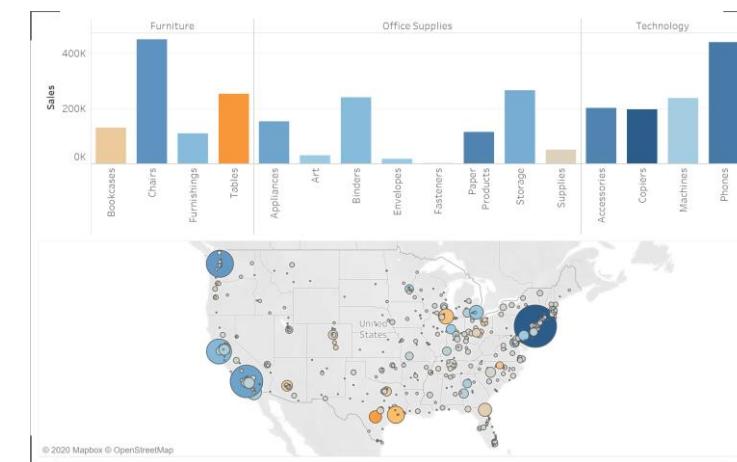
The **Device Designer** allows you to create dashboards specifically sized and optimized for different devices

- The **Default** dashboard is the “parent” view which supports desktop, tablet and phone views; any sheet, action, legend, or object **must exist in the default dashboard** in order to be used in another view

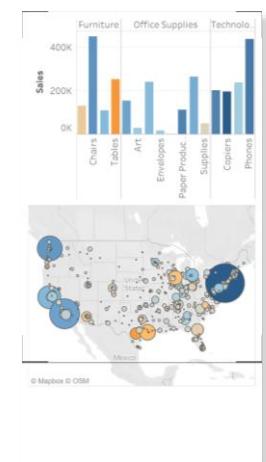
Desktop View



Tablet View

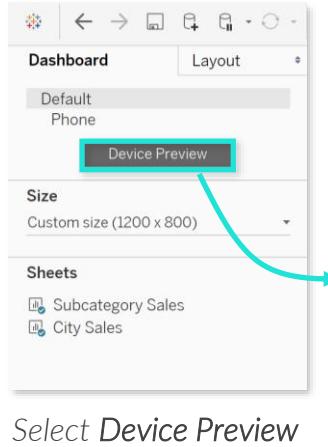


Mobile View

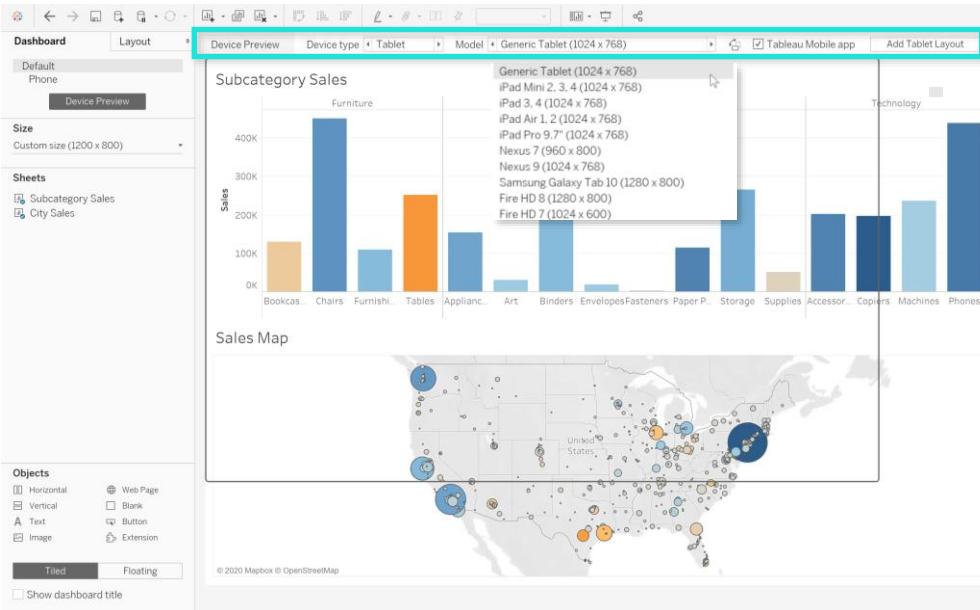


NOTE: To add a phone layout, select **Dashboard > Add Phone Layouts to Existing/New Dashboard**

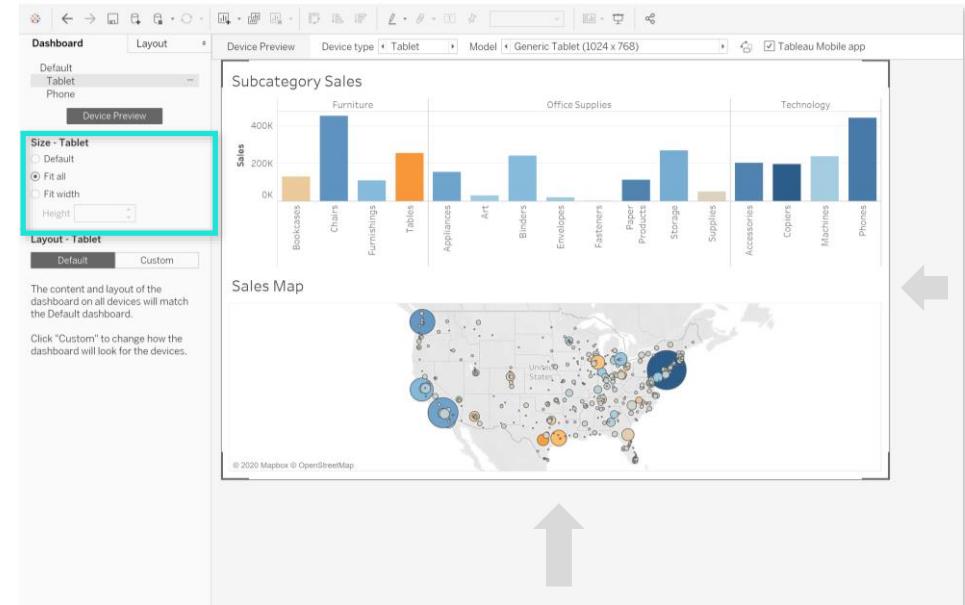
Enabling Device Designer



Select Device Preview



Choose Device Type, select a Model, and Add the Layout



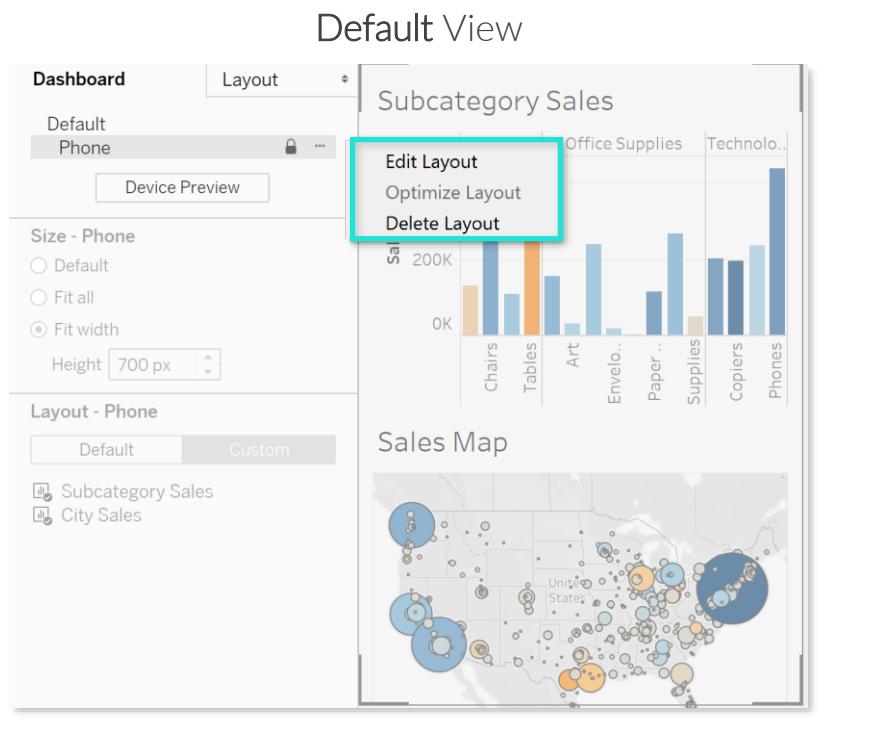
Adjust the Size to Default, Fit All, or Fit Width

Automatic Phone Layouts

Tableau automatically generates a **Phone Layout** when a dashboard is created, which is **locked** by default

- Unlock the phone layout to access size and sheet customization tools (which creates a new, independent layout)

Default View



Dashboard Layout

Default Phone Locked

Device Preview

Size - Phone

- Default
- Fit all
- Fit width

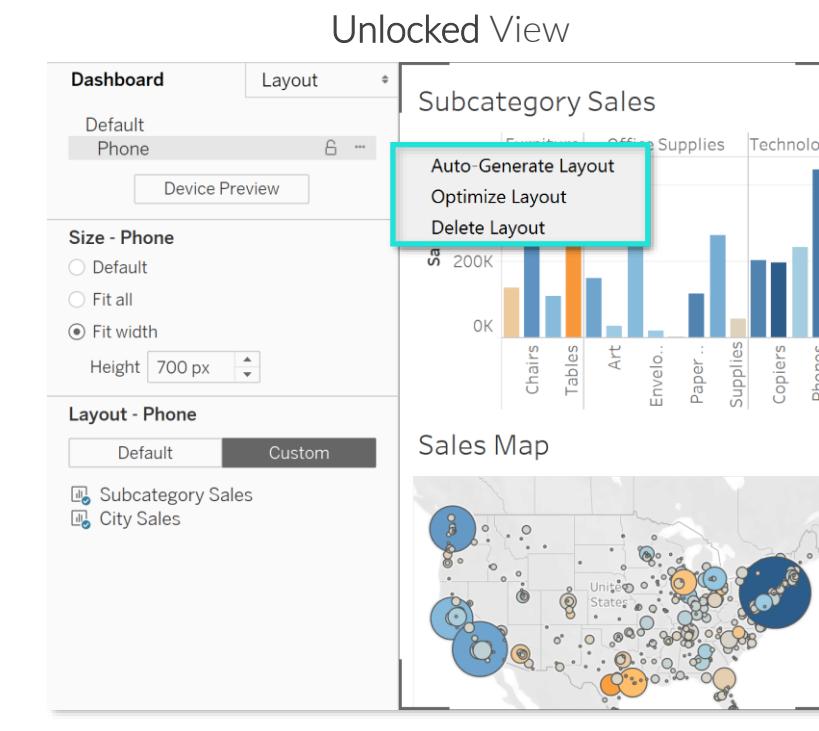
Height 700 px

Layout - Phone

Default Custom

Subcategory Sales City Sales

Unlocked View



Dashboard Layout

Default Phone Unlocked

Device Preview

Size - Phone

- Default
- Fit all
- Fit width

Height 700 px

Layout - Phone

Default Custom

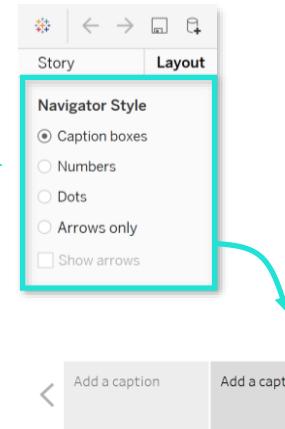
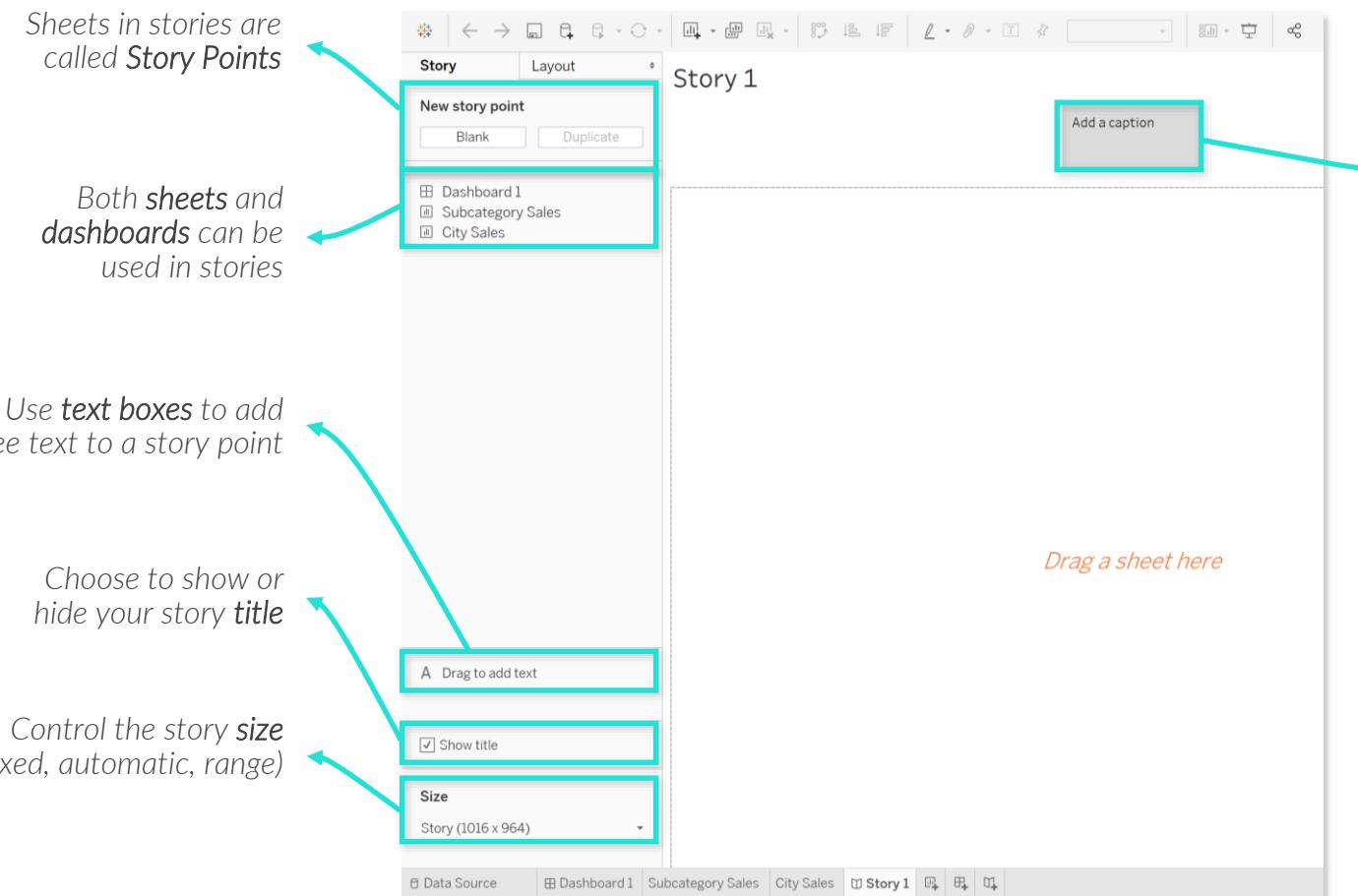
Subcategory Sales City Sales



PRO TIP: Use the **Optimize Layout** option to clean up a manually-created phone layout

Stories

Stories allow you to create visual sequences to build narratives, add context, and bring data to life



Caption Boxes
Annotated, text-based story points

Numbers
Sequential, ordered story points

Dots
Subtle progression between story points

Arrows Only
Minimal controls with numbers & arrows

Data Visualization Best Practices

Know Your Audience

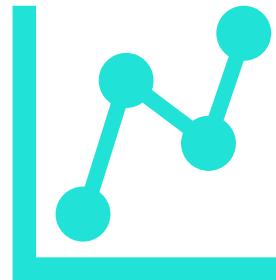


Don't design in a bubble

When building dashboards for others, communicate often and integrate iterative feedback into your design.

Build with your end users in mind, not yourself!

Keep it Simple



Forget the bells & whistles

Don't get caught up in the glitz and glamour of data viz; focus on the clarity of your message and aim to eliminate as much noise as possible.

When in doubt, stick to the basics!

Don't be a Perfectionist



Remember the 80/20 rule

It's easy to go overboard trying to make everything perfect but try to focus on the 20% of factors that drive 80% of the impact.

The only one who will notice your perfect pixel spacing is you!

HOMEWORK: Dashboards & Stories

THE **SITUATION**

You've been hired as a consultant for the **Washington State Department of Energy**, where you will be responsible for planning the electric car charging infrastructure and developing a rebate awareness program.

THE **BRIEF**

All you've been given is an incomplete dashboard from a former colleague, and now you're in charge of taking it to the finish line for an executive planning meeting.

You'll need to build out the dashboard to provide a drill-down profile on current BEV (*Battery Electric Vehicle*) and PHEV (*Plug-in Hybrid Electric Vehicle*) owners across the state.

THE **OBJECTIVE**

Use Tableau Desktop to:

- Design and create a visual dashboard
- Enable dynamic drilldown with action filters
- Format your dashboard for mobile access

