

SELF-STUDY HANDBOOK

Data Analytics & Visualization with Qlik and Tableau

CommunityForce Inc.

Modules in this edition:

- **QT-13** Tableau Platform & Connecting to Data
- **QT-14** Building Views: Pills, Shelves & Axes
- **QT-15** The Tableau Chart Gallery
- **QT-16** Maps in Tableau
- **QT-17** Filters & the Order of Operations
- **QT-18** Groups, Sets, Bins, Hierarchies & Sorting
- **QT-19** Parameters for Interactive Analysis
- **QT-20** Calculated Fields & Time Intelligence
- **QT-21** LOD Expressions & Table Calculations
- **QT-22** Interactive Dashboards & Actions

Screens are from recorded training sessions. Names, avatars and account details are replaced or removed; replaced values are marked DEMO DATA in the videos.

Tableau Platform & Connecting to Data

Video: 13_QT-13_Tableau_Platform_and_Connecting_Data.mp4 · 6:05 · Stage: Development · Audience: Analysts new to Tableau; QT-01 and QT-02 recommended

Learning objectives

- Name the Tableau products and what each is for
- Connect to a file and explore the data source page
- Choose between relationships, joins, unions and blending

The Tableau product family

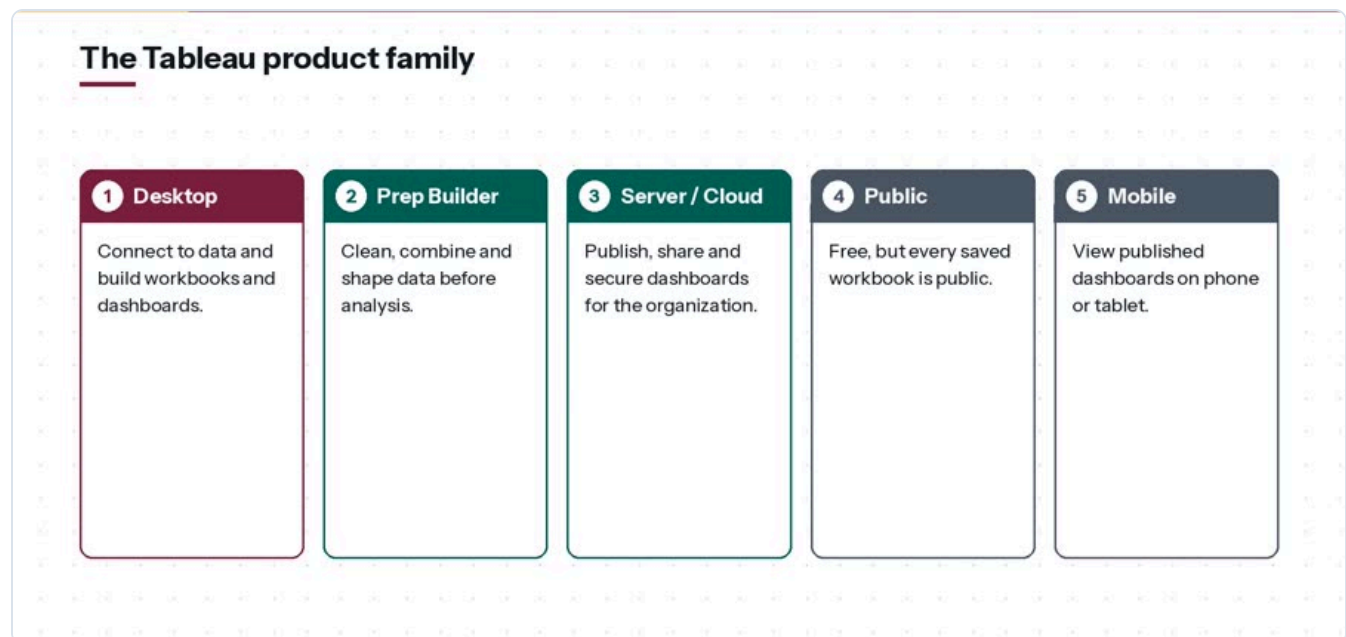
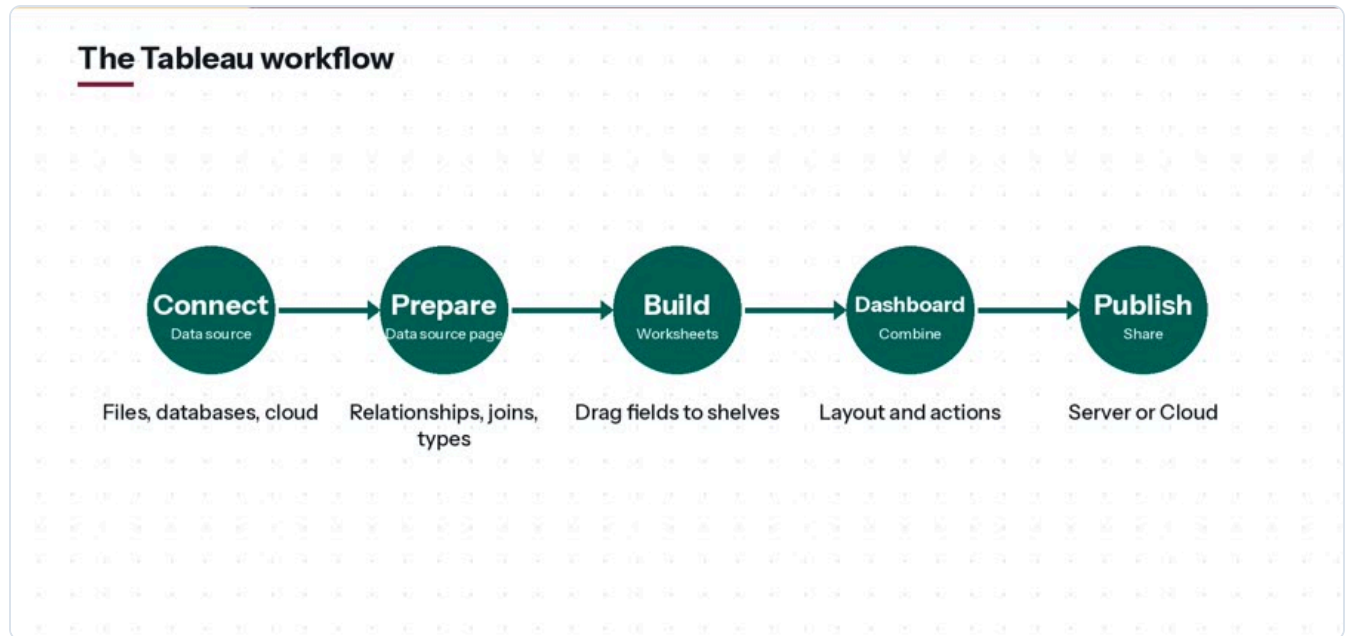


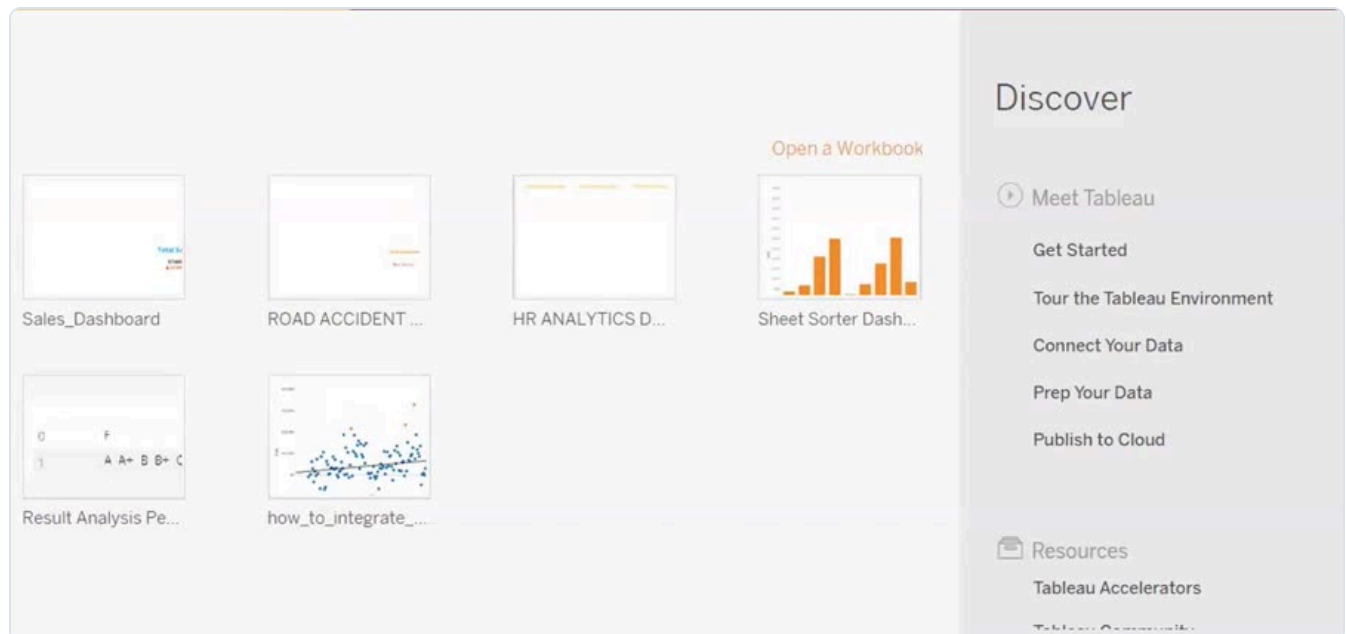
Tableau is a family of products. Tableau Desktop is where analysts connect to data and build workbooks. Tableau Prep Builder cleans and shapes data before analysis. Tableau Server, or the hosted Tableau Cloud, is where an organization publishes, shares, and secures dashboards. Tableau Public is free, but everything you save there is public. And the mobile app lets people view published dashboards on the go.

A typical Tableau workflow has five steps



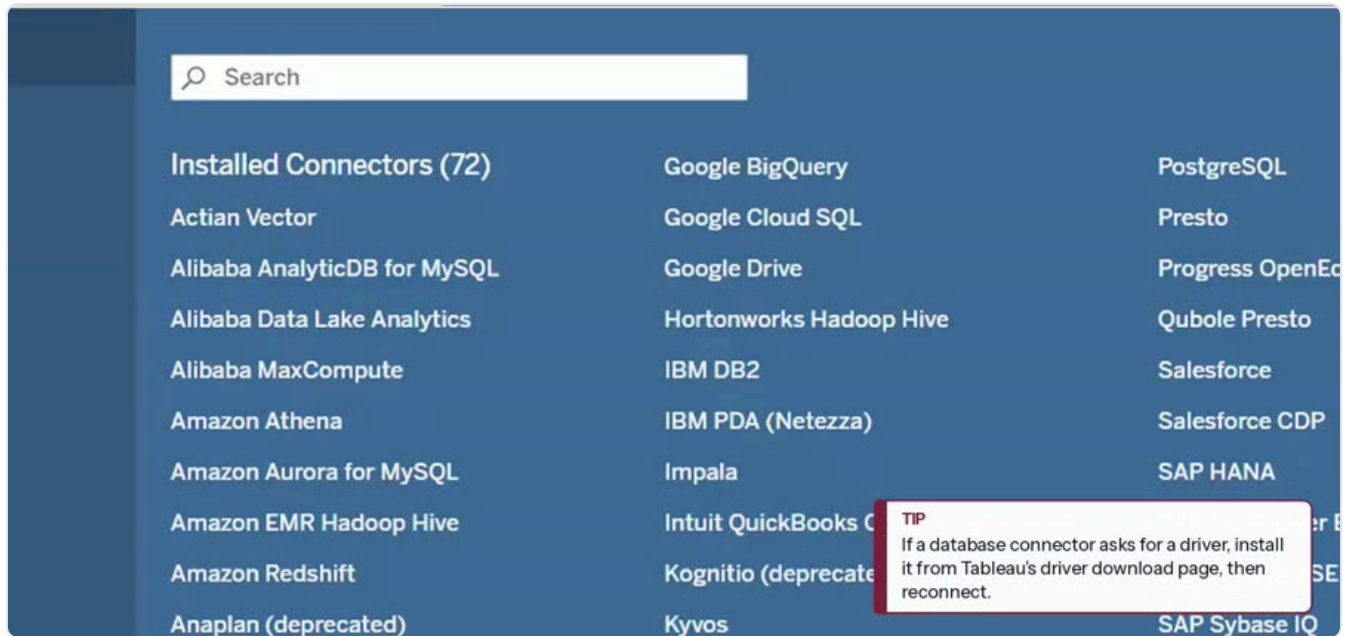
A typical Tableau workflow has five steps. Connect to your data. Prepare it on the data source page. Build views on worksheets. Combine views into dashboards. Then publish and share them through Tableau Server or Tableau Cloud.

This is the Tableau Desktop start page



This is the Tableau Desktop start page. The Connect pane on the left lists the data you can reach. To a File covers Excel, text, JSON, PDF, and spatial files. To a Server covers databases such as Microsoft SQL Server, MySQL, Oracle, and Amazon Redshift. In the center, Open shows your recent workbooks, and Discover on the right links to learning resources.

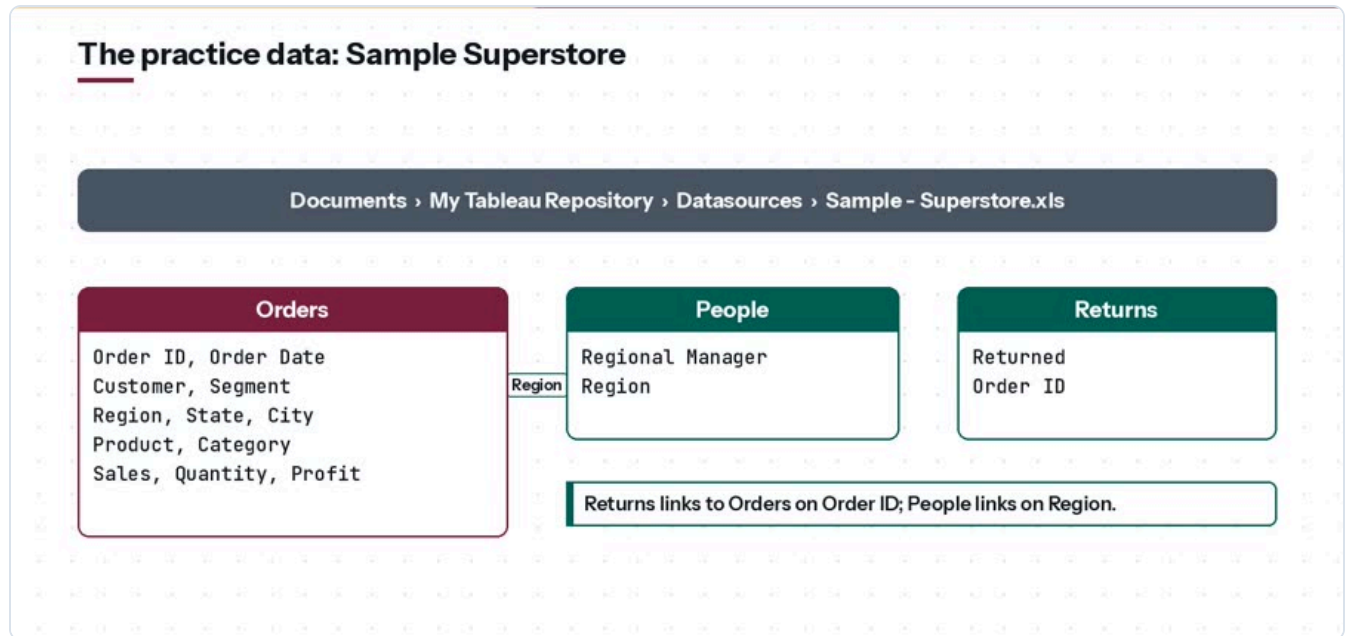
Select More, and Tableau lists every connector



Select More, and Tableau lists every connector. This installation has seventy-two built-in connectors, from cloud warehouses like Snowflake and Databricks to applications like Salesforce, plus additional connectors from partners. Type in the search box to find a source quickly. Built-in connectors need no extra setup, although some databases need a driver installed.

Tip If a database connector asks for a driver, install it from Tableau's driver download page, then reconnect.

The practice data: Sample Superstore



For practice, the trainer used Sample Superstore, an Excel workbook that installs with Tableau. You'll find it in your Documents folder, under My Tableau Repository, then Datasources. It holds three sheets: Orders, with one row per order line; People, with a regional manager for each region; and Returns, listing returned orders.

Connecting opens the data source page



Connecting opens the data source page. The Connections pane shows the Excel workbook, and Sheets lists its tables. Drag Orders onto the canvas. Tableau reports twenty-four fields and ten thousand one hundred ninety-four rows, previews the first hundred rows below, and shows each field's name, type, and source in the metadata grid. At the top right you choose a Live connection or an Extract.

Tableau assigns a data type to every field automatically: number, d...

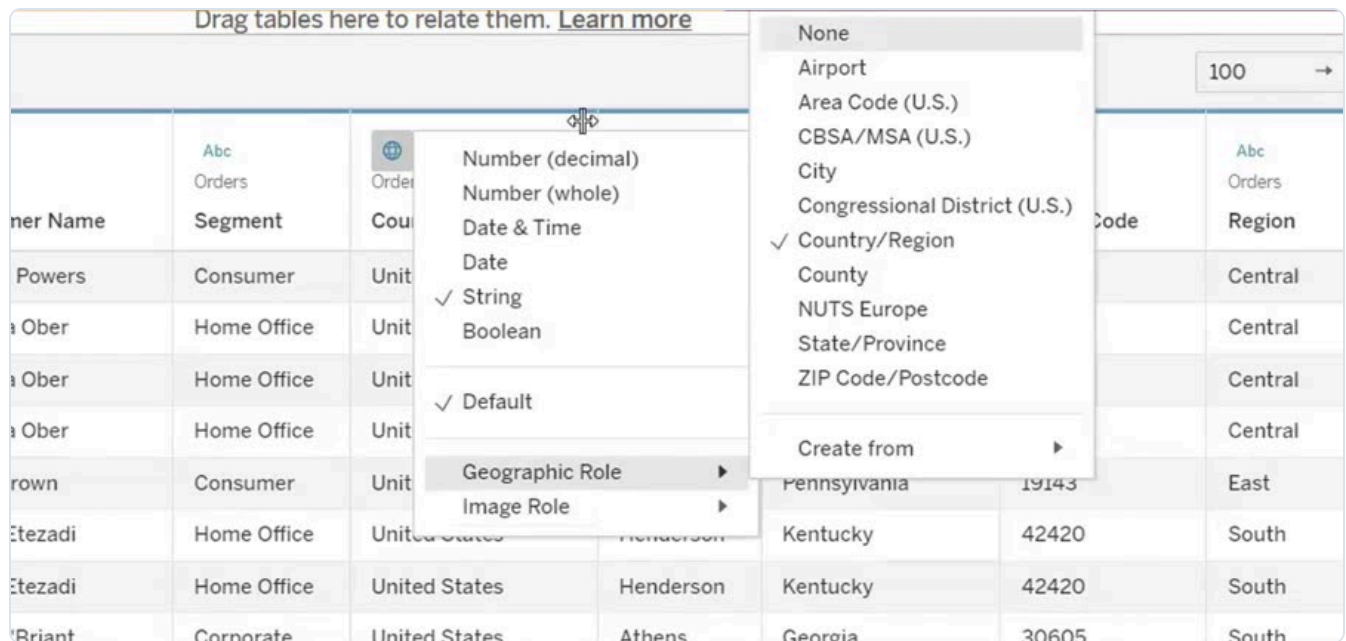
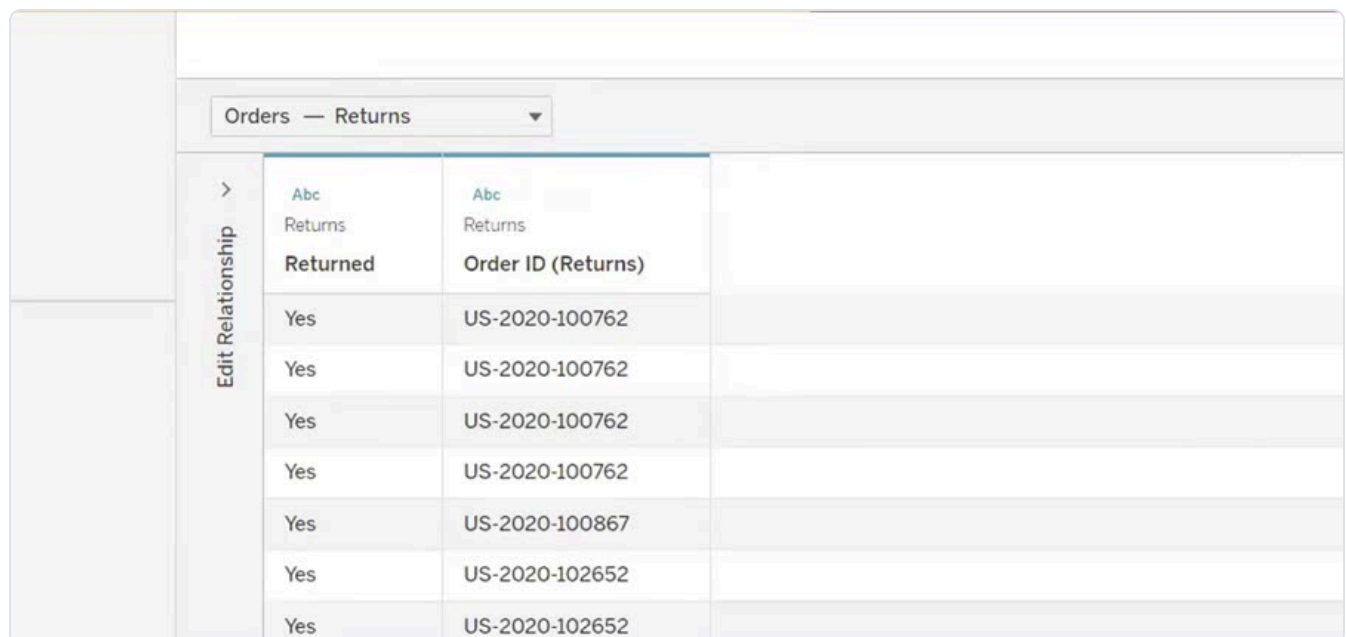


Tableau assigns a data type to every field automatically: number, date, string, or boolean. Select the type icon above any column to change it. Country, state, and city fields also get a geographic role, which lets Tableau plot them on a map. Here the menu shows the roles, such as Country or Region, State or Province, and Zip Code.

Now drag People and Returns onto the canvas



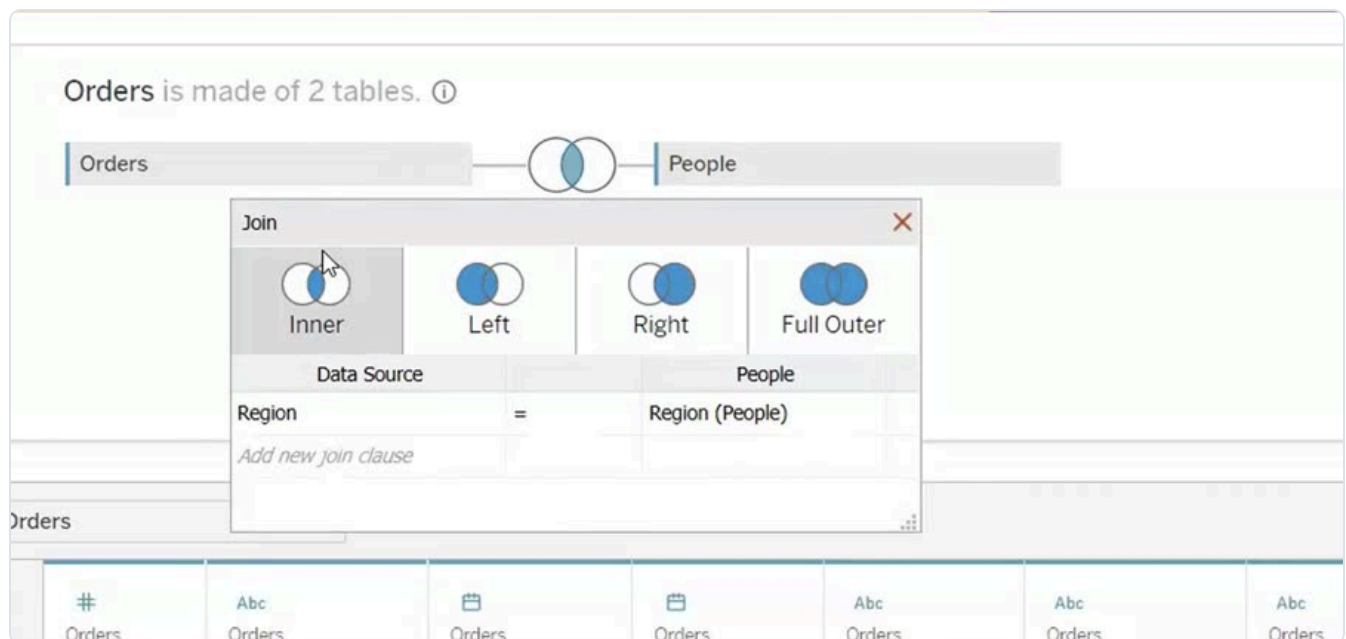
Now drag People and Returns onto the canvas. Tableau draws a flexible line, called a noodle, to each one. These are relationships. Tableau detected the common fields automatically: Order ID links Returns, and Region links People. Select a noodle, or the Edit Relationship panel, to check or change the matching fields.

Two layers on the data source page

Two layers on the data source page		
	Logical layer (relationships)	Physical layer (joins & unions)
Where	The canvas you see first	Double-click a logical table
Tables	Stay separate	Merged into one table
When combined	At query time, per view, at the right level of detail	Before any view is built
Risk	Less duplication of measures	Joins can duplicate rows and inflate totals

This is the key idea of the data source page: it has two layers. The logical layer, which you see first, uses relationships. Each table stays separate, and Tableau writes the right query, at the right level of detail, only when a view needs those fields. The physical layer, which opens when you double-click a table, merges tables into one using joins or unions, before any view is built.

Double-click Orders to open its physical layer



Double-click Orders to open its physical layer. Tableau now says Orders is made of two tables. Selecting the Venn icon opens the join dialog. Choose inner, left, right, or full outer, and set the join clause: here, Region from the data source equals Region from People.

Combining data: which method?

Combining data: which method?

Method	Use it when	Layer / scope
Relationship	Default choice; tables at different levels of detail	Logical layer
Join	You need one flat table and know the row counts	Physical layer
Union	Stack tables with the same columns, e.g. one file per month	Physical layer
Blending	Combine separate data sources: primary + secondary on linking fields	Per worksheet

So how should you combine tables? Use relationships by default. Use a join when you need one flat table and you understand the row counts. Use a union to stack tables with the same columns, such as one file per month. And use data blending only to combine separate data sources, where a primary source is linked to a secondary source on common fields, one worksheet at a time.

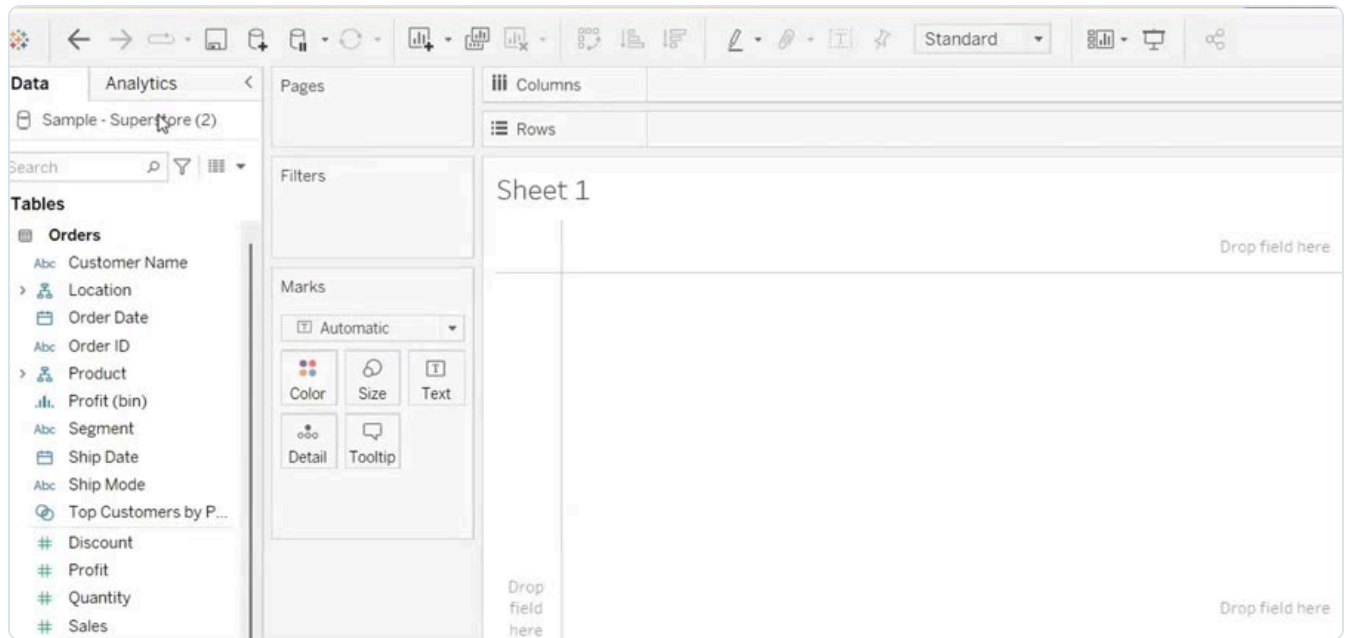
Live connection or extract?

Live connection or extract?

	Live	Extract (.hyper)
How	Queries the source on every change	Saved snapshot in Hyper format
Freshness	Always current	As fresh as the last refresh
Speed	Depends on the database	Fast; works offline
Upkeep	None in Tableau	Schedule refreshes after publishing

Finally, Live or Extract. A live connection queries the source every time the view changes, so data is always current, but speed depends on the database. An extract saves a snapshot in Tableau's fast Hyper format. It's quick, works offline, and can be filtered to fewer rows, but it must be refreshed, usually on a schedule after publishing.

On a worksheet, related tables stay separate in the Data pane



On a worksheet, related tables stay separate in the Data pane. Orders, People, and Returns each list their own fields, with dimensions above measures. Next to them are the Marks card and the Columns and Rows shelves, which you'll use in the next module.

Key takeaways

- Desktop builds; Server or Cloud shares
- Connected to Sample Superstore
- Checked data types; related three tables
- Relationships first; joins, unions, blending when needed

Practice

1. Connect Tableau Desktop to Sample - Superstore and drag Orders, People and Returns onto the canvas. Write down which field links each relationship.
2. Change the data type of Postal Code to String and give City a geographic role.
3. Double-click Orders, join People with a left join, and compare the row count with the related version.

Check your understanding

1. Which Tableau product cleans and shapes data before analysis?
2. Which layer keeps tables separate and combines them at query time?
3. When would you use a union?
4. What is the main trade-off of an extract?

Answers at the back of this handbook.

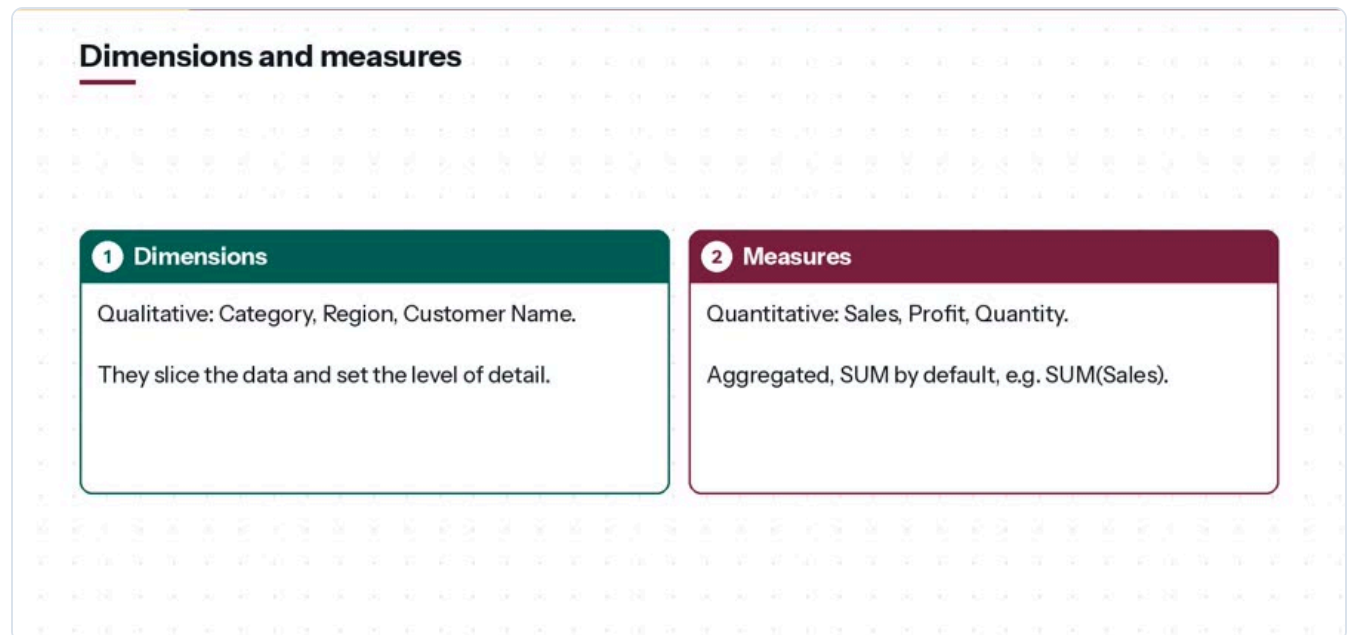
Building Views: Pills, Shelves & Axes

Video: 14_QT-14_Building_Views_Pills_Shelves_Axes.mp4 · 4:42 · Stage: Development · Audience: Analysts who completed QT-13

Learning objectives

- Place fields on Columns, Rows and the Marks card
- Read pills: dimension vs measure, discrete vs continuous
- Build nested views, small multiples and dual axes

Dimensions and measures



Dimensions and measures

1 Dimensions	2 Measures
Qualitative: Category, Region, Customer Name.	Quantitative: Sales, Profit, Quantity.
They slice the data and set the level of detail.	Aggregated, SUM by default, e.g. SUM(Sales).

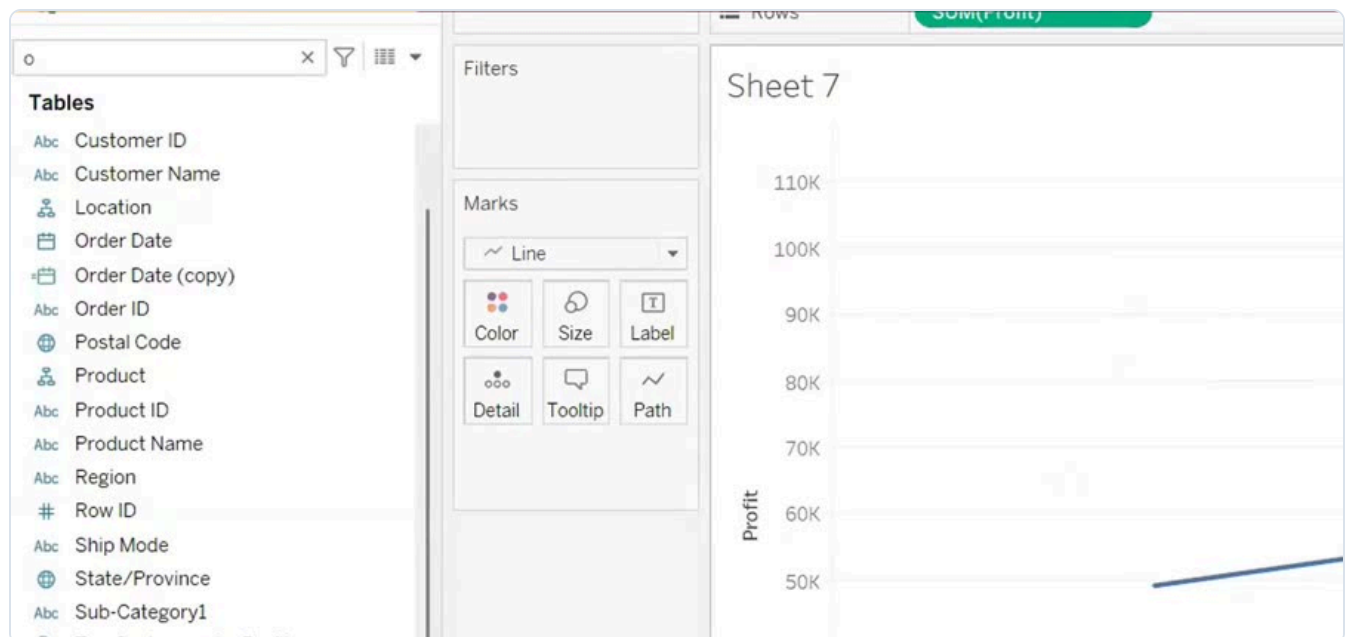
Tableau sorts every field into two kinds. Dimensions are qualitative: category, region, customer name. They slice the data. Measures are quantitative: sales, profit, quantity. Tableau aggregates them, summing by default, at the level of detail set by the dimensions in the view.

Discrete (blue) vs continuous (green)

Discrete (blue) vs continuous (green)		
	Discrete (blue pill)	Continuous (green pill)
Creates	Headers: one label per value	An axis: a range of values
Typical	Most dimensions	Most measures
Dates	YEAR(Order Date) → 2023 2024 2025	Order Date as a timeline
Change it	Right-click a pill → Discrete	Right-click a pill → Continuous
Text fields can't be continuous: they have no numeric range.		

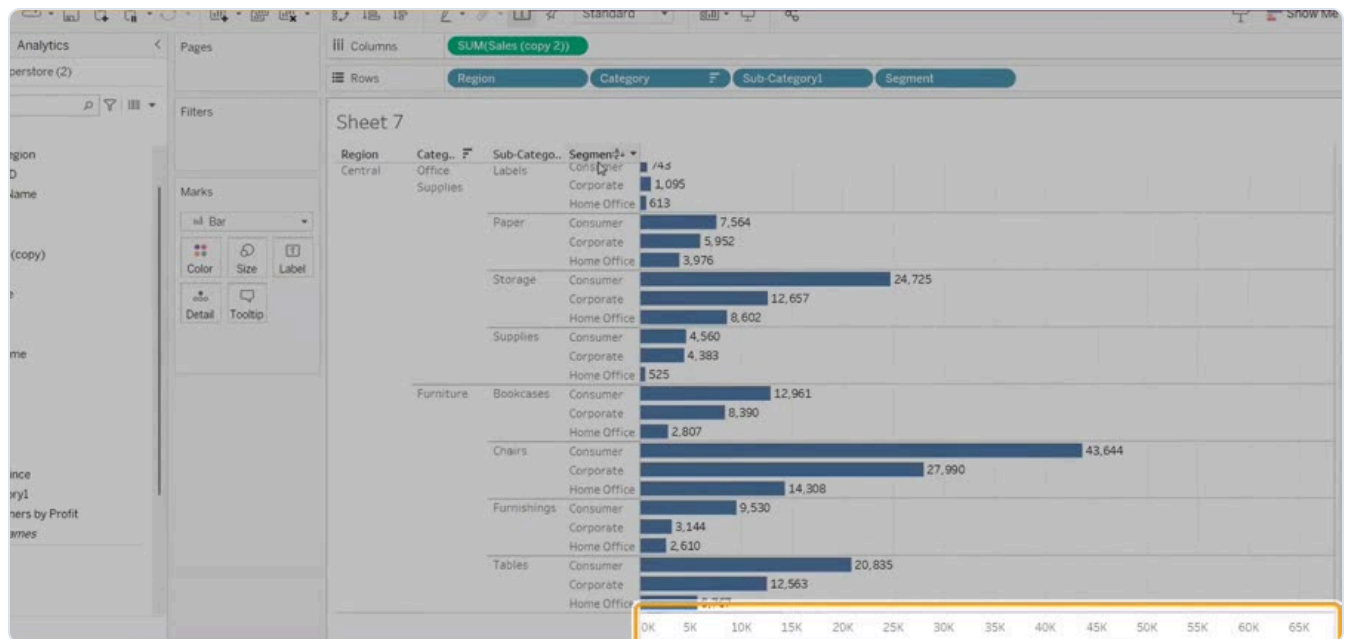
Separately, every field is either discrete or continuous, and the color of the pill tells you which. Blue pills are discrete: they create headers, with one distinct value per label. Green pills are continuous: they create an axis, a continuous range of values. Most dimensions are blue and most measures are green, but you can convert many fields. A date, for example, can be discrete, giving one header per year, or continuous, giving a timeline.

Here's a continuous field in action



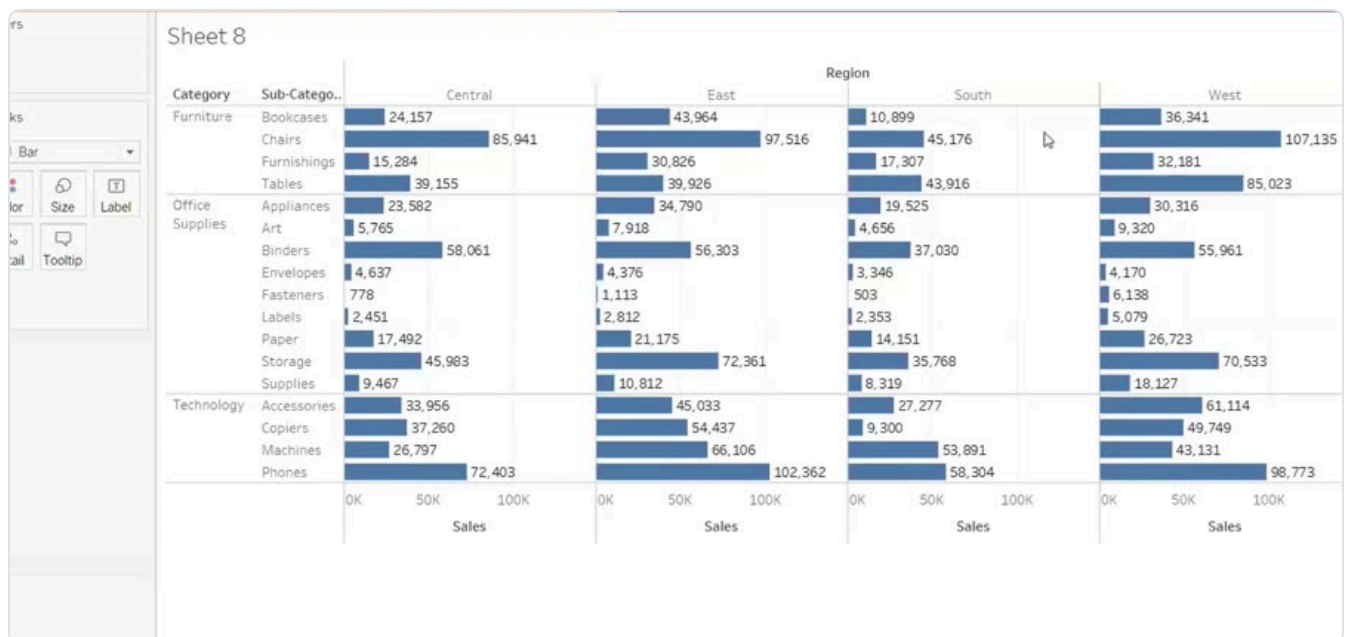
Here's a continuous field in action. Quarter of order date is a green pill on Columns, so Tableau draws an axis along the bottom, and the profit measure on Rows becomes a line. Notice the Marks card has switched to Line automatically.

Now discrete dimensions



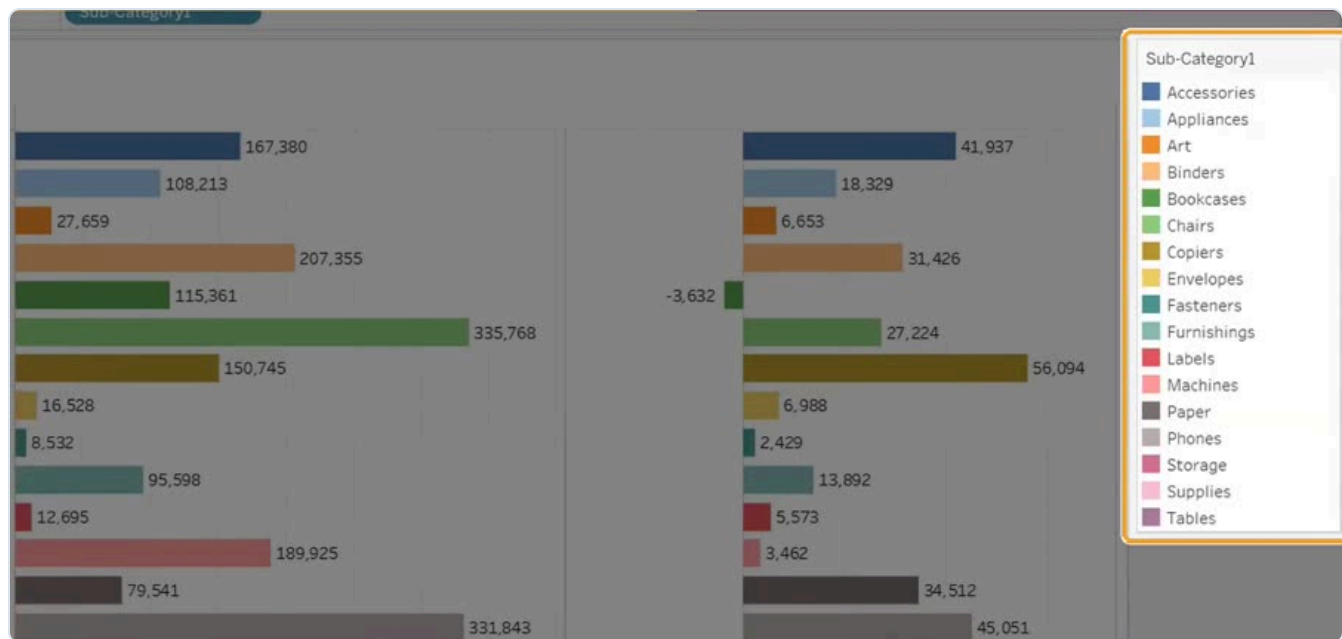
Now discrete dimensions. The trainer placed Region, Category, Sub-Category, and Segment on Rows, all blue. Each one nests inside the one before it, so the headers form a hierarchy: region, then category, then sub-category, then segment. Sales on Columns is green, so it draws the horizontal axis and the bars.

Move a dimension to Columns and you get small multiples



Move a dimension to Columns and you get small multiples. Here Region sits on Columns next to Sales, so Tableau draws one panel per region, Central, East, South, and West, each with the same axis. Comparing regions side by side becomes easy.

What about two measures? Place Sales and Profit side by side on Col...



What about two measures? Place Sales and Profit side by side on Columns, and each gets its own individual axis, with its own scale. Sub-Category on the Color shelf gives every bar a color, and the legend on the right explains it.

To put several measures on one shared axis, use a blended axis with...



To put several measures on one shared axis, use a blended axis with Measure Names and Measure Values. Measure Values on Columns holds the numbers. Measure Names on Rows labels each one. The Measure Values card lists which measures are included, and a Measure Names filter controls them. Here, profit, sales, quantity, and discount share a single value axis.

Three ways to show several measures

Three ways to show several measures

1 Individual axes

Measures side by side, each with its own scale.

Drag both to Columns or Rows.

2 Blended axis

One shared scale.

Measure Names + Measure Values. Best for similar units.

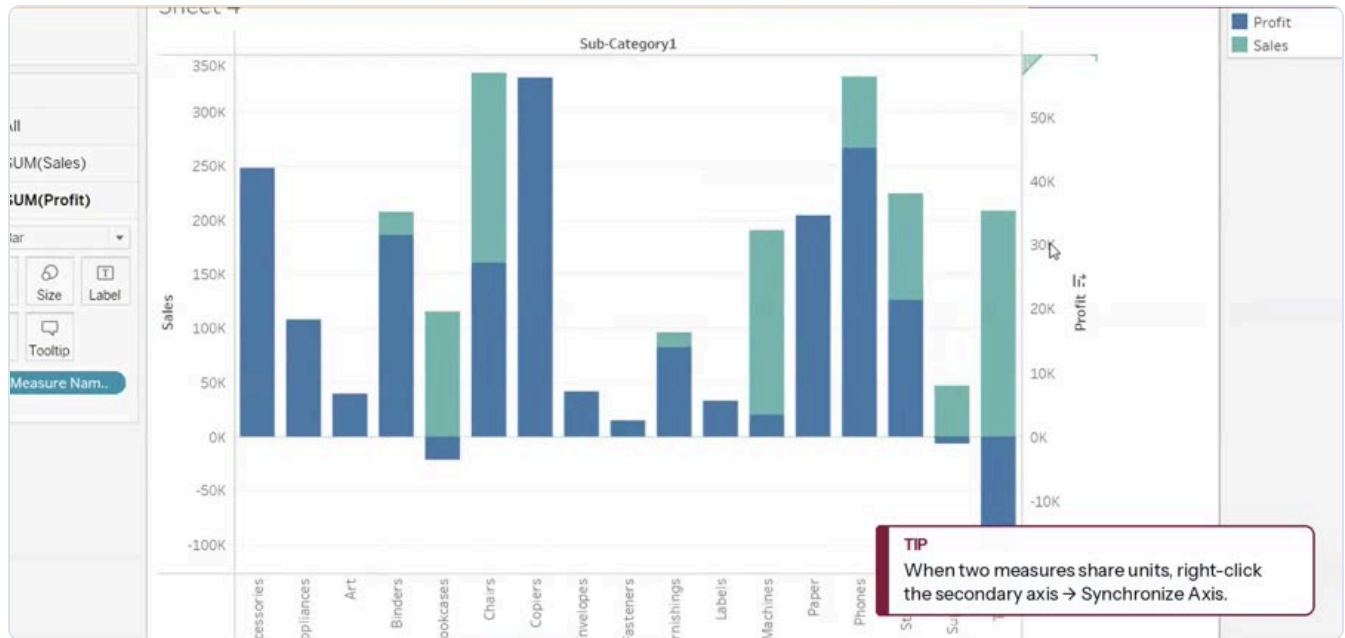
3 Dual axis

Two measures overlaid, one axis on each side.

Right-click the second pill → Dual Axis.

Let's compare the three ways to show two or more measures. Individual axes give each measure its own scale, side by side. A blended axis puts them on one shared scale, which works when the units are similar. And a dual axis overlays two measures in the same space, each with its own axis on either side.

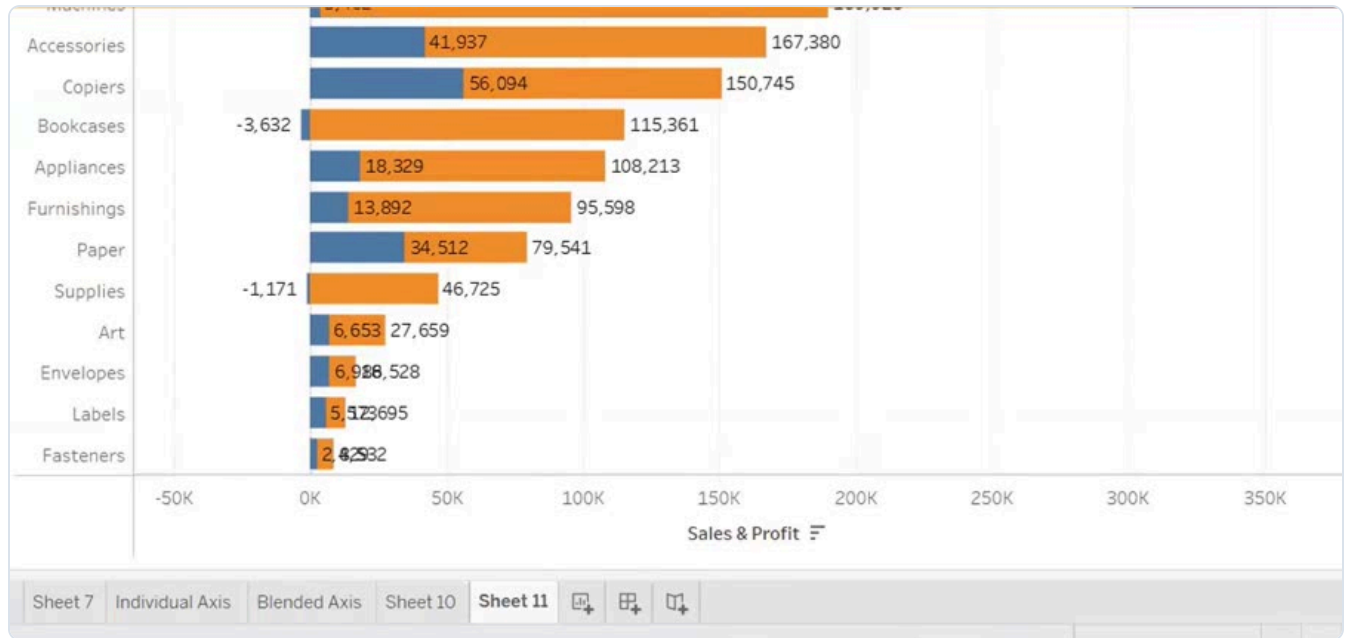
Here's a dual axis



Here's a dual axis. Sales and Profit are both on Rows, combined with Dual Axis, so the bars overlap. But look at the two axes. Sales on the left runs to three hundred and fifty thousand, while profit on the right only reaches fifty thousand. The scales don't match, so the bars can mislead.

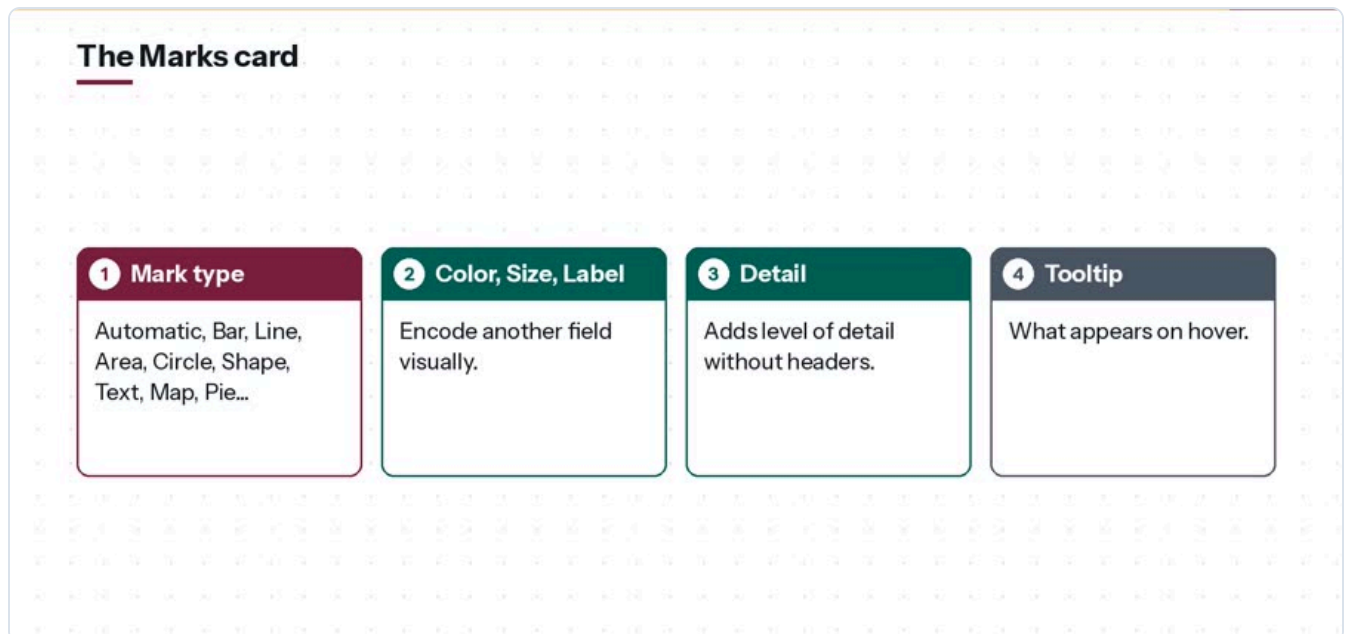
Tip When two measures share units, right-click the secondary axis → Synchronize Axis.

The fix is Synchronize Axis



The fix is Synchronize Axis. After synchronizing, sales and profit share the same scale, so a profit bar of forty-five thousand is drawn true to size against sales of three hundred and thirty thousand. Measure Names on Color tells the two measures apart, and the axis title now reads Sales and Profit.

The Marks card



Finally, the Marks card. The mark type picks the chart: automatic, bar, line, area, circle, and more. Color, Size, and Label encode extra fields. Detail adds a dimension to the level of detail without drawing headers. And Tooltip controls what appears when you hover.

Key takeaways

- Dimensions slice; measures aggregate
- Blue = headers; green = axes
- Nested views and small multiples
- Individual, blended and dual axes

Practice

1. With Sample Superstore, put Category and Sub-Category on Rows and SUM(Sales) on Columns. Then move Region to Columns to create small multiples.
2. Drag Order Date to Columns, then switch it between discrete YEAR and continuous MONTH and describe how the view changes.
3. Build a dual-axis chart of Sales and Profit by Sub-Category and synchronize the axes.

Check your understanding

1. What does a blue pill create in the view?
2. What does a green pill create?
3. Which two generated fields build a blended axis?
4. When should you synchronize a dual axis?

Answers at the back of this handbook.

The Tableau Chart Gallery

Video: 15_QT-15_Tableau_Chart_Gallery.mp4 · 4:21 · Stage: Development · Audience: Analysts who completed QT-14

Learning objectives

- Choose a chart by the question you're answering
- Build core charts quickly with Show Me
- Build custom donut and lollipop charts

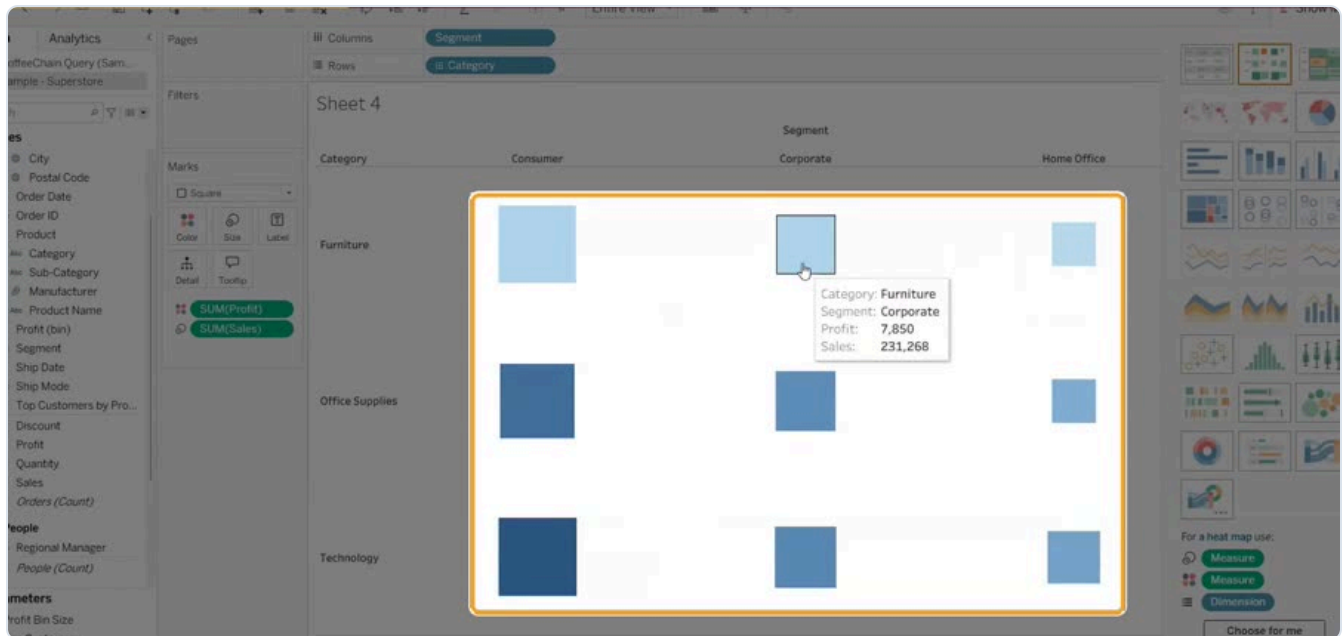
Start with the question

Start with the question

1 Compare Bar chart, stacked bar, lollipop	2 Trend Line chart, area chart	3 Part of a whole Pie, donut, treemap: few slices only
4 Relationship Scatter plot	5 Target Bullet graph	6 Pattern Heat map, highlight table

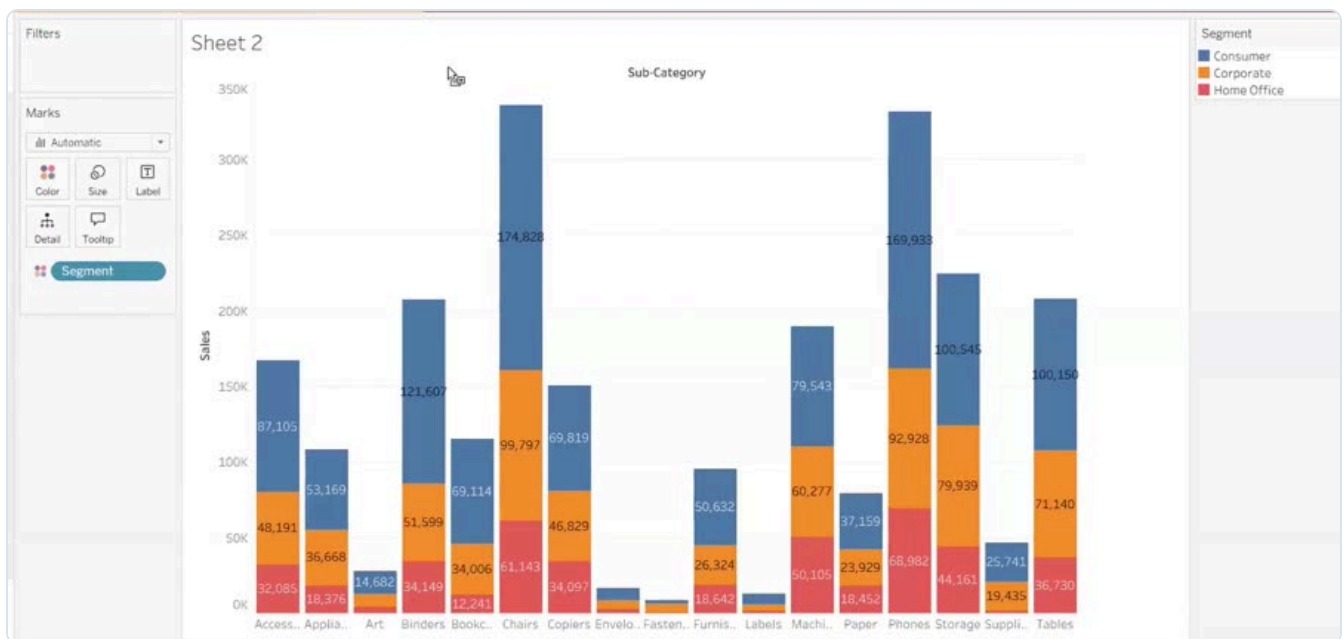
Start with the question, not the chart. To compare categories, use bars. To show a trend over time, use a line or area chart. For part of a whole, use a pie, donut, or treemap, but only with a few slices. To show a relationship between two measures, use a scatter plot. To compare a value with a target, use a bullet graph. And for patterns across two dimensions, use a heat map or highlight table.

Show Me, in the top right, suggests charts for the fields you've se...



Show Me, in the top right, suggests charts for the fields you've selected. Charts that fit are highlighted, and hovering one tells you what it needs. For a heat map, that's one or more dimensions and up to two measures. Here, Segment and Category set the grid, profit sets the color, and sales sets the size of each square.

The workhorse is the bar chart



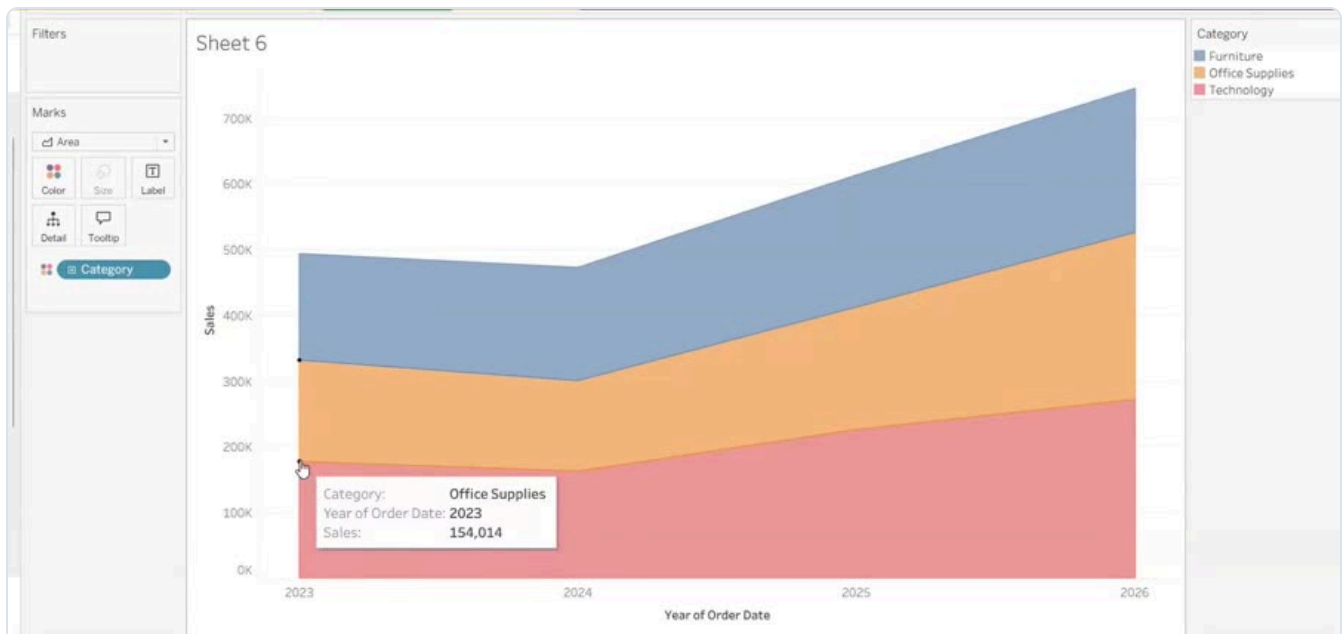
The workhorse is the bar chart. Sub-Category on Columns and sales on Rows give one bar each. Drop Segment on Color, and the bars become stacked, so you can see each segment's share of the total.

A highlight table is a text table where color shows the value

		Segment			642	174.8
Category	Sub-Category	Consumer	Corporate	Home Office		
Furniture	Bookcases	69,114	34,006	12,241		
	Chairs	174,828	99,797	61,143		
	Furnishings	50,632	26,324	18,642		
	Tables	100,150	71,140	36,730		
Office Supplies	Appliances	53,169	36,668	18,376		
	Art	14,682	8,701	4,276		
	Binders	121,607	51,599	34,149		
	Envelopes	7,823	5,943	2,763		
	Fasteners	1,892	5,998	642		
	Labels	6,918	4,102	1,675		
	Paper	37,159	23,929	18,452		
	Storage	100,545	79,939	44,161		
	Supplies	25,741	19,435	1,549		
	Technology	Accessories	87,105	48,191	32,085	
Copiers		69,819	46,829	34,097		
Machines		79,543	60,277	50,105		
Phones		169,933	92,928	68,982		

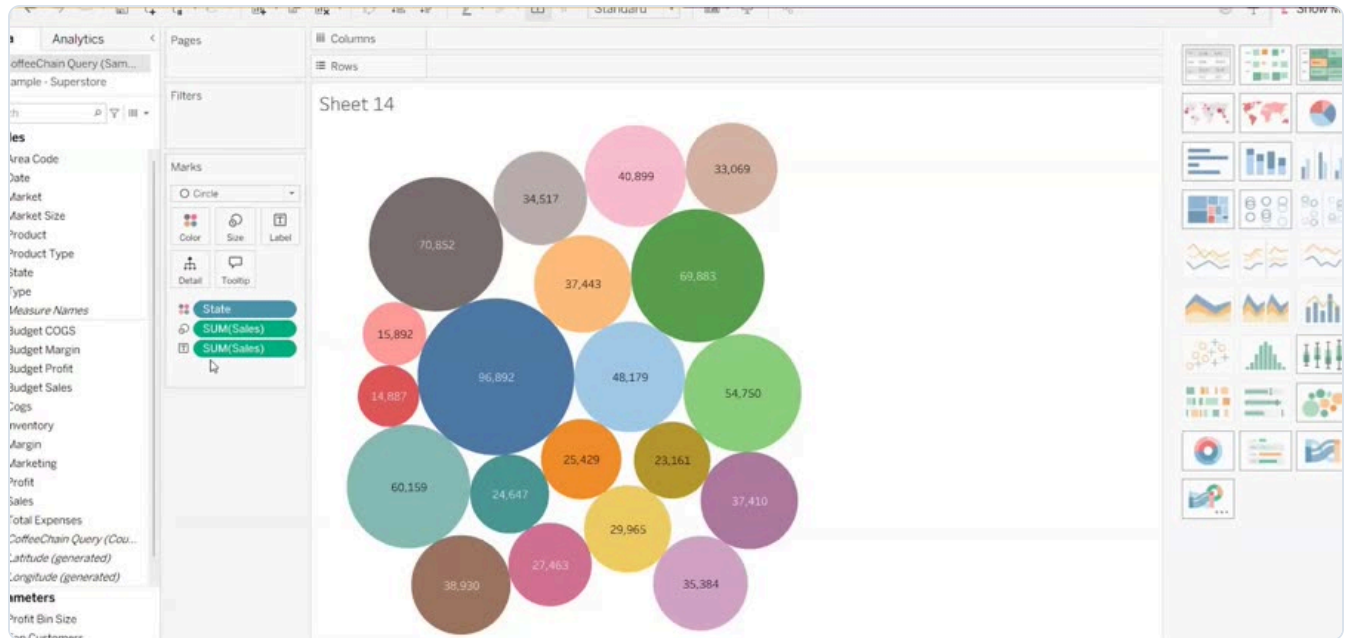
A highlight table is a text table where color shows the value. Each cell keeps its exact number, and the shading lets you spot the high and low values at a glance. Here, sales by sub-category and segment.

For trends over time, an area chart is a line chart with the space ...



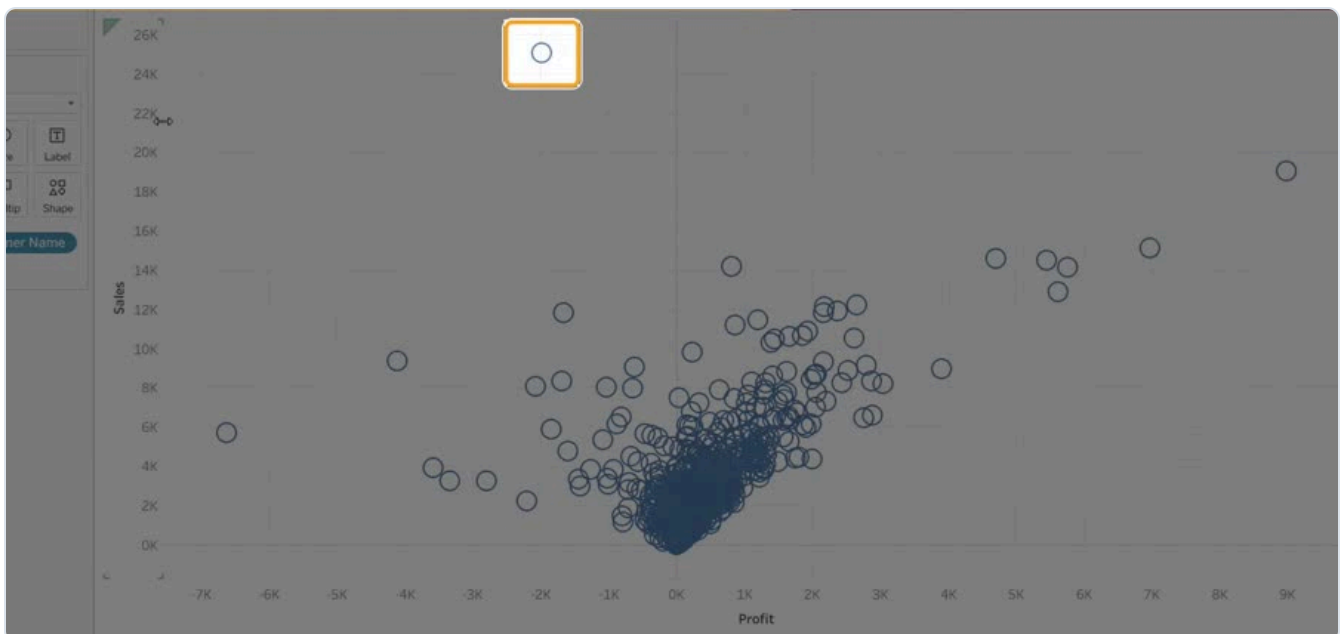
For trends over time, an area chart is a line chart with the space below filled. Year of order date is continuous on Columns, and Category on Color stacks the areas, so the top edge shows the total sales each year.

For part of a whole, a treemap nests rectangles: each one's size sh...



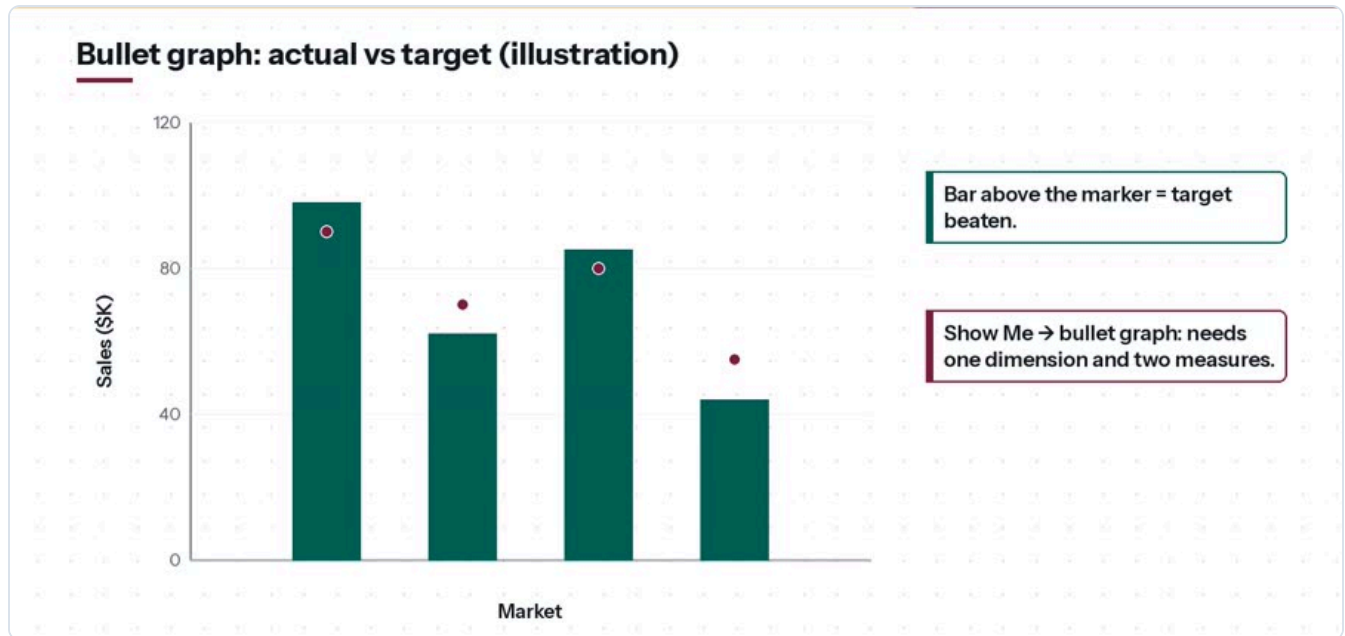
For part of a whole, a treemap nests rectangles: each one's size shows its share, and color separates the groups. Change the mark type to Circle and drag the same fields, and you get packed bubbles. They look striking, but exact comparisons are harder, so use them for a quick overview.

A scatter plot shows the relationship between two measures



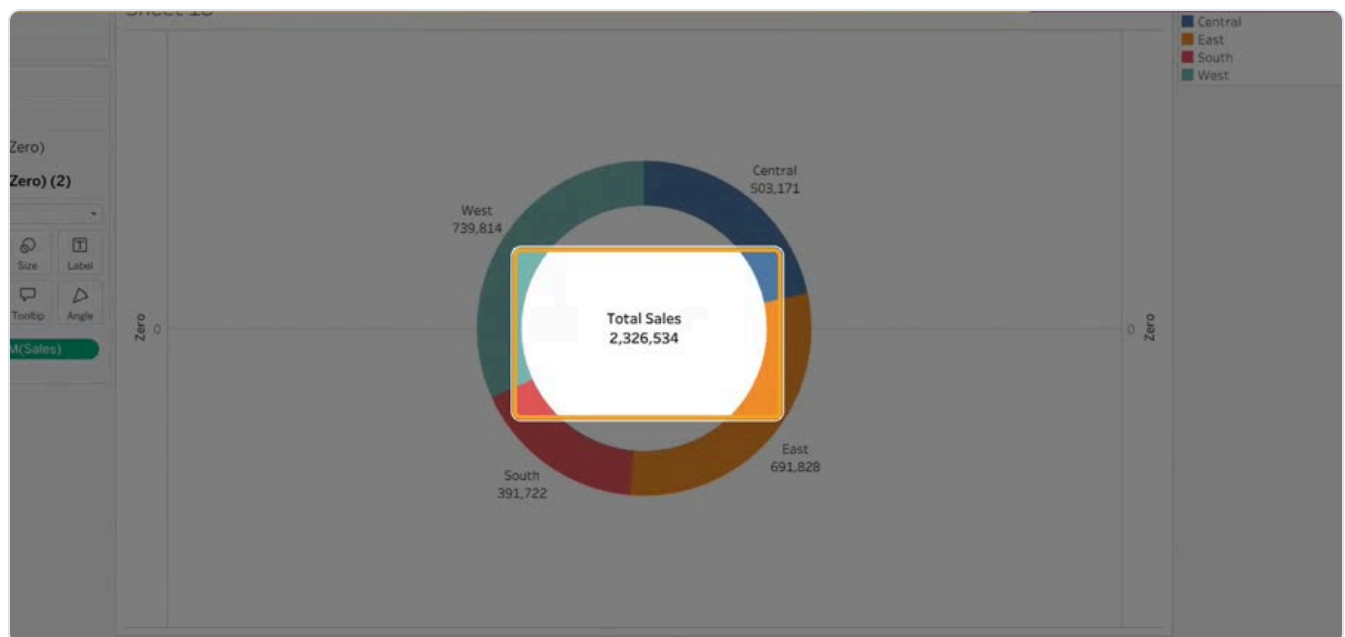
A scatter plot shows the relationship between two measures. Profit is on Columns and sales is on Rows, and with Customer Name on Detail, there's one circle per customer. Most customers cluster near zero profit and low sales, while a few outliers stand out, with high sales but negative profit.

Bullet graph: actual vs target (illustration)



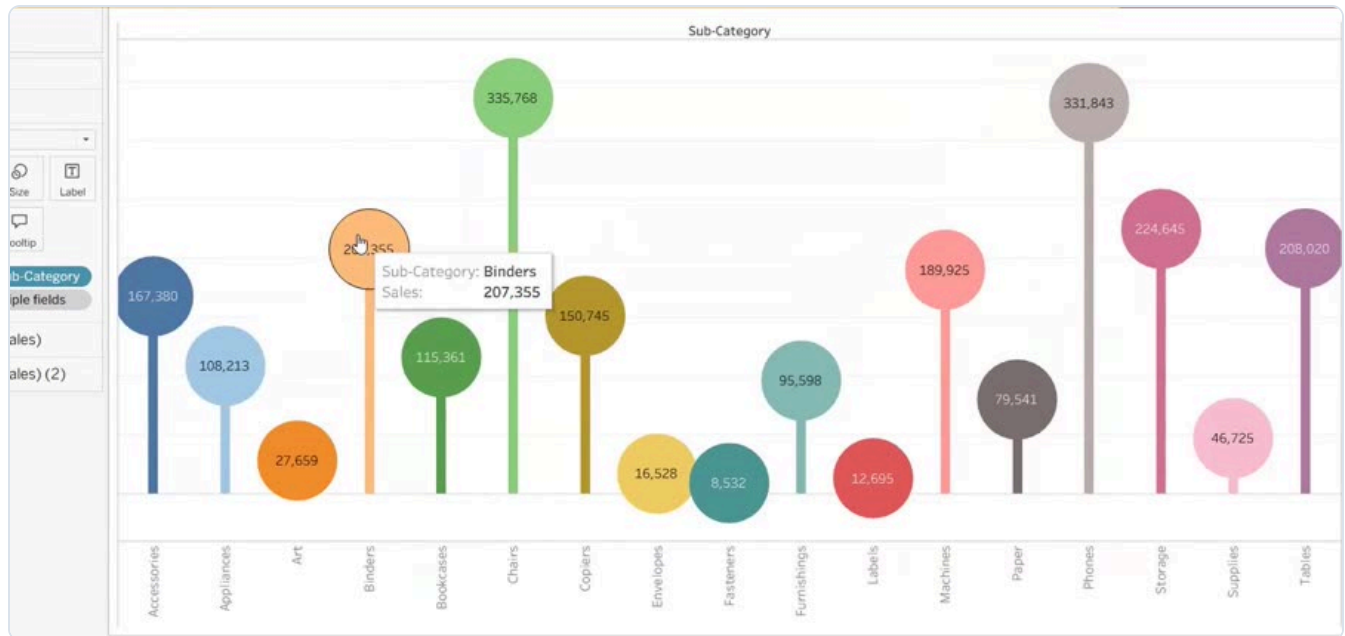
A bullet graph compares actual values against a target. Each bar shows actual sales for a market, and the marker shows the budget. Where the bar passes its marker, the market beat its target. In Tableau, select an actual and a target measure and choose bullet graph in Show Me. The trainer built this with the Coffee Chain sample data.

Now a custom chart: the donut



Now a custom chart: the donut. It's two pies on a dual axis. Put a field that returns zero on Rows twice, and make it a dual axis. The first pie uses Region on Color and sales on Angle. The second pie is smaller, colored white, with total sales as its label, which punches out the hole in the middle.

The lollipop is a cleaner alternative to a bar chart



The lollipop is a cleaner alternative to a bar chart. It's also a dual axis: sales twice on Rows, one as a thin bar and one as a circle, synchronized. The result highlights the end value of each sub-category with less ink.

Rules of thumb

Rules of thumb	
Rule	Why
Pies and donuts: about five slices or fewer	Angles are hard to compare
Start bar axes at zero	Truncated bars exaggerate differences
Use color for meaning	Decoration distracts from the data
Sort bars by value	Unless the order matters, like months

A few rules of thumb keep charts honest. Keep pies and donuts to about five slices; beyond that, use a bar chart. Start bar axes at zero. Use color for meaning, not decoration. And sort bars by value unless the order itself matters, like months.

Key takeaways

- Choose the chart from the question
- Show Me builds core charts fast
- Dual axes make donuts and lollipops

Practice

1. Build a heat map of Profit by Segment and Category using Show Me, then convert it to a highlight table.
2. Build a scatter plot of Sales vs Profit with Customer Name on Detail and identify three outliers.
3. Build a donut chart of Sales by Region: create a calculated field that returns 0, put it on Rows twice and make a dual axis.

Check your understanding

1. Which chart compares an actual value to a target?
2. Which chart shows the relationship between two measures?
3. How many axes does a donut chart use?
4. About how many slices should a pie have at most?

Answers at the back of this handbook.

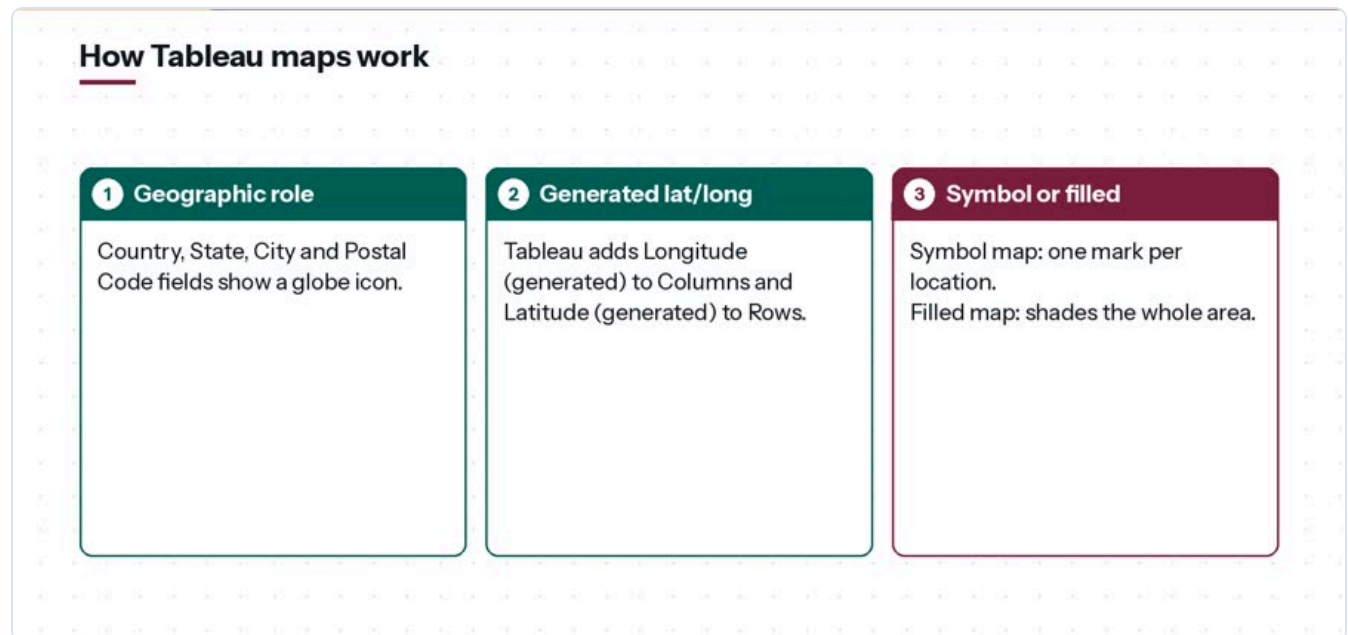
Maps in Tableau

Video: 16_QT-16_Maps_in_Tableau.mp4 · 5:22 · Stage: Development · Audience: Tableau users who completed QT-14 and QT-15

Learning objectives

- Build symbol and filled maps
- Fix unknown locations with Edit Locations
- Combine maps on a dual axis; use custom shapes

How Tableau maps work



Maps start with geographic roles. Fields like Country, State, and City show a small globe icon in the data pane. When you use one, Tableau generates latitude and longitude for you and places them on Columns and Rows. Then you choose a map type. A symbol map draws a mark at each location, sized or colored by a measure. A filled map shades each whole area instead.

Here the trainer connects to the Global Superstore data and double-...



Here the trainer connects to the Global Superstore data and double-clicks Country. Tableau builds a map straight away. Longitude and latitude, both generated, land on Columns and Rows, and Country goes on the Detail shelf of the Marks card, giving one dot for each of the hundred and forty-seven countries in the data.

Now add measures



Now add measures. Drag Sales to Size, so bigger dots mean more sales, and drag Profit to Color. The legends on the right explain both. Orange marks show losses and blue marks show profit. The large, dark blue dot is the United States, the biggest and most profitable market in this data.

Tip Size encodes one measure, colour another. Lower the mark size if busy regions overlap.

Try the same with State, and something odd happens



Try the same with State, and something odd happens. Only United States states appear, and the corner shows more than a thousand unknown locations. That's because, in this workbook, Tableau assumes every state belongs to the United States, so it can't place states from other countries.

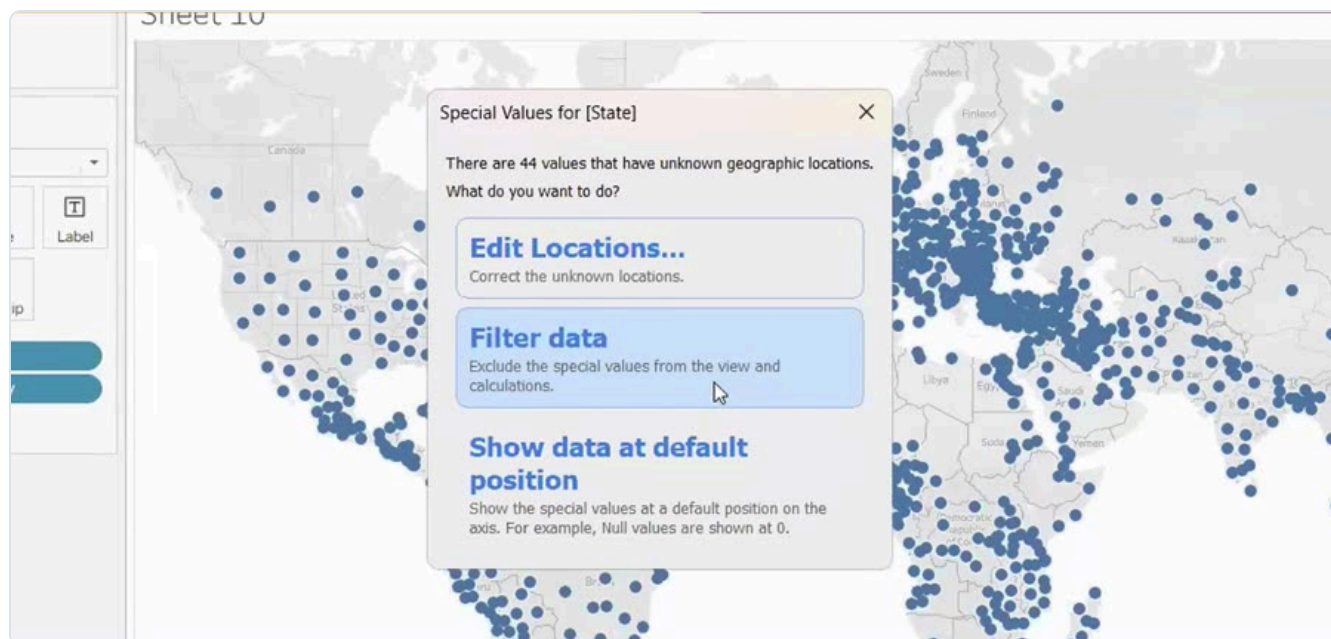
Tip Unknown marks never appear on the map, but they can still affect totals.

Click the unknown indicator and choose Edit Locations



Click the unknown indicator and choose Edit Locations. The dialog shows the country is fixed to United States, and every state outside it is flagged as unrecognized. Change Country slash Region from Fixed to From field, and pick Country. Now each state is matched within its own country, and the map fills with locations worldwide. Only forty-five remain unknown.

In the next session, the trainer tackled those remaining issues



In the next session, the trainer tackled those remaining issues. For a region like Alsace, you can look up its coordinates and choose Enter latitude and longitude in the matching list, so it shows a lat long pair instead of Unrecognized. For anything left over, the unknown indicator offers two more choices: Filter data removes them from the view, and Show data at default position keeps them, placed at zero.

Handling unknown locations

Handling unknown locations		
Option	What it does	Watch out for
Edit Locations	Match by a country field, or type latitude and longitude	Best fix; a little manual work
Filter data	Adds a filter that removes unknowns from the view	Also removes them from totals
Show at default position	Keeps the values, plotted at 0, 0	Marks appear in the ocean off Africa

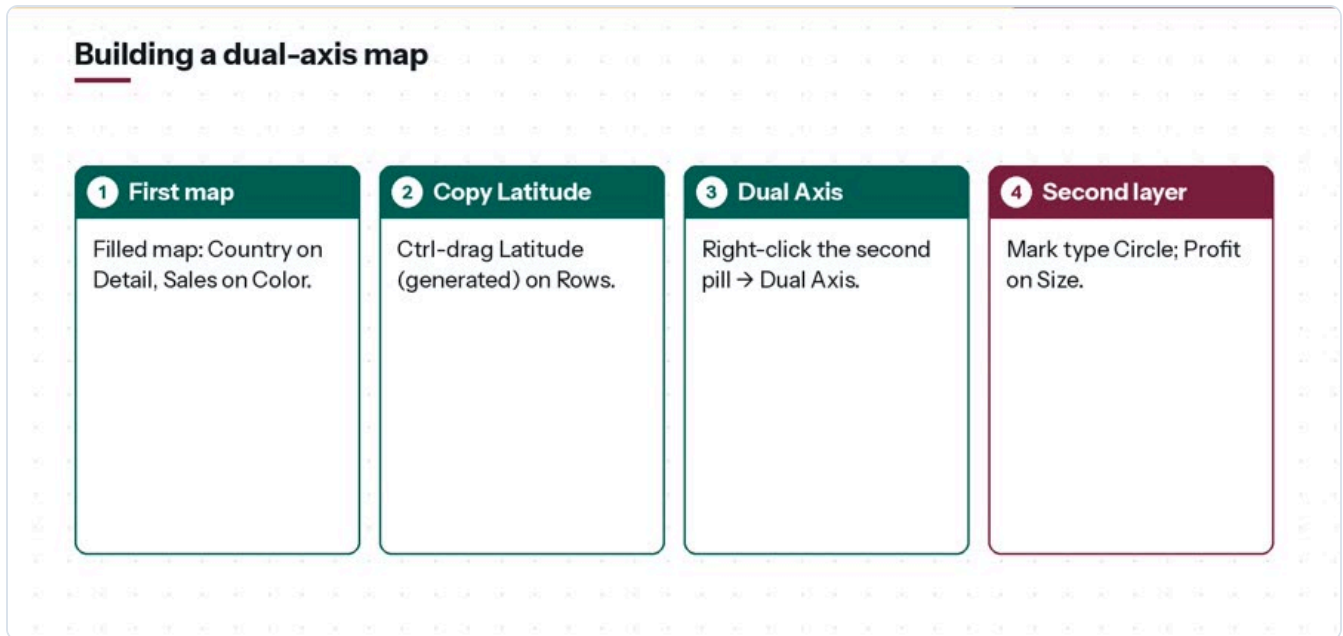
So you have three ways to handle unknown locations. Edit Locations fixes the match, either by pointing at the right country field or by typing coordinates. Filter data drops the unknowns, but it also removes them from your totals. And Show data at default position keeps them in the numbers while placing them at zero latitude and longitude.

For a filled map, put Country on Detail and Sales on Color



For a filled map, put Country on Detail and Sales on Color. With the mark type left on Automatic, Tableau draws a filled map and shades every country by its sales. Then the trainer combined the two map types. The latitude pill on Rows was duplicated and set to a dual axis, and the second layer uses circles sized by profit. Now one view shows sales as shading and profit as dots.

Building a dual-axis map



Here are the dual axis map steps again. Build the first map, for example a filled map colored by sales. Control-drag Latitude on Rows to make a copy. Right-click the second pill and choose Dual Axis. Then, on the second Marks card, change the mark type to Circle and drag a different measure to Size.

You can also replace dots with shapes



You can also replace dots with shapes. Set the mark type to Shape, open the Shape palette, and pick a built-in symbol. For your own icons, save image files into a new folder inside My Tableau Repository, under Shapes. Back in Tableau, choose More Shapes, reload the shapes, and select your new palette. Here every country shows a custom sales icon, still sized by sales.

Tip Documents › My Tableau Repository › Shapes › <your folder>. Then More Shapes › Reload Shapes.

Going further with maps

Going further with maps

1 Map layers

Map › Background Maps and Map Layers: streets, terrain, borders, a plain base.

2 Spatial files

Shapefiles, GeoJSON or KML add custom areas such as sales territories.

3 Spatial functions

MAKEPOINT(lat, long), MAKELINE(a, b), BUFFER(point, 10, 'km').

Beyond the trainer's demos, Tableau offers more map tools worth exploring. Map layers and background map styles let you show streets, terrain, or a plain base. Spatial files, such as shapefiles and GeoJSON, add custom boundaries like sales territories. And spatial functions like MAKEPOINT, MAKELINE, and BUFFER build points, routes, and radius areas from latitude and longitude.

Key takeaways

- Geographic roles generate latitude and longitude
- Symbol maps vs filled maps
- Fix unknowns with Edit Locations
- Dual-axis maps and custom shapes

Practice

1. Build a symbol map of Global Superstore countries with Sales on Size and Profit on Color. Which large market makes a loss?
2. Put State on a map, find the unknown locations, and fix them with Edit Locations › From field › Country.
3. Build a dual-axis map: a filled map coloured by Sales, with circles sized by Profit on the second axis.

Check your understanding

1. What does Tableau add to Columns and Rows when you double-click a geographic field?
2. Why did only US states appear on the State map?
3. Which unknown-location option removes the values from totals?
4. Where must custom shape images be saved?

Answers at the back of this handbook.

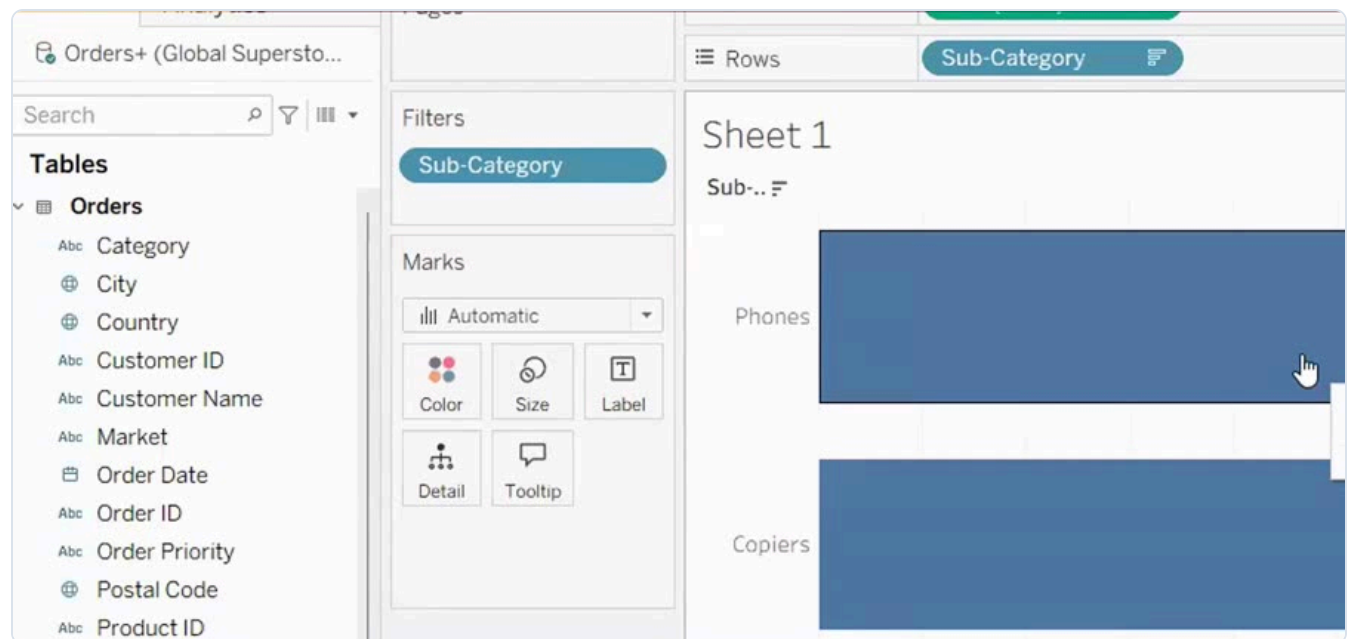
Filters & the Order of Operations

Video: 17_QT-17_Filters_and_Order_of_Operations.mp4 · 3:56 · Stage: Development · Audience: Tableau users who completed QT-13 to QT-16

Learning objectives

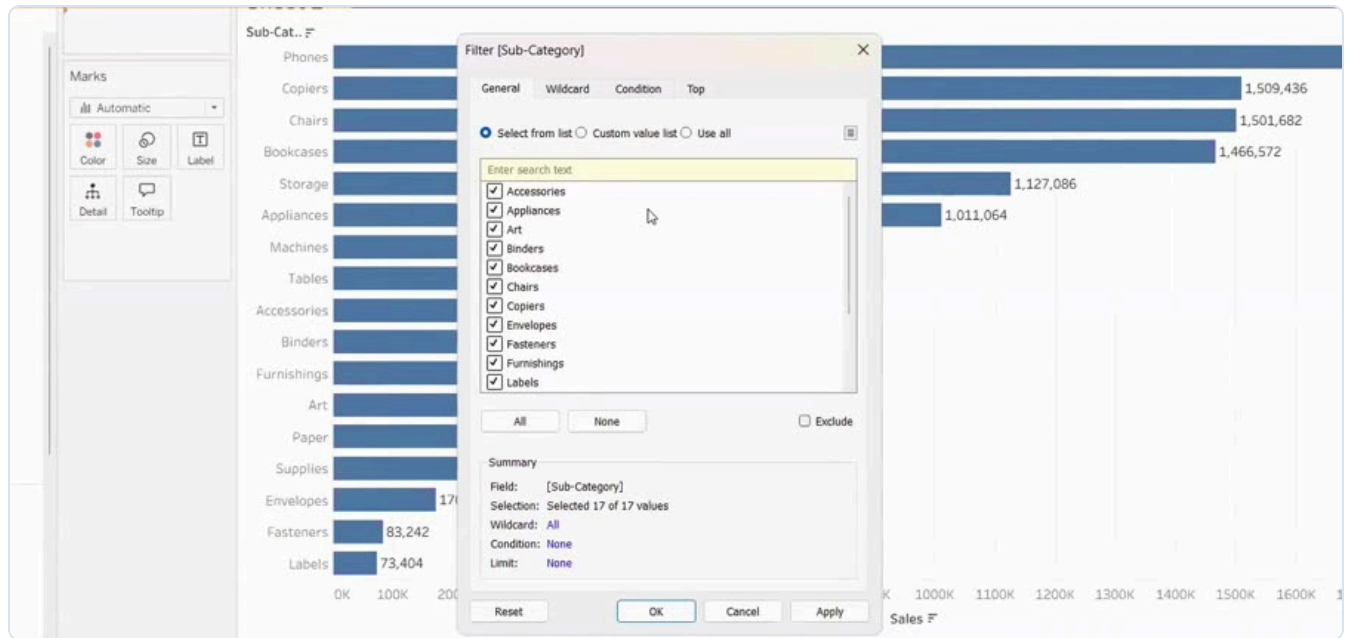
- Use general, wildcard, condition and Top N filters
- Filter measures by range, at least and at most
- Use context filters and the order of operations

The quickest filter is a selection



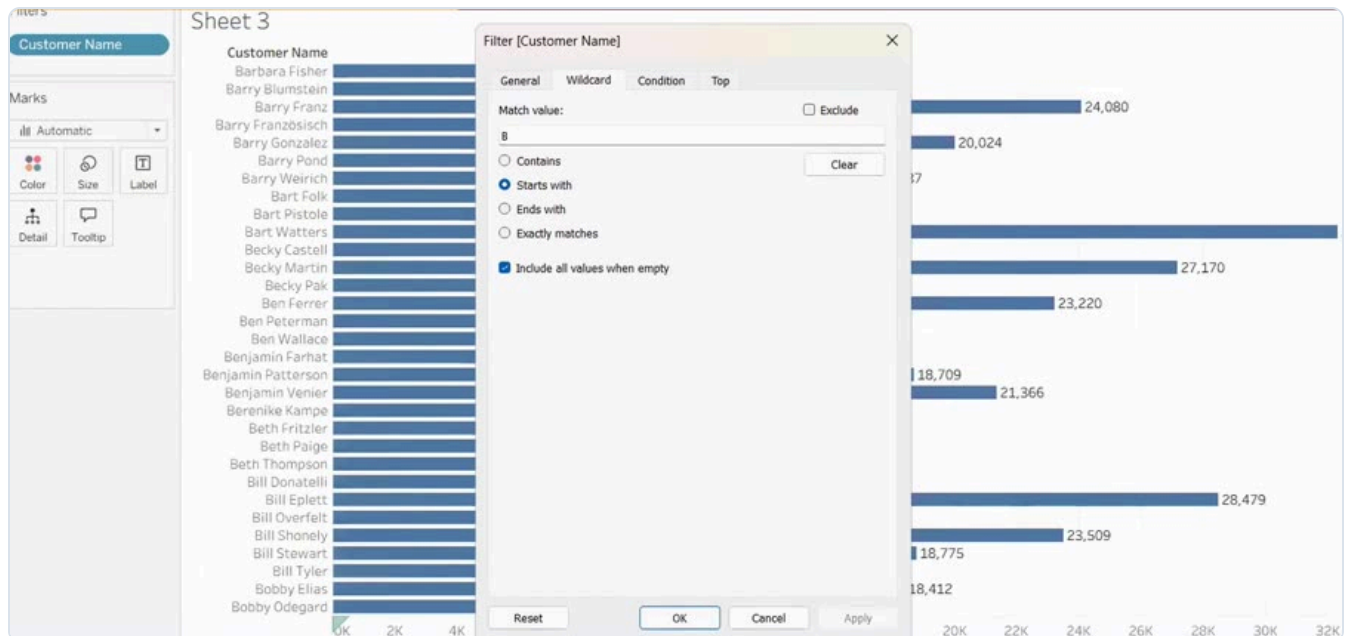
The quickest filter is a selection. Here we select the top four sub-categories in the view. A toolbar appears with Keep Only and Exclude. Choose Keep Only, and just those four remain. Tableau also adds the field to the Filters shelf, so the filter is saved with the sheet.

Drag a dimension onto the Filters shelf to open the full filter dia...



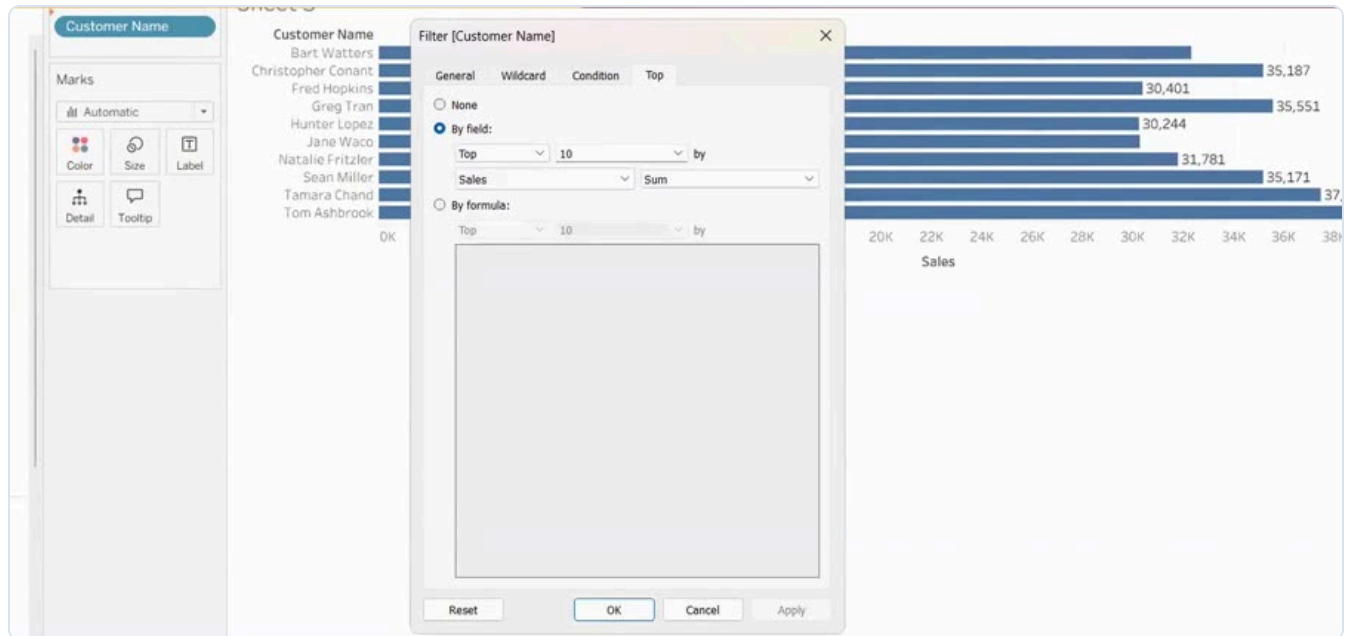
Drag a dimension onto the Filters shelf to open the full filter dialog. It has four tabs: General, Wildcard, Condition, and Top. On the General tab you tick values from a list, or tick Exclude to remove them instead. The Summary at the bottom shows every rule you've set across all four tabs.

The Wildcard tab matches text patterns



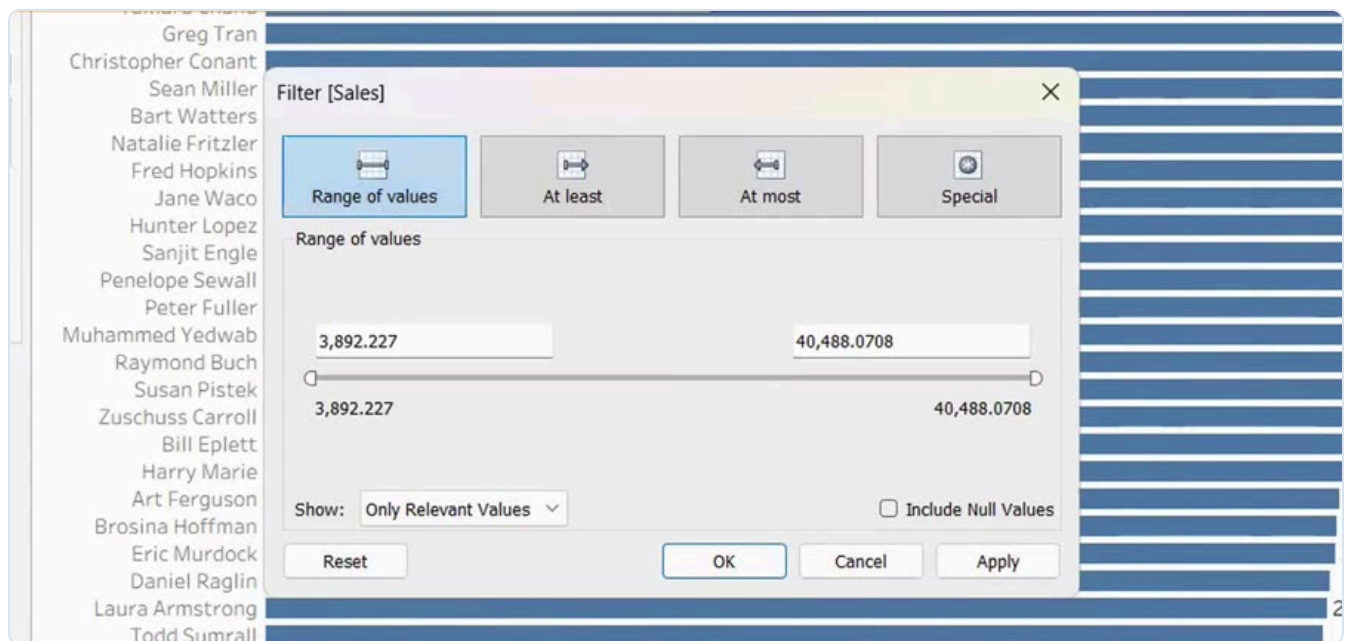
The Wildcard tab matches text patterns. Type a match value, then choose Contains, Starts with, Ends with, or Exactly matches. Here, Starts with B keeps the fifty-six customers whose names begin with B. Tick Exclude to keep everything except the matches.

The Condition tab filters dimension members by a measure



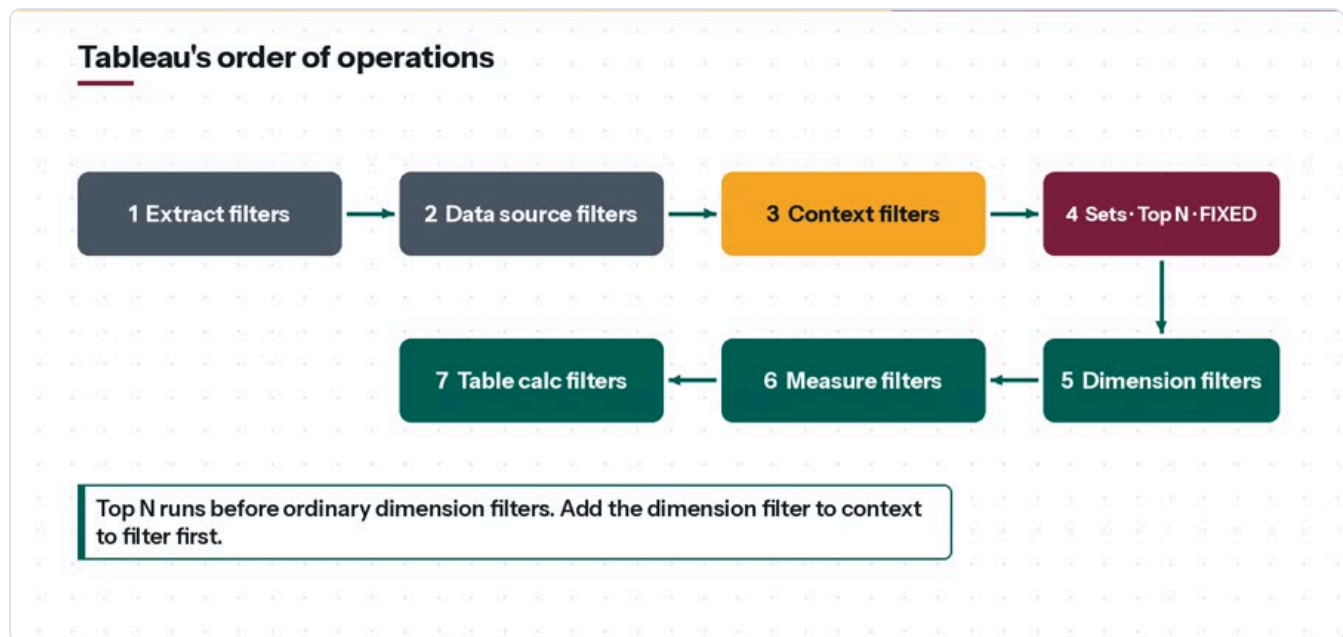
The Condition tab filters dimension members by a measure. By field: sum of Sales greater than thirty-five thousand. The dialog even shows the range of values, from the minimum to the maximum, to help you choose. The Top tab keeps the top or bottom N members, here the top ten customers by sum of Sales.

Drag a measure to Filters, and Tableau first asks how to aggregate ...



Drag a measure to Filters, and Tableau first asks how to aggregate it: all values, or the sum, average, minimum, maximum, and so on. Choose Sum and click Next. Now you pick Range of values, At least, or At most, and set the limits with a slider. The Special option keeps only null or non-null values.

Tableau's order of operations



Now the key idea. Tableau applies filters in a fixed order. Extract filters run first, then data source filters, then context filters. Next come sets, conditions, Top N, and fixed level of detail calculations. Then ordinary dimension filters, then measure filters, and finally table calculation filters. A Top N filter is calculated before your dimension filter, unless you promote that dimension filter to context.

Here's that problem in practice



Here's that problem in practice. This view has a Top ten filter on Product Name, plus a Category filter set to Furniture. Instead of ten furniture products, only three bars remain, because Top N found the top ten across all categories first. The fix: right-click the Category filter and choose Add to Context. The pill turns gray, the category is filtered first, and now we see the top ten furniture products.

Controlling a filter's reach

Controlling a filter's reach

1 Apply to Worksheets

Right-click the filter → Apply to Worksheets: selected sheets, or all using this data source.

2 Data source filter

Data Source page → Filters → Add. Restricts every sheet that uses the source.

3 Extract filter

Applied when the extract is created. Rows never reach the file.

Three more ways to control a filter's reach. Apply to Worksheets lets one filter drive selected sheets, or every sheet that uses the same data source. A data source filter restricts the data for every sheet and every user of that source. And an extract filter removes rows before they're even stored in the extract, which keeps the file small.

Key takeaways

- Keep Only and Exclude for quick filters
- General, Wildcard, Condition, Top tabs
- Measures filter by range, at least, at most
- Context filters run before Top N

Practice

1. Build a bar chart of sales by customer and add a Wildcard filter for names that start with your initial.
2. Add a Top 10 by sales filter on Product Name, then a Category filter. Note the result, then Add to Context and compare.
3. Create a measure filter that keeps customers with at least 10,000 in sales.

Check your understanding

1. Which filter runs first: context or dimension?
2. Why did the Top 10 view show only three furniture products?
3. What colour is a context filter pill?
4. Which tab filters dimension members by a measure value?

Answers at the back of this handbook.

Groups, Sets, Bins, Hierarchies & Sorting

Video: 18_QT-18_Groups_Sets_Bins_Hierarchies_and_Sorting.mp4 · 4:02 · Stage: Development · Audience: Tableau users who completed QT-17

Learning objectives

- Combine members with groups
- Build fixed, conditional and combined sets
- Use bins, hierarchies and sorting

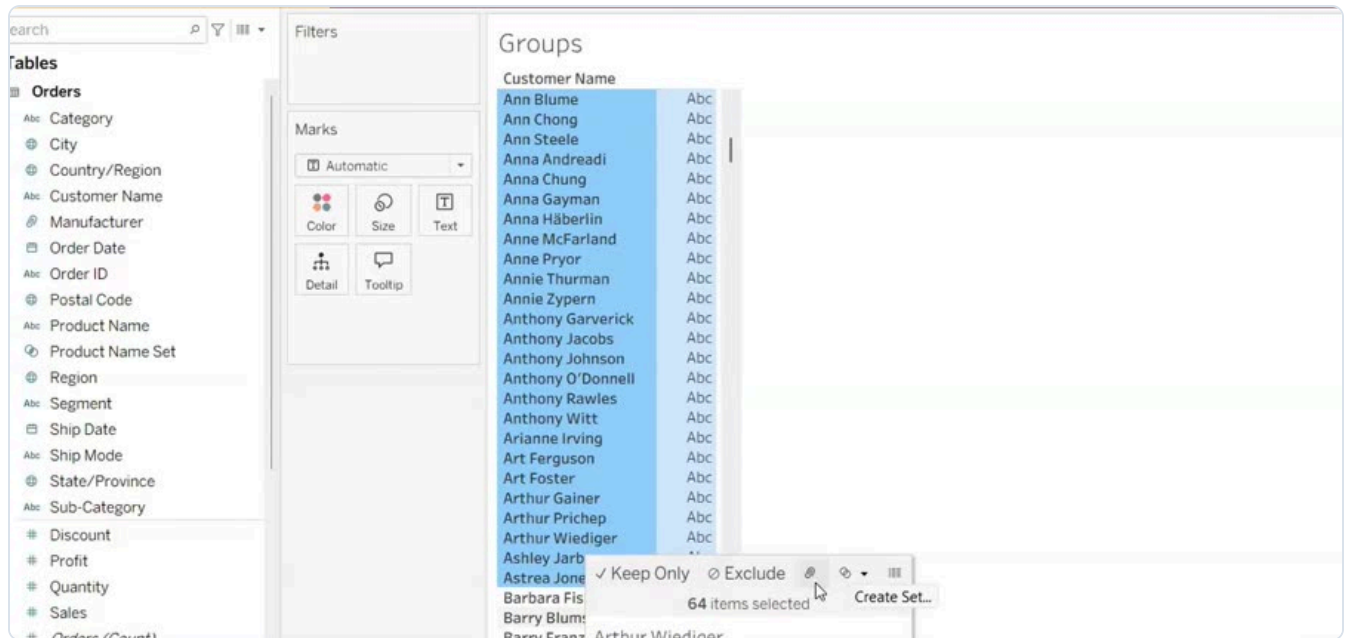
Four ways to reshape a dimension

Four ways to reshape a dimension

Tool	What it does	Example
Group	Combines members into a coarser category	Customers A–M vs N–Z
Set	Splits members into IN and OUT	Top 10 products vs the rest
Bin	Buckets a measure into equal ranges	Sales in 5,000 bands
Hierarchy	Stacks dimensions for drill-down	Country → State → City

First, which tool for which job? A group combines dimension members into a new, coarser category. A set divides members into two buckets, in and out. A bin divides a continuous measure into equal-sized ranges. And a hierarchy stacks dimensions so you can drill down from one level to the next.

To create a group, select the members in the view



To create a group, select the members in the view. Here the trainer selects every customer whose name starts with A, sixty-four in all. Then click the paper clip icon in the toolbar to group them.

Tableau creates a new field, Customer Name group

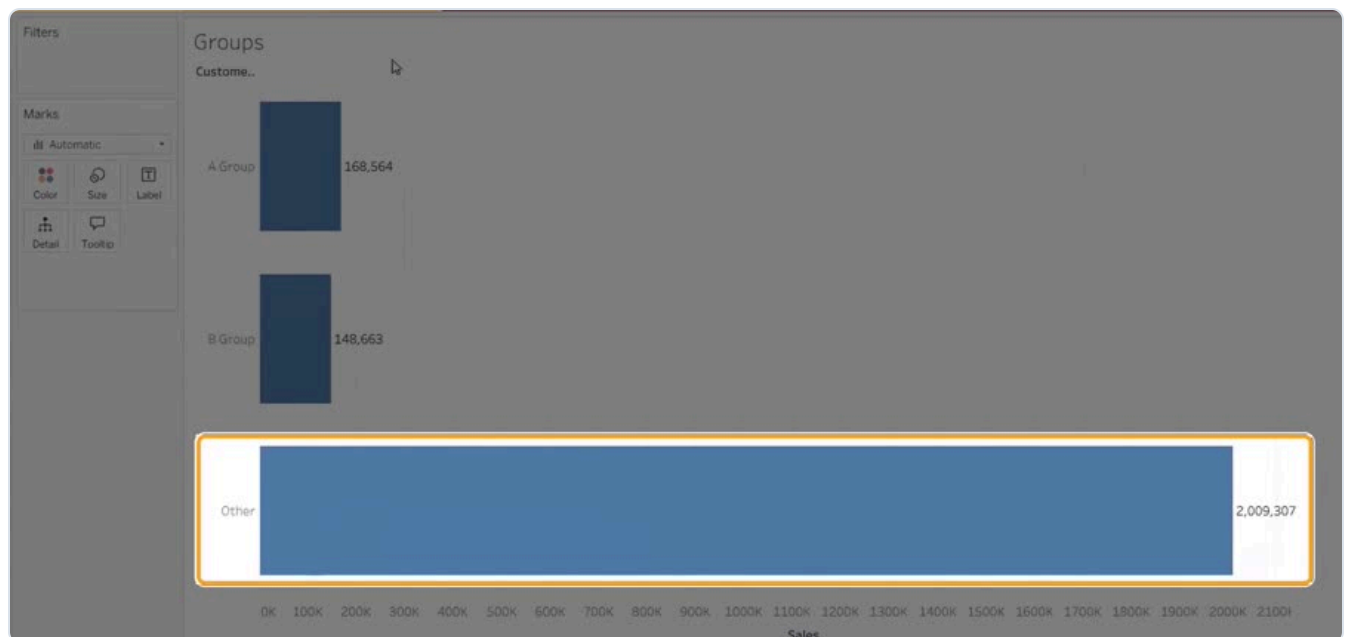


Tableau creates a new field, Customer Name group. Edit it to see the Edit Group dialog, where you select more members and choose Group to add them, or rename one. Tick Include Other to put everything ungrouped into one bucket. On the chart, A Group, B Group, and Other now appear as three bars.

Calculated grouping

Calculated grouping

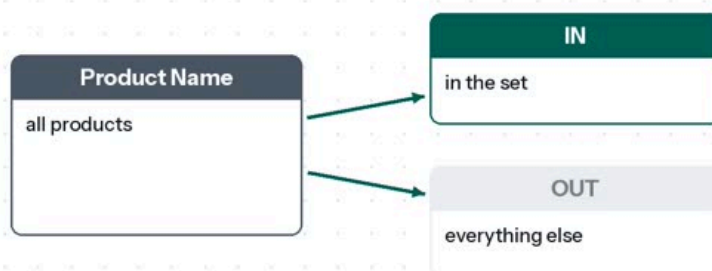
```
1 // Customer Initial Group
2 IF LEFT([Customer Name], 1) = 'A' THEN 'A Group'
3 ELSEIF LEFT([Customer Name], 1) = 'B' THEN 'B Group'
4 ELSE 'Other'
5 END
```

Rules re-evaluate on every refresh, unlike a manual group.

For rules rather than clicks, use a calculated grouping. This calculated field uses an IF statement with LEFT to label customers by the first letter of their name. Anything that doesn't match falls into the ELSE branch. Unlike a manual group, it updates automatically when new customers arrive.

Sets: IN or OUT

Sets: IN or OUT



Fixed set

pick members by hand

Conditional / Top N set

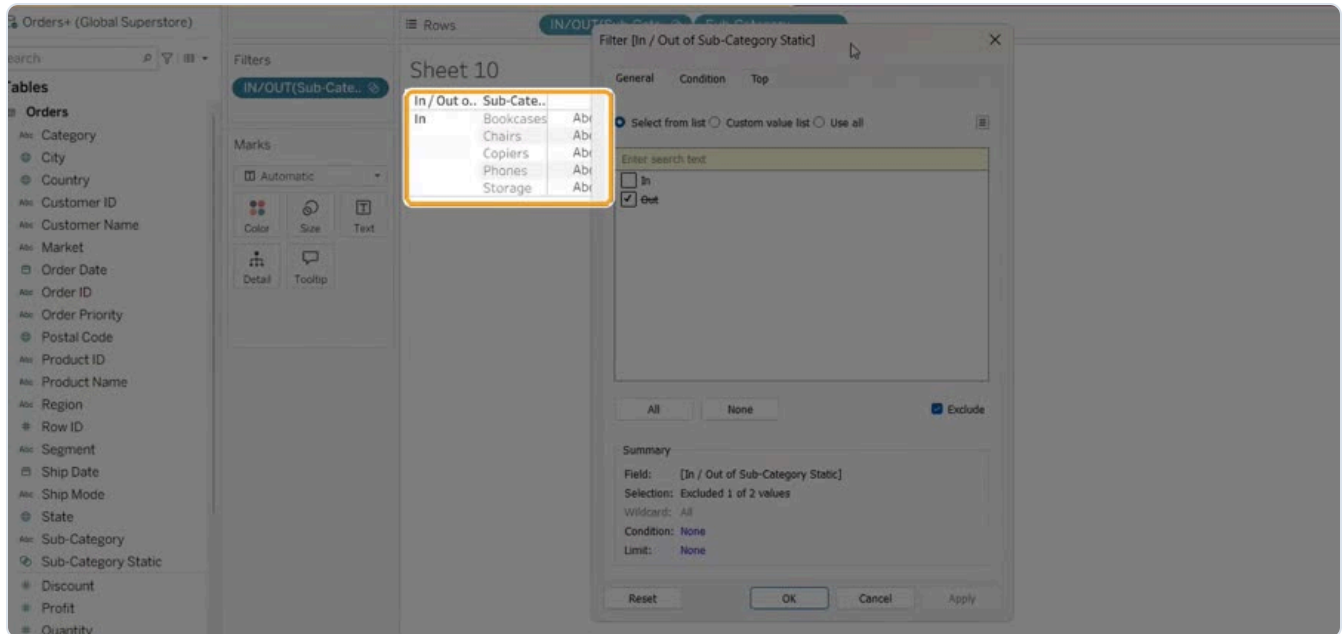
e.g. top 10 by sales

Combined set

both · either · A not B

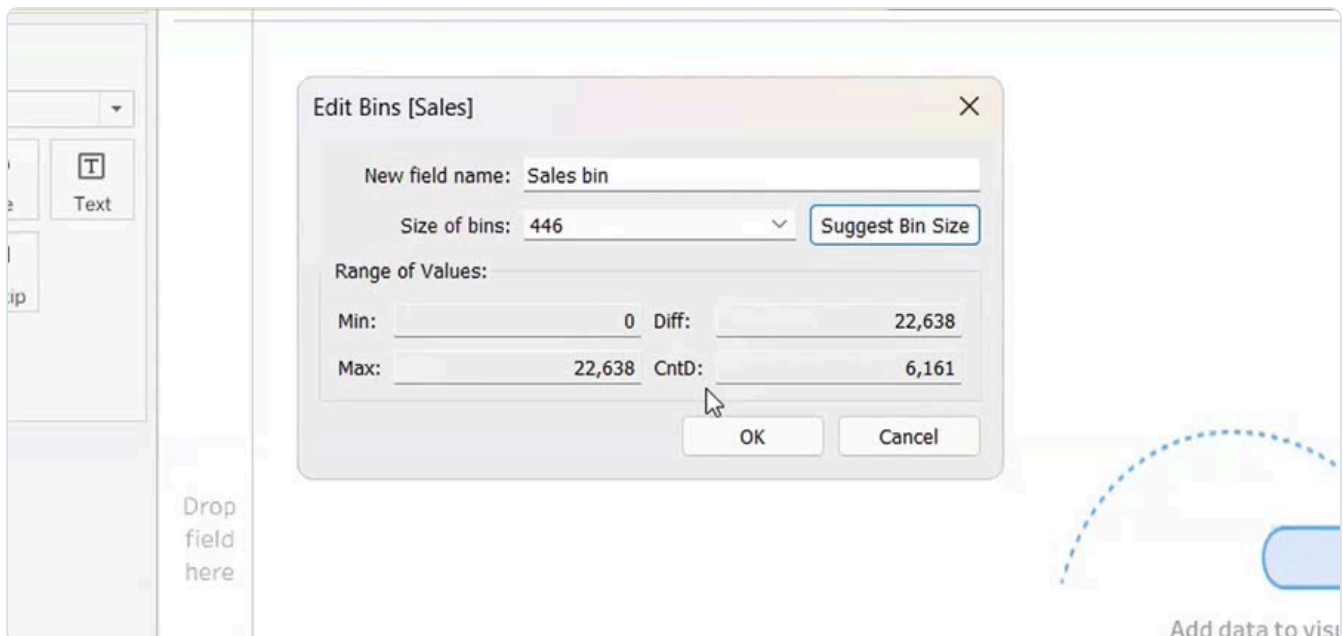
A set splits a dimension into two parts: members that are in the set, and members that are out. You can build a fixed set by picking members, or a conditional set with a rule, such as the top ten products by sales. Sets can also be combined: members in both sets, in either set, or in one set but not the other.

A set appears in the data pane with its own icon



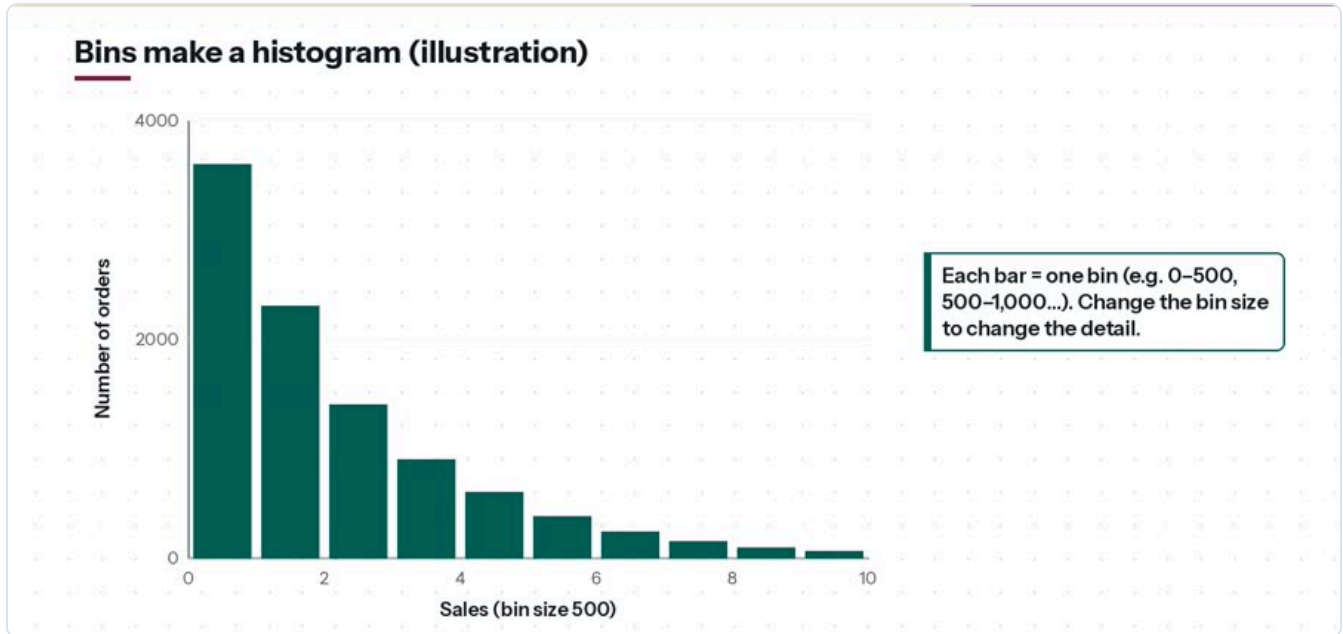
A set appears in the data pane with its own icon. Drag it to Rows and it splits the view into two groups: In, the five sub-categories in the set, and Out, everything else. You can also put the set on the Filters shelf. Here, Out is ticked with Exclude, so only the members in the set remain.

Bins turn a measure into a dimension



Bins turn a measure into a dimension. Right-click Sales and choose Create, Bins. Set the size of bins, or let Tableau suggest one. The dialog shows the range of values, from the minimum to the maximum, to help you pick a sensible size.

Bins make a histogram (illustration)



Put the bin on Columns and a count on Rows, and you get a histogram. Each bar counts the orders that fall within one sales band. Most orders are small, and a long tail of large orders stretches to the right.

A hierarchy stacks related dimensions

Pages

Filters

Marks

Automatic

Color

Size

Text

Detail

Tooltip

SUM(Sales)

Columns

Rows

Country/Region

Region

State/Province

City

Sheet 5

Country/Region	Region	State/Province	City		
Canada	Central	Manitoba	Winnipeg	1,931	
	East	New Brunswick	Moncton	226	
		Newfoundland and L.	St. John's	515	
		Nova Scotia	Halifax	382	
		Ontario	Toronto	7,009	
		Prince Edward Island	Charlottetown	1,088	
		Quebec	Montreal	3,053	
			Quebec City	774	
	West	Alberta	Calgary	10,972	
			Edmonton	489	
United States		British Columbia	Vancouver	2,763	
		Saskatchewan	Regina	132	
Total			29,333		
Central	Illinois	Arlington Heights	14		
		Aurora	7,573		
		Bloomington	964		
		Bolingbrook	218		
		Buffalo Grove	831		

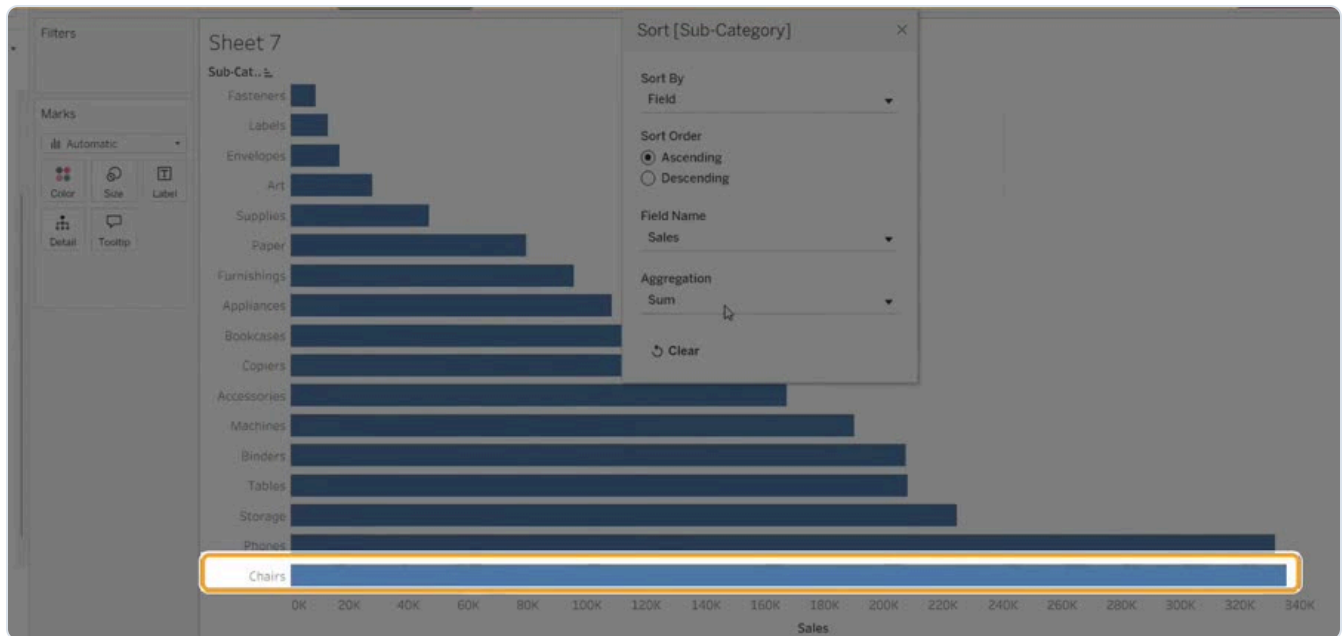
TIP

Create your own: drag one dimension onto another in the data pane, then name the hierarchy.

A hierarchy stacks related dimensions. In the data pane, Location contains Country, Region, State, City, and Postal Code. Drag the hierarchy into the view and click the plus sign to drill down one level at a time, or the minus sign to roll back up. Dates get a hierarchy automatically, from year to quarter to month.

Tip Create your own: drag one dimension onto another in the data pane, then name the hierarchy.

Finally, sorting



Finally, sorting. Click the sort icon on an axis for a quick sort, or right-click the field and choose Sort for full control. You can sort by data source order, alphabetically, manually, by a field, or as a nested sort within each pane. Here, sorting by field, sum of Sales, ascending, puts Fasteners at the top and Chairs at the bottom.

Key takeaways

- Groups combine members
- Sets mark members IN or OUT
- Bins bucket a measure into ranges
- Hierarchies drill; Sort controls order

Practice

1. Group the Sub-Category members into two groups of your choice and tick Include Other.
2. Create a conditional set of the top 10 customers by profit, put it on Color, and compare IN vs OUT.
3. Create a Sales bin of size 1,000 and build a histogram with CNT(Orders).

Check your understanding

1. Which tool splits members into IN and OUT?
2. What does Include Other do in a group?
3. What do bins turn a measure into?
4. Which sort option sorts by a measure?

Answers at the back of this handbook.

Parameters for Interactive Analysis

Video: 19_QT-19_Parameters_for_Interactive_Analysis.mp4 · 4:39 · Stage: Development · Audience: Tableau users who completed QT-14 to QT-18 (views, filters and sets)

Learning objectives

- Create parameters: type, current value, allowable values
- Drive a Top N set and a sales threshold filter
- Let viewers swap between Sales and Profit views

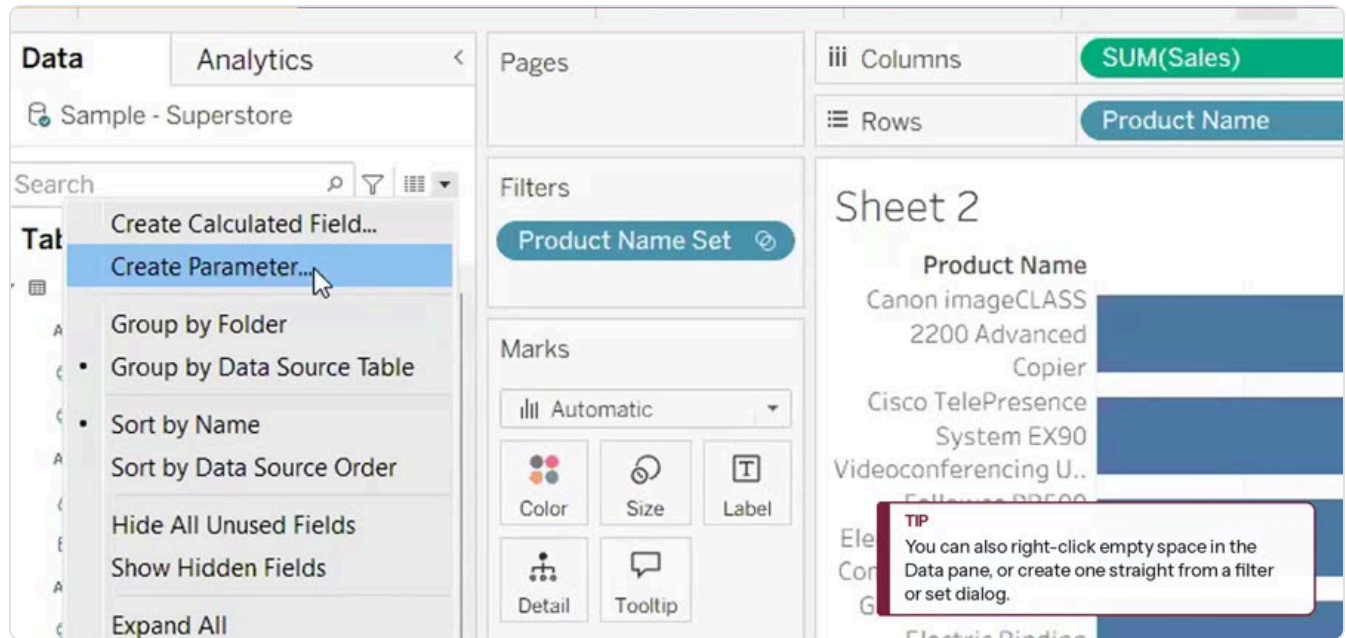
What is a parameter?

What is a parameter?

- 1 A user-defined value**
One value the viewer types, picks from a list, or slides along a range.
- 2 Workbook-wide**
The same value applies on every sheet that uses it.
- 3 Does nothing alone**
Reference it in a filter, set, calculation, reference line or bin size.

A parameter is a single, user-defined value, like a variable. It belongs to the whole workbook, not to one sheet. On its own a parameter does nothing. It only changes the view once you reference it: in a filter, a set, a calculated field, a reference line, or a bin size.

This Sample Superstore view shows ten products, kept by a Product Name...



This Sample Superstore view shows ten products, kept by a Product Name set on the Filters shelf. To let viewers choose how many products to see, open the menu at the top of the Data pane and select Create Parameter. You can also right-click any empty space in the Data pane.

Tip You can also right-click empty space in the Data pane, or create one straight from a filter or set dialog.

The Create Parameter dialog has four key settings

Product Name

Canon imageCLASS 2200 Advanced Copier

Cisco TelePresence System EX90

Videoconferencing U..

Fellowes PB500

Electric Punch Plastic Comb Binding Machi..

GBC DocuBind P400

Electric Binding System

GBC DocuBind TL300

Electric Binding System

GBC Ibimaster 500

Manual ProClick Binding System

Hewlett Packard LaserJet 3310 Copier

High Speed Automatic Electric Letter Opener

Name

Top N

Properties

Data type

Integer

Display format

10

Current value

10

Value when workbook opens

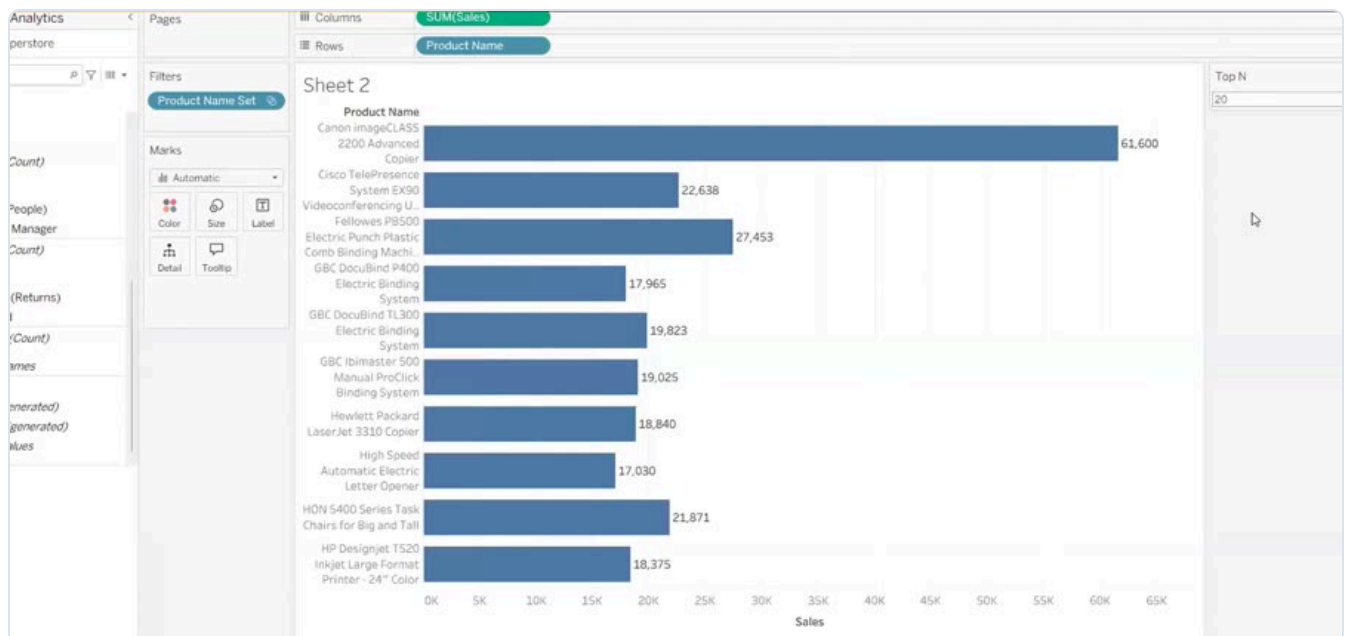
Current value

Allowable values

☒ All ☐ List ☐ Range

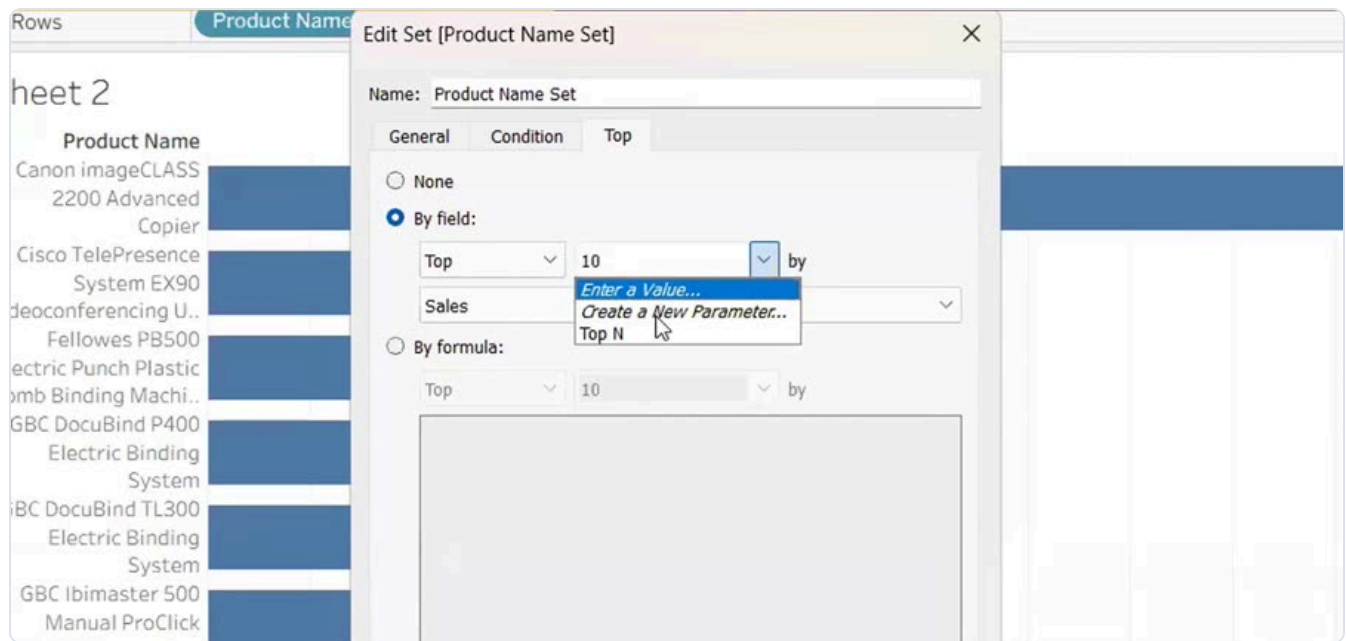
The Create Parameter dialog has four key settings. Give it a clear name, here Top N. Choose the data type: integer, float, string, boolean, date, or date and time. Set the current value, which is what viewers see first. And choose the allowable values: all values, a fixed list, or a range.

Select OK, and the new parameter appears in the Parameters section ...



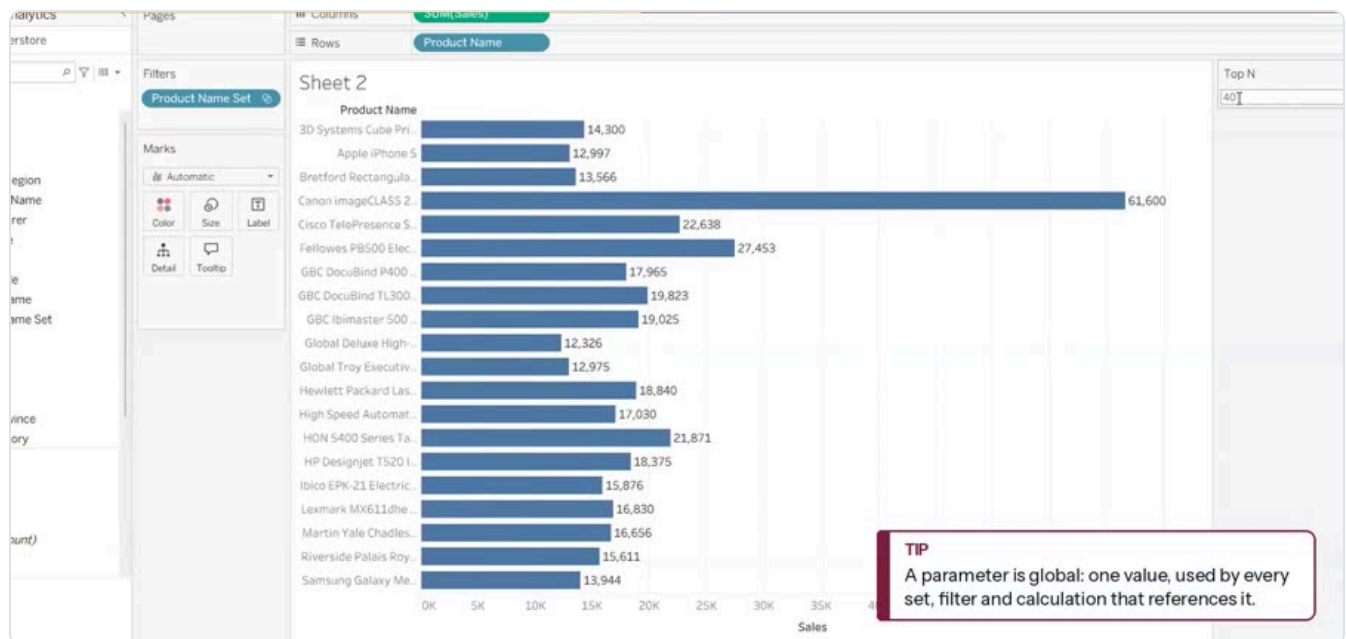
Select OK, and the new parameter appears in the Parameters section at the bottom of the Data pane. Right-click it and choose Show Parameter. A control appears beside the view, ready for input. But the chart hasn't changed yet, because nothing uses the parameter.

So connect it



So connect it. Edit the Product Name set and open its Top tab. Instead of a fixed ten, open the drop-down and pick the Top N parameter. You could also create a new parameter right here.

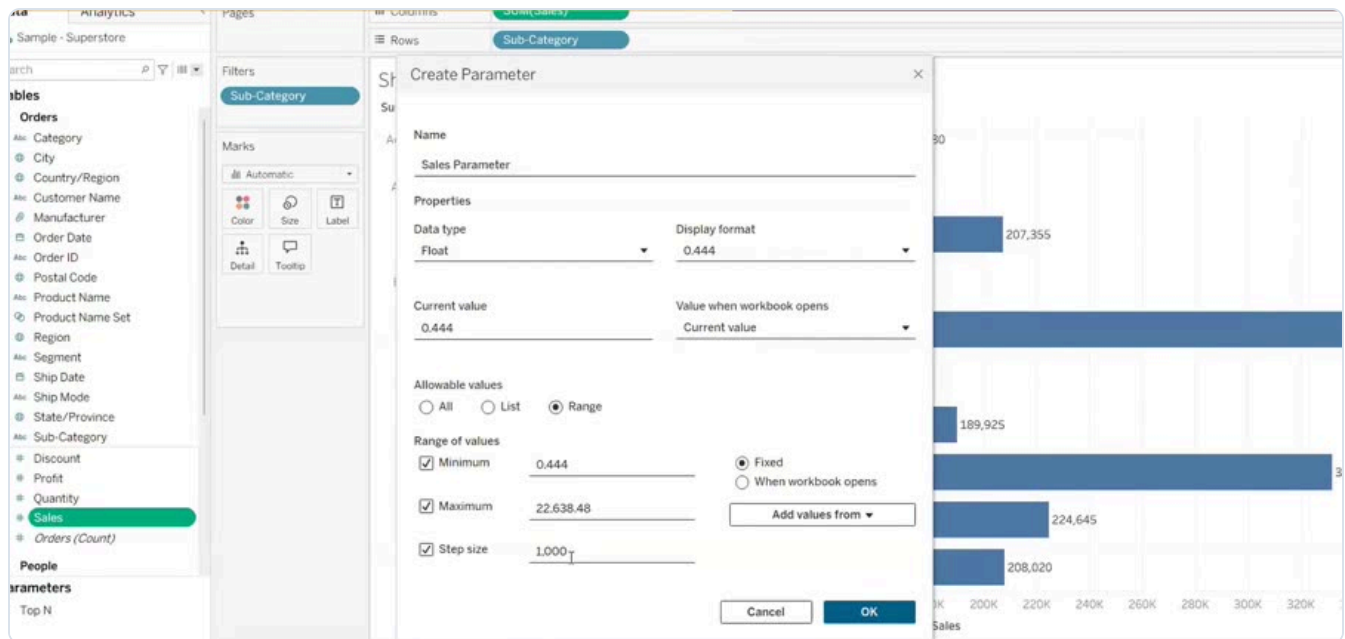
Now type a value in the Top N control



Now type a value in the Top N control. Twenty products, then forty: the set recalculates and the chart updates instantly. Because a parameter belongs to the workbook, you can reuse it on any sheet. Change it once, and everything that uses it follows.

Tip A parameter is global: one value, used by every set, filter and calculation that references it.

Parameters also work on measures



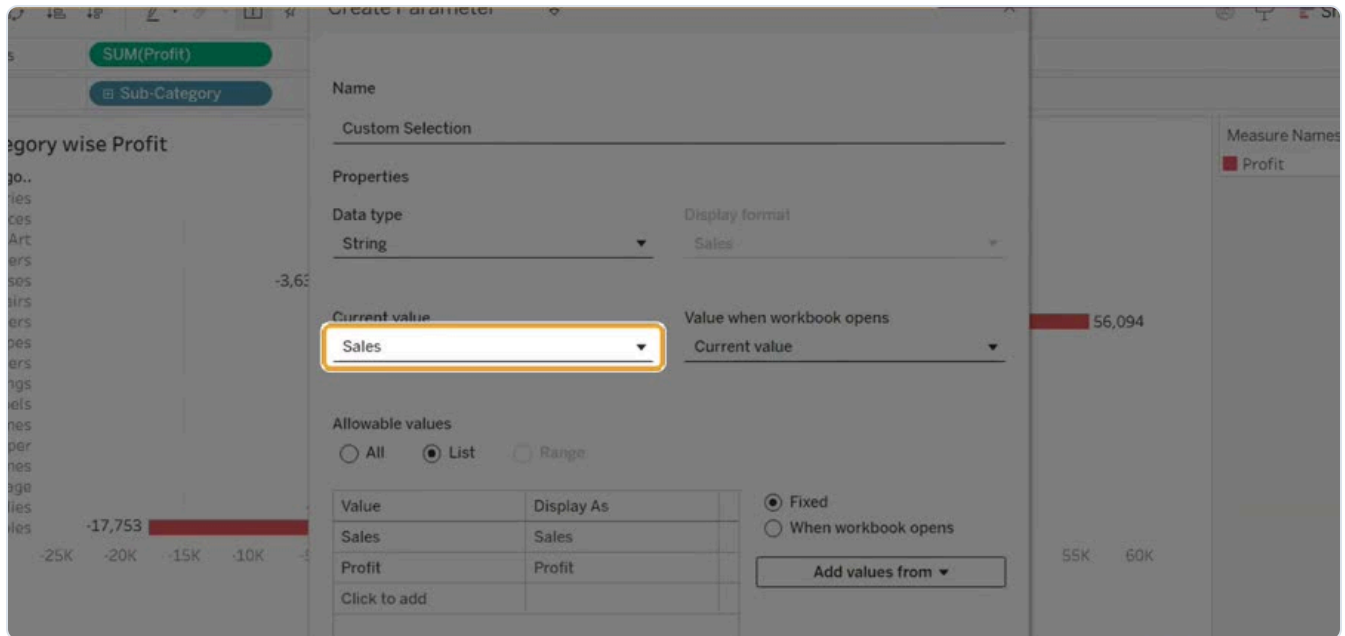
Parameters also work on measures. This one, Sales Parameter, is a float with a range. Select Add values from, and Tableau fills the minimum and maximum from the Sales field. Then set a step size of one thousand, so each click of the slider moves one thousand dollars.

On the Sub-Category filter, the Condition tab first used a hard-cod...



On the Sub-Category filter, the Condition tab first used a hard-coded formula: sum of sales greater than one hundred thousand. The trainer replaces the number with the Sales Parameter. Notice the colors: fields are orange and parameters are purple. Now drag the slider. At eleven thousand, all seventeen sub-categories show. Push it to seventeen thousand, and Envelopes and Labels drop out of the view.

A string parameter can even swap whole sheets on a dashboard



A string parameter can even swap whole sheets on a dashboard. Here, Custom Selection is a string parameter. Its allowable values are a list of two values, Sales and Profit, and the current value is Sales.

How a sheet swap works

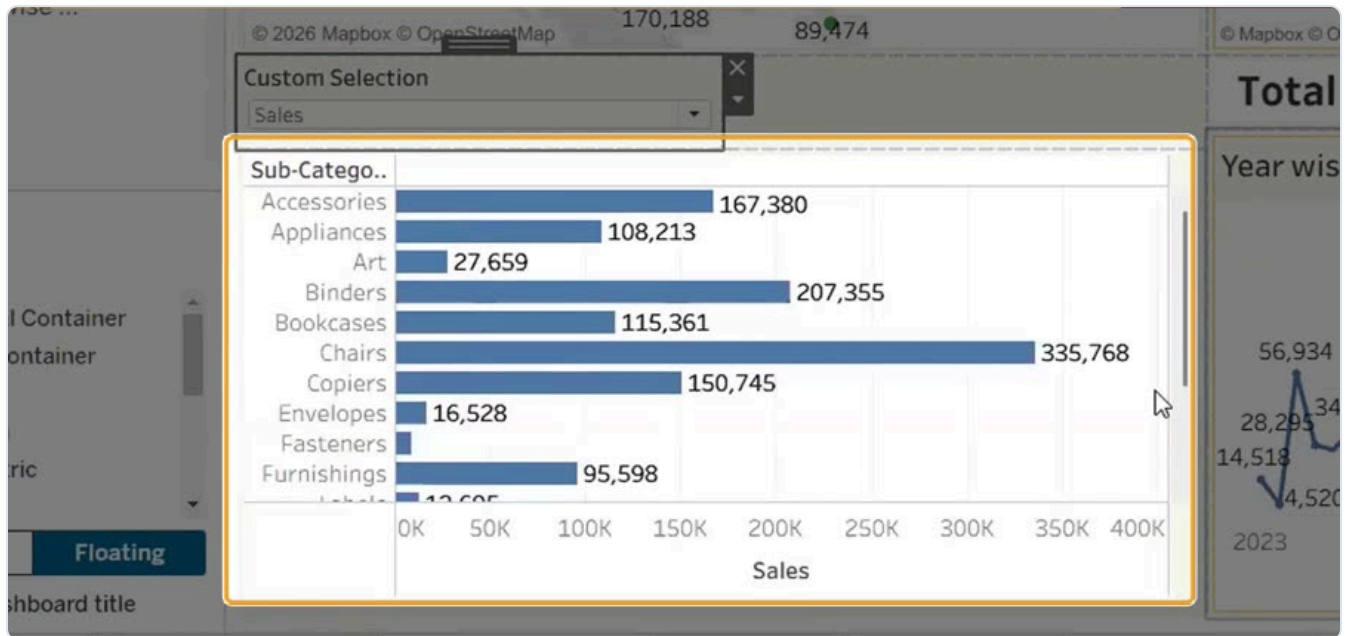
How a sheet swap works

```
1 // Calculated field: Swap Filter
2 [Custom Selection]
3
4 // Sheet 'Sales by Sub-Category'
5 Filters shelf: Swap Filter = "Sales"
6
7 // Sheet 'Profit by Sub-Category'
8 Filters shelf: Swap Filter = "Profit"
9
10 // Dashboard
11 One vertical container holds both sheets
12 Hide sheet titles; show the parameter control
```

3. A container collapses the empty sheet, so the selected one fills the space.

The logic takes three steps. Create a calculated field that simply returns the parameter. Put that field on the Filters shelf of each sheet: keep Sales on the sales sheet, and Profit on the profit sheet. Then place both sheets in one container on the dashboard, and hide their titles. Only the selected sheet has data, so the container shows just that one.

Here's the result on the trainer's Sales Dashboard



Here's the result on the trainer's Sales Dashboard. With Profit selected in the Custom Selection control, the profit chart fills the space. Choose Sales, and the sales chart takes its place.

More ways to use parameters

More ways to use parameters

- 1 Bin size**
Edit a bin and choose a parameter for its size.
- 2 Last N days**
`DATEDIFF('day', [Order Date], TODAY()) <= [N Days]`
- 3 Target line**
Reference line value = a target parameter.
- 4 Measure picker**
`CASE [Measure] WHEN 'Sales' THEN SUM([Sales]) WHEN 'Profit' THEN SUM([Profit]) END`

Other common uses: a bin size parameter controls histogram buckets. A last N days parameter, compared with DATEDIFF, builds a rolling date filter. A target parameter drives a reference line. And a CASE statement on a string parameter lets viewers choose which measure a single chart shows.

Key takeaways

- A workbook-wide value the viewer controls
- Type, current value, allowable values
- Reference it in a set, filter or calculation
- A string parameter can swap sheets

Practice

1. Create an integer parameter Top N (current value 10) and use it in a Top filter on Customer Name by SUM(Sales).
2. Create a float Sales Threshold parameter with a range and step size, and use it in a Condition formula on Sub-Category.
3. Build a Sales/Profit sheet swap on a dashboard with a string parameter.

Check your understanding

1. Does a parameter change the view on its own?
2. What does 'Add values from' do in a range parameter?
3. What colour are parameters in the calculation editor?
4. What makes a sheet swap collapse the unused sheet?

Answers at the back of this handbook.

Calculated Fields & Time Intelligence

Video: 20_QT-20_Calculated_Fields_and_Time_Intelligence.mp4 · 3:46 · Stage: Development · Audience: Tableau users who completed QT-19

Learning objectives

- Use number, string and logical functions
- Work with DATEPART, DATEDIFF and DATETRUNC
- Build a YTD vs previous-YTD growth KPI

Four function families you'll use most

The graphic is titled "Four function families you'll use most" and is set against a background of a grid of small, faint function names. It contains four distinct boxes, each representing a family of functions:

- 1 Number** (green header):
 - ROUND, CEILING, FLOOR, ABS
 - ZN(x): turns null into 0
- 2 String** (green header):
 - LEFT, RIGHT, MID
 - FIND, CONTAINS, SPLIT
- 3 Logical** (maroon header):
 - IF ... THEN ... ELSE ...
 - END
 - IIF, CASE ... WHEN
- 4 Date** (maroon header):
 - DATEPART, DATEADD, DATEDIFF, DATETRUNC, TODAY

Create a calculated field from the data pane menu, give it a name, and write a formula. The editor lists every function, with help on the right. You'll use four families most. Number functions like ROUND and ZN. String functions like LEFT, MID, and FIND. Logical functions like IF and CASE. And date functions, which power time intelligence.

Everyday calculations

Everyday calculations

```
1 ZN(SUM([Profit]))           // null → 0
2
3 LEFT([State], 2)             // 'Ca' from 'California'
4
5 LEFT([Customer Name],
6     FIND([Customer Name], ' ') - 1) // first name
7
8 IF SUM([Profit]) > 0 THEN 'Profitable'
9 ELSE 'Loss' END
```

Aggregate inside IF when comparing totals.

A few everyday examples. ZN replaces nulls with zero, so totals don't go blank. LEFT takes the first characters of a string, for example the first two letters of a state name. FIND returns the position of a character, which you can combine with LEFT or MID to split text. And IF returns a label based on a condition.

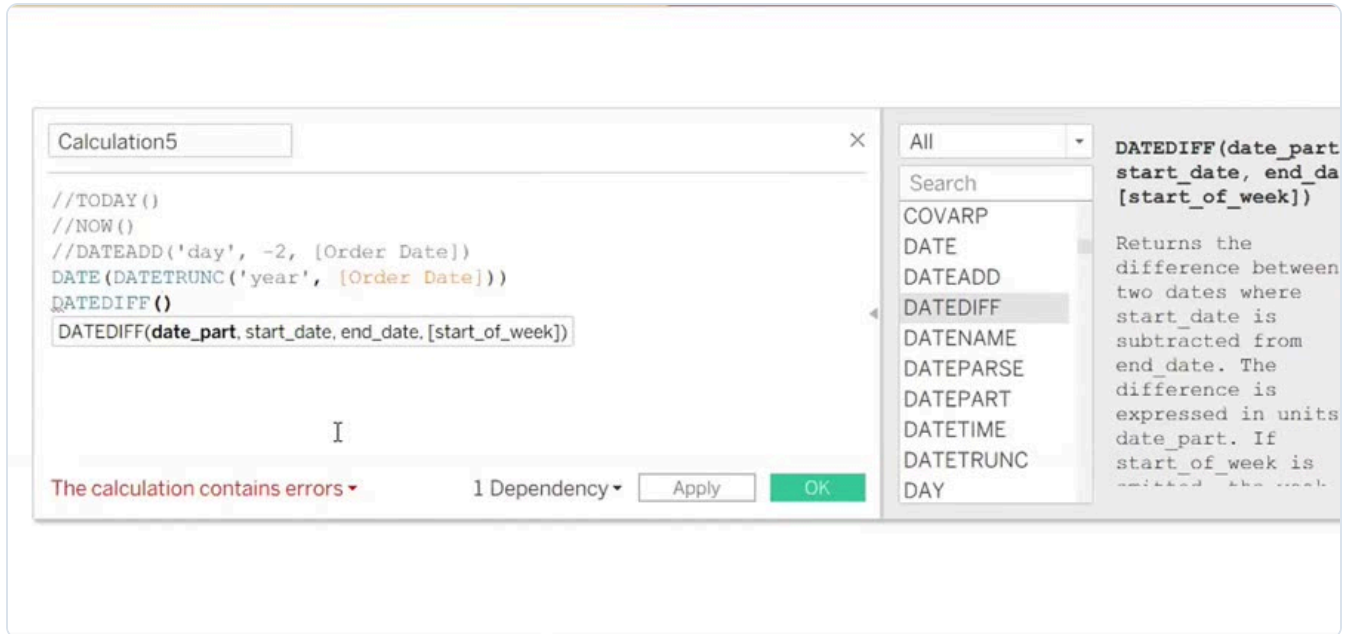
Date functions at a glance

Date functions at a glance

Function	Example	Result
DATEPART	DATEPART('month', #2026-03-15#)	3
DATENAME	DATENAME('month', #2026-03-15#)	March
DATEADD	DATEADD('day', -2, #2026-03-15#)	2026-03-13
DATEDIFF	DATEDIFF('day', #2026-03-01#, #2026-03-15#)	14
DATETRUNC	DATETRUNC('month', #2026-03-15#)	2026-03-01

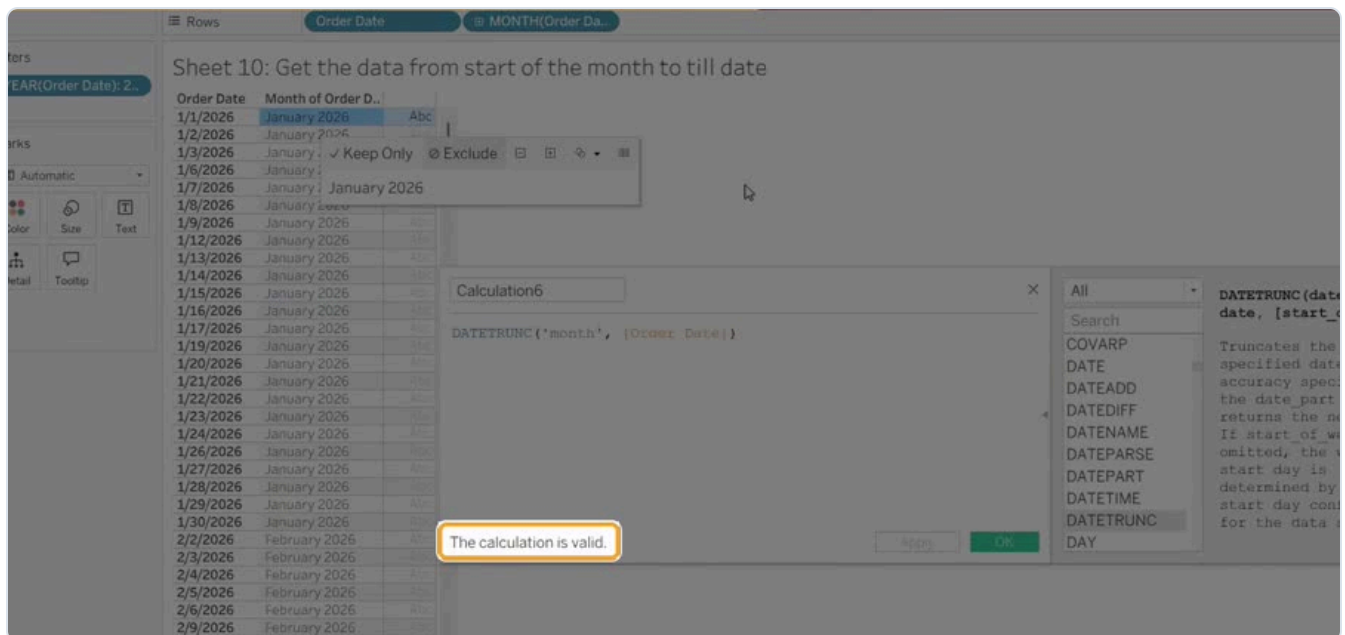
Dates have their own toolkit. DATEPART returns a number, such as month three. DATENAME returns text, such as March. DATEADD shifts a date, for example minus two days. DATEDIFF counts the units between two dates. And DATETRUNC rounds a date down to the start of its month, quarter, or year.

Here the trainer experiments in the calculation editor



Here the trainer experiments in the calculation editor. Earlier lines are commented out with two slashes. The DATEDIFF line is incomplete, so the editor reports that the calculation contains errors. The function list and the help panel on the right show the exact syntax: a date part, a start date, and an end date.

Next, DATETRUNC by month



Next, DATETRUNC by month. Every order date in January is truncated to January 2026, so the new month column groups the rows by month start. The editor confirms the calculation is valid.

YTD vs previous YTD

YTD vs previous YTD

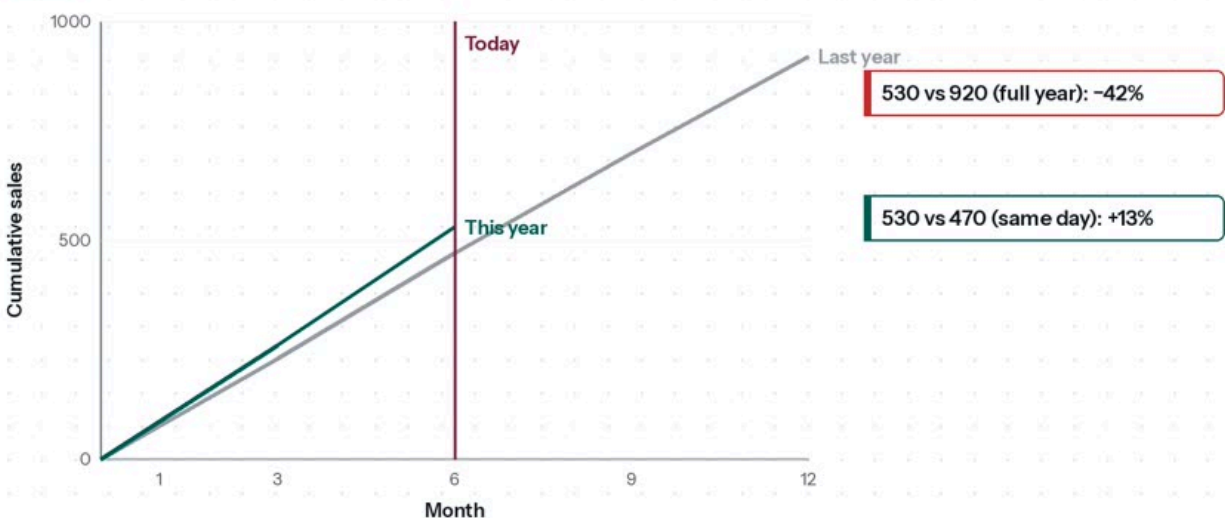
```
1 Current YTD:  
2 IF YEAR([Order Date]) = YEAR(TODAY())  
3   AND [Order Date] ≤ TODAY() THEN [Sales] END  
4  
5 Previous YTD:  
6 IF YEAR([Order Date]) = YEAR(TODAY()) - 1  
7   AND DATEADD('year', 1, [Order Date]) ≤ TODAY()  
8 THEN [Sales] END  
9  
10 YTD Growth %:  
11 (SUM([Current YTD]) - SUM([Previous YTD]))  
12 / SUM([Previous YTD])
```

Format as a percentage.

Now the time-intelligence pattern. Current YTD keeps sales from this year up to today. Previous YTD keeps last year's sales, up to the same day last year, so the comparison is fair. Growth is the difference divided by the previous year-to-date total.

Compare like with like (illustration)

Compare like with like (illustration)



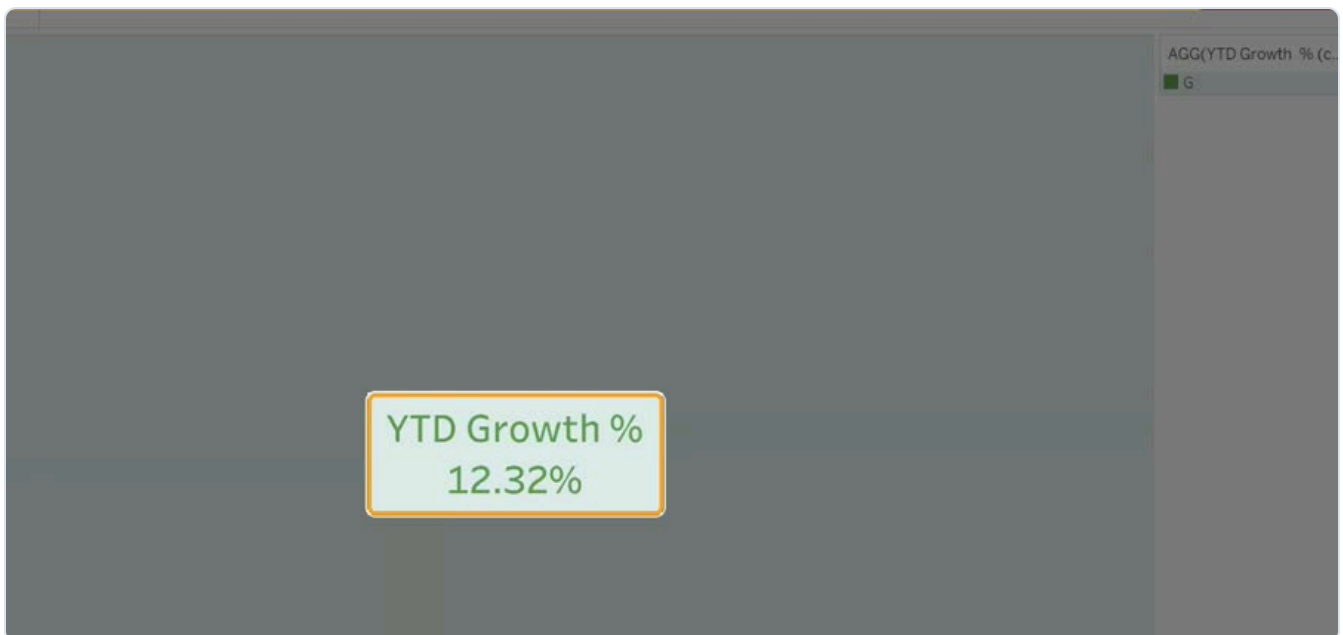
Here's why the same-day cutoff matters. If you compare this year so far with all of last year, growth looks badly negative. Compare like with like, and you see the real trend.

On a new sheet, the trainer drops YTD Growth on Text



On a new sheet, the trainer drops YTD Growth on Text. It shows a raw decimal, zero point one two three two. In the Format pane, set Numbers to Percentage with two decimal places. Then edit the label to add a title above the value, and enlarge the font. The card now reads YTD Growth, twelve point three two percent.

To color the card, the trainer writes a logical calculation: if gro...



To color the card, the trainer writes a logical calculation: if growth is above zero, return G, otherwise R. Drag that field onto the Color card in the Marks pane. Then assign green to G, and red to R for negative growth. Positive growth now shows green at a glance.

Key takeaways

- Number, string and logical functions
- DATEPART, DATEDIFF, DATETRUNC
- YTD vs same-period-last-year growth KPI

Practice

1. Create calculated fields with ZN, LEFT and FIND on Sample Superstore, and check each result in a text table.
2. Build Current YTD and Previous YTD calculations, then a YTD Growth % KPI card formatted as a percentage.
3. Colour the KPI green when growth is positive and red when negative.

Check your understanding

1. What does ZN do?
2. DATEPART or DATENAME: which returns text such as 'March'?
3. What does DATETRUNC('month', date) return?
4. Why cap previous-year sales at the same day last year?

Answers at the back of this handbook.

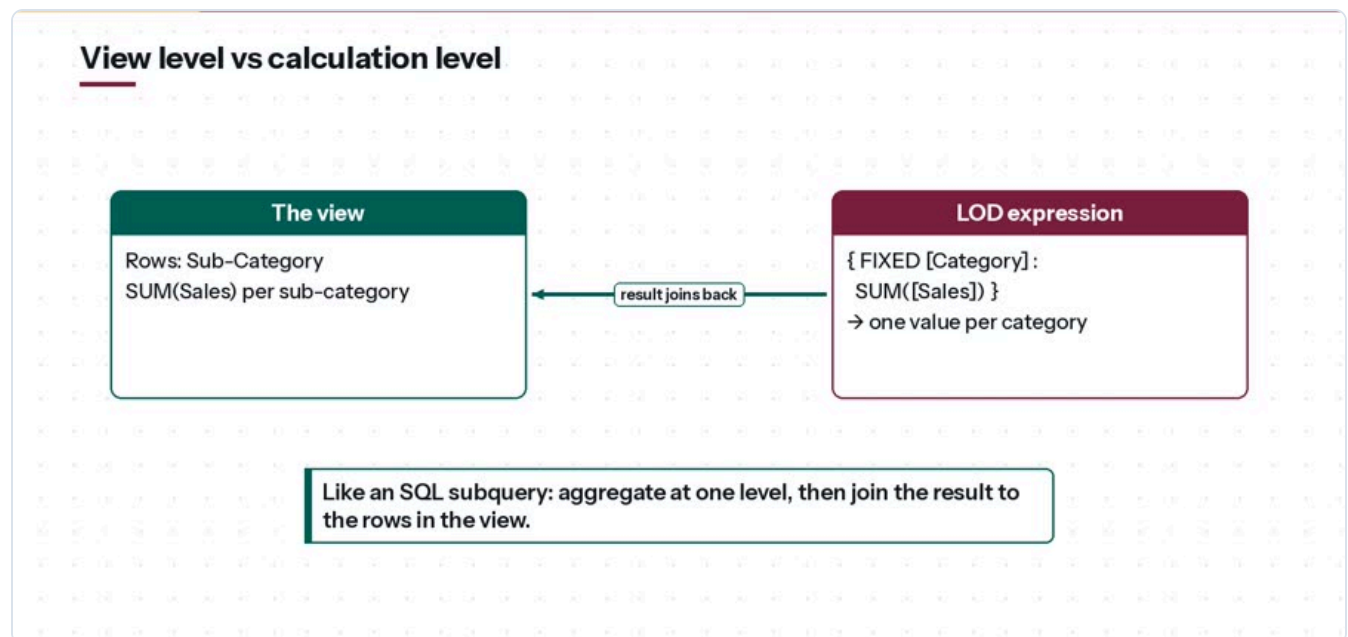
LOD Expressions & Table Calculations

Video: 21_QT-21_LOD_Expressions_and_Table_Calculations.mp4 · 5:23 · Stage: Development · Audience: Tableau users who completed QT-20

Learning objectives

- Explain view level of detail vs calculation level
- Write FIXED, INCLUDE and EXCLUDE expressions
- Use INDEX, FIRST, RANK and running totals; set Compute Using

View level vs calculation level



Every view has a level of detail: the dimensions on rows, columns, and the Marks card. Normally an aggregate like SUM of Sales is computed at that level. A level of detail expression, or LOD, lets you compute at a different level, then bring the result back into the view. It works much like a subquery in SQL.

The simplest LOD is a table-scoped FIXED: curly braces, FIXED, a co...

The screenshot shows the Tableau LOD editor. On the left, a table lists sub-categories and segments with their respective sales values. On the right, the calculation editor shows the formula `{ FIXED : SUM([Sales]) }`. A tip box at the bottom right states: **TIP** `{ FIXED : SUM([Sales]) }` = total sales for the whole data source, on every row.

Sub-Category	Segment	Sales
Accessories	Consumer	87,105
	Corporate	48,191
	Home Office	32,085
Appliances	Consumer	53,169
	Corporate	36,668
	Home Office	18,376
Art	Consumer	14,682
	Corporate	8,701
	Home Office	4,276
Binders	Consumer	121,607
	Corporate	51,599
	Home Office	34,149
Bookcases	Consumer	69,114
	Corporate	34,006
	Home Office	12,241
Chairs	Consumer	174,828
	Corporate	99,797
	Home Office	61,143
Copiers	Consumer	69,819
	Corporate	46,829
	Home Office	34,097
Envelopes	Consumer	7,823
	Corporate	5,943
	Home Office	2,763
Fasteners	Consumer	1,892
	Corporate	5,998

The simplest LOD is a table-scoped FIXED: curly braces, FIXED, a colon, and an aggregate, with no dimension. It returns the grand total of sales, the same on every row, whatever is in the view.

Tip `{ FIXED : SUM([Sales]) }` = total sales for the whole data source, on every row.

Add a dimension and FIXED computes per value of that dimension

The screenshot shows the Tableau LOD editor with a dimension-based calculation. The formula is `{ FIXED [Category] : SUM([Sales]) }`. A tooltip for the 'Category' dimension shows the following data:

Category	Sub-Category	SUM
Furniture	Bookcases	4,416
Office Supplies	Appliances	9,893
Technology	Accessories	22,638

The calculation is valid.

Add a dimension and FIXED computes per value of that dimension. Here, FIXED Category, MAX of Sales returns the single largest sale in each category. Every Furniture row shows four thousand, four hundred and sixteen, even though the view is broken down by sub-category.

When the FIXED dimension matches the view, as with FIXED Sub-Catego...

Sheet 25

Order ID	Sub-Catego..	Fixed SubCat..	Sales
CA-2023-100867	Phones	331,84	3
CA-2023-107153	Storage	224,64	1
CA-2023-115238	Furnishings	95,59	6
	Paper	79,54	
	Phones	331,84	21
CA-2023-115777	Paper	79,54	38
CA-2023-117964	Art	27,65	1
	Furnishings	95,59	4
CA-2023-119508	Art	27,65	1
	Furnishings	95,59	2
CA-2023-123625	Fasteners	8,53	8
	Furnishings	95,59	17
CA-2023-123664	Furnishings	95,59	5
CA-2023-125388	Furnishings	95,59	11
	Storage	224,64	5
CA-2023-126438	Art	27,65	1
CA-2023-126634	Furnishings	95,59	9
CA-2023-129322	Appliances	108,21	11
	Art	27,65	4
	Binders	207,35	44
CA-2023-131807	Appliances	108,21	1
	Chairs	335,76	43
	Fasteners	8,53	1
	Furnishings	95,59	3

When the FIXED dimension matches the view, as with FIXED Sub-Category, SUM of Sales, the LOD equals plain Sales. Now watch what happens when the view goes finer. With Order ID added to the rows, the FIXED value doesn't change: it still shows each sub-category's total on every order line. FIXED ignores the view's dimensions.

FIXED, INCLUDE and EXCLUDE

FIXED, INCLUDE and EXCLUDE		
Keyword	Computes at	Example
FIXED	Exactly the listed dimensions; ignores the view	{ FIXED [Customer Name] : MIN([Order Date]) } → first order date
INCLUDE	View level + listed dimensions (finer)	AVG({ INCLUDE [Customer Name] : SUM([Sales]) }) → avg sales per customer
EXCLUDE	View level - listed dimensions (coarser)	{ EXCLUDE [Region] : SUM([Sales]) } → total across regions
Filters	FIXED runs before dimension filters	Add to context so a filter applies first

There are three LOD keywords. FIXED computes at exactly the dimensions you list, ignoring the view. INCLUDE adds dimensions to the view's level, for example the average sales per customer within each region. EXCLUDE removes dimensions from the view's level, for example each region's share of a category total. And note the order of operations: FIXED is calculated before dimension filters, so use context filters if a filter must apply first.

Here's a real customer question: what was each customer's second mo...

2nd latest purchase date of a customer

Customer Name	2 Max OD by Cust	2nd latest ..	
Aaron Bergman	3/7/2023	11/10/2025	Abc
Aaron Hawkins	3/20/2025	12/18/2026	Abc
Aaron Smayling	9/4/2026	10/3/2026	Abc
Adam Bellavance	11/5/2026	11/6/2026	Abc
Adam Hart	10/23/2026	11/26/2026	Abc
Adam Shillingsburg	9/16/2026	12/2/2026	Abc
Adrian Barton	9/19/2026	11/19/2026	Abc
Adrian Hane	8/17/2026	10/31/2026	Abc
Adrian Shami	11/13/2025	11/19/2026	Abc
Aimee Bixby	9/4/2026	11/19/2026	Abc
Alan Barnes	12/5/2026	12/20/2026	Abc
Alan Dominguez	11/13/2026	12/1/2026	Abc
Alan Haines	8/24/2026	11/5/2026	Abc
Alan Hwang	11/23/2026	12/24/2026	Abc
Alan Schoenberger	9/13/2026	12/8/2026	Abc
Alan Shonely	6/25/2025	6/21/2026	Abc
Alejandro Ballentine	6/16/2026	7/17/2026	Abc
Alejandro Grove	3/27/2026	9/20/2026	Abc
Alejandro Savely	11/11/2025	12/11/2026	Abc
Aleksandra Gannaw...	12/5/2025	9/3/2026	Abc
Alex Avila	3/3/2025	6/29/2026	Abc
Alex Grayson	12/18/2026	12/22/2026	Abc
Alex Russell	9/8/2026	9/10/2026	Abc
Alice McCarthy	5/28/2026	12/2/2026	Abc
Allen Arnold	9/7/2026	12/11/2026	Abc
Allen Goldenen	12/1/2025	9/7/2026	Abc
Allen Rosenblatt	6/19/2026	8/27/2026	Abc
Alyssa Crouse	2/23/2025	5/12/2026	Abc
Alyssa Tate	4/2/2026	12/9/2026	Abc

2 Max OD by Cust

Sample - Superstore

```

( FIXED [Customer Name] :
  MAX( (IF [Order Date] < [2nd latest OrDate]
    THEN [Order Date] END) ) )

```

The calculation is valid.

1 Dependency

Apply OK

TIP

Aaron Bergman: latest 11/10/2025, second latest 3/7/2023.

Here's a real customer question: what was each customer's second most recent order date? Step one, a FIXED by customer finds the latest order date. Step two, a second FIXED by customer takes the maximum of the order dates that come before that latest date. The result is one second-latest date per customer, with no table calculation needed.

Tip In the demo this column is named “2nd latest OrDate”, but it holds each customer's latest order date.

Tip Aaron Bergman: latest 11/10/2025, second latest 3/7/2023.

Nested LOD: second most recent order

Nested LOD: second most recent order

```
1 // Latest Order
2 { FIXED [Customer Name] : MAX([Order Date]) }
3
4 // Second Latest Order
5 { FIXED [Customer Name] :
6   MAX( IF [Order Date] < [Latest Order]
7     THEN [Order Date] END ) }
```

FIXED by customer: the result is the same whatever the view shows.

Here are the two calculations written out cleanly. Latest Order is a FIXED maximum by customer. Second Latest Order keeps only order dates earlier than the latest, then takes the maximum of those. Because both are FIXED by customer, they work at customer level wherever you use them.

Table calculation functions

Table calculation functions

Function	Returns
INDEX()	Row number in the partition: 1, 2, 3...
FIRST() / LAST()	Offset to the first / last row (0 on that row)
SIZE()	Number of rows in the partition
LOOKUP(expr, n)	Value n rows away (-1 = previous row)
RANK(expr)	Rank of each value (1 = highest by default)
RUNNING_SUM(expr)	Cumulative total down the partition

Table calculations work differently. They run last, on the aggregated values already in the view. INDEX numbers each row. FIRST and LAST give the distance to the first and last row. SIZE counts the rows in the partition. LOOKUP reads a value from another row. RANK orders the values. And RUNNING SUM accumulates as it goes.

In this sheet, the trainer added several table calculations side by side...

Sheet 10

Sub-Category..	Sales	Table Cal..	LAST() al..	INDEX() ..	SIZE() al..
Accessories	167,380	0	16	1	17
Appliances	108,213	-1	15	2	17
Art	27,659	-2	14	3	17
Binders	207,355	-3	13	4	17
Bookcases	115,361	-4	12	5	17
Chairs	335,768	-5	11	6	17
Copiers	150,745	-6	10	7	17
Envelopes	16,528	-7	9	8	17
Fasteners	8,532	-8	8	9	17
Furnishings	95,598	-9	7	10	17
Labels	12,695	-10	6	11	17
Machines	189,925	-11	5	12	17
Paper	79,541	-12	4	13	17
Phones	331,843	-13	3	14	17
Storage	224,645	-14	2	15	17
Supplies	46,725	-15	1	16	17
Tables	208,020	-16	0	17	17

Table Calculations

Results are computed along Table (across).

The calculation is valid.

1 Dependency ▾ Apply OK

In this sheet, the trainer added several table calculations side by side for seventeen sub-categories. INDEX counts one to seventeen. SIZE is seventeen on every row. LAST counts down to zero, and FIRST counts from zero down to minus sixteen. The editor notes that results are computed along the table.

Compute Using decides the direction and the partition

Sheet 10

Category	Sub-Category..	Differen..	FIRST() a..	Table Cal..	Sales	Calculati..
Furniture	Bookcases		0		115,361	451,129
	Chairs	220,407	-1	220,407	335,768	431,366
	Furnishings	-240,170	-2	-240,170	95,598	303,618
	Tables	-112,422	-3	-112,422	208,020	316,238
Office Supplies	Appliances	-99,807	0	-99,807	108,213	135,872
	Art	-80,554	1	-80,554	27,659	235,014
	Binders	-179,696	-2	-179,696	207,355	223,883
	Envelopes	-190,827	-3	-190,827	16,528	25,061
	Fasteners	-7,996	-4	-7,996	8,532	21,227
	Labels	4,163	-5	4,163	12,695	92,236
	Paper	66,845	-6	66,845	79,541	304,185
	Storage	145,104	-7	145,104	224,645	271,370
Supplies	-177,919	-8	-177,919	46,725	214,106	
Technology	Accessories	120,655	0	120,655	167,380	318,126
	Copiers	-16,635	-1	-16,635	150,745	340,670
	Machines	39,180	2	39,180	189,925	521,768
	Phones	141,918	3	141,918	331,843	331,843

Table Calculation FIRST()

Compute Using

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

☒ Sub-Category
☐ Category

At the level *

Restarting every *

Sort order Specific Dime... ▾

☒ Show calculation assistance

Compute Using decides the direction and the partition. Table down runs straight through every row. Pane restarts inside each pane. Choosing specific dimensions gives full control. With Sub-Category ticked and Category unticked, FIRST restarts for each category, so Furniture counts zero to minus three, then Office Supplies starts again.

RANK of sales, computed table down, gives Chairs first and Phones s...

Sub-Catego..	Rank of ..	FIRST() a..	Table Cal..
Accessories	7	0	
Appliances	10	-1	-59,167
Art	14	-2	-80,554
Binders	5	-3	179,696
Bookcases	9	-4	-91,994
Chairs	1	-5	220,407
Copiers	8	-6	-185,023
Envelopes	15		
Fasteners	17		
Furnishings	11		
Labels	16		
Machines	6		
Paper	12	-12	-110,384
Phones	2	-13	252,302
Storage	3	-14	-107,198
Supplies	13	-15	-177,919
Tables	4	-16	161,295

Sub-Category: Copiers

Rank of Sales along Table (Down): 8

Table Calculations along Table (Down): -185,023

RANK of sales, computed table down, gives Chairs first and Phones second. Hover a mark and the tooltip names the table calculation and its direction, which is a handy check that it's computing the way you intended.

LOD or table calculation?

LOD or table calculation?		
	LOD expression	Table calculation
Computes on	Row-level data at the level you choose	Aggregated marks already in the view
Typical use	First order date, customer cohorts, totals	Rank, running total, % of total, vs previous
Filters	FIXED ignores dimension filters (use context)	Sees only what survived all filters
Pick it when	The level you need isn't in the view	The answer depends on the marks shown

So which should you use? Use an LOD when the answer depends on data at a level that isn't in the view, such as a customer's first order, or when it must ignore filters on the view. Use a table calculation when the answer depends on the marks already in the view, such as rank, running total, percent of total, or difference from the previous period.

Key takeaways

- LODs: FIXED, INCLUDE, EXCLUDE
- Nested FIXED for customer-level questions
- Table calcs work on the marks in the view
- Compute Using sets direction and partitions

Practice

1. Write {FIXED [Category] : SUM([Sales])} and compare it with SUM(Sales) in a view by Sub-Category.
2. Find each customer's latest and second-latest order date with nested FIXED expressions.
3. Add a running total and a RANK table calculation, then change Compute Using and observe the result.

Check your understanding

1. Which LOD keyword ignores the dimensions in the view?
2. Do FIXED expressions run before or after dimension filters?
3. When do table calculations run?
4. What does Compute Using control?

Answers at the back of this handbook.

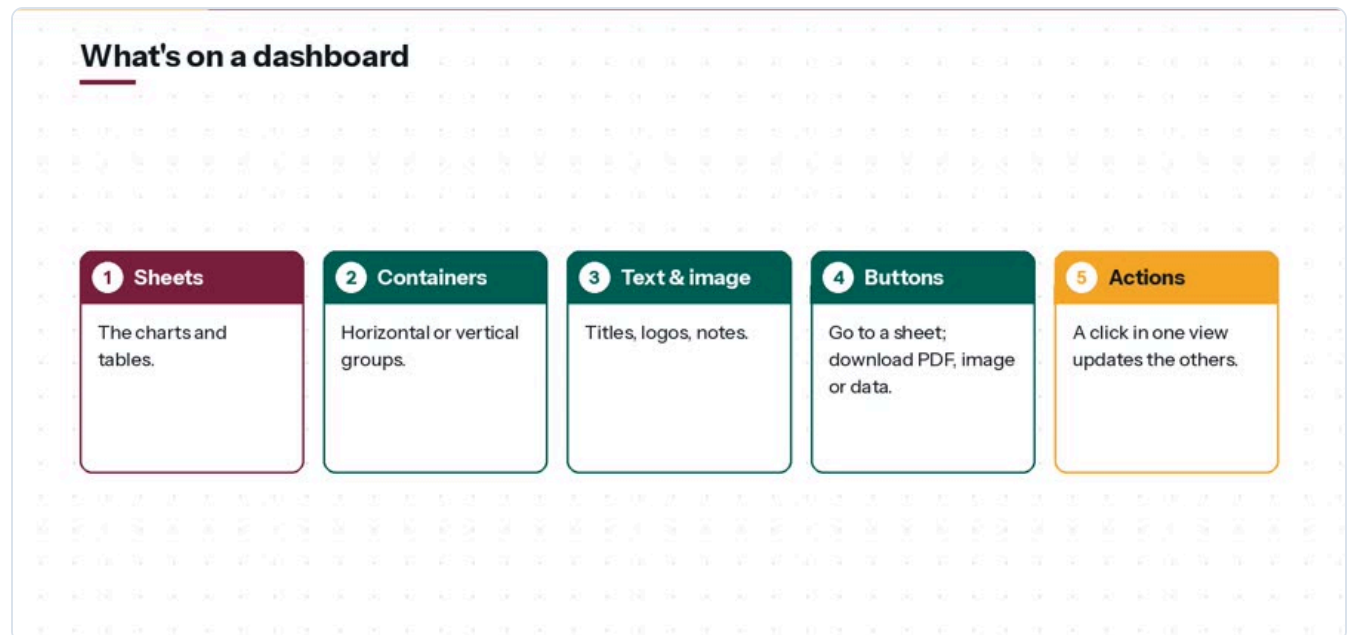
Interactive Dashboards & Actions

Video: 22_QT-22_Interactive_Dashboards_and_Actions.mp4 · 5:11 · Stage: Development · Audience: Tableau users who completed QT-19 to QT-21

Learning objectives

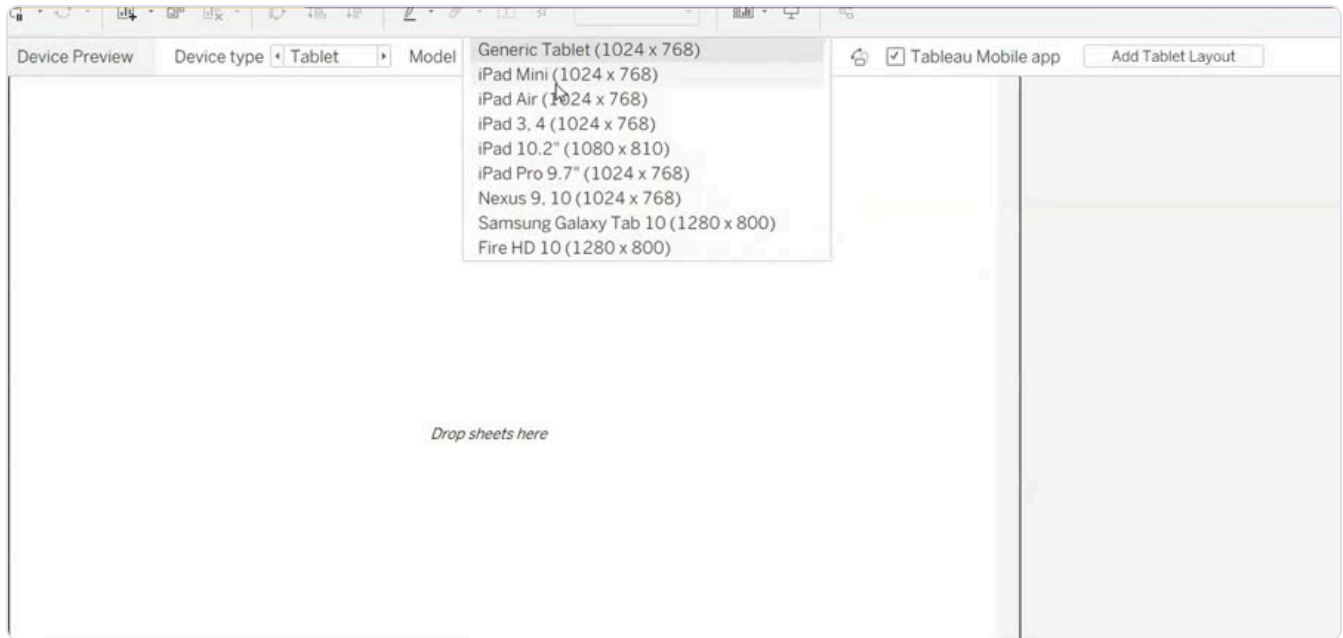
- Size and lay out a dashboard for each device
- Organize objects with tiled and floating containers
- Add filter, highlight, set and parameter actions

What's on a dashboard



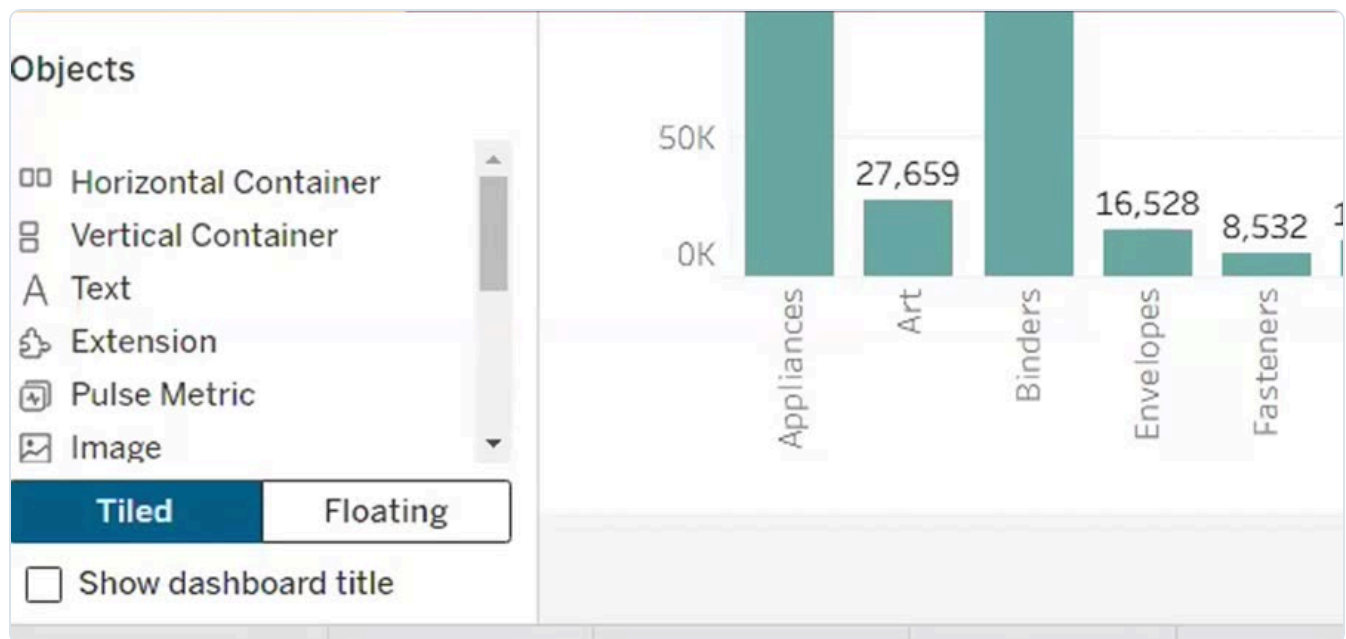
A dashboard is a canvas that combines sheets with other objects. Sheets bring the charts. Containers arrange them horizontally or vertically. Text and image objects add titles, logos, and notes. Navigation and download buttons help people move around and take results away. And actions connect everything, so a click in one view updates the others.

Start with size and device



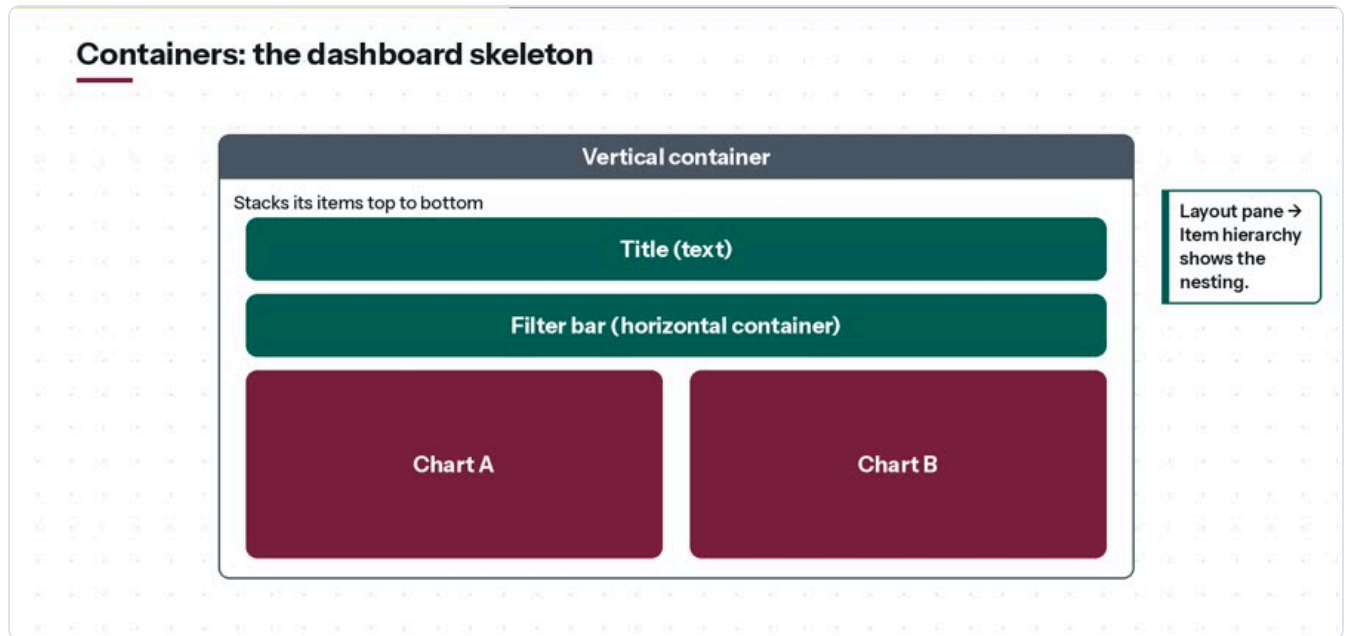
Start with size and device. Under Size, pick a preset such as Desktop Browser, or set a custom, automatic, or range size. Device Preview shows how the dashboard looks on a desktop, tablet, or phone, with presets for common models. From here you can add a tablet or phone layout, so each device gets its own arrangement.

Objects go in tiled, snapping into a grid, or floating, placed anywhere...



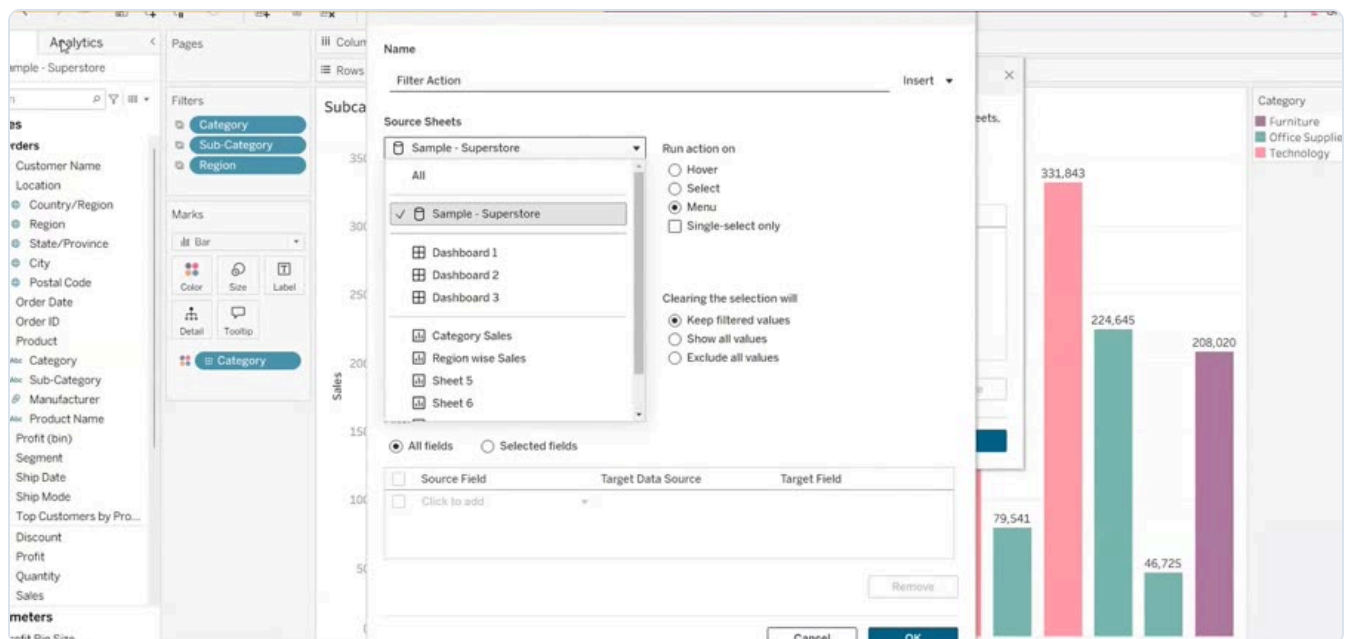
Objects go in tiled, snapping into a grid, or floating, placed anywhere on top. Here the trainer has a title text object, an image floated in the corner, and two sheets side by side. The Objects panel at the bottom left lists containers, text, image, and more, down to web page, navigation, and download.

Containers: the dashboard skeleton



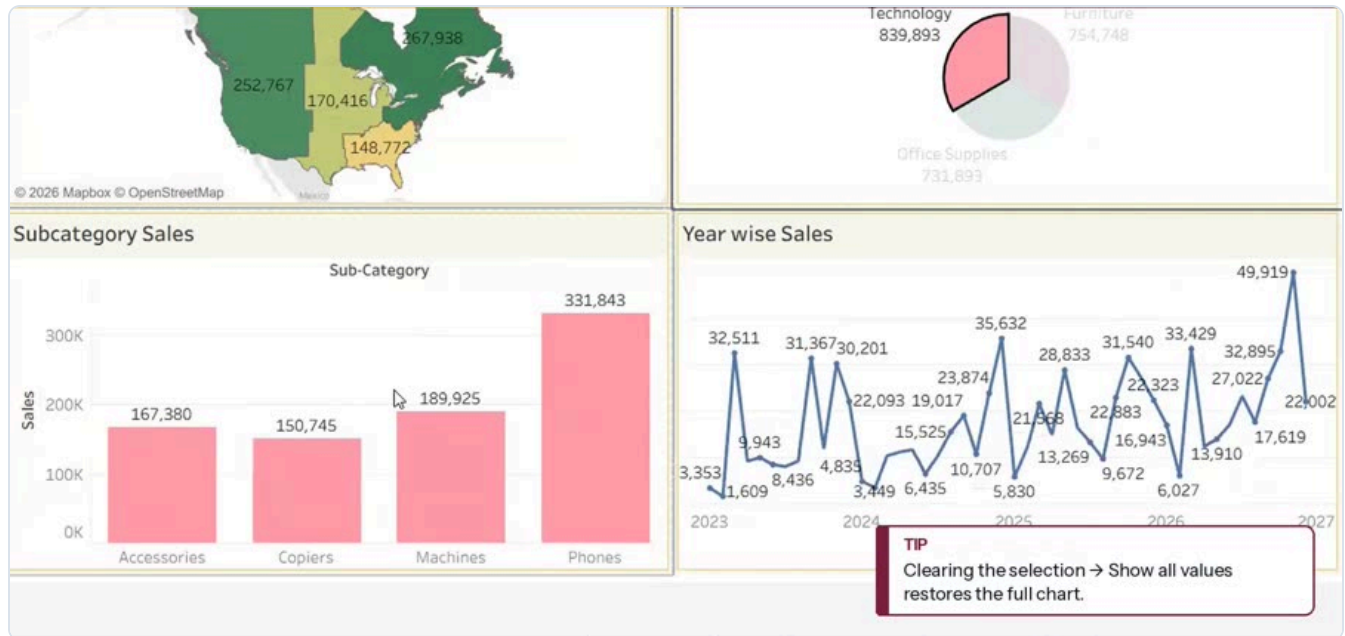
Containers are the key to clean layouts. A vertical container stacks the title, the filter bar, and the main area. Inside the main area, a horizontal container places charts side by side. Use Distribute Contents Evenly to keep widths equal, and check the Item hierarchy in the Layout pane to see exactly what sits inside what.

Now the interactivity



Now the interactivity. From the Dashboard or Worksheet menu, choose Actions, then Add Action, Filter. Pick the source sheets, and choose whether the action runs on hover, select, or from the menu. Then decide what clearing the selection does: keep the filtered values, show all values, or exclude all values.

With the filter action in place, selecting Technology in the category...



With the filter action in place, selecting Technology in the category pie filters the subcategory chart. It now shows only accessories, copiers, machines, and phones. Set clearing to Show all values, so one click on the background brings everything back.

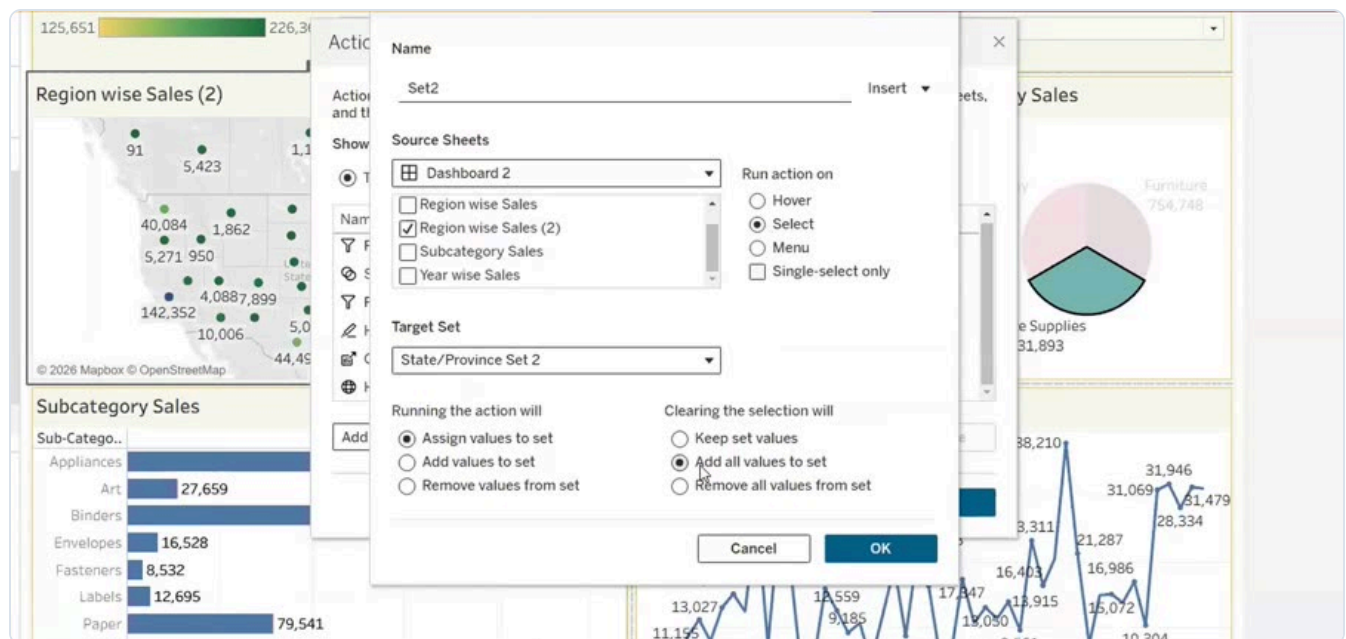
Tip Clearing the selection → Show all values restores the full chart.

Six dashboard actions

Six dashboard actions	
Action	What it does
Filter	Shows only the data related to the selection
Highlight	Keeps all marks; emphasizes related ones
Go to URL	Opens a web page, optionally with field values in the link
Go to Sheet	Navigates to another sheet or dashboard
Change Set Values	Adds, assigns or removes set members
Change Parameter	Writes the selected value into a parameter

Tableau offers six kinds of dashboard action. Filter shows only the related data. Highlight keeps everything visible but emphasizes the related marks. Go to URL opens a web page. Go to Sheet navigates to another sheet or dashboard. Change Set Values updates a set's members. And Change Parameter writes a value into a parameter.

A set action needs a set to update



A set action needs a set to update. Choose the source sheet, here the region map, and the target set. Running the action can assign values to the set, add them, or remove them. Clearing the selection can keep the set, add all values, or remove all values.

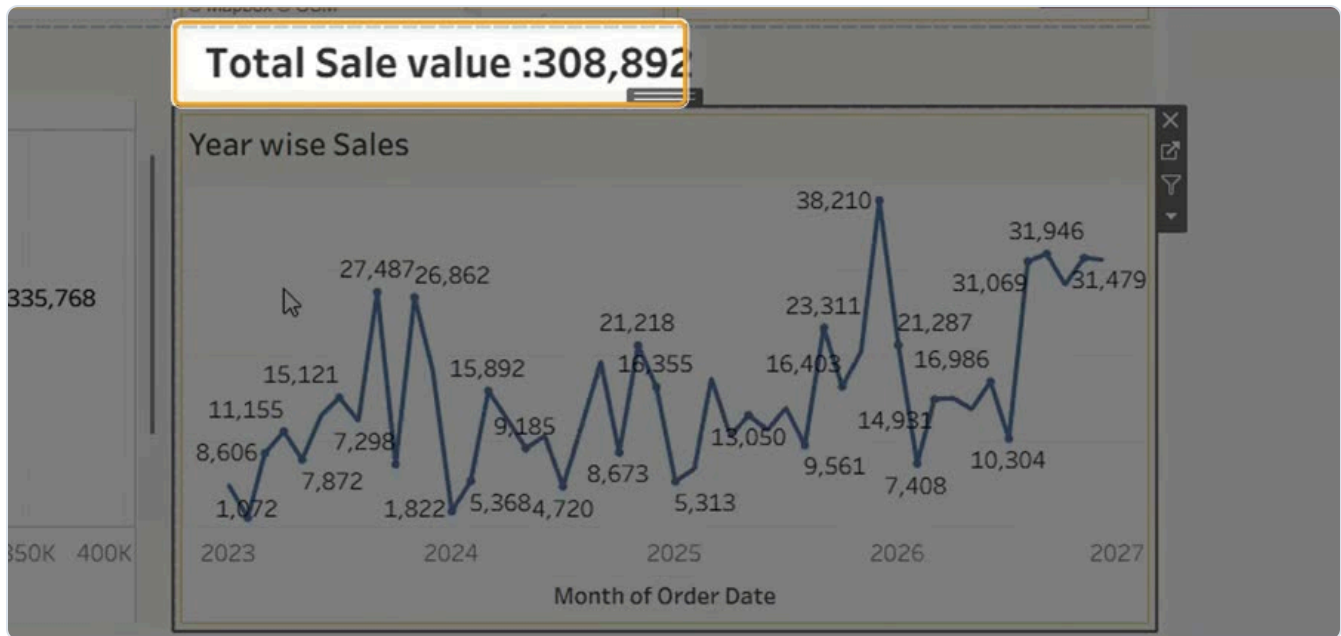
After selecting a state on the map, the action assigns that state t...



After selecting a state on the map, the action assigns that state to the set. The subcategory chart uses a calculation based on the set, so next to each subcategory's overall sales it now shows the selected state's sales, ready to compare.

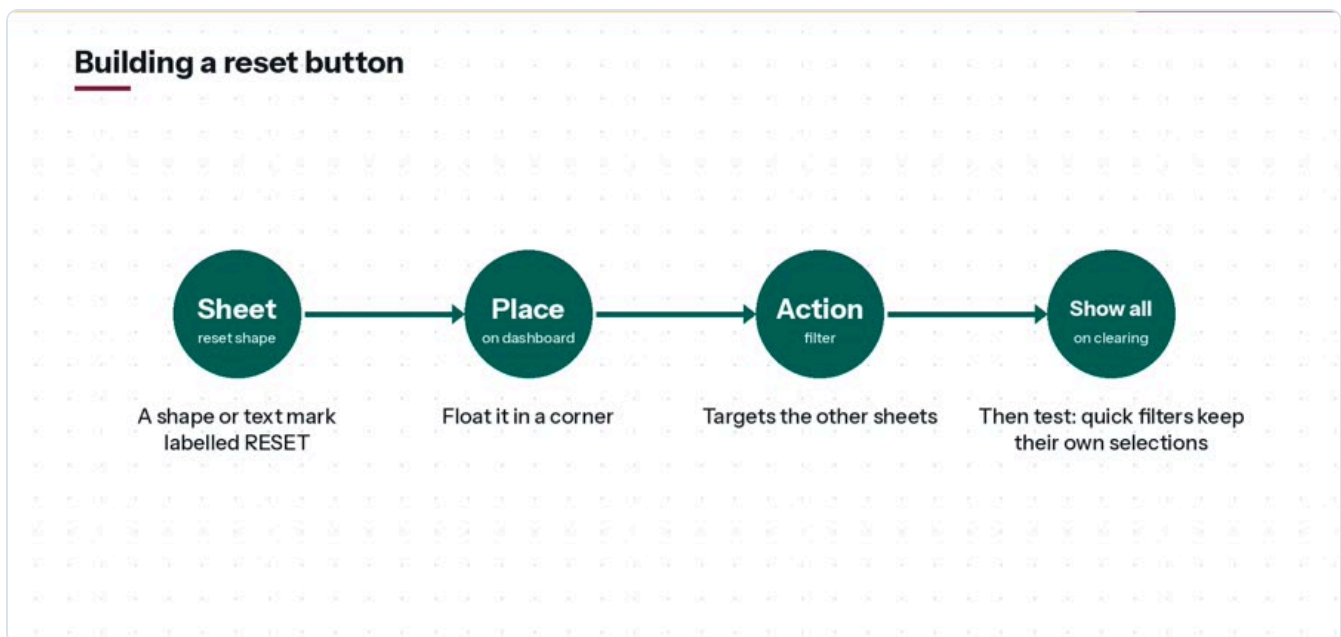
Tip Set actions make in/out-of-set comparisons interactive.

A parameter action writes a selection into a parameter



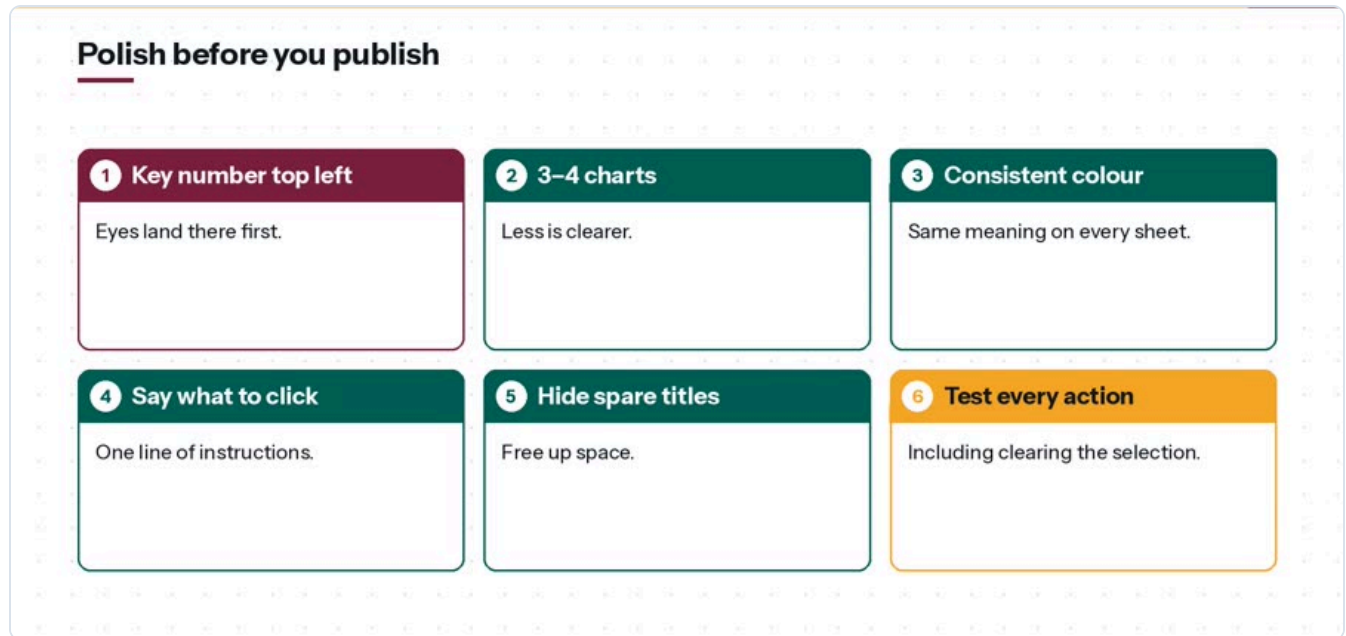
A parameter action writes a selection into a parameter. The source is the year-wise sales line, and the target is Total Sales Parameter, set from the sum of sales. Select a range of points on the line, and the Total Sale value card updates to the sum of the selected months. Select a different range and it changes again.

A reset button is a small but popular touch



A reset button is a small but popular touch. Make a tiny sheet that shows a reset shape. Place it on the dashboard. Add a filter action from that sheet to the other sheets, with clearing set to show all values. Then test it: it resets what actions control, while quick filters keep their selections until you clear them.

Polish before you publish



A few polish tips before you publish. Keep the most important number top left, where eyes land first. Limit each dashboard to three or four charts. Use one consistent colour meaning across sheets. Add a short subtitle that tells people what to click. Hide sheet titles you don't need. And always test every action, including what happens when the selection is cleared.

Key takeaways

- Sized and laid out for each device
- Organized with tiled and floating containers
- Filter, set and parameter actions
- A reset button that shows all values

Practice

1. Build a dashboard with a vertical and a horizontal container holding three sheets, a title and a filter, sized for desktop and phone.
2. Add a filter action from a category chart to the other sheets, and test the Clearing the selection options.
3. Add a set action and a parameter action, then a reset button.

Check your understanding

1. What is the difference between tiled and floating objects?
2. Name three dashboard action types.
3. What does a parameter action do?
4. How do you make a reset button?

Answers at the back of this handbook.

Answer key

QT-13 • Tableau Platform & Connecting to Data

1. Tableau Prep Builder
2. The logical layer (relationships)
3. To stack tables with the same columns, such as one file per month
4. It must be refreshed to stay current

QT-14 • Building Views: Pills, Shelves & Axes

1. Headers (discrete values)
2. An axis (continuous range)
3. Measure Names and Measure Values
4. When both measures share the same units

QT-15 • The Tableau Chart Gallery

1. A bullet graph
2. A scatter plot
3. Two (a dual axis of two pies)
4. About five

QT-16 • Maps in Tableau

1. Longitude (generated) and Latitude (generated)
2. The country was fixed to United States in Edit Locations
3. Filter data
4. A folder under My Tableau Repository › Shapes

QT-17 • Filters & the Order of Operations

1. Context
2. Top N ran before the Category dimension filter
3. Gray
4. Condition

QT-18 • Groups, Sets, Bins, Hierarchies & Sorting

1. A set
2. Puts all ungrouped members into one 'Other' bucket
3. A dimension of equal-sized ranges

4. Sort by Field

QT-19 • Parameters for Interactive Analysis

1. No. It must be referenced in a filter, set, calculation, reference line or bin.
2. Fills the minimum and maximum from a field's values
3. Purple (fields are orange)
4. Both sheets sit in one container and the unselected one is filtered to no data

QT-20 • Calculated Fields & Time Intelligence

1. Replaces null with zero
2. DATENAME
3. The first day of that date's month
4. So year-to-date is compared like with like

QT-21 • LOD Expressions & Table Calculations

1. FIXED
2. Before (unless the filter is a context filter)
3. Last, on the aggregated results in the view
4. The direction and partition of a table calculation

QT-22 • Interactive Dashboards & Actions

1. Tiled snap into the layout grid; floating sit on top at any position
2. Filter, highlight, URL, go to sheet, change set values, change parameter
3. Writes the selected value into a parameter
4. A small sheet plus a filter action that shows all values