
Tableau 2020
LEARNING
VOYAGE

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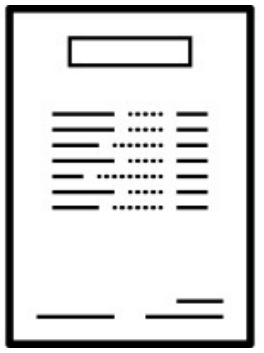
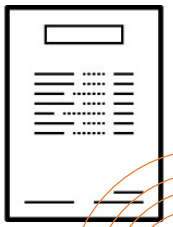


Table of Contents




1. Taking Off with Tableau
LEARNING
VOYAGE

Taking Off with Tableau

We will cover the following topics in this lesson

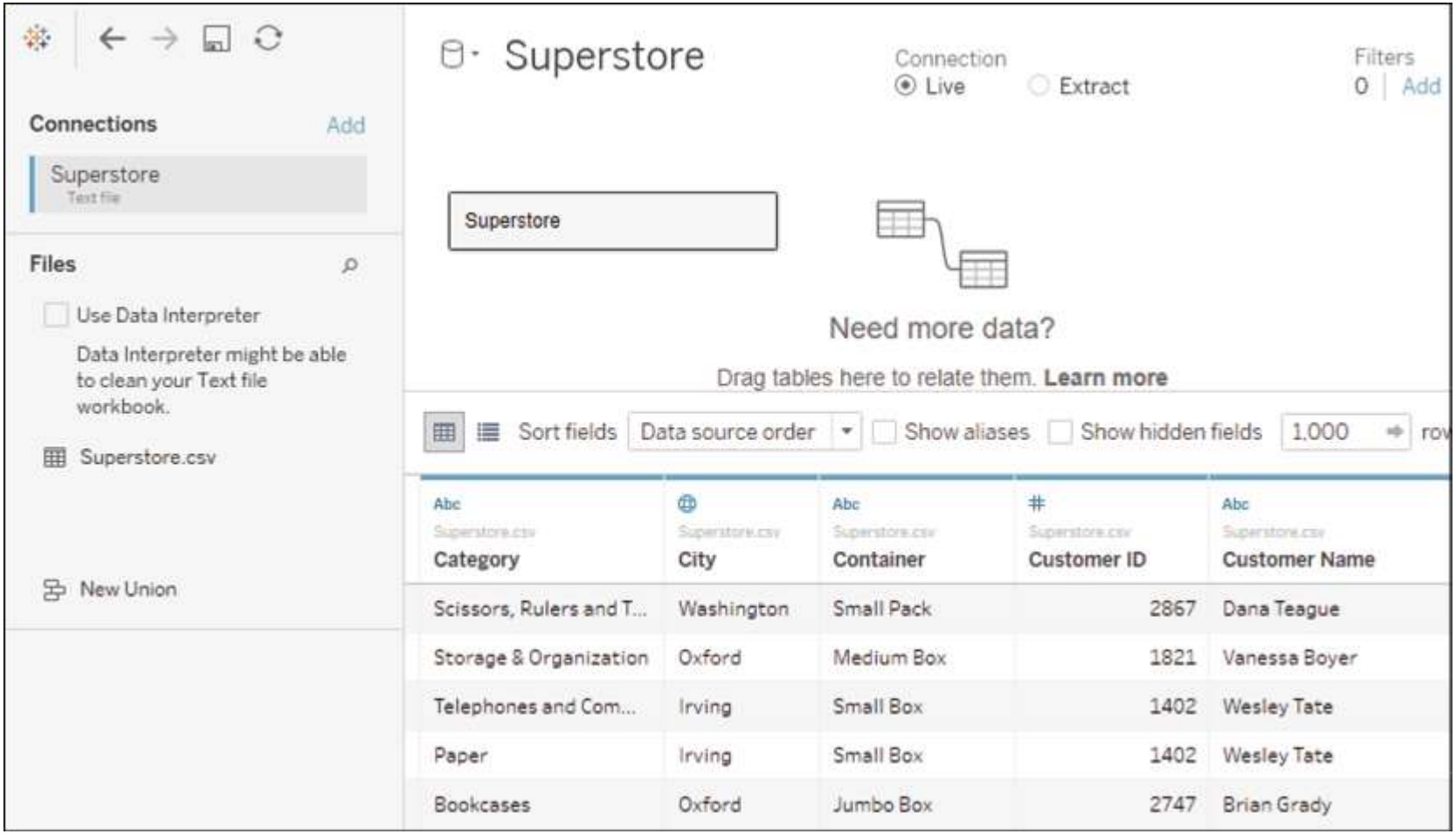
- Connecting to data
- Foundations for building visualizations
- Creating bar charts
- Creating line charts
- Creating geographic visualizations
- Using Show Me
- Bringing everything together in a dashboard

Connecting to data

- Tableau connects to data stored in a wide variety of files and databases.
- This includes flat files, such as Excel documents, spatial files, and text files; relational databases, such as SQL Server and Oracle; cloud-based data sources, such as Snowflake and Amazon Redshift; and Online Analytical Processing (OLAP) data sources, such as Microsoft SQL Server Analysis Services.

Connecting to data

1. Open Tableau. You should see the home screen with a list of connection options on the left and, if applicable, thumbnail previews of recently edited workcourses in the center, along with sample workcourses at the bottom.
2. Under Connect and To a File, click on Text File.
3. In the Open dialog box, navigate to the \Learning Tableau\lesson 01 directory and select the Superstore.csv file.


Superstore
Connection
Live
Extract
Filters
0 | Add
Connections
Add
Superstore
Text file
Files
Use Data Interpreter
Data Interpreter might be able to clean your Text file workbook.
Superstore.csv
New Union
Superstore
Need more data?
Drag tables here to relate them. Learn more
Sort fields
Data source order
Show aliases
Show hidden fields
1,000
Abc
Superstore.csv
Category
City
Container
Customer ID
Customer Name
Scissors, Rulers and T...
Washington
Small Pack
2867
Dana Teague
Storage & Organization
Oxford
Medium Box
1821
Vanessa Boyer
Telephones and Com...
Irving
Small Box
1402
Wesley Tate
Paper
Irving
Small Box
1402
Wesley Tate
Bookcases
Oxford
Jumbo Box
2747
Brian Grady

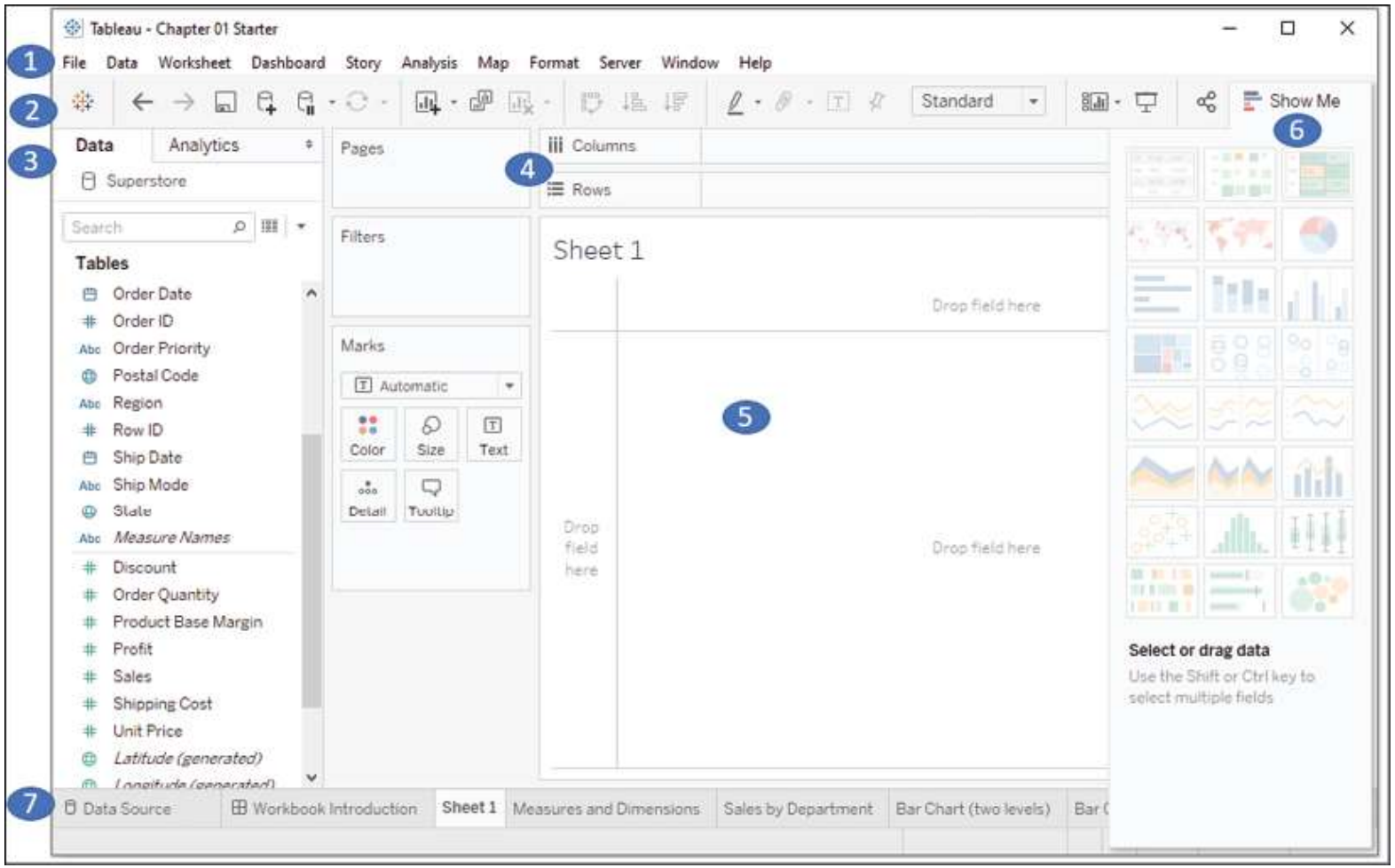


Tableau - Chapter 01 Starter
File Data Worksheet Dashboard Story Analysis Map Format Server Window Help
Standard
Show Me
Data
Analytics
Superstore
Search
Tables
Order Date
Order ID
Order Priority
Postal Code
Region
Row ID
Ship Date
Ship Mode
State
Measure Names
Discount
Order Quantity
Product Base Margin
Profit
Sales
Shipping Cost
Unit Price
Latitude (generated)
Pages
Filters
Marks
Automatic
Color
Size
Text
Detail
Tooltip
Columns
Rows
Sheet 1
Drop field here
Drop field here
Drop field here
Select or drag data
Use the Shift or Ctrl key to select multiple fields
1
2
3
4
5
6
7
Data Source
Workbook Introduction
Sheet 1
Measures and Dimensions
Sales by Department
Bar Chart (two levels)

Connecting to data

To prepare for this, please do the following:

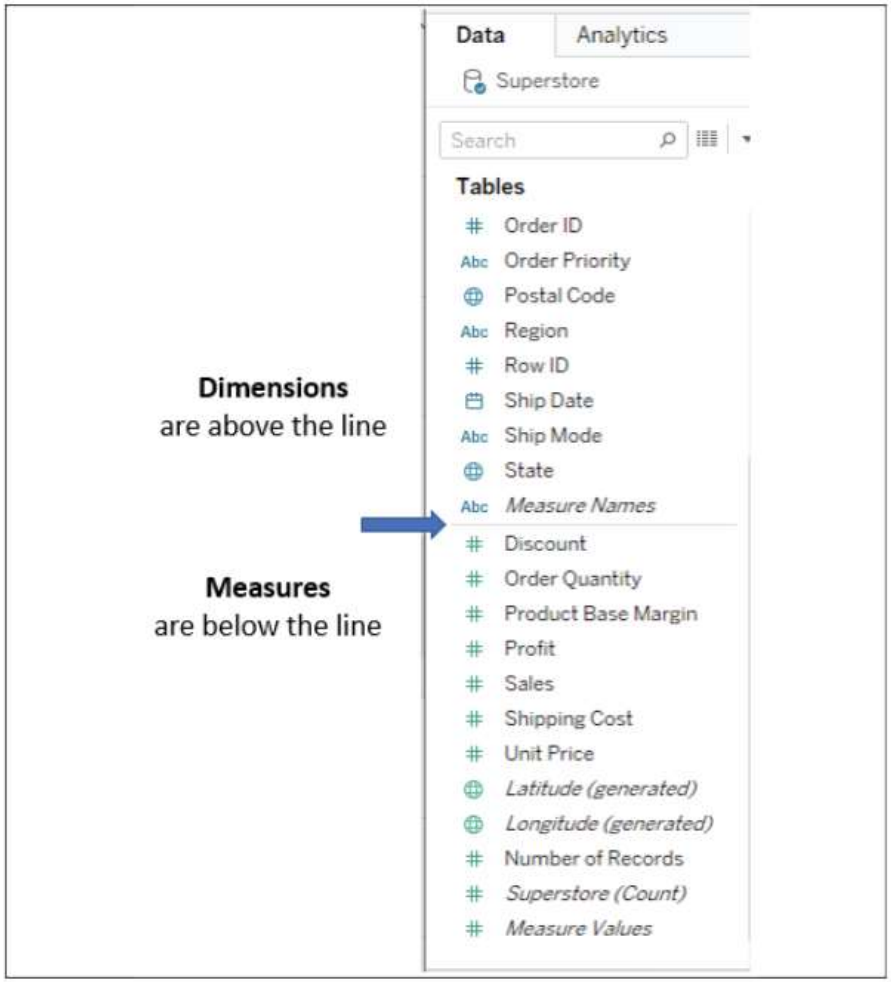
- From the menu, select File | Exit.
- When prompted to save changes, select No.
- From the \learning Tableau\lesson 01 directory, open the file lesson 01 Starter.twbx. This file contains a connection to the Superstore data file and is designed to help you walk through the examples in this lesson.

Foundations for building visualizations

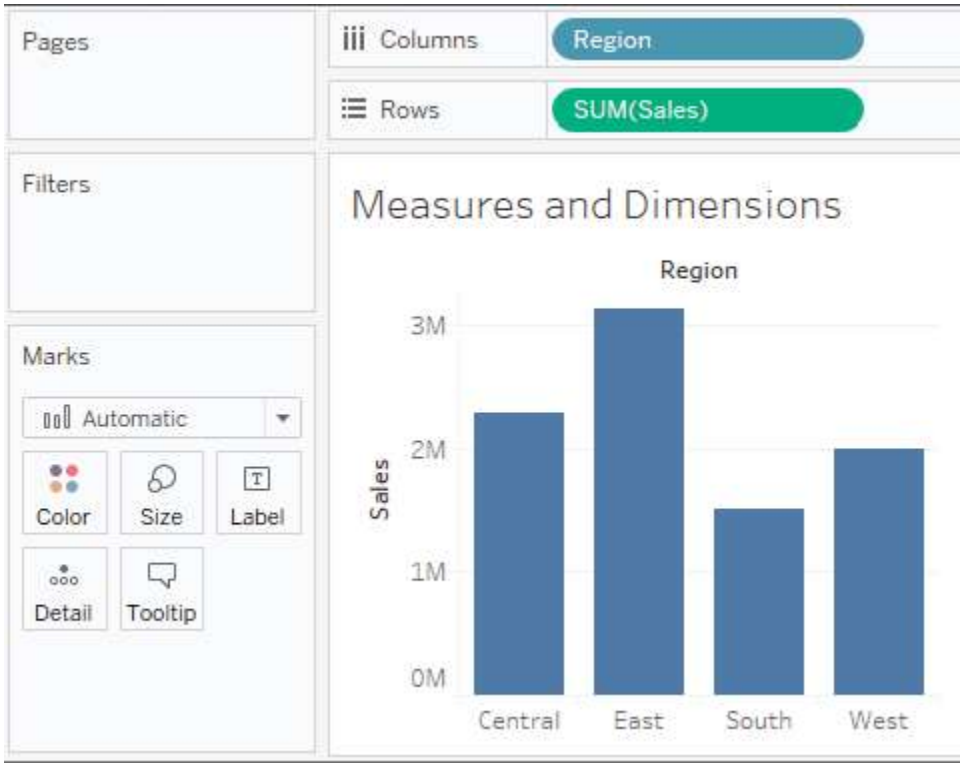
- When you first connect to a data source such as the Superstore file, Tableau will display the data connection and the fields in the Data pane.

- Fields can be dragged from the data pane onto the canvas area or onto various shelves such as Rows, Columns, Color, or Size.

Measures and dimensions



Measures and dimensions



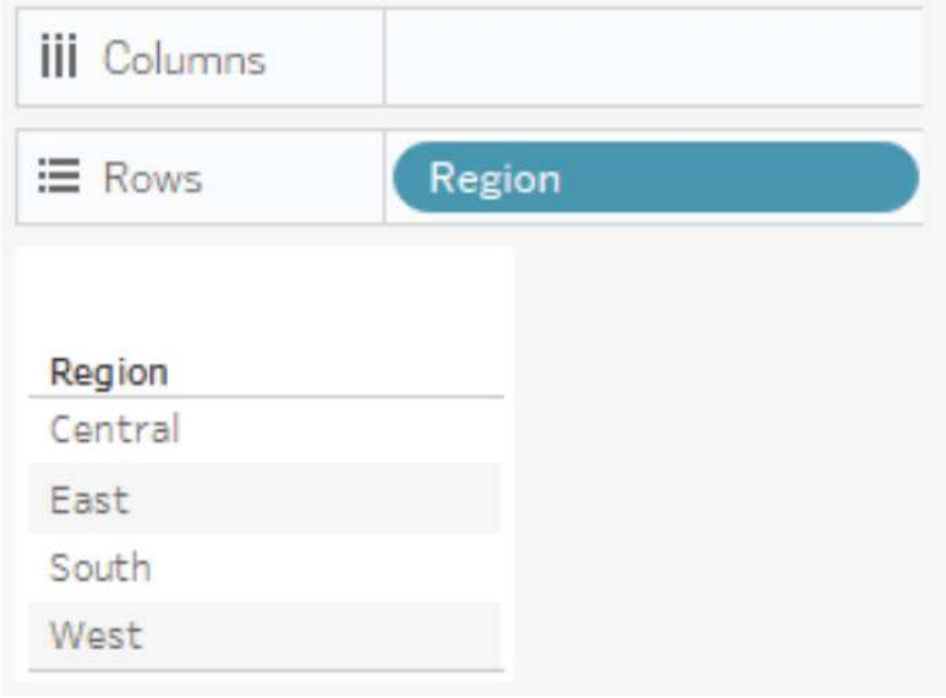
Discrete and continuous fields

- Another important distinction to make with fields is whether a field is being used as discrete or continuous.
- Whether a field is discrete or continuous determines how Tableau visualizes it based on where it is used in the view.

Discrete fields

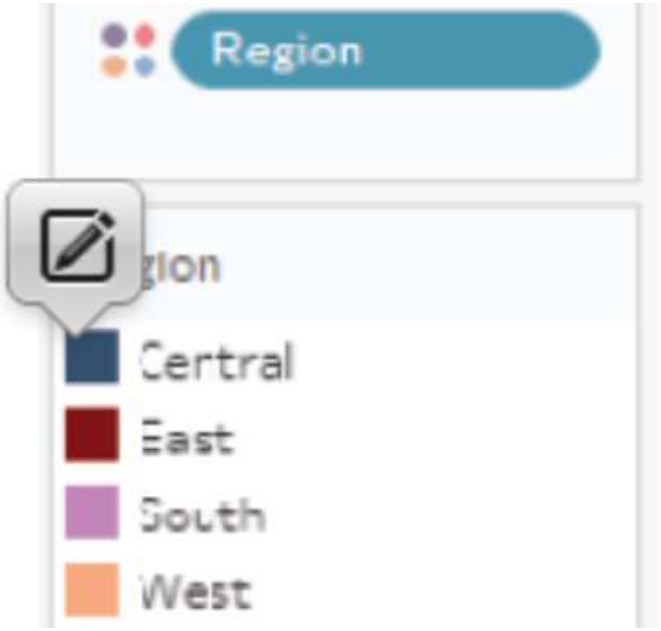
Discrete fields

- Here, it defines the row headers:



Discrete fields

- When used for Color, a discrete field defines a discrete color palette in which each color aligns with a distinct value of the field:



Continuous fields

- When used on Rows or Columns, a continuous field defines an axis

Continuous fields

- When used for color, a continuous field defines a gradient:

Continuous fields

While most dimensions are discrete by default, and most measures are continuous by default, it is possible to use any measure as a discrete field and some dimensions as continuous fields in the view, as shown here:

		can be	
		Discrete	Continuous
A	Dimension	**Yes**	If **Numeric** or **Date**
	Measure	**Yes**	**Yes**

Continuous fields

In general, you can think of the differences between the types of fields as follows:

- Choosing between a dimension and measure tells Tableau how to slice or aggregate the data.
- Choosing between discrete and continuous tells Tableau how to display the data with a header or an axis and defines individual colors or a gradient.

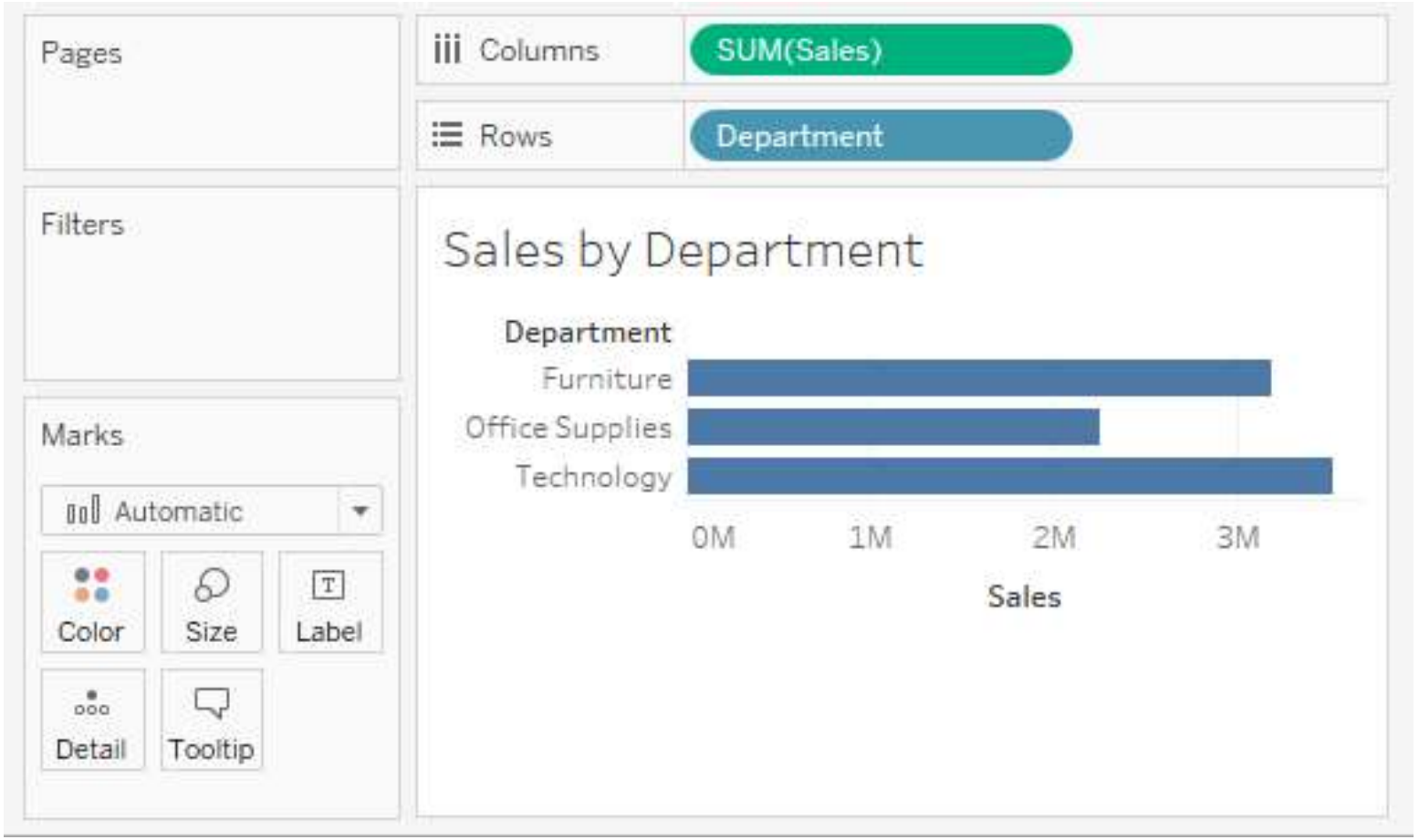
Visualizing data

- A new connection to a data source is an invitation to explore and discover! At times, you may come to the data with very well-defined questions and a strong sense of what you expect to find.

- Other times, you will come to the data with general questions and very little idea of what you will find.

Bar charts

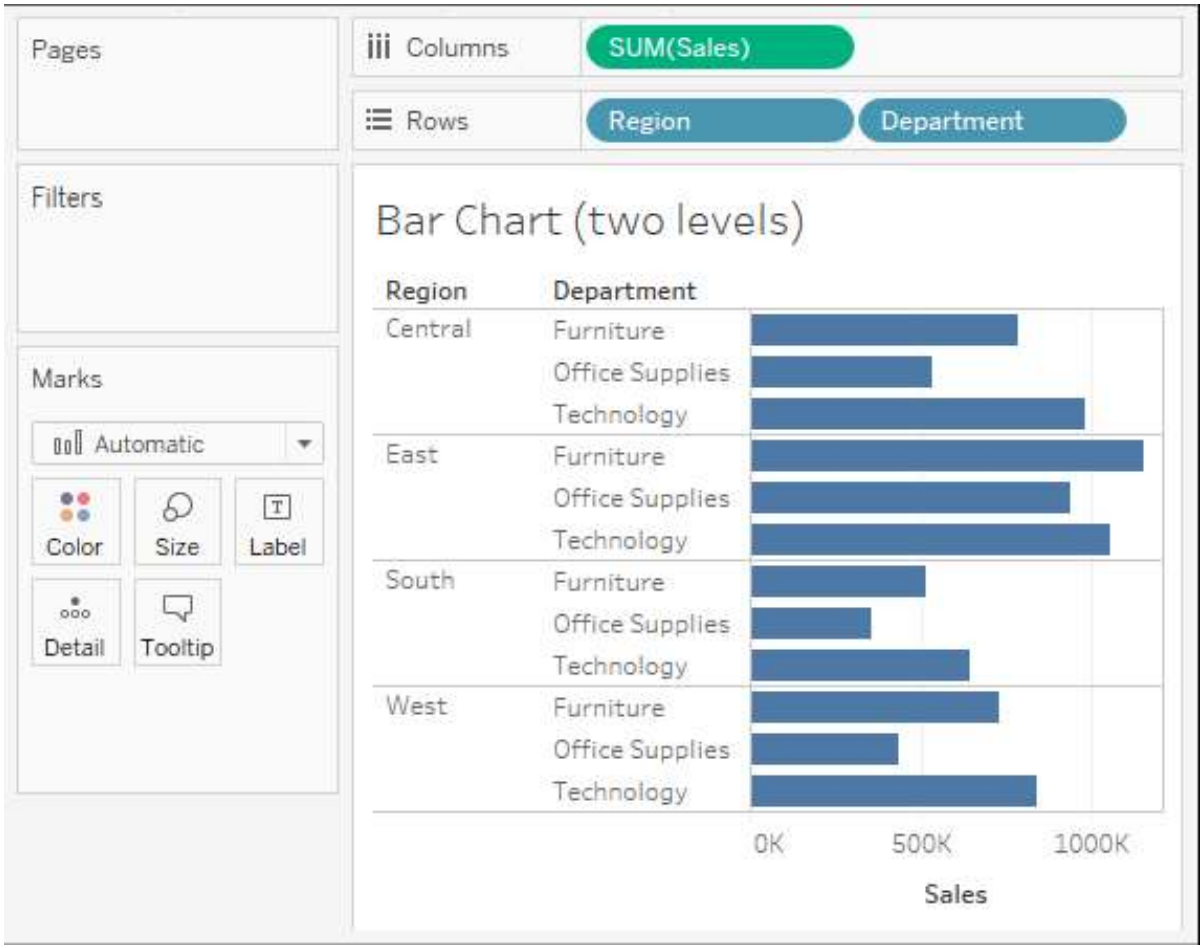
- Bar charts visually represent data in a way that makes the comparison of values across different categories easy.
- The length of the bar is the primary means by which you will visually understand the data.
- You may also incorporate color, size, stacking, and order to communicate additional attributes and values.


Pages
Columns
SUM(Sales)
Rows
Department
Filters
Sales by Department
Department
Furniture
Office Supplies
Technology
0M
1M
2M
3M
Sales
Marks
Automatic
Color
Size
Label
Detail
Tooltip

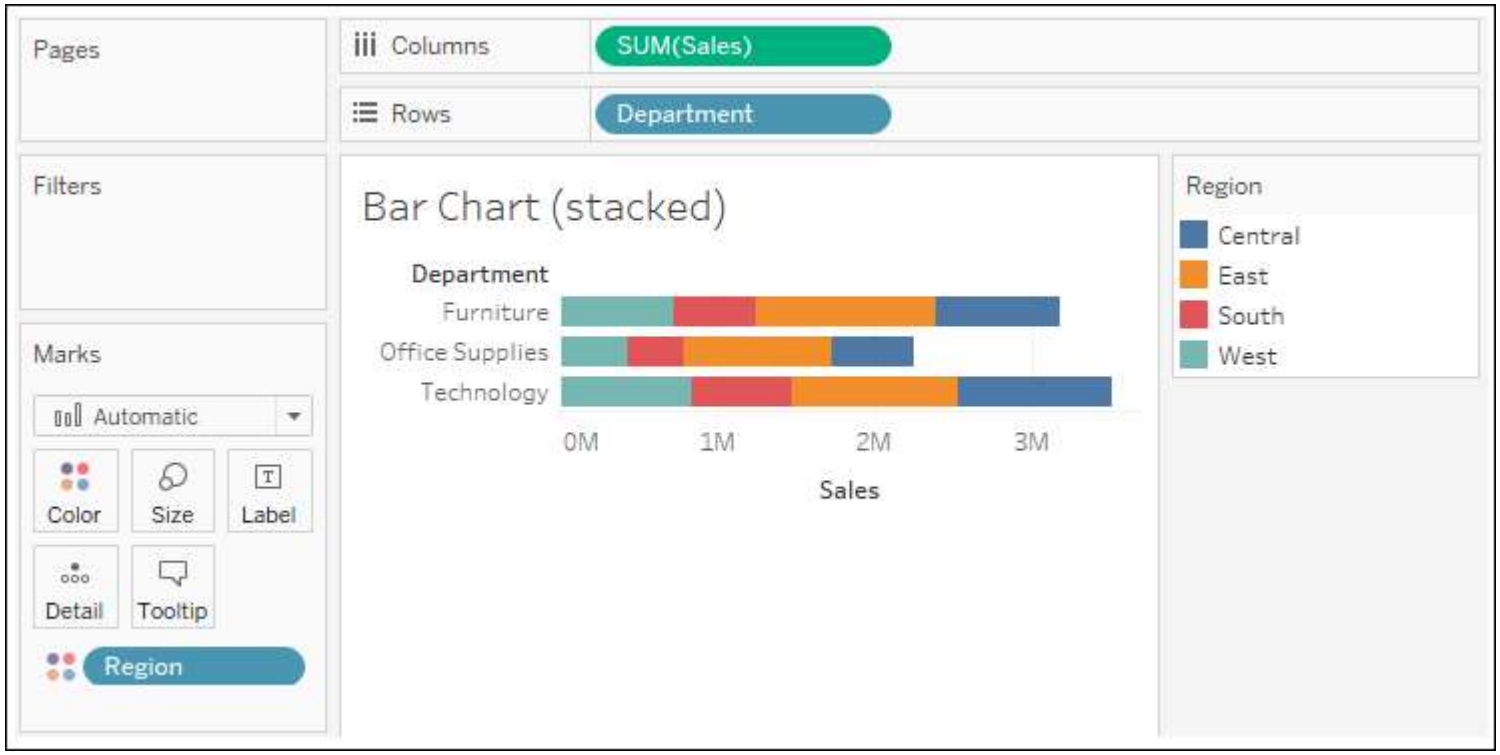
Iterations of bar charts for deeper analysis

1. Navigate to the Bar Chart (two levels) sheet, where you will find an initial view that is identical to the one you created earlier.

2. Drag the Region field from Dimensions in the Data pane to the Rows shelf and drop it to the left of the Department field already in view.

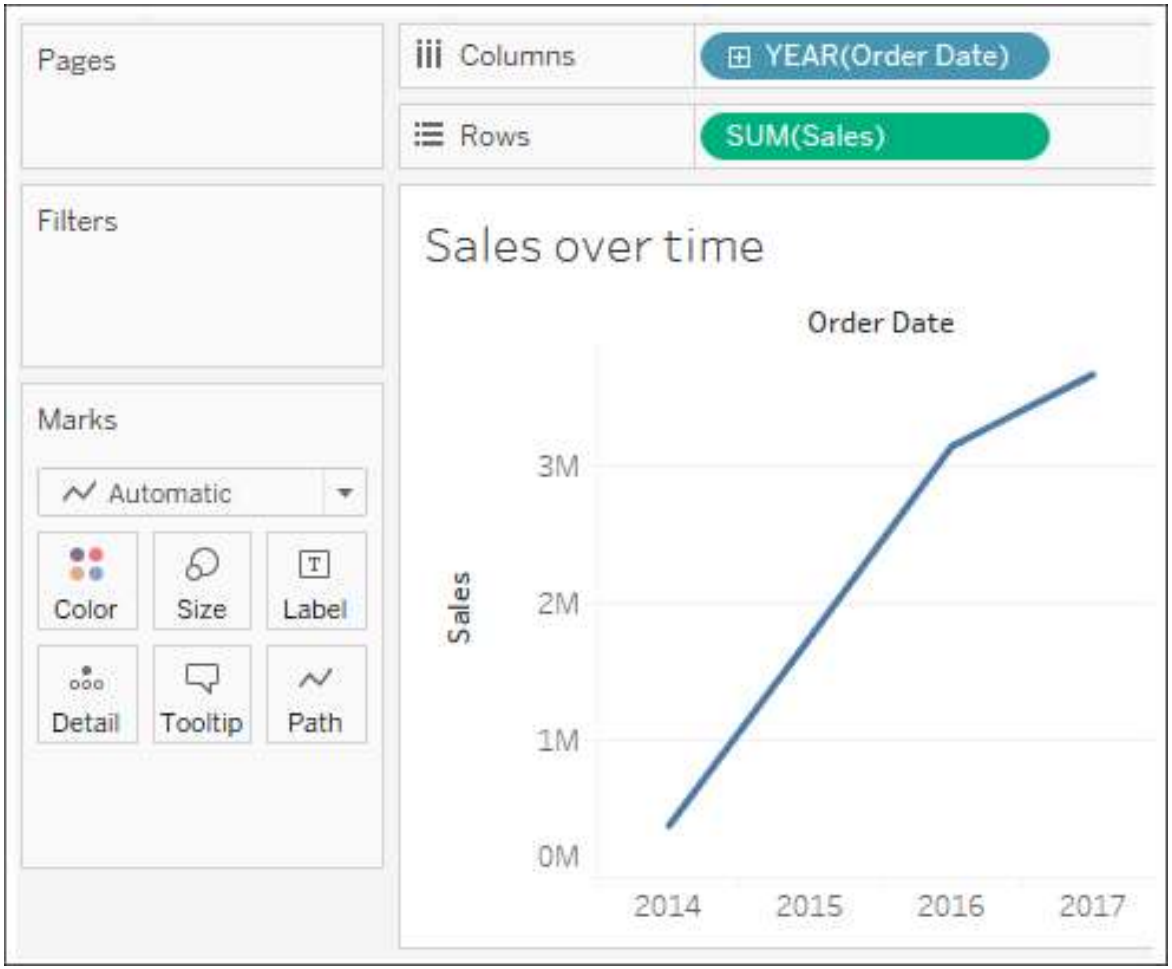

Pages
Columns
SUM(Sales)
Rows
Region
Department
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Bar Chart (two levels)
Region
Department
Central
Furniture
Office Supplies
Technology
East
Furniture
Office Supplies
Technology
South
Furniture
Office Supplies
Technology
West
Furniture
Office Supplies
Technology
0K
500K
1000K
Sales

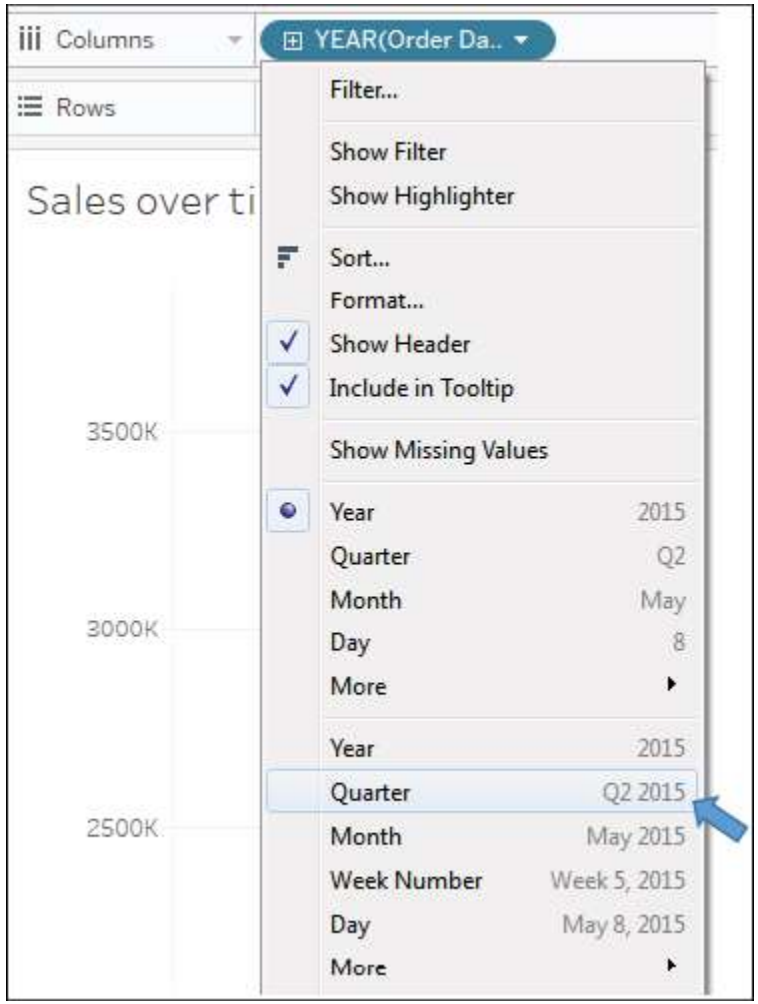
Iterations of bar charts for deeper analysis

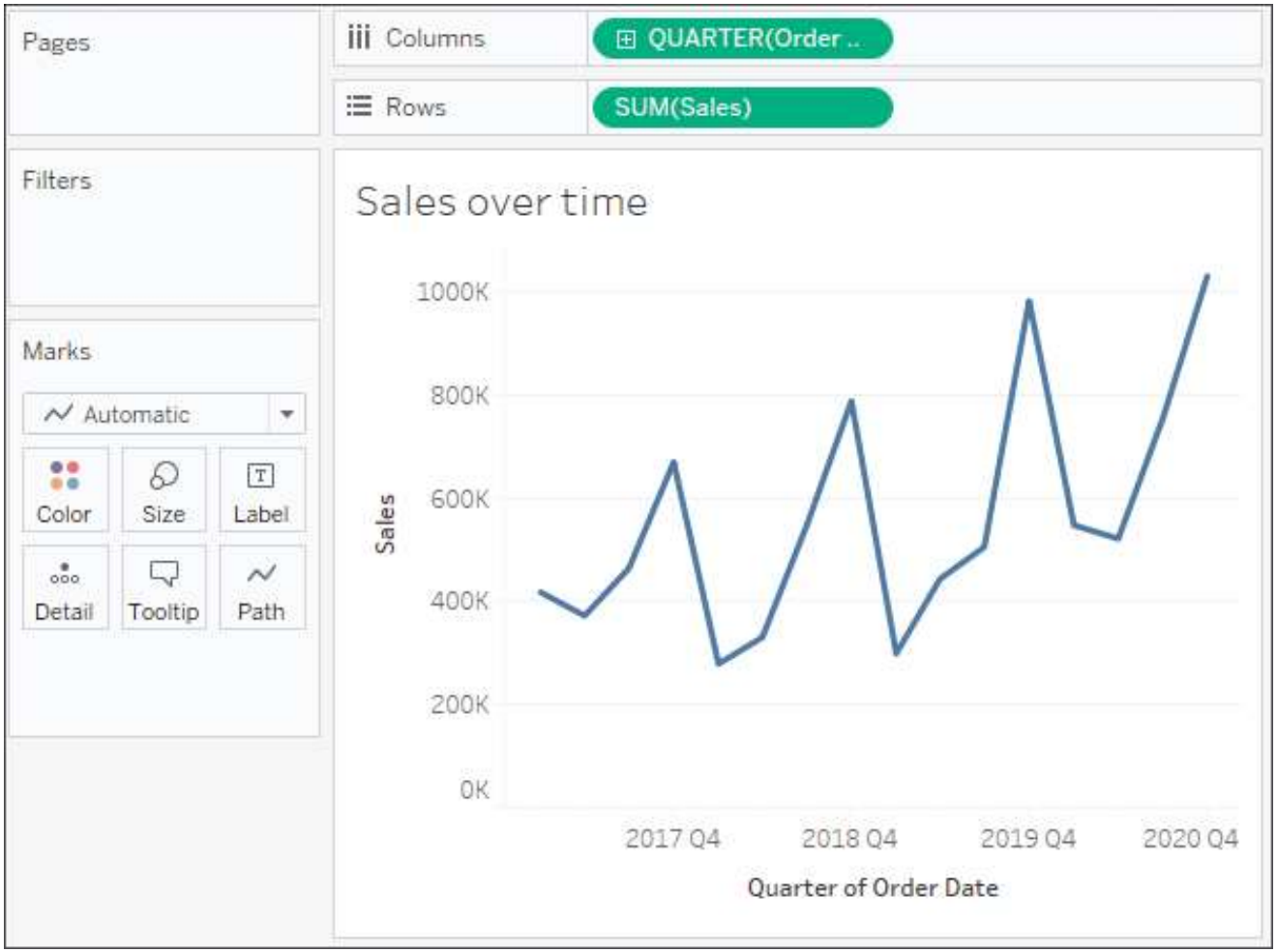


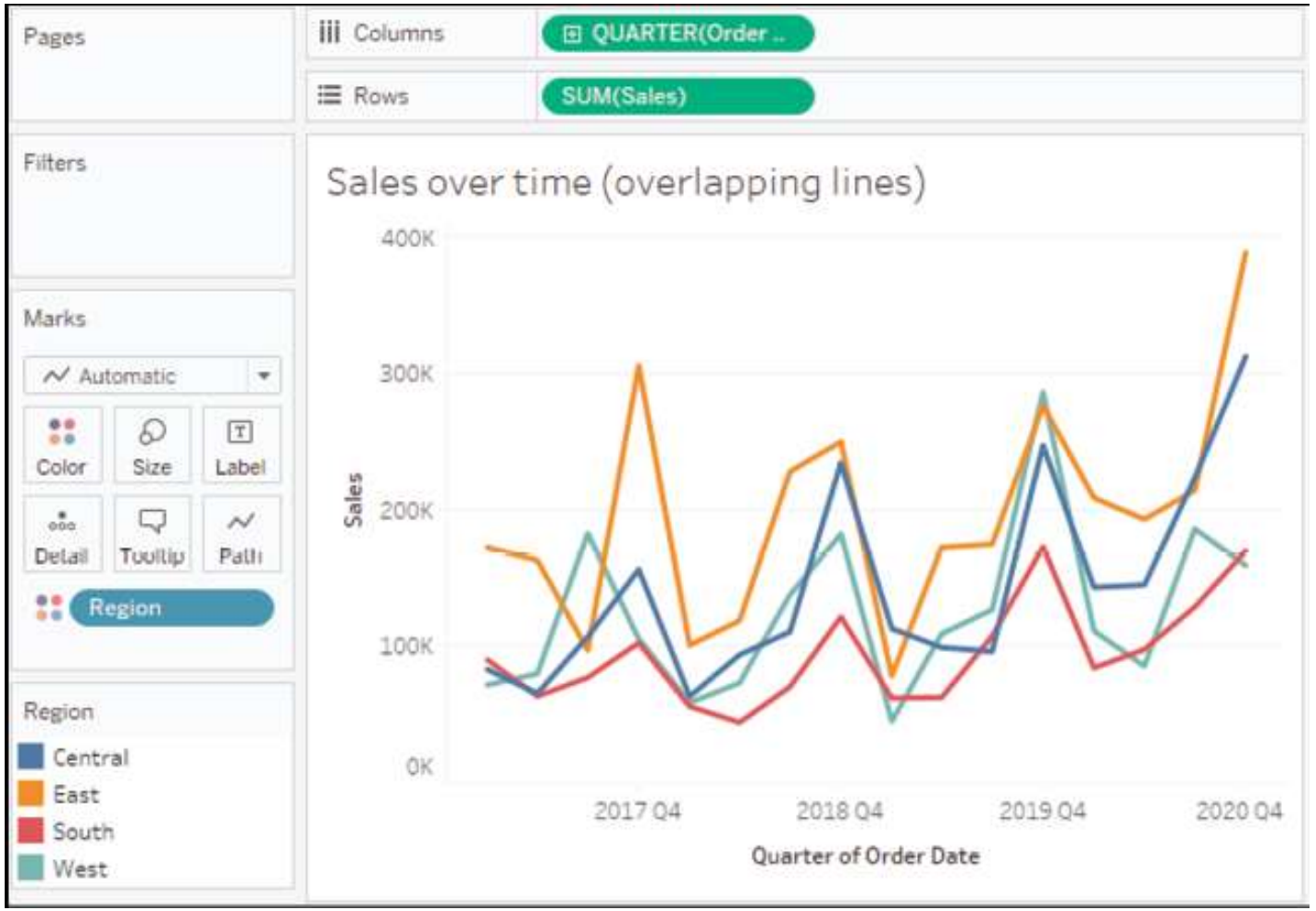
Line charts

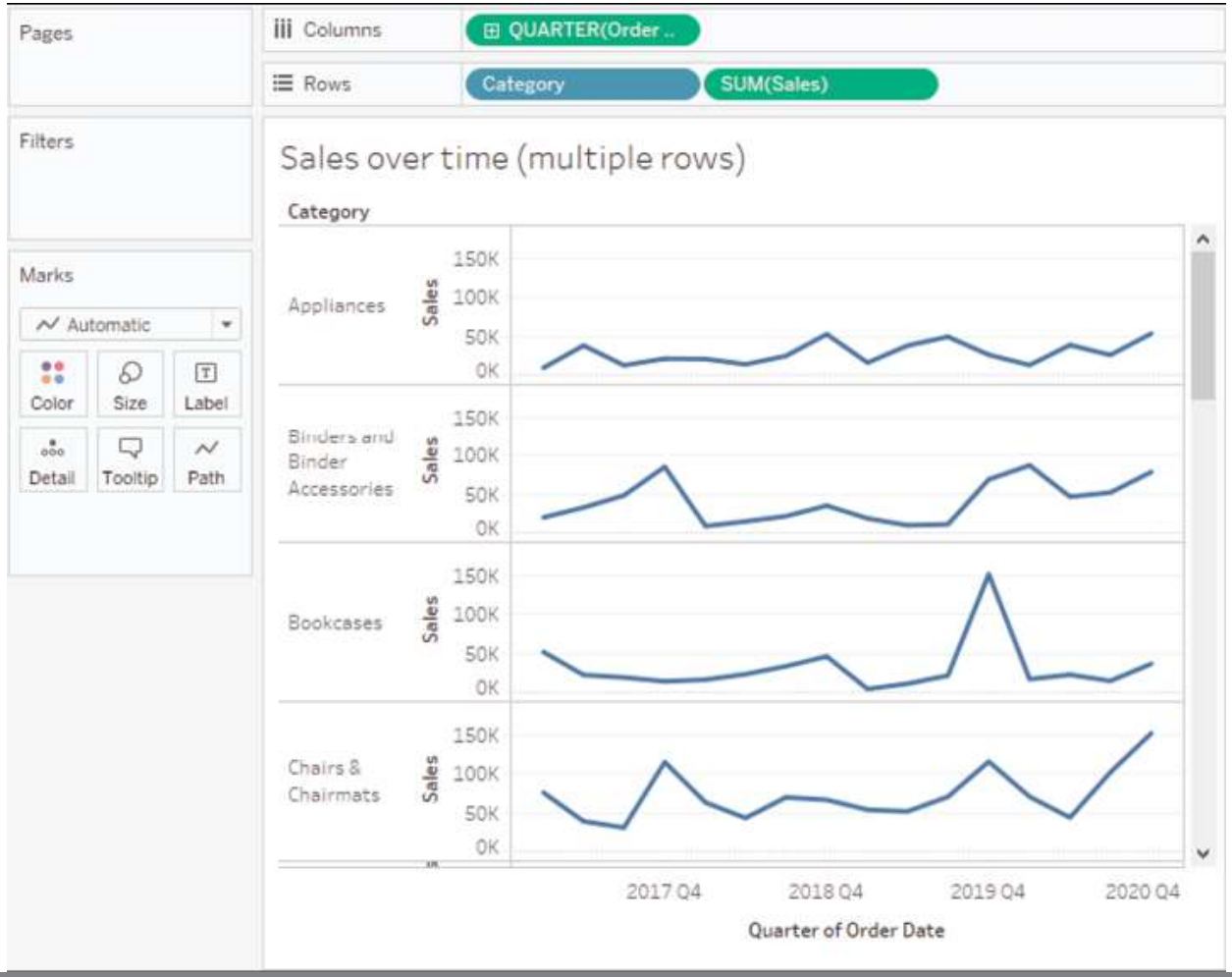
- Line charts connect related marks in a visualization to show movement or a relationship between those connected marks.
- The position of the marks and the lines that connect them are the primary means of communicating the data.
- Additionally, you can use size and color to communicate additional information.


Pages
Columns
YEAR(Order Date)
Rows
SUM(Sales)
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Path
Sales over time
Order Date
Sales
3M
2M
1M
0M
2014
2015
2016
2017


Columns
YEAR(Order Da..
Rows
Sales over ti
3500K
3000K
2500K
Filter...
Show Filter
Show Highlighter
Sort...
Format...
Show Header
Include in Tooltip
Show Missing Values
Year 2015
Quarter Q2
Month May
Day 8
More
Year 2015
Quarter Q2 2015
Month May 2015
Week Number Week 5, 2015
Day May 8, 2015
More


Pages
Columns
QUARTER(Order ..
Rows
SUM(Sales)
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Path
Sales over time
1000K
800K
600K
400K
200K
0K
Sales
2017 Q4
2018 Q4
2019 Q4
2020 Q4
Quarter of Order Date


Pages
Columns
QUARTER(Order ..
Rows
SUM(Sales)
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Path
Region
Region
Central
East
South
West
Sales over time (overlapping lines)
400K
300K
200K
100K
0K
Sales
2017 Q4
2018 Q4
2019 Q4
2020 Q4
Quarter of Order Date


Pages
Columns
QUARTER(Order ..
Rows
Category
SUM(Sales)
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Path
Sales over time (multiple rows)
Category
Appliances
Binders and Binder Accessories
Bookcases
Chairs & Chairmats
Sales
150K
100K
50K
0K
2017 Q4
2018 Q4
2019 Q4
2020 Q4
Quarter of Order Date

Geographic visualizations

- In Tableau, the built-in geographic database recognizes geographic roles for fields such as Country, State, City, Airport, Congressional District, or Zip Code.

- Even if your data does not contain latitude and longitude values, you can simply use geographic fields to plot locations on a map.

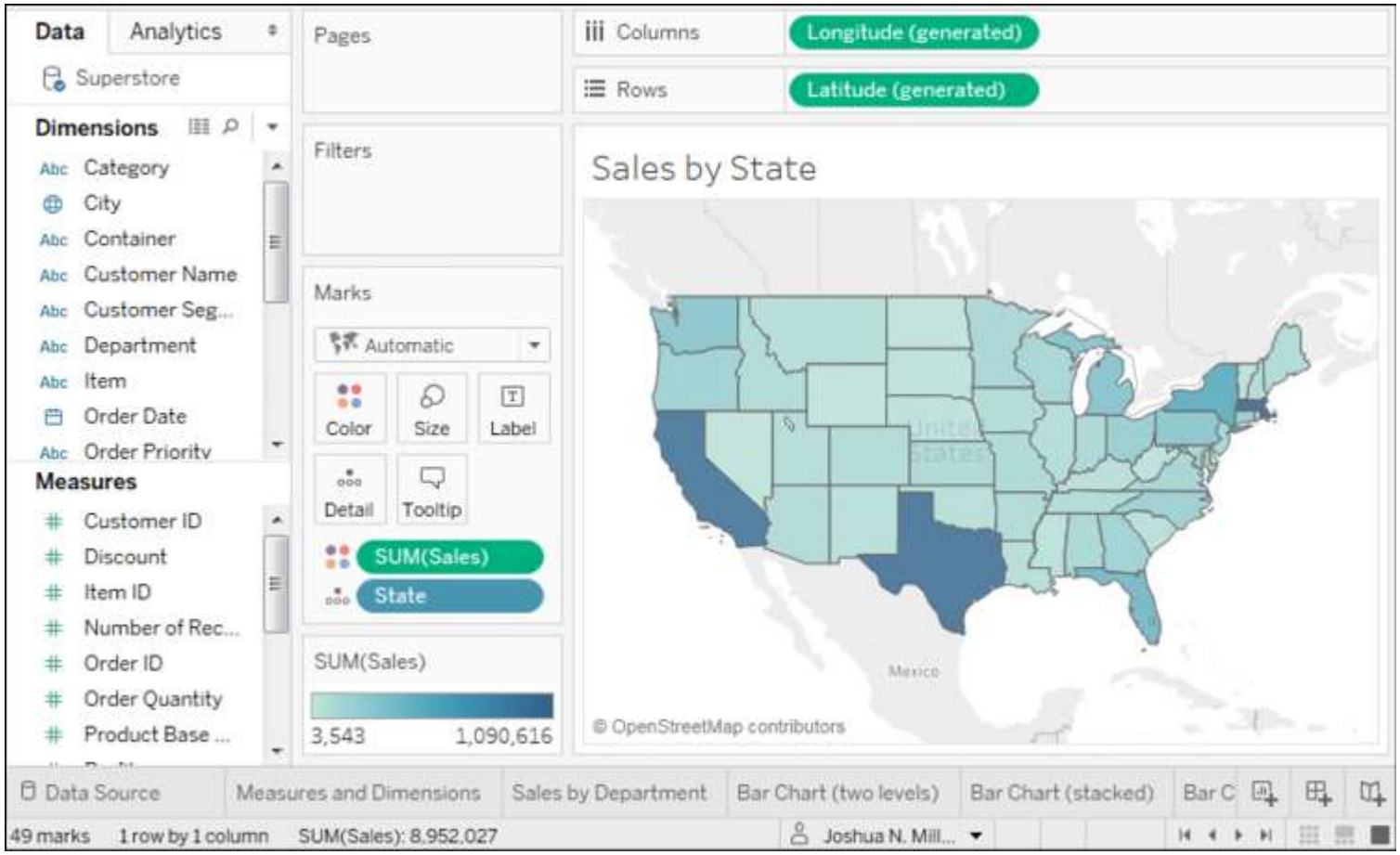
Geographic visualizations

Geographic visualization is incredibly valuable when you need to understand where things happen and whether there are any spatial relationships within the data. Tableau offers several types of geographic visualization:

- Filled maps
- Symbol maps
- Density maps

Filled maps

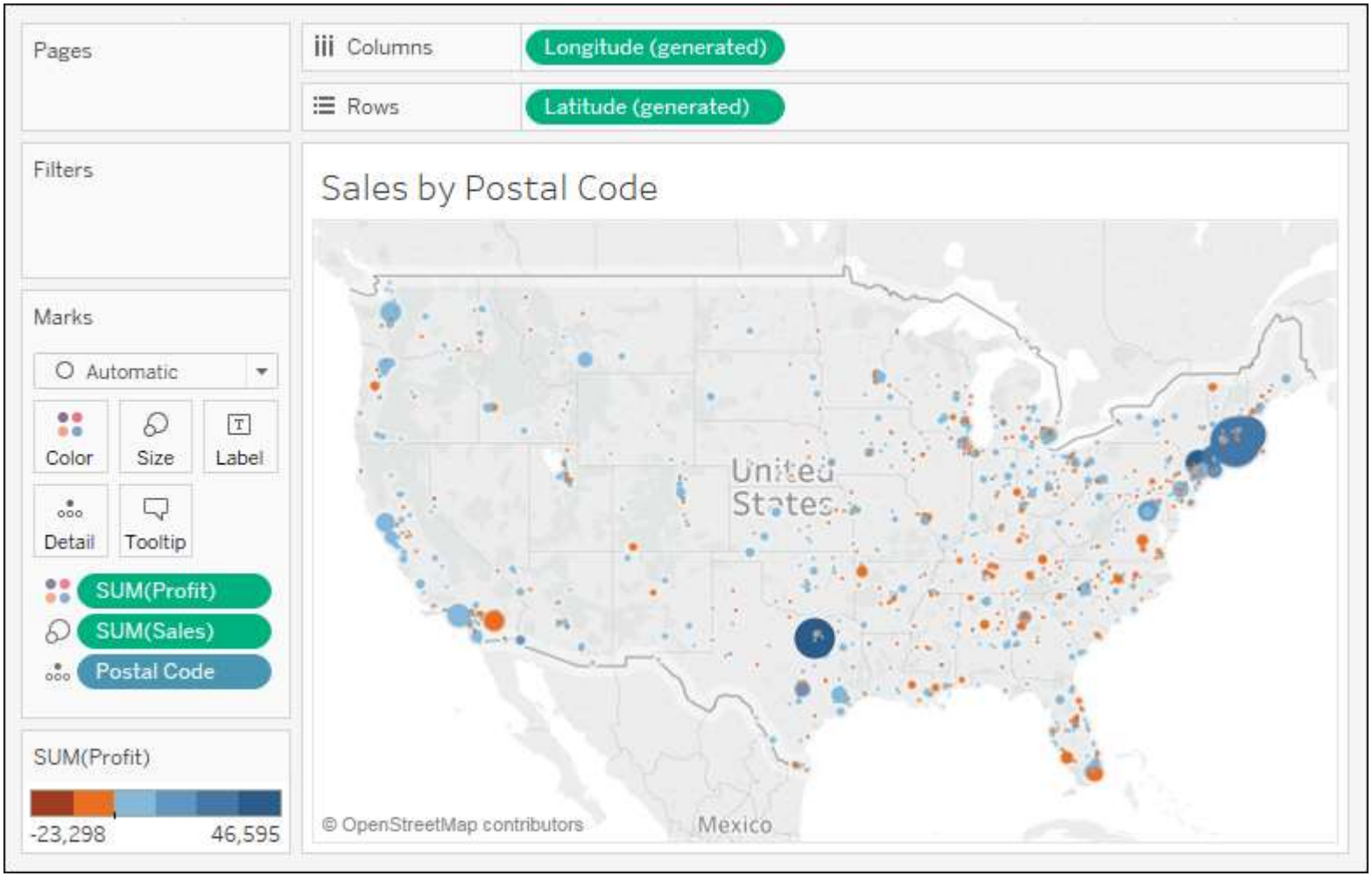
- Filled maps fill areas such as countries, states, or ZIP codes to show a location.
- The color that fills the area can be used to communicate measures such as average sales or population as well as dimensions such as region.
- These maps are also called choropleth maps.


Data
Analytics
Superstore
Dimensions
Abc Category
City
Abc Container
Abc Customer Name
Abc Customer Seg...
Abc Department
Abc Item
Order Date
Abc Order Priority
Measures
Customer ID
Discount
Item ID
Number of Rec...
Order ID
Order Quantity
Product Base ...
Pages
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
SUM(Sales)
State
SUM(Sales)
3,543
1,090,616
Columns
Longitude (generated)
Rows
Latitude (generated)
Sales by State
Mexico
© OpenStreetMap contributors
Data Source
Measures and Dimensions
Sales by Department
Bar Chart (two levels)
Bar Chart (stacked)
Bar C
49 marks
1 row by 1 column
SUM(Sales): 8,952,027
Joshua N. Mill...

Symbol maps

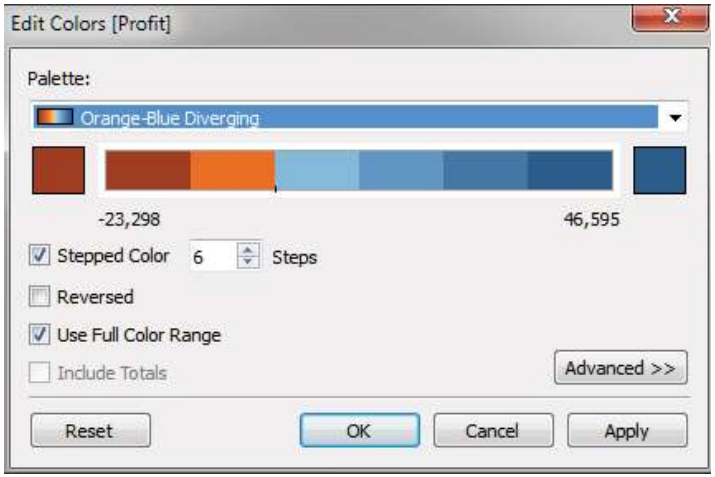
- With symbol maps, marks on the map are not drawn as filled regions; rather, marks are shapes or symbols placed at specific geographic locations.

- The size, color, and shape may also be used to encode additional dimensions and measures.


Pages
Columns
Longitude (generated)
Rows
Latitude (generated)
Filters
Sales by Postal Code
Marks
Automatic
Color
Size
Label
Detail
Tooltip
SUM(Profit)
SUM(Sales)
Postal Code
SUM(Profit)
-23,298
46,595
United States
Mexico
© OpenStreetMap contributors

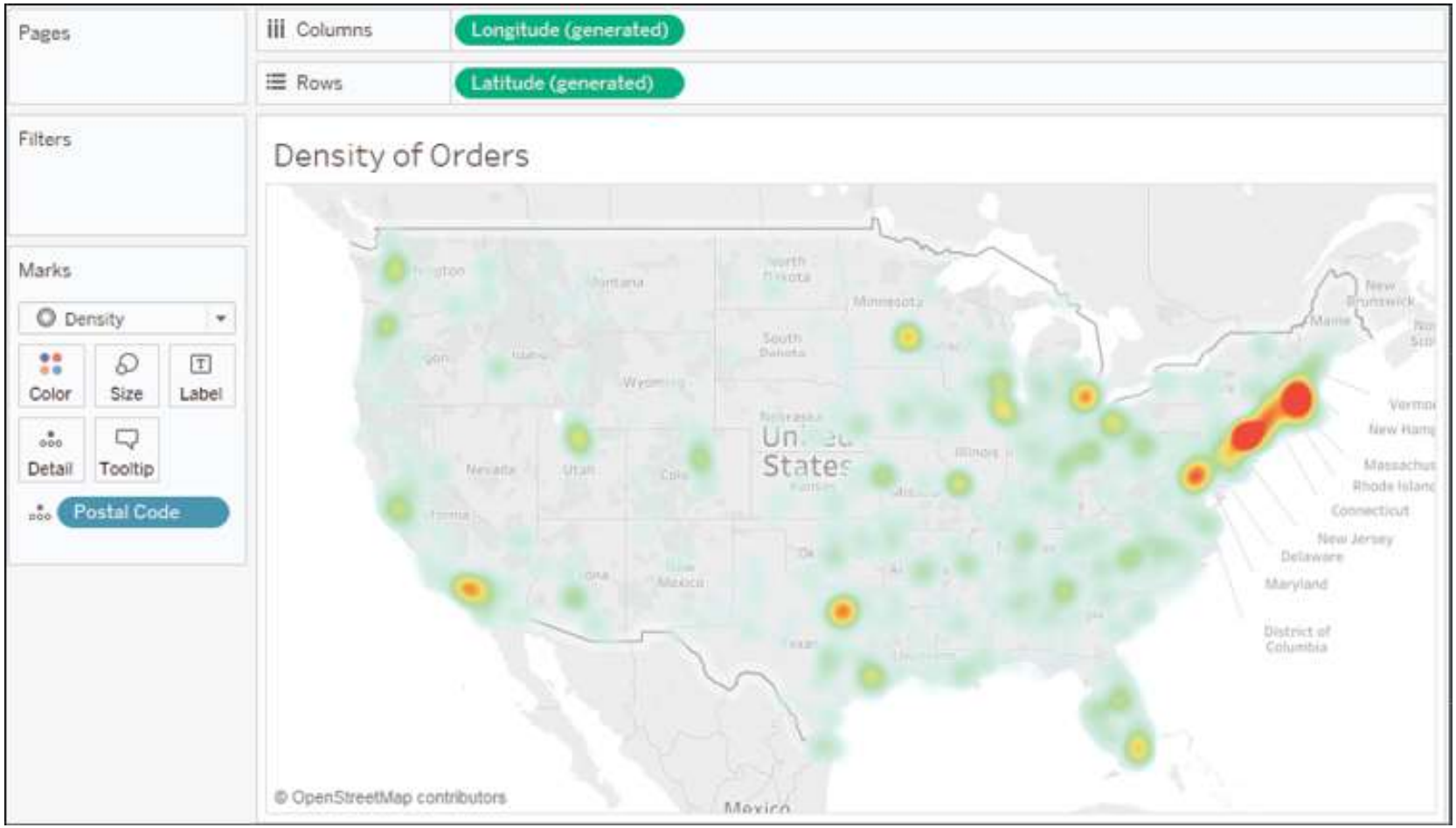
Symbol maps

- A combination of tweaking the size and using Stepped Color and Use Full Color Range, as shown here, produced the result for this example:



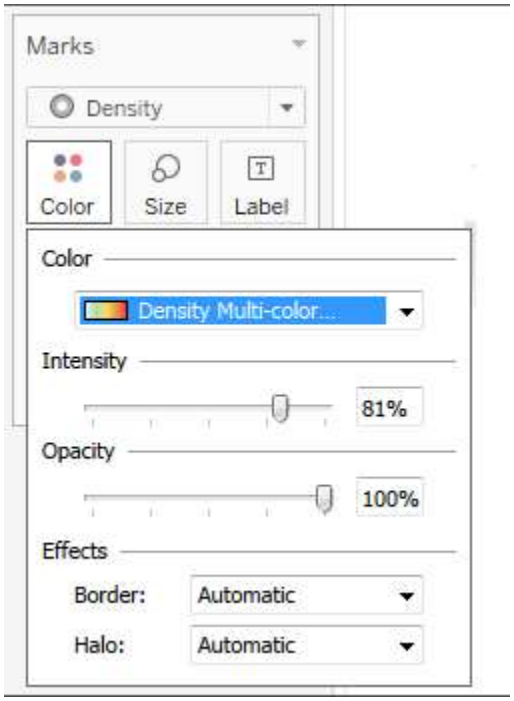
Density maps

- Density maps show the spread and concentration of values within a geographic area.
- Instead of individual points or symbols, the marks blend together, showing greater intensity in areas with a high concentration.
- You can control the Color, Size, and Intensity.


Pages
Columns
Longitude (generated)
Rows
Latitude (generated)
Filters
Marks
Density
Color
Size
Label
Detail
Tooltip
Postal Code
Density of Orders
Montana
Minnesota
South Dakota
Wyoming
Nevada
Utah
Illinois
New Jersey
Delaware
Maryland
District of Columbia
Connecticut
Rhode Island
Massachus
New Hamp
Vermo
New Brunswick
Maine
States
Mexico
© OpenStreetMap contributors

Density maps

- Try experimenting with the Color and Size options.
- Clicking on Color, for example, reveals some options specific to the Density mark type:



Using Show Me

- Show Me is a powerful component of Tableau that arranges selected and active fields into the places required for the selected visualization type.

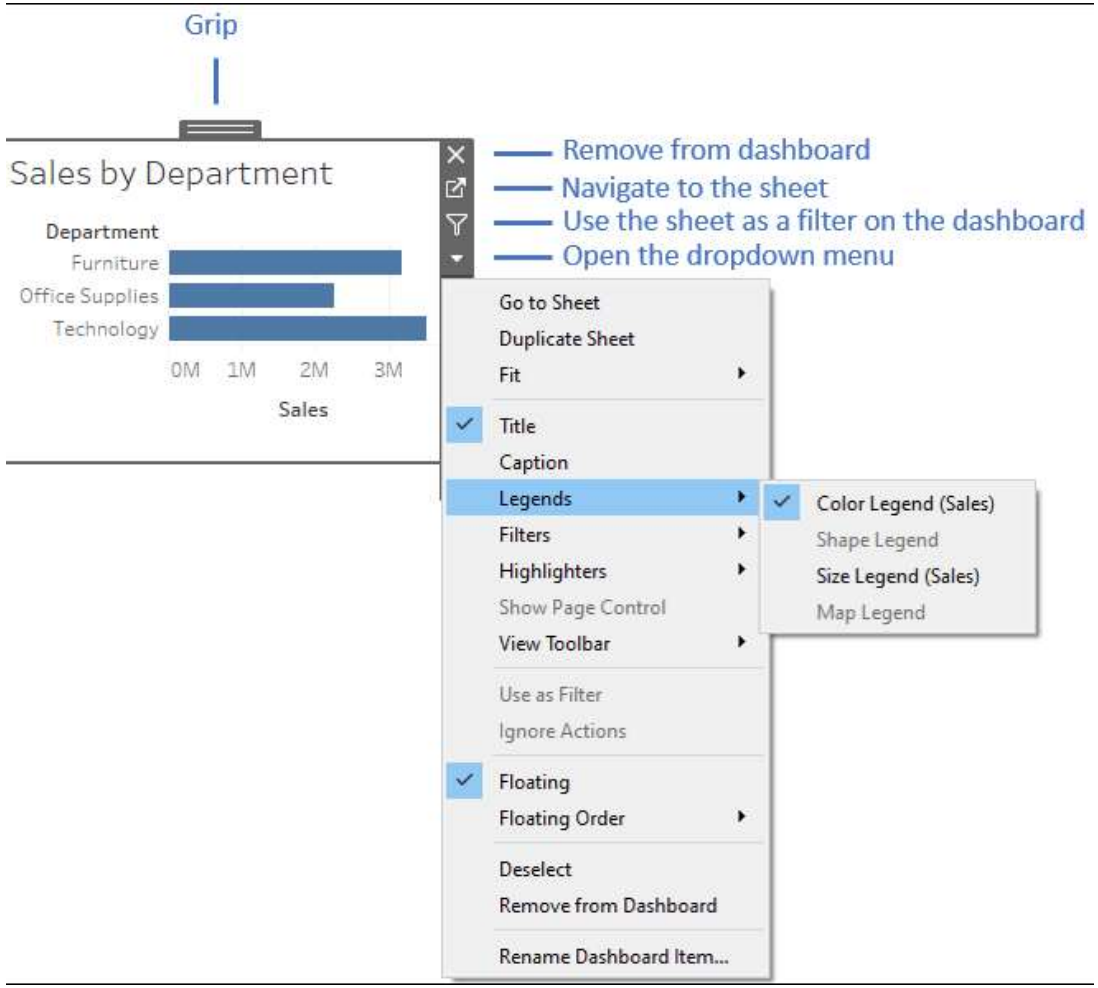
- The Show Me toolbar displays small thumbnail images of different types of visualizations, allowing you to create visualizations with a single click.


Show Me
For symbol maps try
1 geo
Dimension
0 or more
Dimensions
0 to 2
Measures
May use spatial measure in place of geo dimension

Putting everything together in a dashboard

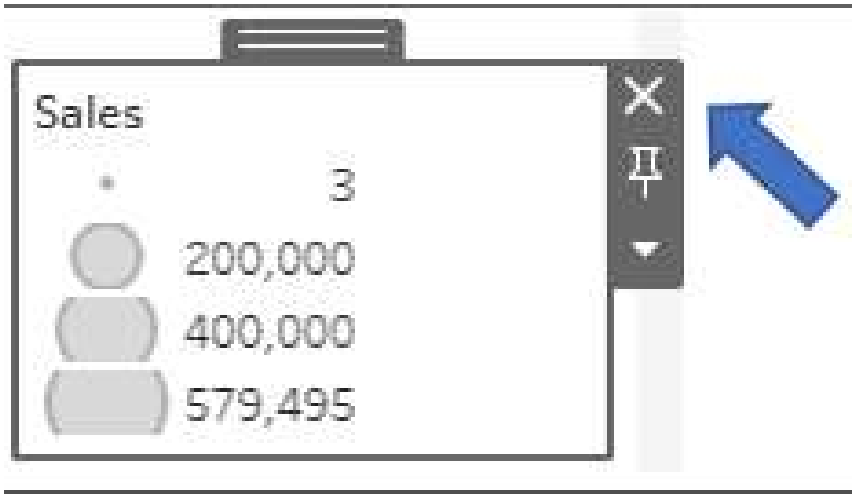
- Often, you'll need more than a single visualization to communicate the full story of the data.
- In these cases, Tableau makes it very easy for you to use multiple visualizations together on a dashboard.
- In Tableau, a dashboard is a collection of views, filters, parameters, images, and other objects that work together to communicate a data story.

The dashboard interface


Grip
Sales by Department
Department
Furniture
Office Supplies
Technology
0M
1M
2M
3M
Sales
Remove from dashboard
Navigate to the sheet
Use the sheet as a filter on the dashboard
Open the dropdown menu
Go to Sheet
Duplicate Sheet
Fit
Title
Caption
Legends
Filters
Highlighters
Show Page Control
View Toolbar
Use as Filter
Ignore Actions
Floating
Floating Order
Deselect
Remove from Dashboard
Rename Dashboard Item...
Color Legend (Sales)
Shape Legend
Size Legend (Sales)
Map Legend

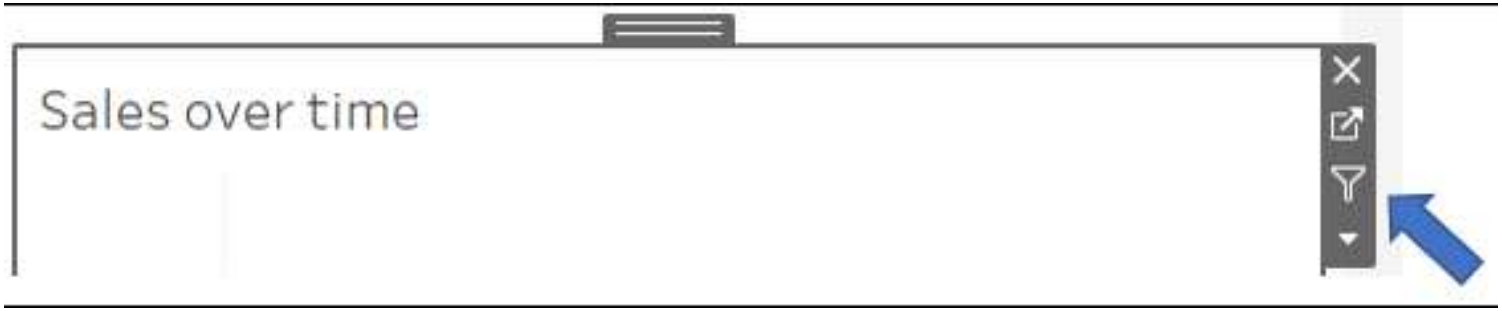
Building your dashboard

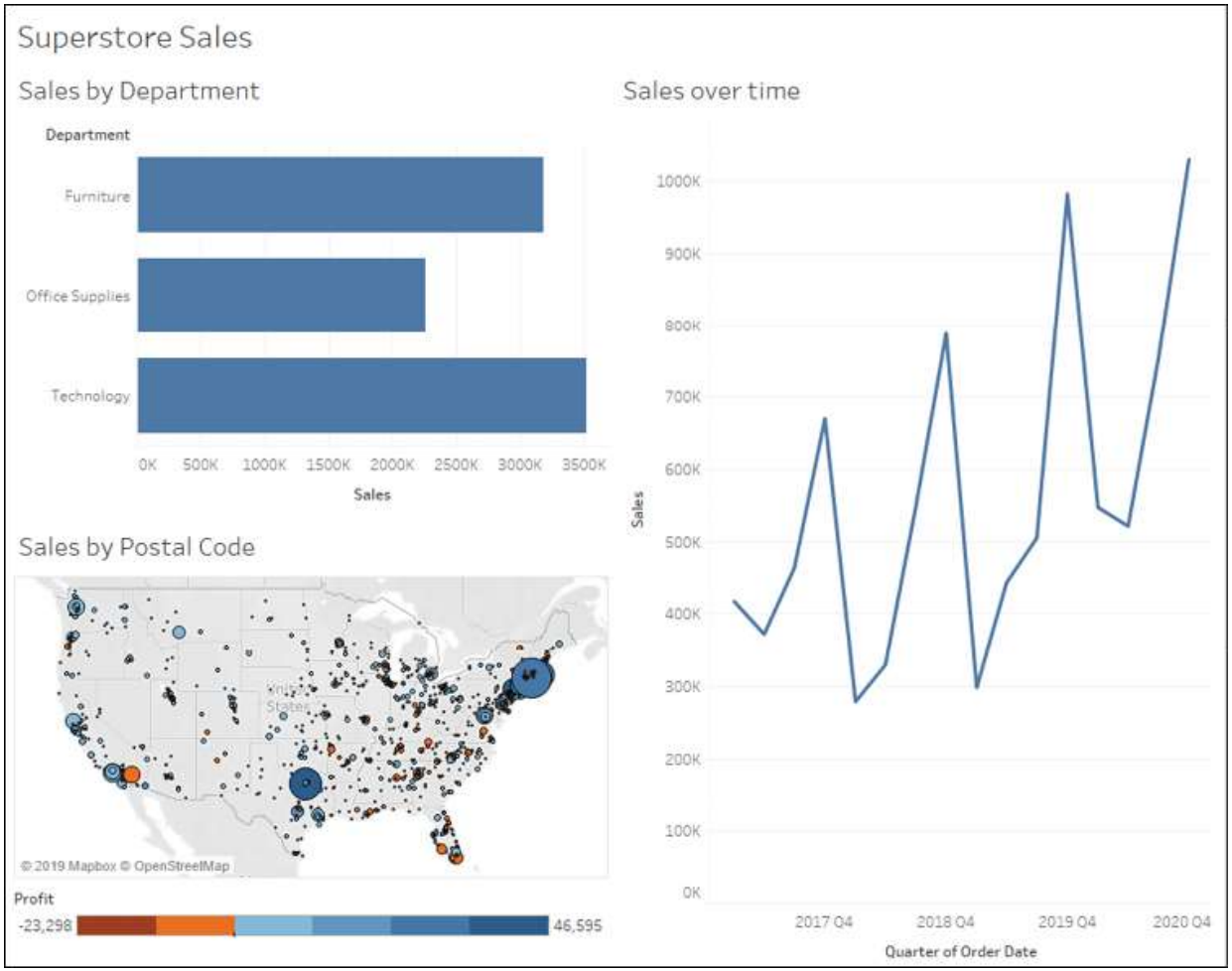
- Select the Sales size legend by clicking on it. Use the X option to remove the legend from the dashboard:



Building your dashboard

- For each view (Sales by Department, Sales by Postal Code, and Sales over time), select the view by clicking on an empty area in the view.
- Then, click on the Use as Filter option to make that view an interactive filter for the dashboard:




Superstore Sales
Sales by Department
Department
Furniture
Office Supplies
Technology
0K
500K
1000K
1500K
2000K
2500K
3000K
3500K
Sales
Sales over time
1000K
900K
800K
700K
600K
500K
400K
300K
200K
100K
0K
Sales
2017 Q4
2018 Q4
2019 Q4
2020 Q4
Quarter of Order Date
Sales by Postal Code
© 2019 Mapbox © OpenStreetMap
Profit
-23,298
46,595

Summary

- Tableau's visual environment allows a rapid and iterative process of exploring and analyzing data visually.
- You've taken your first steps toward understanding how to use the platform.
- You connected to data and then explored and analyzed the data using some key visualization types such as bar charts, line charts, and geographic visualizations.

COMPLETE LAB 1

2. Connecting to Data in Tableau

LEARNING VOYAGE

Connecting to Data in Tableau

We'll cover the following topics:

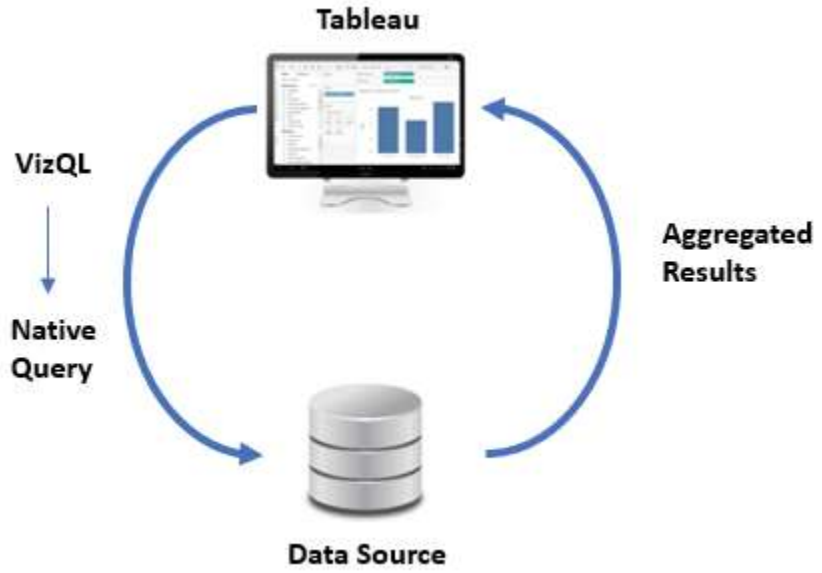
- The Tableau paradigm
- Connecting to data
- Managing data source metadata
- Working with extracts instead of live connections
- Filtering data

The Tableau paradigm

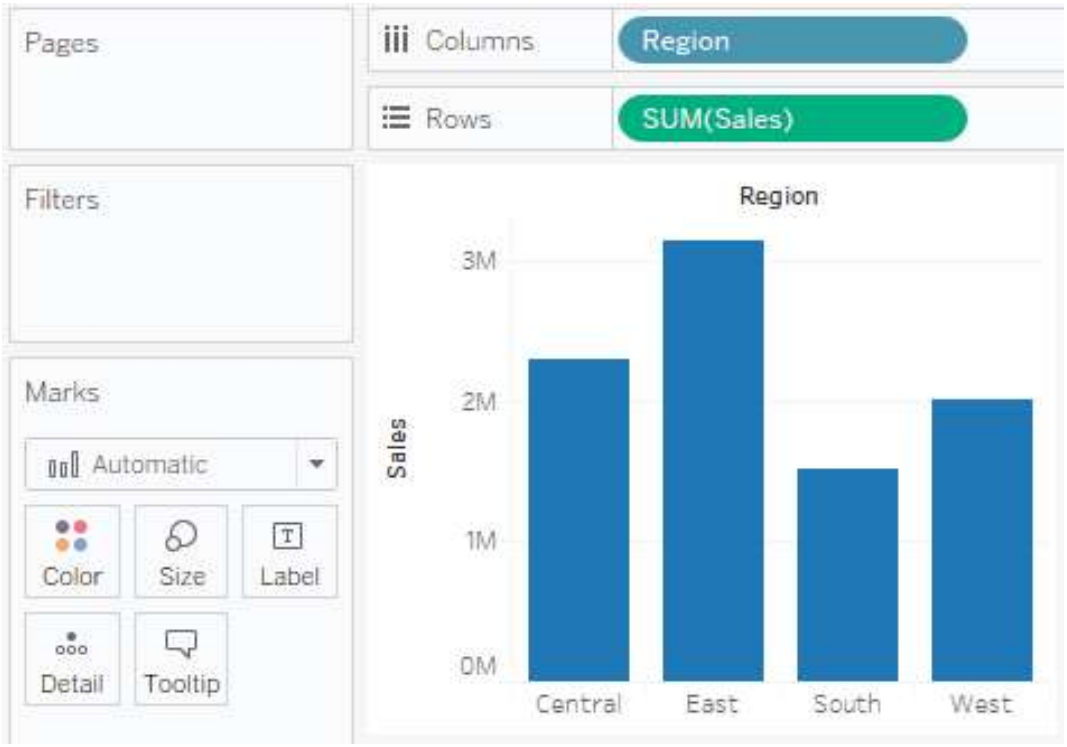
- The unique and exciting experience of working with data in Tableau is a result of VizQL (Visual Query Language).
- VizQL was developed as a Stanford University research project, focusing on the natural ways that humans visually perceive the world and how that could be applied to data visualization.
- We naturally perceive differences in size, shape, spatial location, and color.

The Tableau paradigm

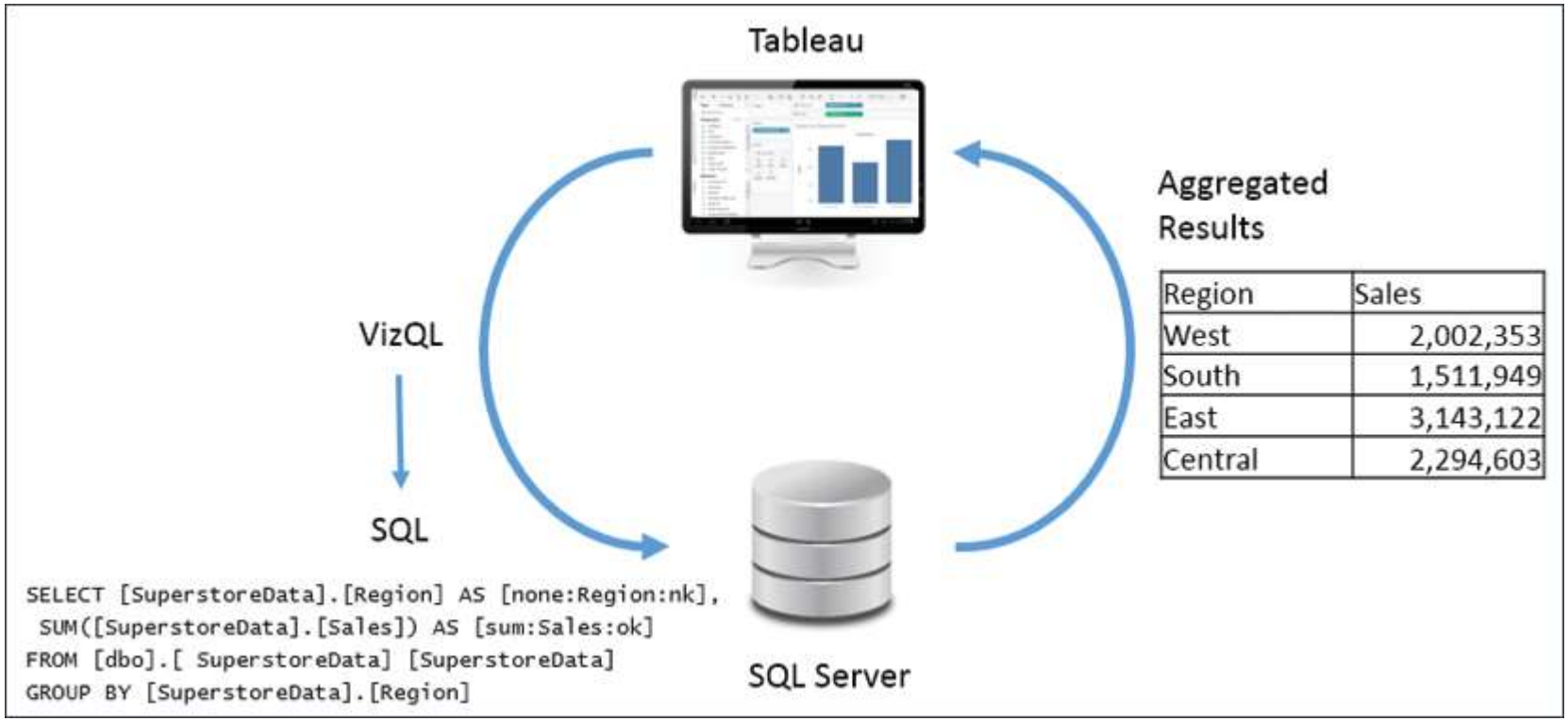
- In its simplest form, the Tableau paradigm of working with data looks like the following diagram:



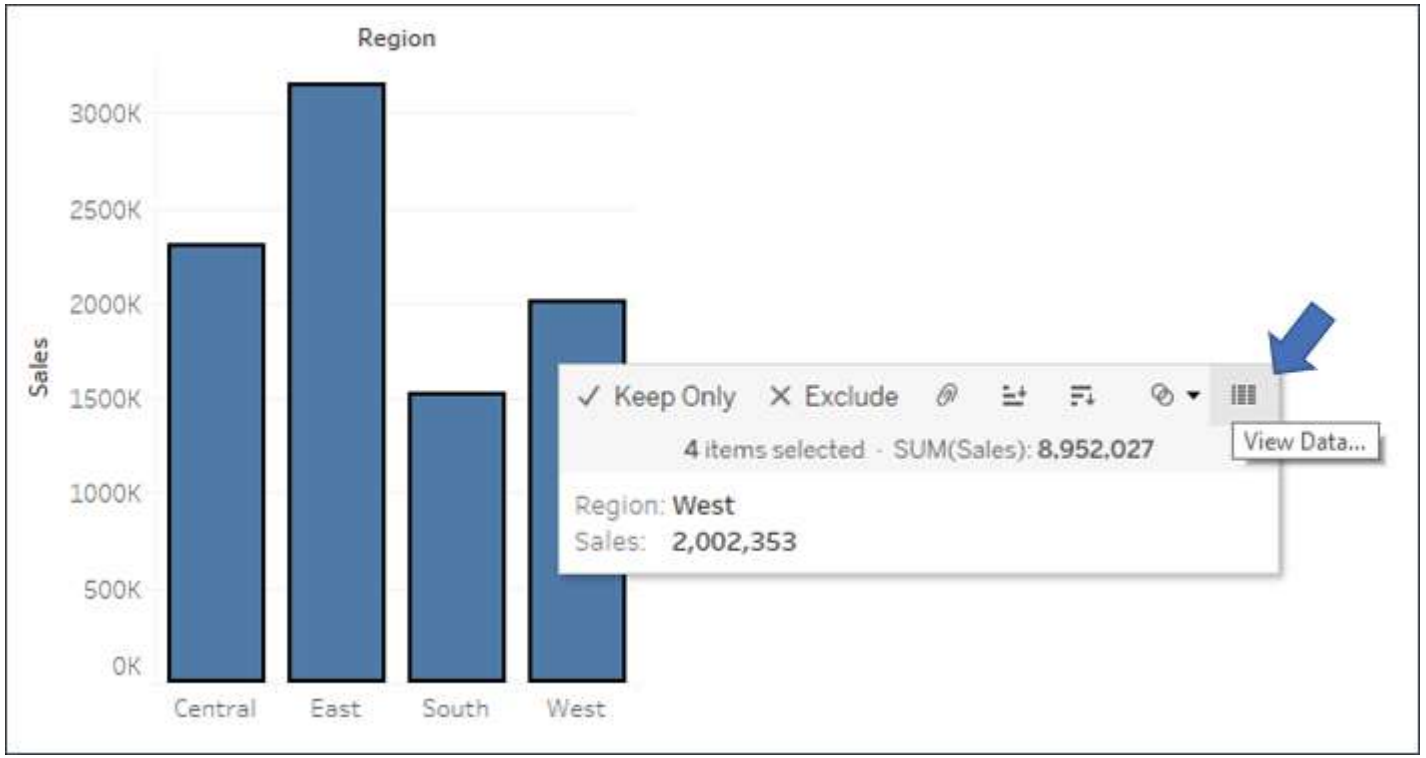
A simple example



A simple example

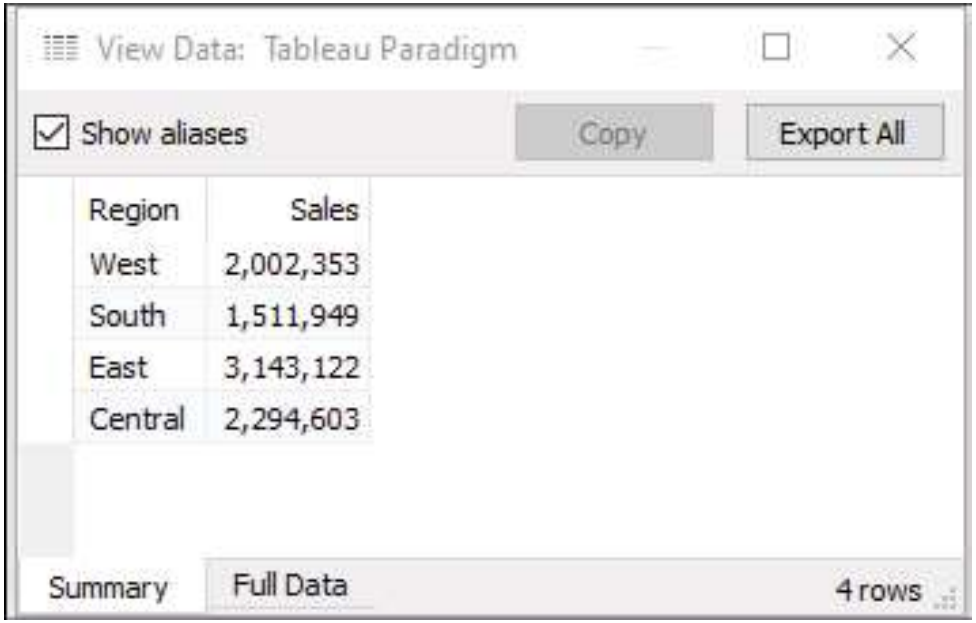


A simple example



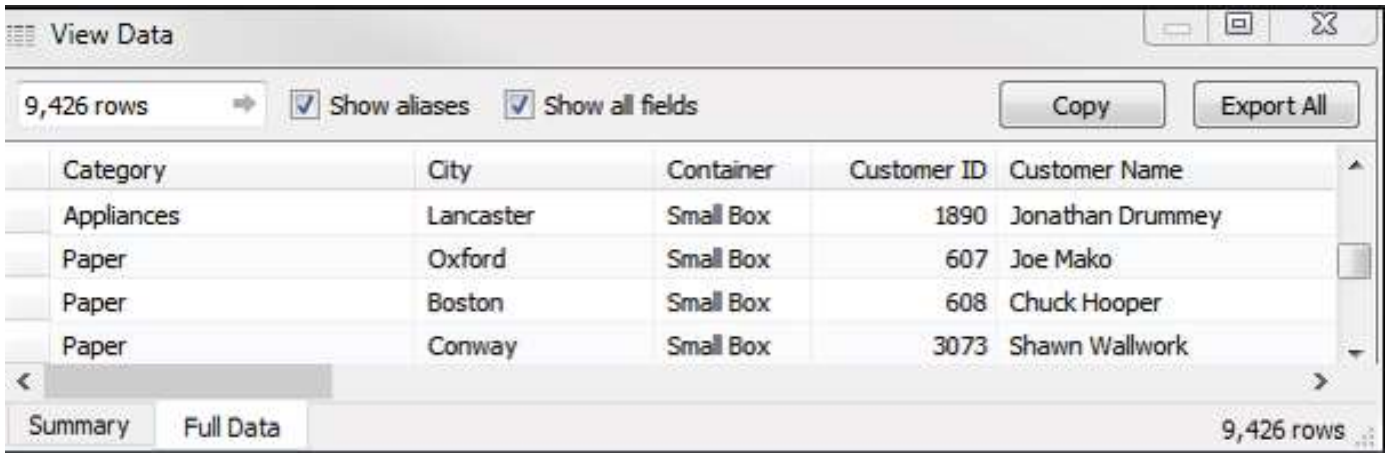
A simple example

- This will reveal a View Data window:

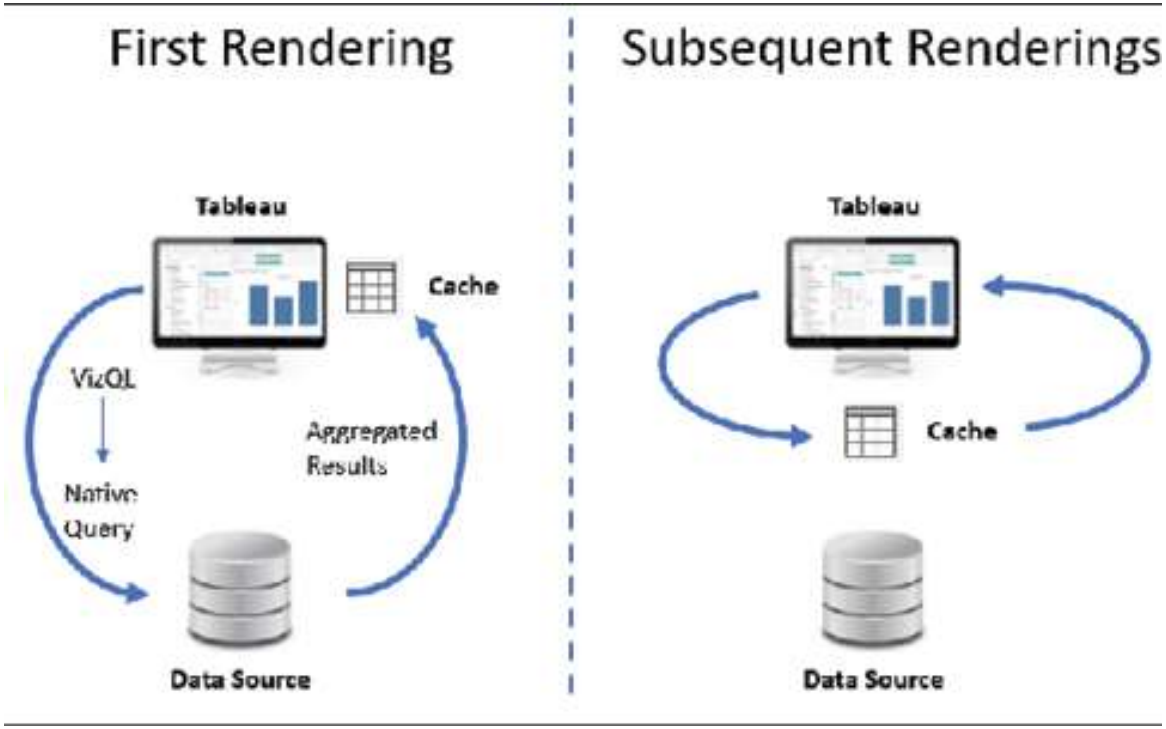


A simple example

- In this case, there are 9,426 underlying records, as indicated on the status bar in the lower-right corner of the following screenshot:



A simple example



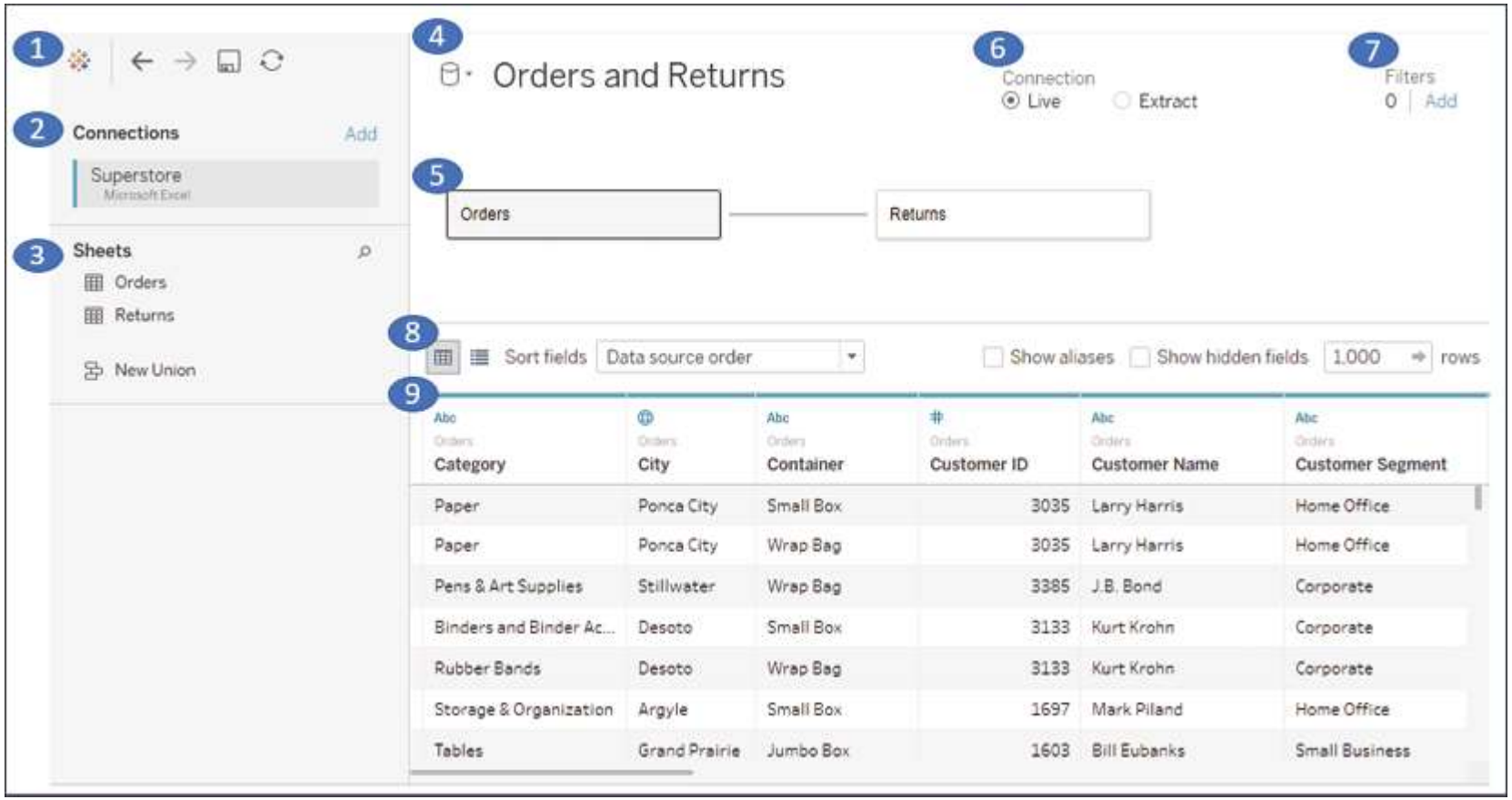
Connecting to data

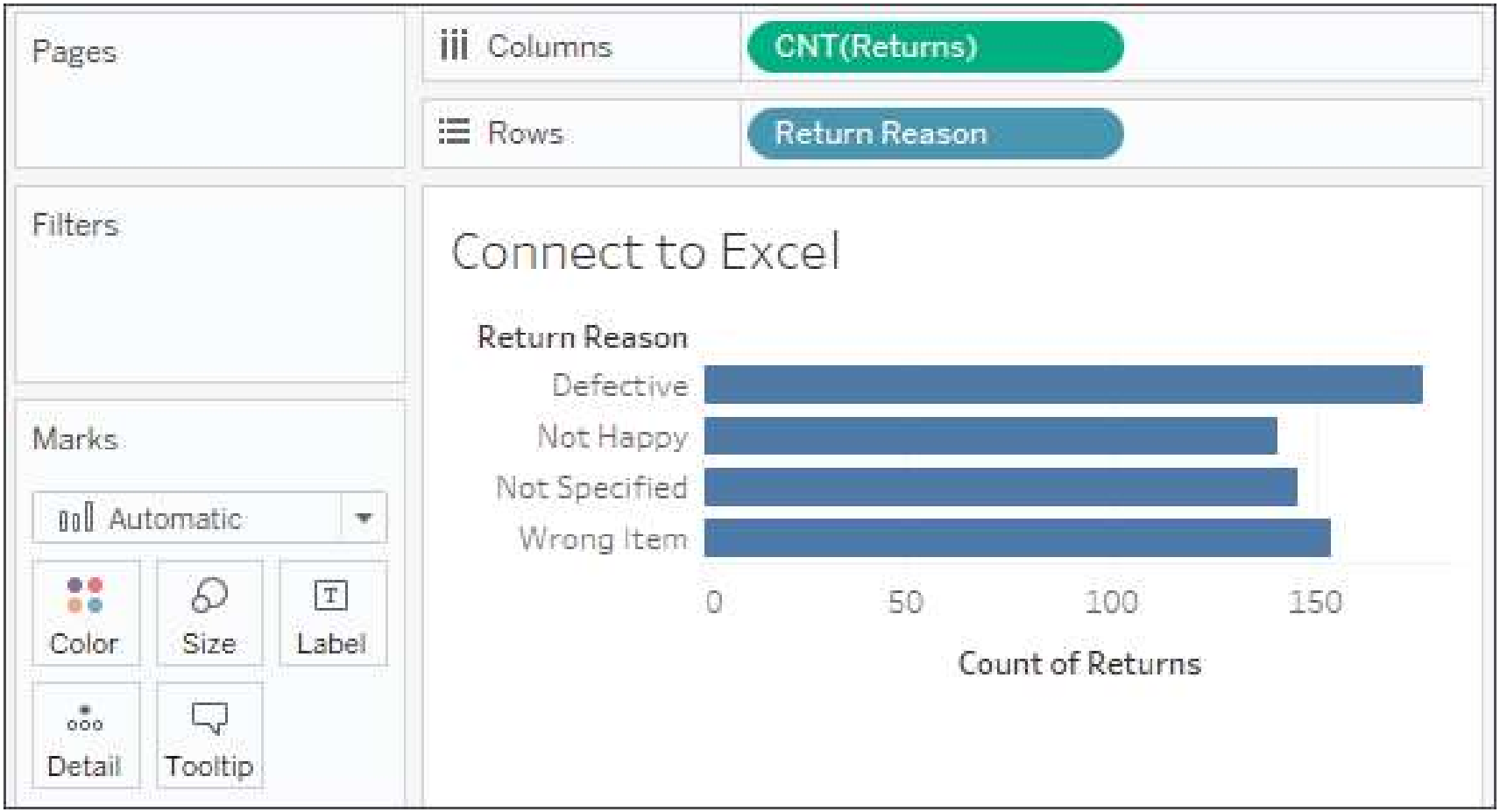
- There is virtually no limit to the data that Tableau can visualize! Almost every new version of Tableau adds new native connectors.
- Tableau continues to add native connectors for cloud-based data.
- The web data connector allows you to write a connector for any online data you wish to retrieve.
- The Tableau Hyper API allows you to programmatically read and write extracts of data, enabling you to access data from any source and write it to a native Tableau format.

Connecting to data in a file

File-based data includes all sources of data where the data is stored in a file. File-based data sources include the following:

- Extracts: A .hyper or .tde file containing data that was extracted from an original source.
- Microsoft Access: An .mdb or .accdb database file created in Access.
- Microsoft Excel: An .xls, .xlsx, or .xlsm spreadsheet created in Excel. Multiple Excel sheets or sub-tables may be joined or unioned together in a single connection.


1
2
Connections
Add
Superstore
Microsoft Excel
3
Sheets
Orders
Returns
New Union
4
Orders and Returns
6
Connection
Live
Extract
7
Filters
0
Add
5
Orders
Returns
8
Sort fields
Data source order
Show aliases
Show hidden fields
1,000
rows
9
Abc
Orders
Category
Orders
City
Abc
Orders
Container
Orders
Customer ID
Abc
Orders
Customer Name
Abc
Orders
Customer Segment
Paper
Ponca City
Small Box
3035
Larry Harris
Home Office
Paper
Ponca City
Wrap Bag
3035
Larry Harris
Home Office
Pens & Art Supplies
Stillwater
Wrap Bag
3385
J.B. Bond
Corporate
Binders and Binder Ac...
Desoto
Small Box
3133
Kurt Krohn
Corporate
Rubber Bands
Desoto
Wrap Bag
3133
Kurt Krohn
Corporate
Storage & Organization
Argyle
Small Box
1697
Mark Piland
Home Office
Tables
Grand Prairie
Jumbo Box
1603
Bill Eubanks
Small Business


Pages
Columns
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Rows
Return Reason
Filters
Connect to Excel
Return Reason
Defective
Not Happy
Not Specified
Wrong Item
0
50
100
150
Count of Returns
Marks
Automatic
Color
Size
Label
Detail
Tooltip

Connecting to data on a server

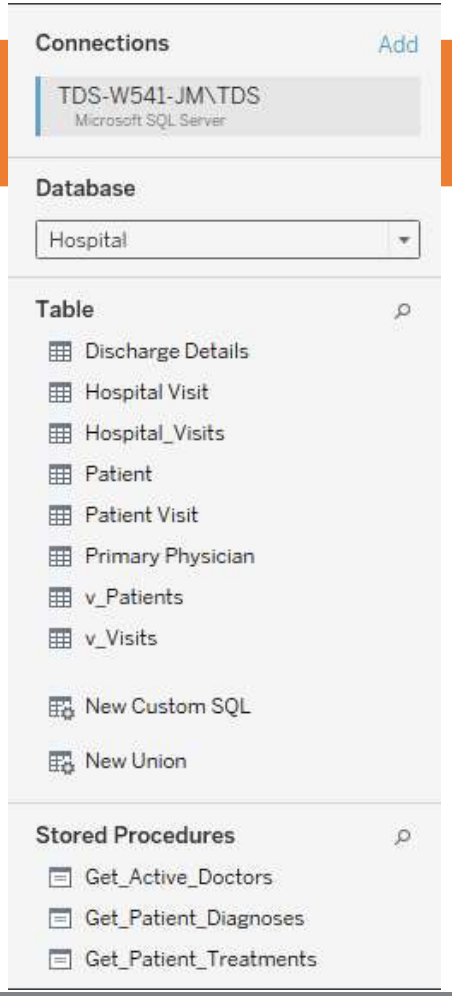
- Database servers, such as SQL Server, Snowflake, Vertica, and Oracle, host data on one or more server machines and use powerful database engines to store, aggregate, sort, and serve data based on queries from client applications.

- Tableau can leverage the capabilities of these servers to retrieve data for visualization and analysis.

- As soon as the Microsoft SQL Server connection is selected, the interface displays options for some initial configuration as follows:

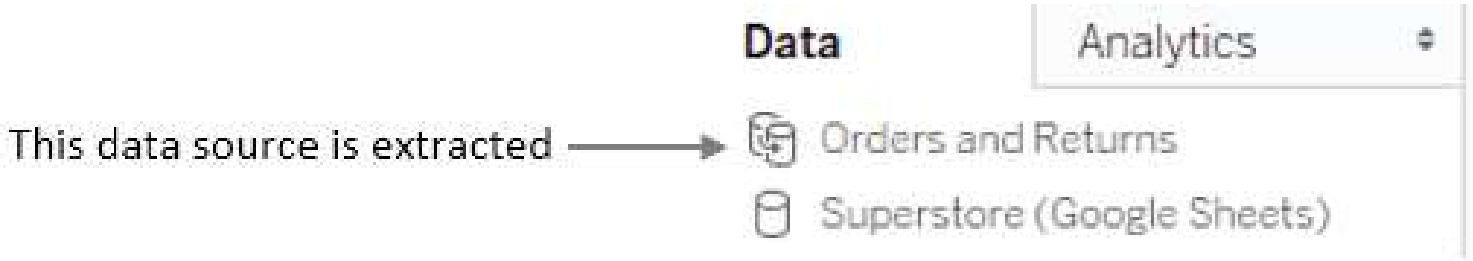
Connecting to data on a server

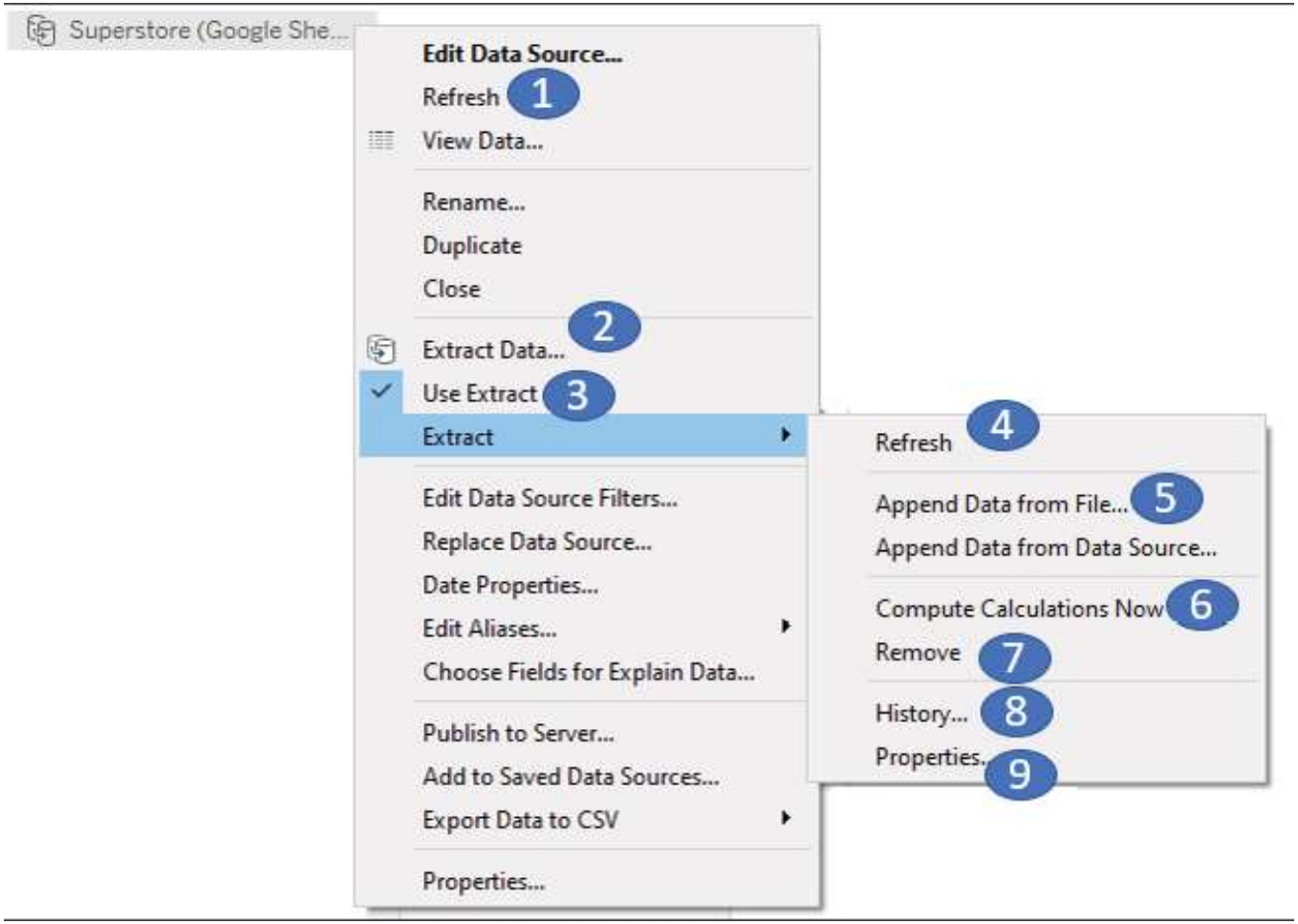
- Once you click the orange Sign In button, you will see a screen that is very similar to the connection screen you saw for Excel.
- The main difference is on the left, where you have an option for selecting a Database, as shown in the following screenshot:



Using extracts

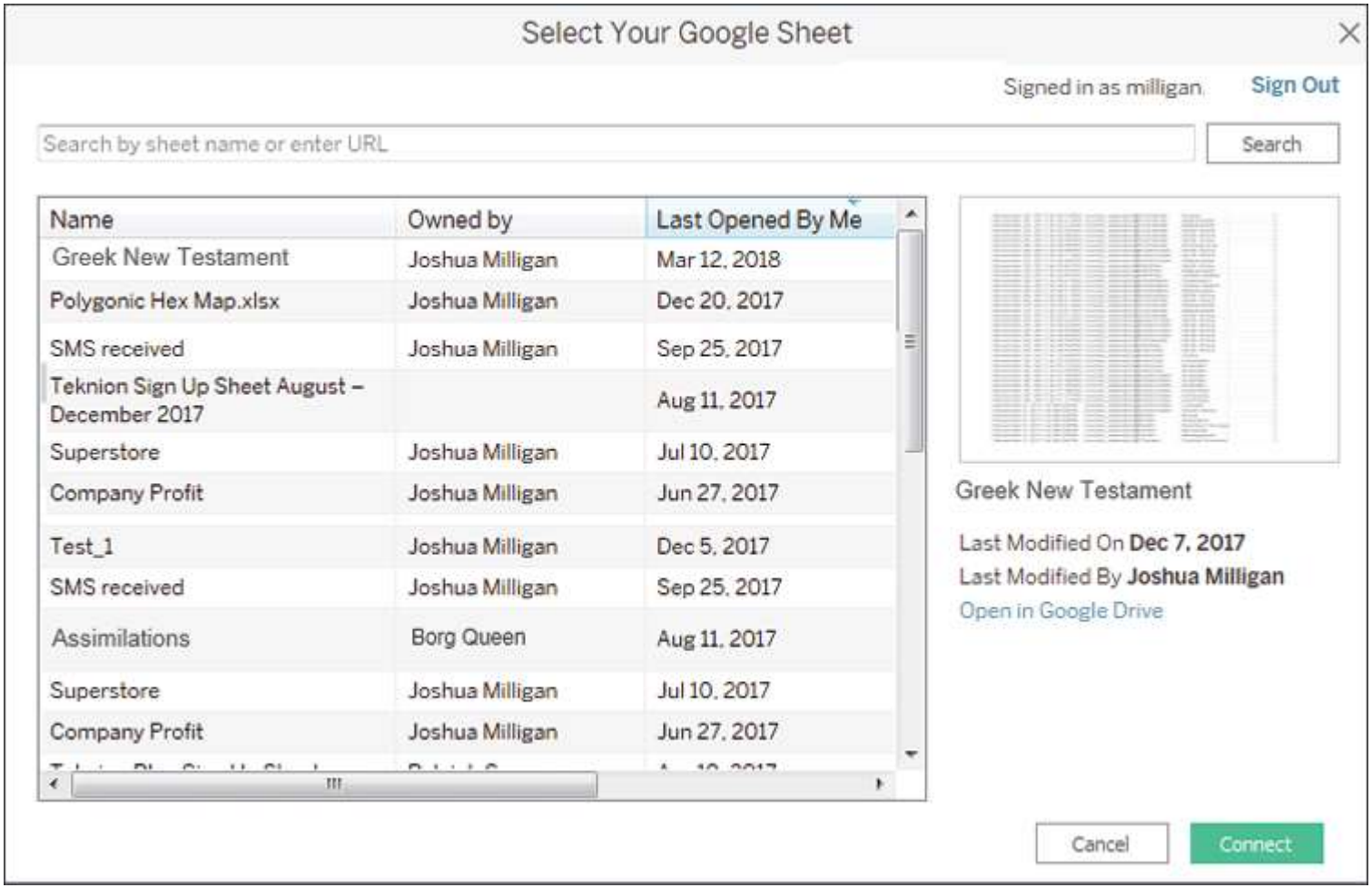
- Any data source that is using an extract will have a distinctive icon that indicates the data has been pulled from an original source into an extract, as shown in the following screenshot:




Superstore (Google She...
Edit Data Source...
Refresh
1
View Data...
Rename...
Duplicate
Close
Extract Data...
2
Use Extract
3
Extract
Edit Data Source Filters...
Replace Data Source...
Date Properties...
Edit Aliases...
Choose Fields for Explain Data...
Publish to Server...
Add to Saved Data Sources...
Export Data to CSV
Properties...
Refresh
4
Append Data from File...
5
Append Data from Data Source...
Compute Calculations Now
6
Remove
7
History...
8
Properties...
9

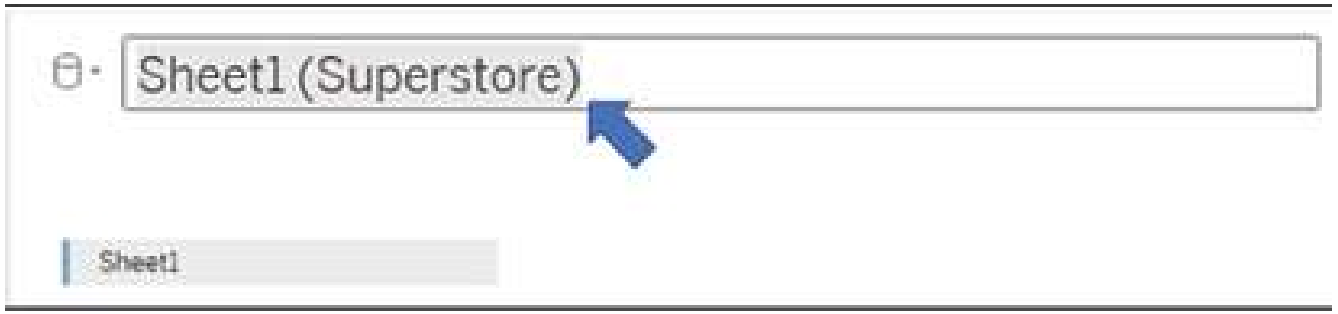
Connecting to data in the cloud

- Certain data connections are made to data that is hosted in the cloud.
- These include Amazon RDS, Google BigQuery, Microsoft SQL Azure, Snowflake, Salesforce, Google Sheets, and many others


Select Your Google Sheet
Signed in as milligan
Sign Out
Search by sheet name or enter URL
Search
Name
Owned by
Last Opened By Me
Greek New Testament
Joshua Milligan
Mar 12, 2018
Polygonic Hex Map.xlsx
Joshua Milligan
Dec 20, 2017
SMS received
Joshua Milligan
Sep 25, 2017
Teknion Sign Up Sheet August – December 2017
Aug 11, 2017
Superstore
Joshua Milligan
Jul 10, 2017
Company Profit
Joshua Milligan
Jun 27, 2017
Test_1
Joshua Milligan
Dec 5, 2017
SMS received
Joshua Milligan
Sep 25, 2017
Assimilations
Borg Queen
Aug 11, 2017
Superstore
Joshua Milligan
Jul 10, 2017
Company Profit
Joshua Milligan
Jun 27, 2017
Greek New Testament
Last Modified On Dec 7, 2017
Last Modified By Joshua Milligan
Open in Google Drive
Cancel
Connect

Connecting to data in the cloud

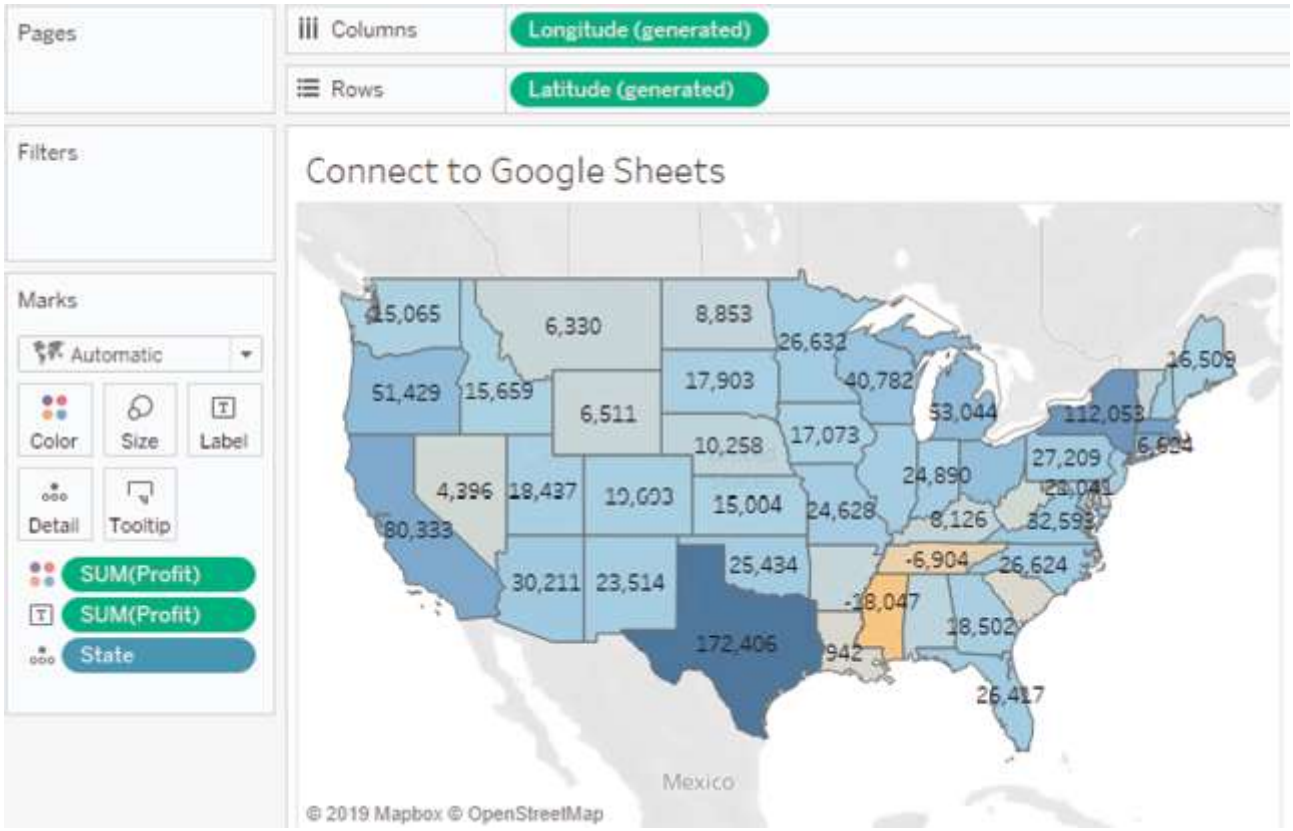
- Click the Data Source name to rename it to Superstore (Google Sheets):



Connecting to data in the cloud

- For the purpose of this example, switch the connection option from Live to Extract.
- When connecting to your own Google Sheets data, you may choose either Live or Extract:

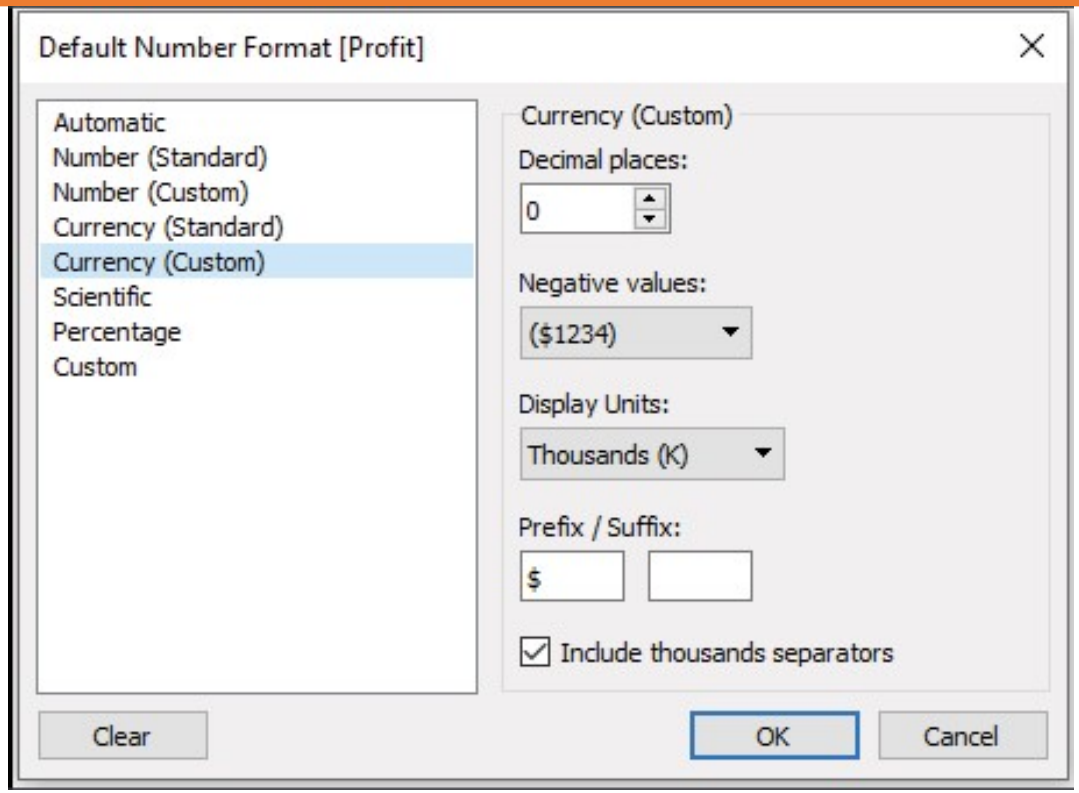
- Create a filled map of Profit by State, with Profit defining the Color and Label:

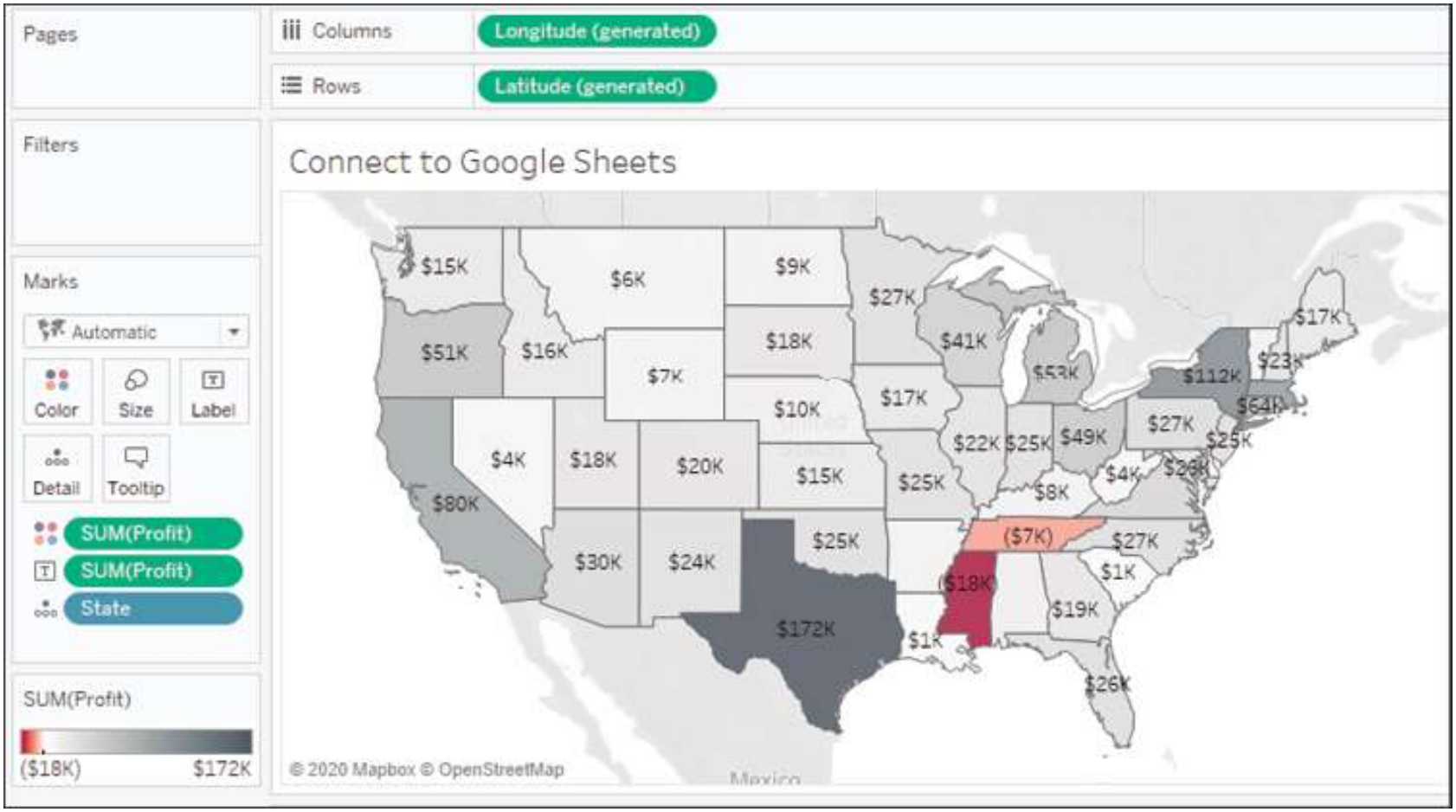


Managing data source metadata

- Data sources in Tableau store information about the connection(s).
- In addition to the connection itself (for example, database server name, database, and/or filenames), the data source also contains information about all the fields available (such as field name, data type, default format, comments, and aliases).
- Often, this data about the data is referred to as metadata.

Managing data source metadata




Pages
Columns
Longitude (generated)
Rows
Latitude (generated)
Filters
Connect to Google Sheets
Marks
Automatic
Color
Size
Label
Detail
Tooltip
SUM(Profit)
SUM(Profit)
State
SUM(Profit)
($18K)
$172K
$15K
$6K
$9K
$27K
$17K
$51K
$16K
$7K
$18K
$41K
$23K
$10K
$112K
$64K
$4K
$18K
$20K
$15K
$25K
$22K
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($7K)
$27K
$25K
$30K
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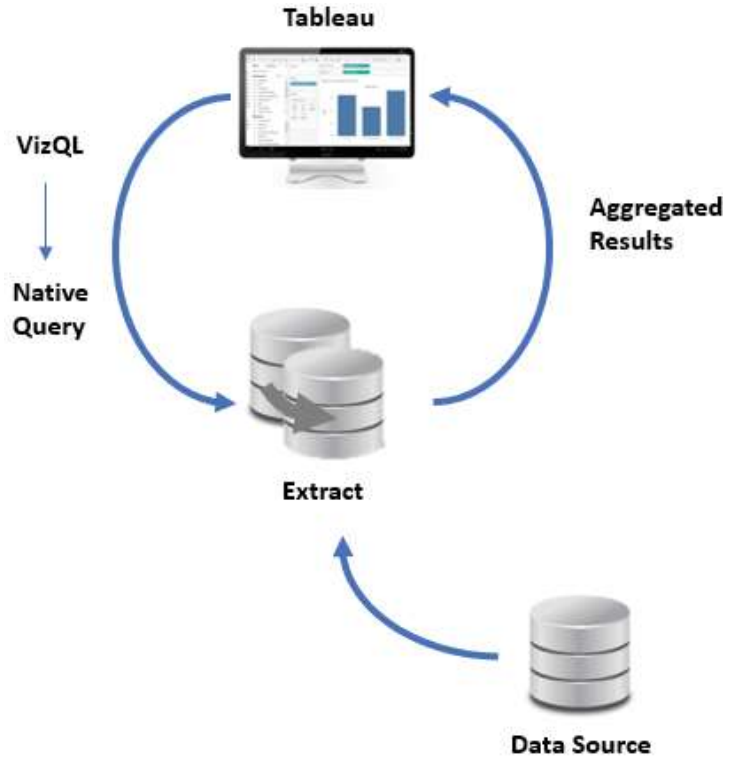
$172K
$19K
$1K
$26K
© 2020 Mapbox © OpenStreetMap
Mexico

Working with extracts instead of live connections

- Extracts extend the way in which Tableau works with data.
- Consider the following diagram:

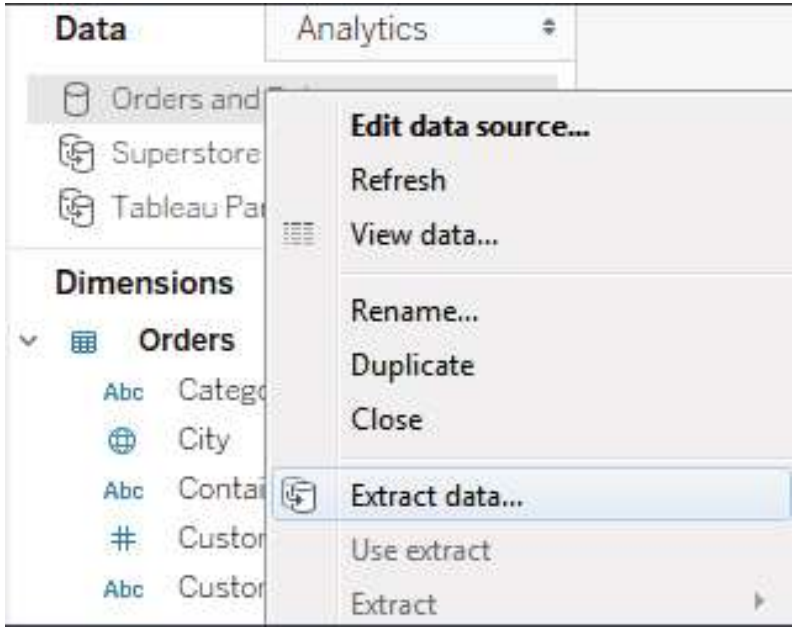


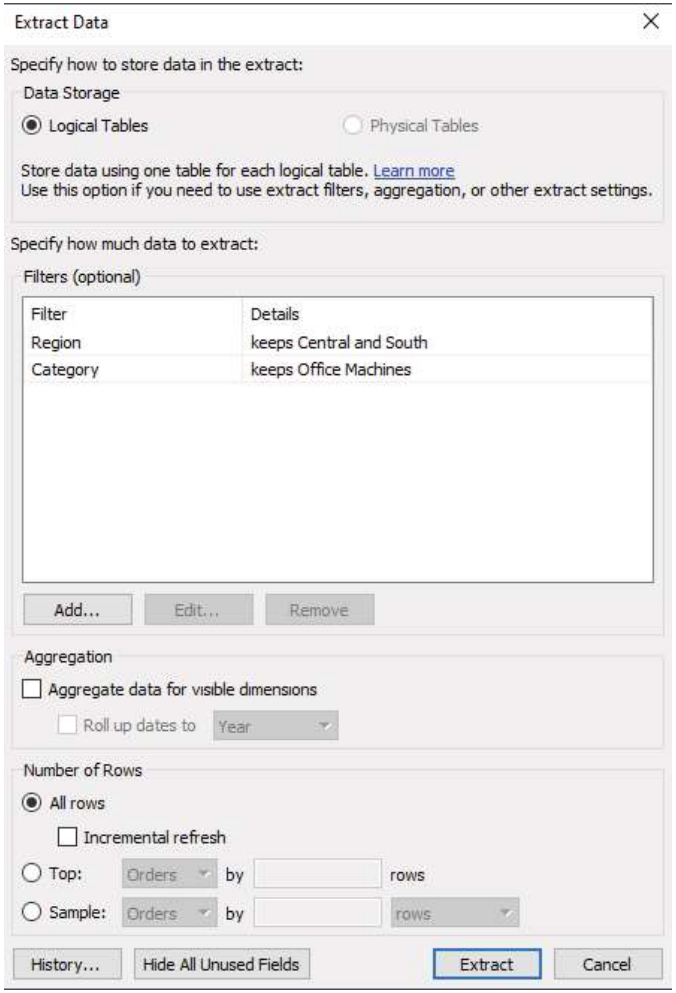
Creating extracts

- Select Extract on the Data Source screen as follows. The Edit... link will allow you to configure the extract:

Creating extracts

- Select the data source from the Data menu, or right-click the data source on the data pane and select Extract data.
- You will be given a chance to set configuration options for the extract, as demonstrated in the following screenshot:




Extract Data
Specify how to store data in the extract:
Data Storage
Logical Tables
Physical Tables
Store data using one table for each logical table. Learn more
Use this option if you need to use extract filters, aggregation, or other extract settings.
Specify how much data to extract:
Filters (optional)
Filter
Details
Region
keeps Central and South
Category
keeps Office Machines
Add...
Edit...
Remove
Aggregation
Aggregate data for visible dimensions
Roll up dates to
Year
Number of Rows
All rows
Incremental refresh
Top:
Orders
by
rows
Sample:
Orders
by
rows
History...
Hide All Unused Fields
Extract
Cancel

Performance

There are two types of extracts in Tableau:

- Tableau Data Extracts (.tde files): prior to Tableau 10.5, these were the only type of extract available.
- Hyper (.hyper files) are available in Tableau 10.5 or later.

Portability and security

- Let's say that your data is hosted on a database server accessible only from inside your office network.
- Normally, you'd have to be onsite or using a VPN to work with the data.
- Even cloud-based data sources require an internet connection.
- With an extract, you can take the data with you and work offline.

When to use an extract

- You should consider various factors when determining whether to use an extract.
- In some cases, you won't have an option (for example, OLAP requires a live connection and some cloud-based data sources require an extract).
- In other cases, you'll want to evaluate your options.

Filtering data

- Data Source Filters are applied before all other filters and are useful when you want to limit your analysis to a subset of data. These filters are applied before any other filters.

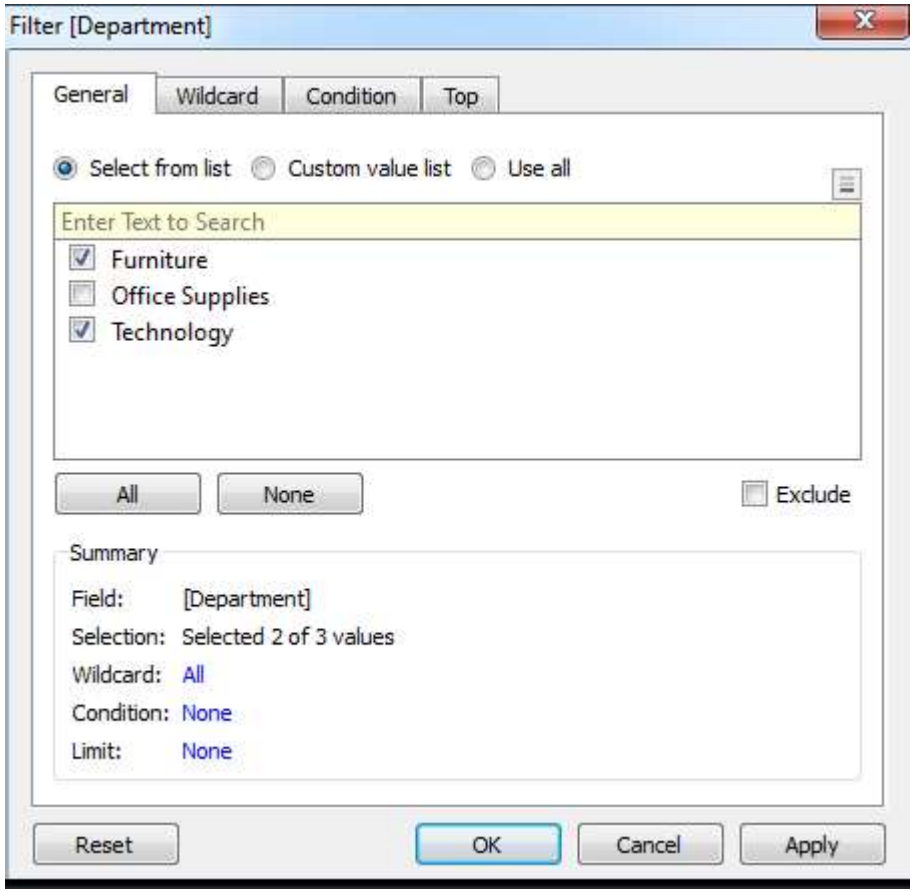
- Extract Filters limit the data that is stored in an extract (.tde or .hyper). Data source filters are often converted into extract filters if they are present when you extract the data.

Filtering data

Additionally, you can apply filters to one or more views using one of the following techniques:

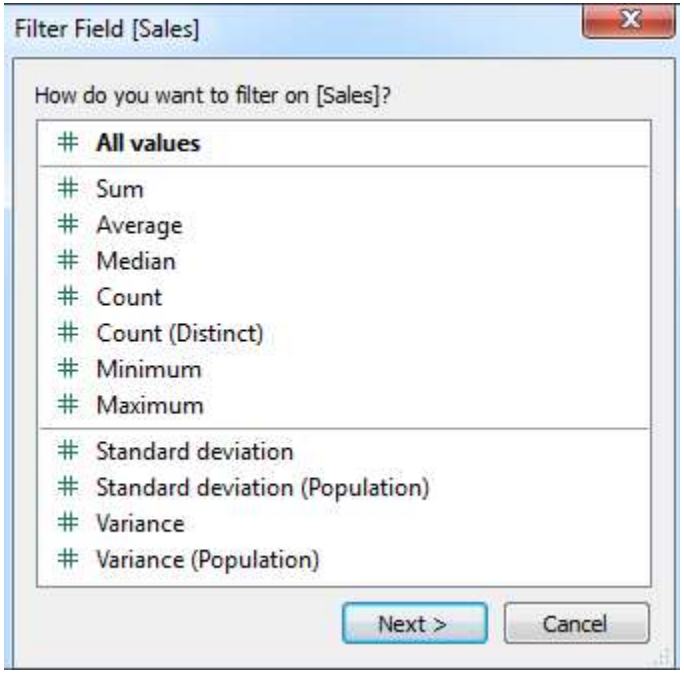
- Drag and drop fields from the data pane to the Filters shelf.
- Select one or more marks or headers in a view and then select Keep Only or Exclude, as shown here:

Filtering discrete (blue) fields



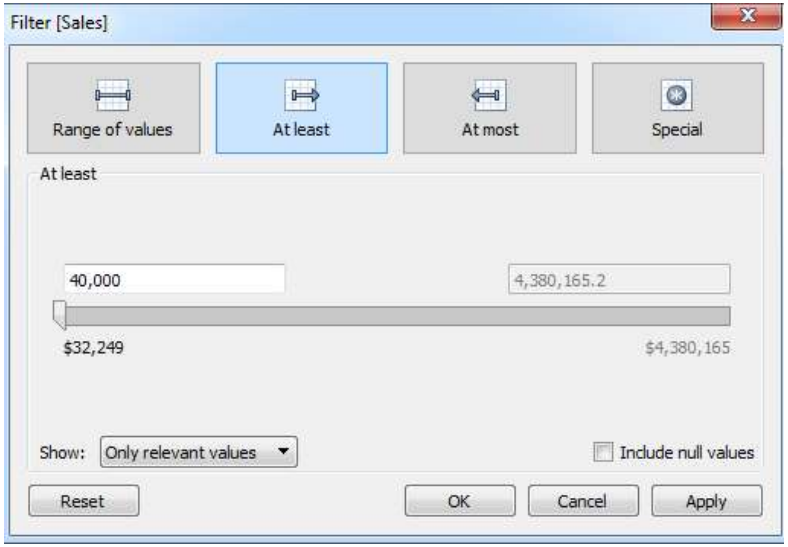
Filtering continuous (green) fields

- If you drop a continuous dimension onto the Filters shelf, you'll get a different set of options.
- Often, you will first be prompted as to how you want to filter the field, as follows:

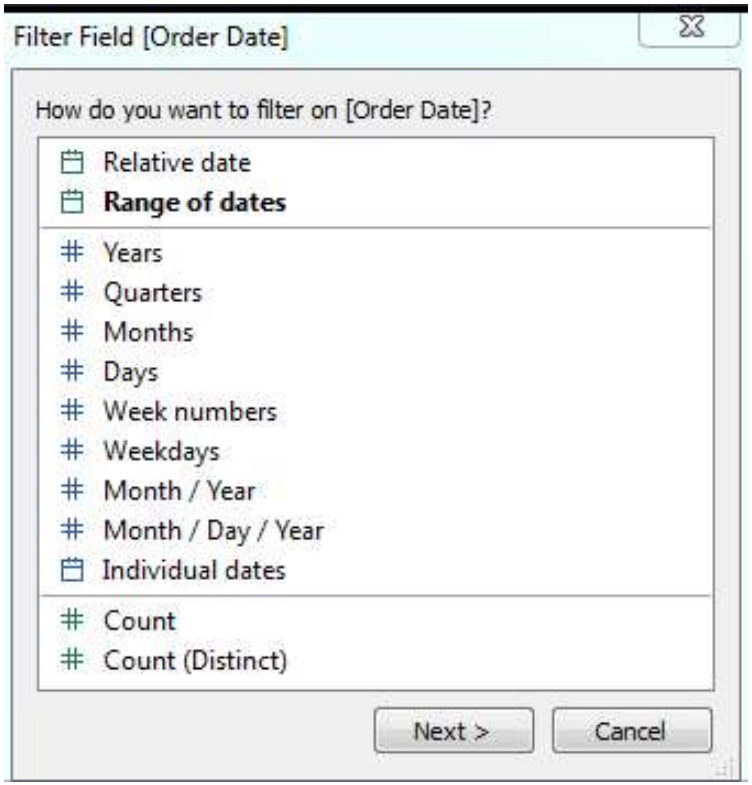


Filtering continuous (green) fields

- Once you've made a selection (or if the selection wasn't applicable for the field selected), you will be given another interface for setting the actual filter, as follows:



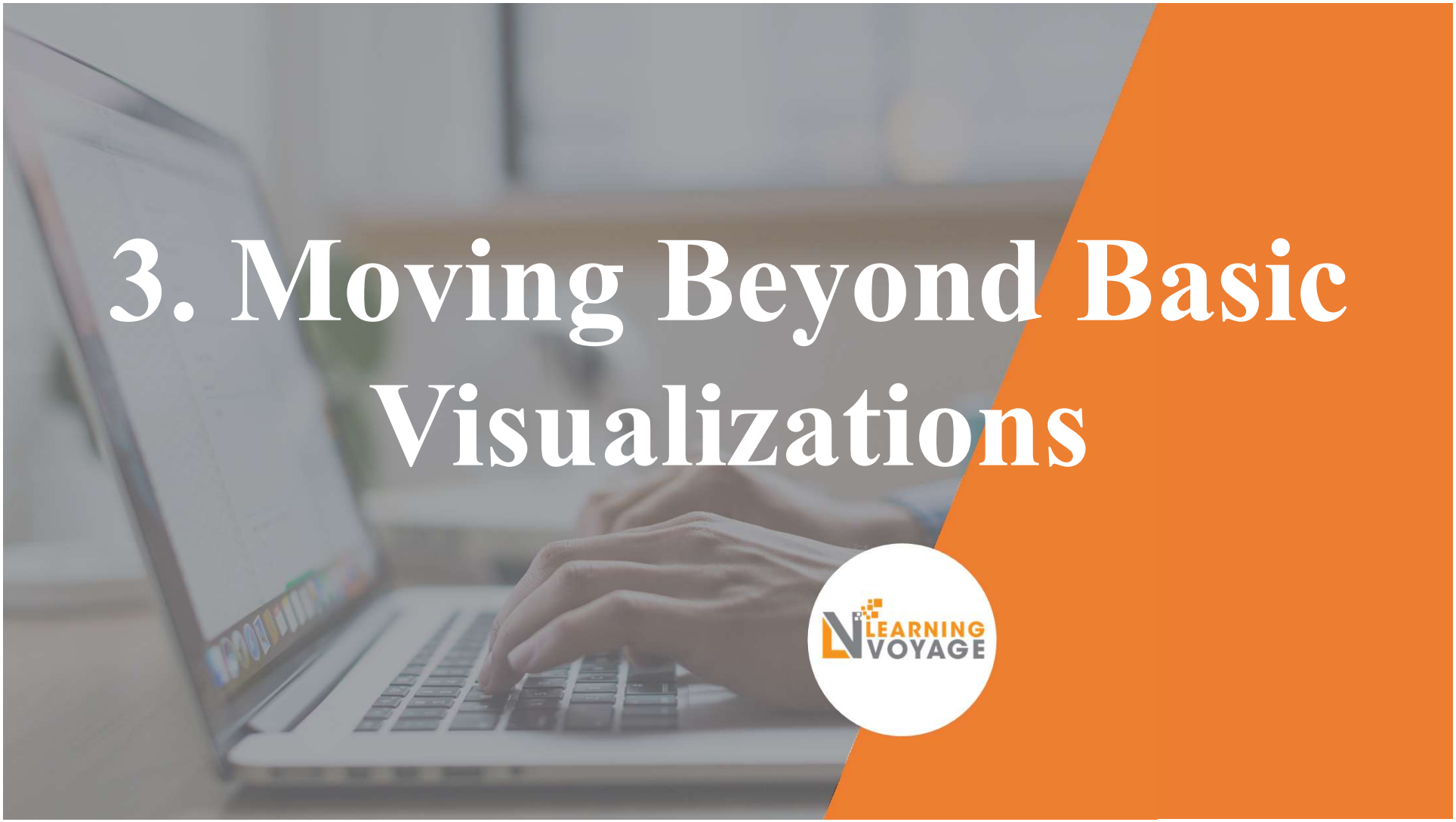
Filtering dates



Summary

- This lesson covered key concepts of how Tableau works with data.
- Although you will not usually be concerned with what queries Tableau generates to query underlying data engines, having a solid understanding of Tableau's paradigm will greatly aid you as you analyze data.

COMPLETE LAB 2



3. Moving Beyond Basic Visualizations

Moving Beyond Basic Visualizations

In this lesson, visualizations will fall under the following major categories:

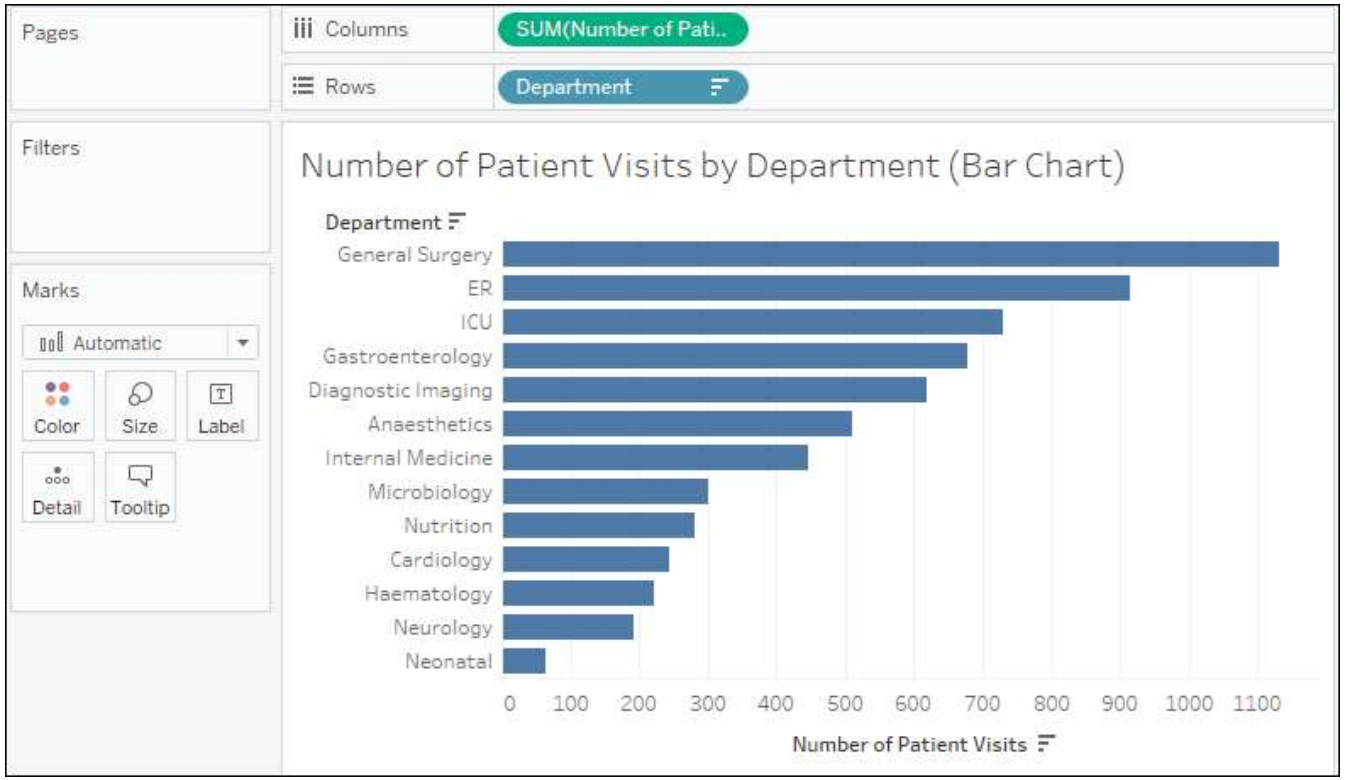
- Comparison
- Dates and times
- Relating parts of the data to the whole
- Distributions
- Multiple axes

Comparing values

Often, you will want to compare the differences between measured values across different categories. You might find yourself asking the following questions:

- How many customers did each store serve?
- How much energy did each wind farm produce?
- How many patients did each doctor see?

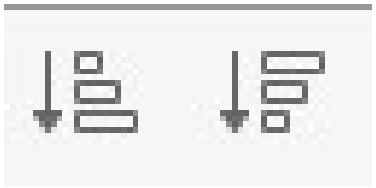
Bar charts


Pages
Columns
SUM(Number of Pati..
Rows
Department
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Number of Patient Visits by Department (Bar Chart)
Department
General Surgery
ER
ICU
Gastroenterology
Diagnostic Imaging
Anaesthetics
Internal Medicine
Microbiology
Nutrition
Cardiology
Haematology
Neurology
Neonatal
0
100
200
300
400
500
600
700
800
900
1000
1100
Number of Patient Visits

Bar charts

- Click one of the sort icons on the toolbar: This results in an automatic sort of the dimension based on the measure that defined the axis.

- Changes in data or filtering that result in a new order will be reflected in the view:



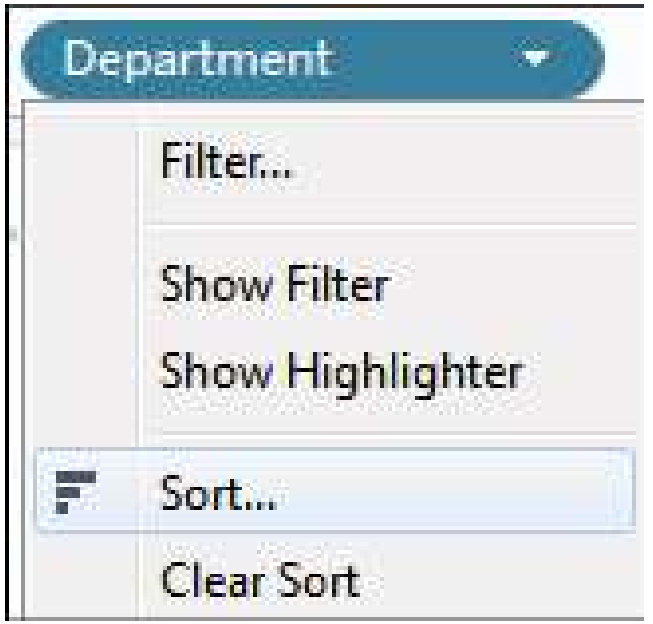
Bar charts

- Click the sort icon on the axis: The option icon will become visible when you hover over the axis and will then remain in place when you enable the sort.

- This will also result in automatic sorting:

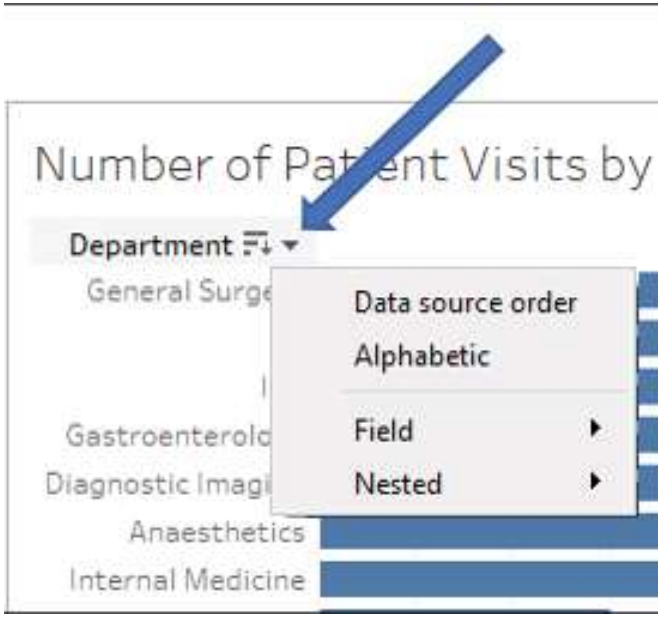
Bar charts

- Use the drop-down on the active dimension field and select Sort to view and edit the sorting options.
- You can also select Clear Sort to remove any sorting:



Bar charts

- Use the drop-down on the field label for rows and select the desired sorting option:

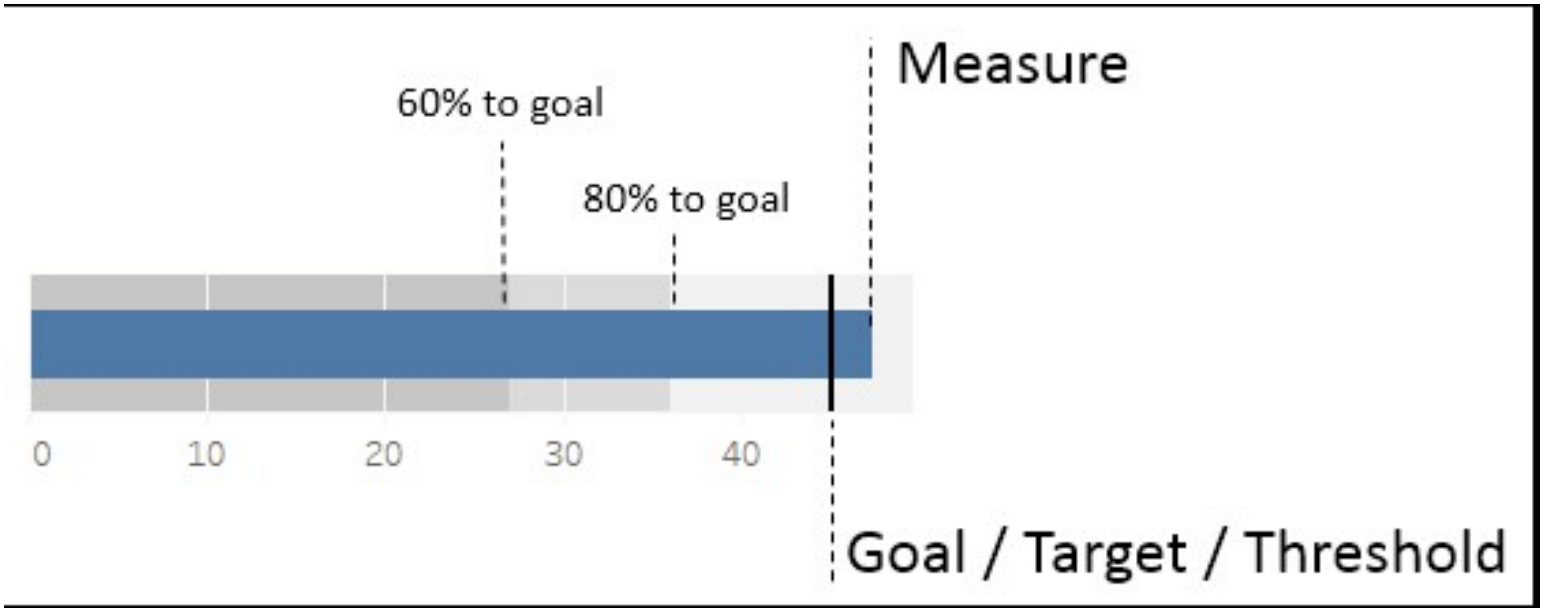


Bar chart variations

A basic bar chart can be extended in many ways to accomplish various objectives. Consider the following variations:

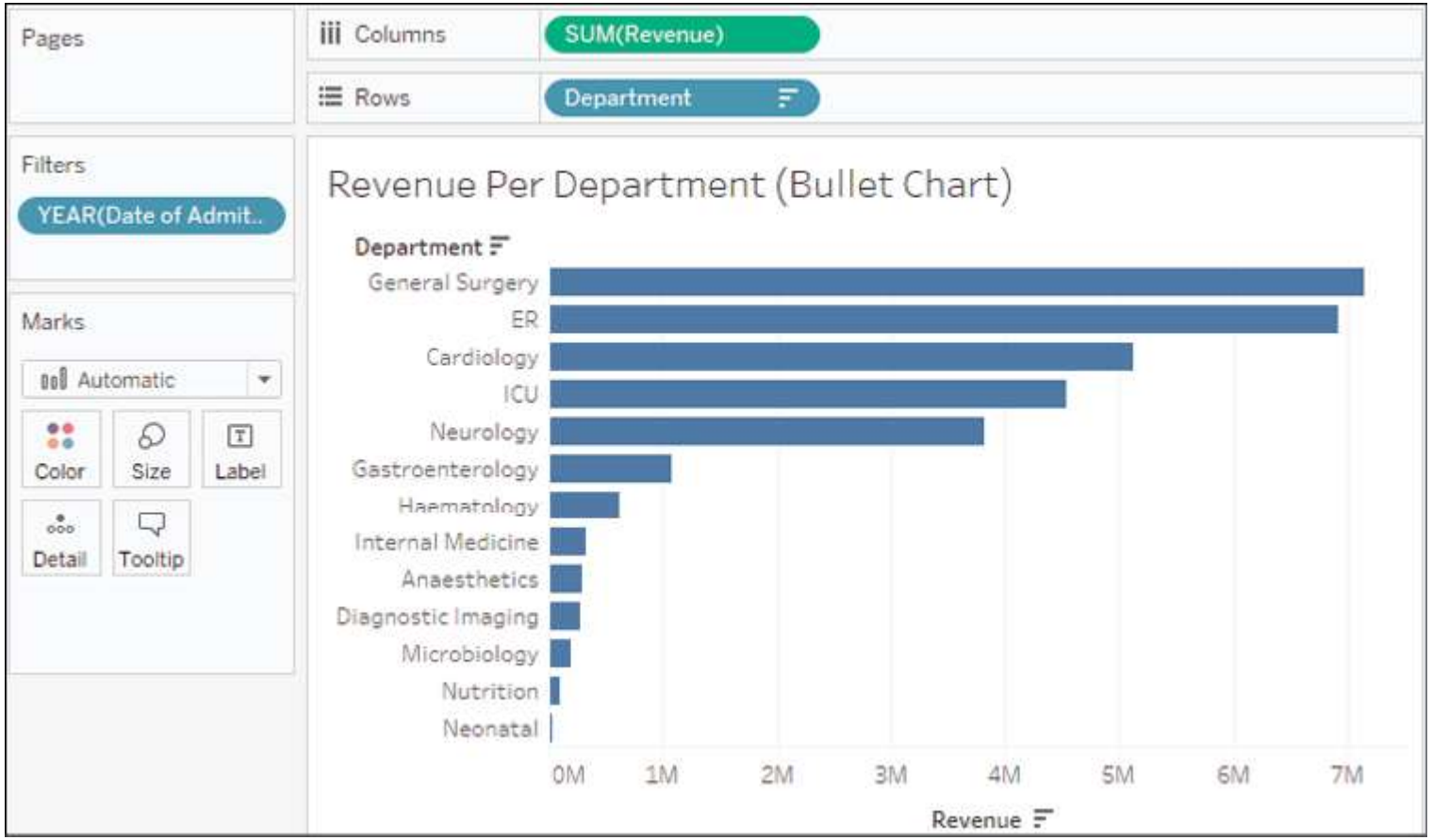
- Bullet chart to show progress towards a goal, target, or threshold
- Bar-in-bar chart to show progress toward a target or compare two specific values within a category
- Highlighting categories of interest

Bullet chart

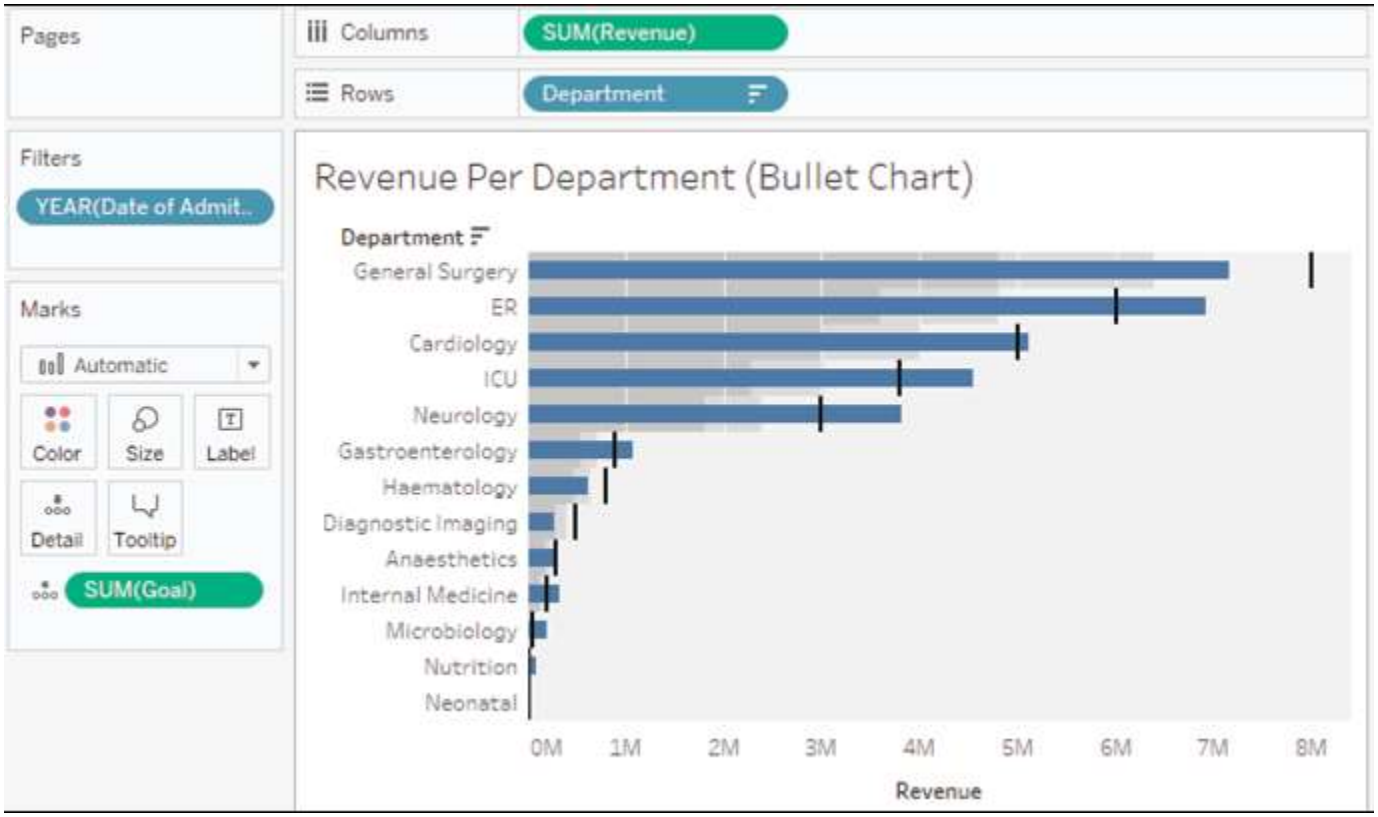


Bullet chart

Department	Goal
Anaesthetics	$300,000
Cardiology	$5,000,000
Diagnostic Imaging	$500,000
ER	$6,000,000
Gastroenterology	$900,000
General Surgery	$8,000,000
Haematology	$800,000
ICU	$3,800,000
Internal Medicine	$200,000
Microbiology	$50,000
Neonatal	$10,000
Neurology	$3,000,000
Nutrition	$10,000

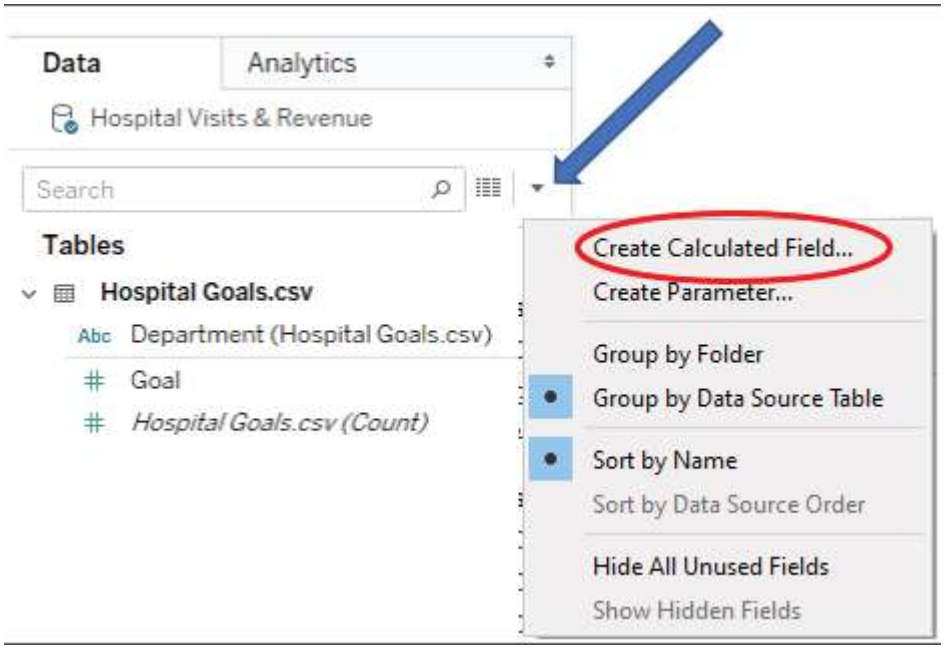

Pages
Columns
SUM(Revenue)
Rows
Department
Filters
YEAR(Date of Admit..
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Revenue Per Department (Bullet Chart)
Department
General Surgery
ER
Cardiology
ICU
Neurology
Gastroenterology
Haematology
Internal Medicine
Anaesthetics
Diagnostic Imaging
Microbiology
Nutrition
Neonatal
0M
1M
2M
3M
4M
5M
6M
7M
Revenue

- The completed bullet chart should look like the following:



Calling out thresholds

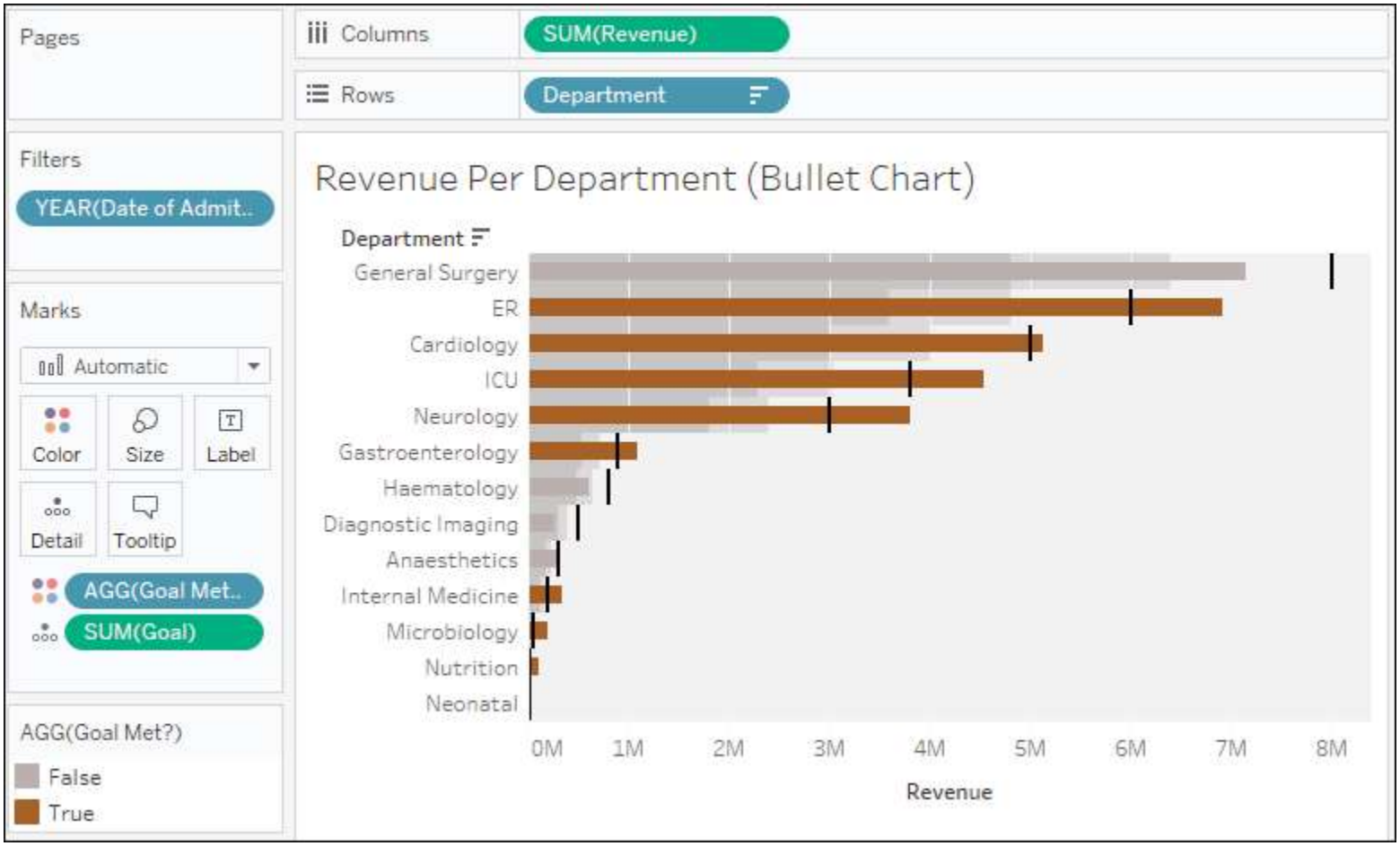
- Use the drop-down arrow in the Data pane and select Create Calculated Field…:

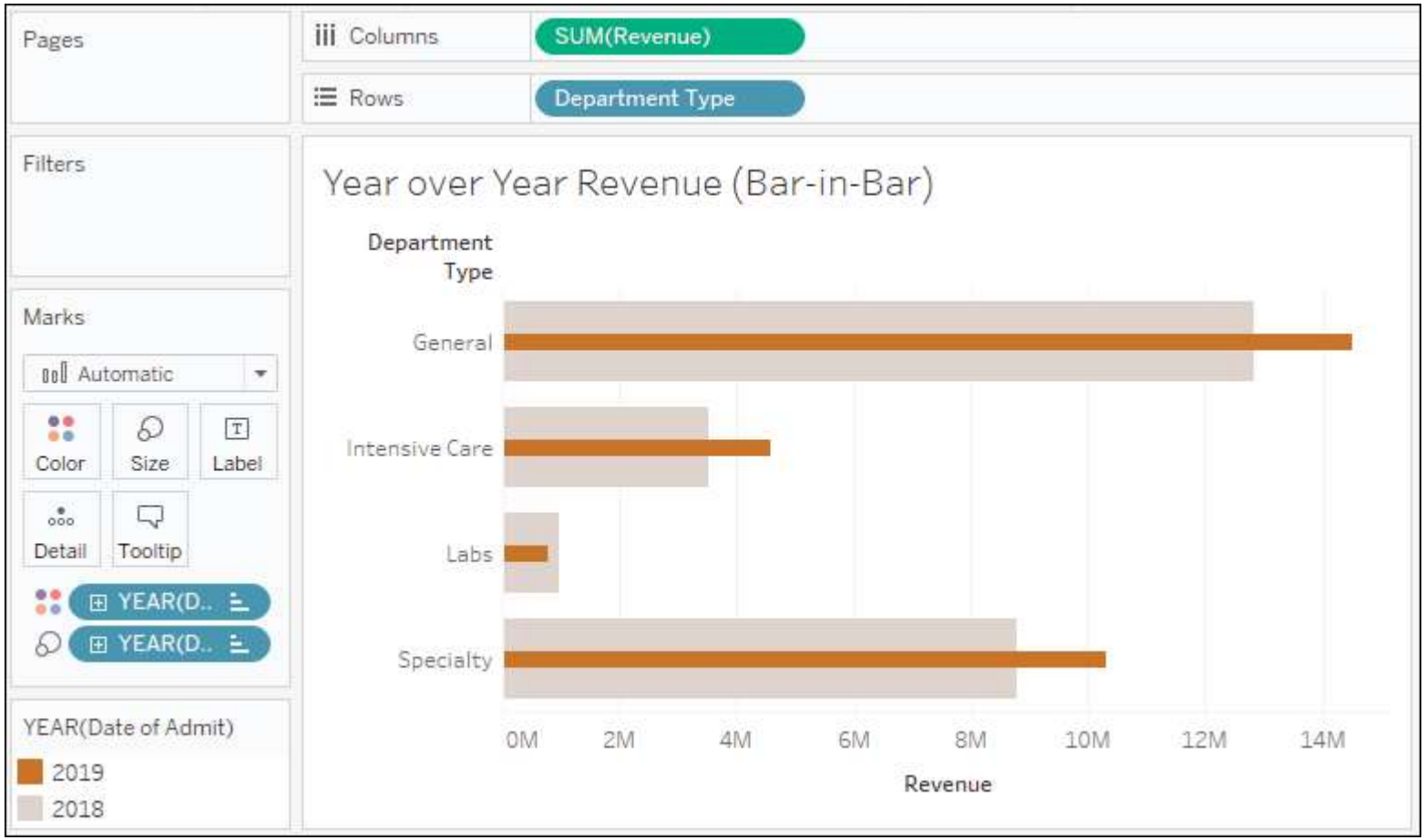


Calling out thresholds

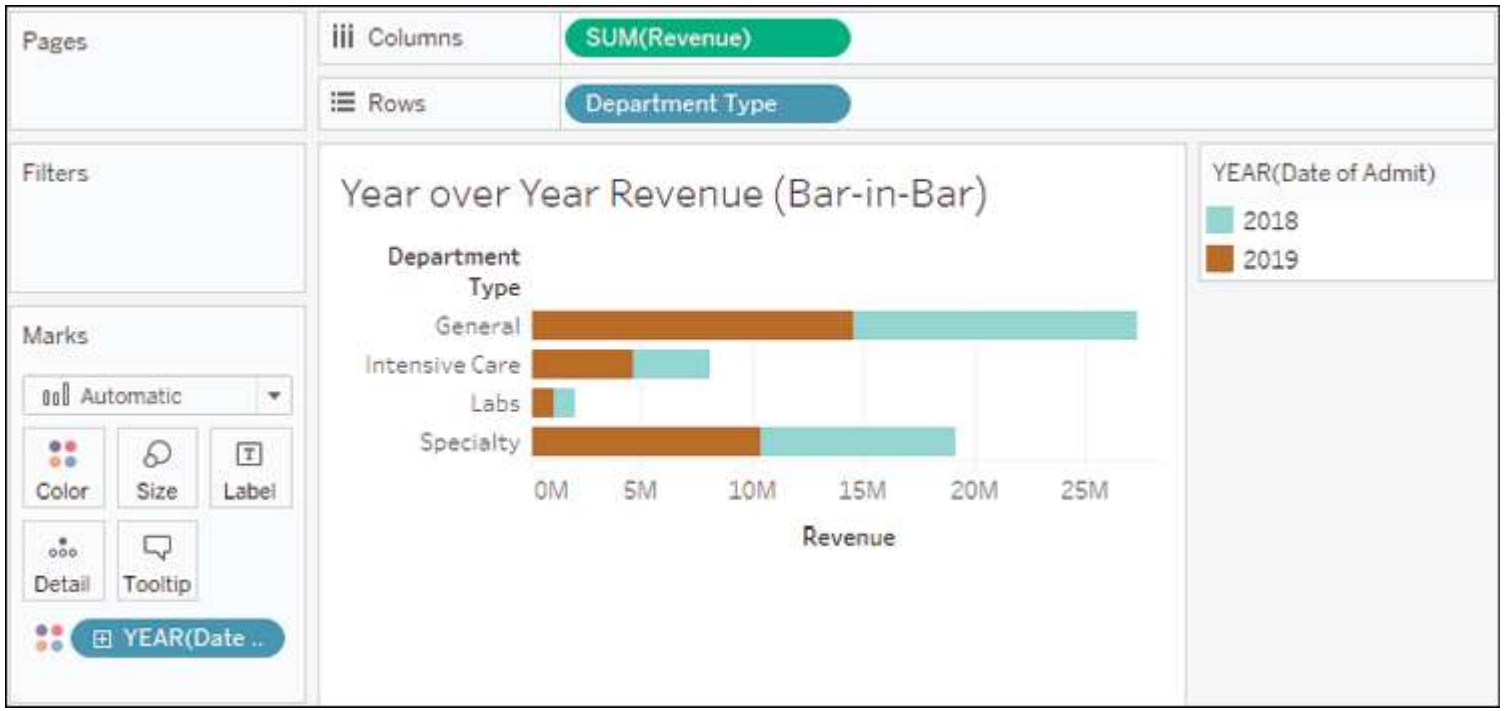
- Name the calculated field named Goal Met? with the following code:

```
SUM([Revenue]) >= SUM([Goal])
```


Pages
Columns
SUM(Revenue)
Rows
Department
Filters
YEAR(Date of Admit..
Marks
Automatic
Color
Size
Label
Detail
Tooltip
AGG(Goal Met..
SUM(Goal)
AGG(Goal Met?)
False
True
Revenue Per Department (Bullet Chart)
Department
General Surgery
ER
Cardiology
ICU
Neurology
Gastroenterology
Haematology
Diagnostic Imaging
Anaesthetics
Internal Medicine
Microbiology
Nutrition
Neonatal
0M
1M
2M
3M
4M
5M
6M
7M
8M
Revenue


Pages
Columns
SUM(Revenue)
Rows
Department Type
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
YEAR(D..
YEAR(D..
YEAR(Date of Admit)
2019
2018
Year over Year Revenue (Bar-in-Bar)
Department Type
General
Intensive Care
Labs
Specialty
0M
2M
4M
6M
8M
10M
12M
14M
Revenue

Bar-in-bar chart



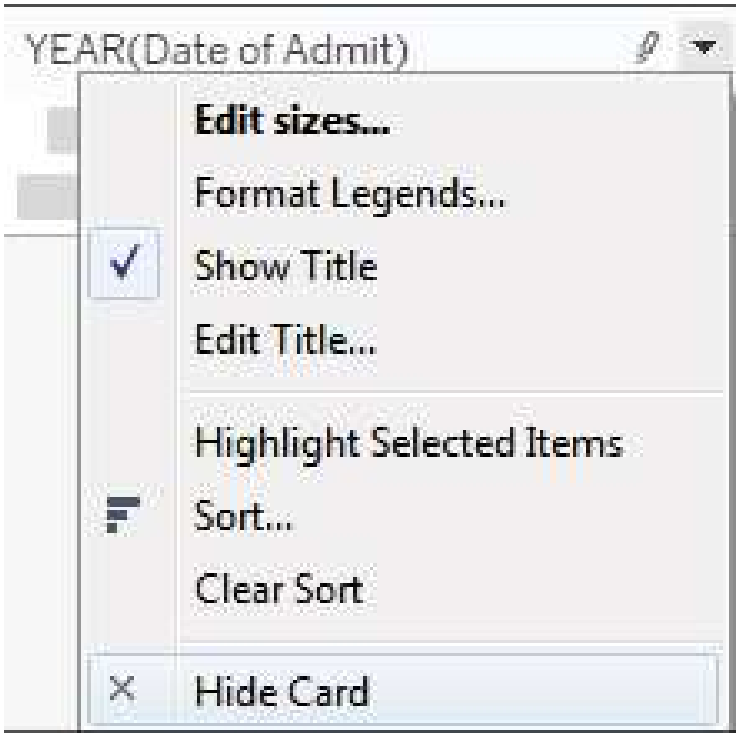
Bar-in-bar chart

- We want 2019 to be in front and 2018 to be in the background, so drag and drop 2019 within the Size legend to reorder the values so that 2018 comes after 2019:

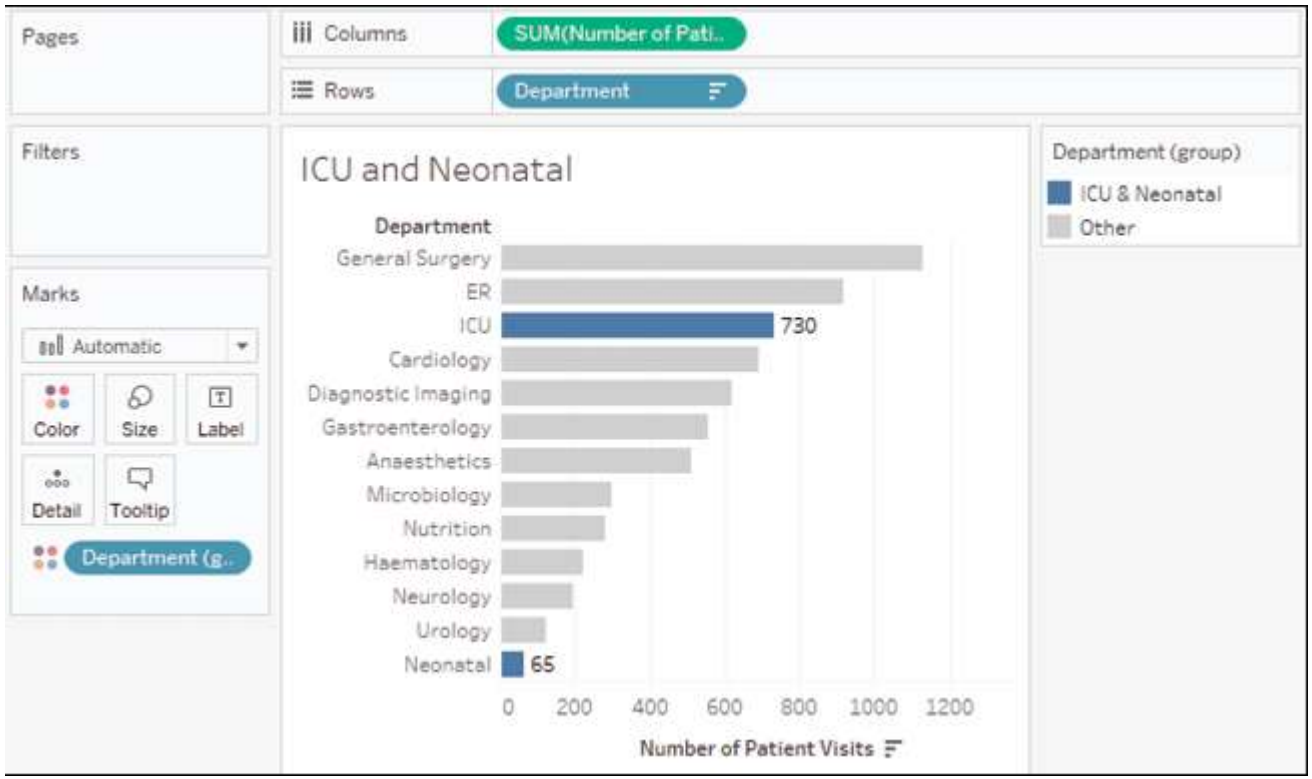
Bar-in-bar chart

- Adjusting the sizing of the view. Accomplish this by hovering over the canvas, just over the bottom border, until the mouse cursor changes to a sizing cursor, and then click and drag to resize the view.
- You may also want to adjust how the view fills the space.
- Use the drop-down on the toolbar and experiment with the options:

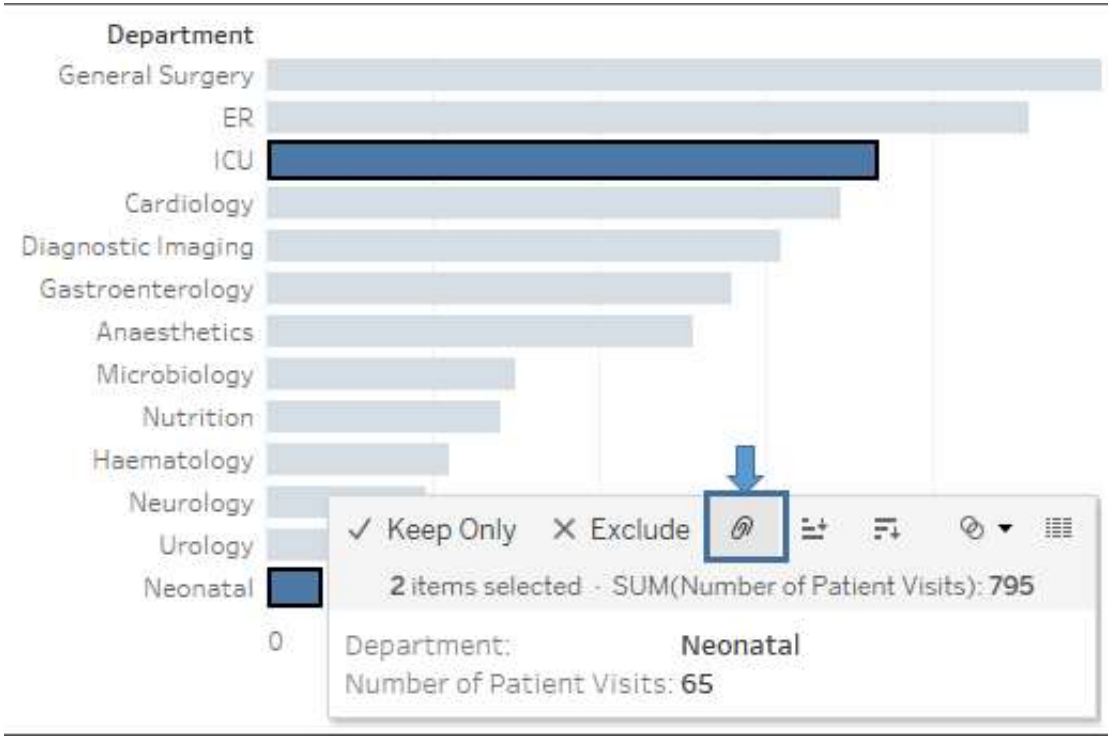
Bar-in-bar chart



Highlighting categories of interest



Highlighting categories of interest



Visualizing dates and times

In your analysis, you will often want to understand when something happened. You'll ask questions like the following:

- When did we gain the most new customers?
- Is profit trending up or down?
- What times of day have the highest call volume?
- What kinds of seasonal trends do we see in sales?

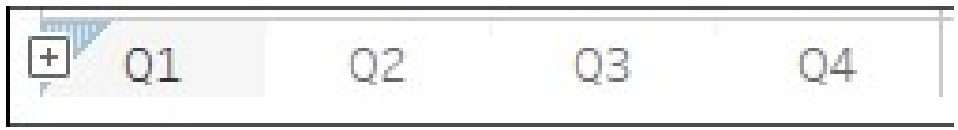
Date parts, date values, and exact dates

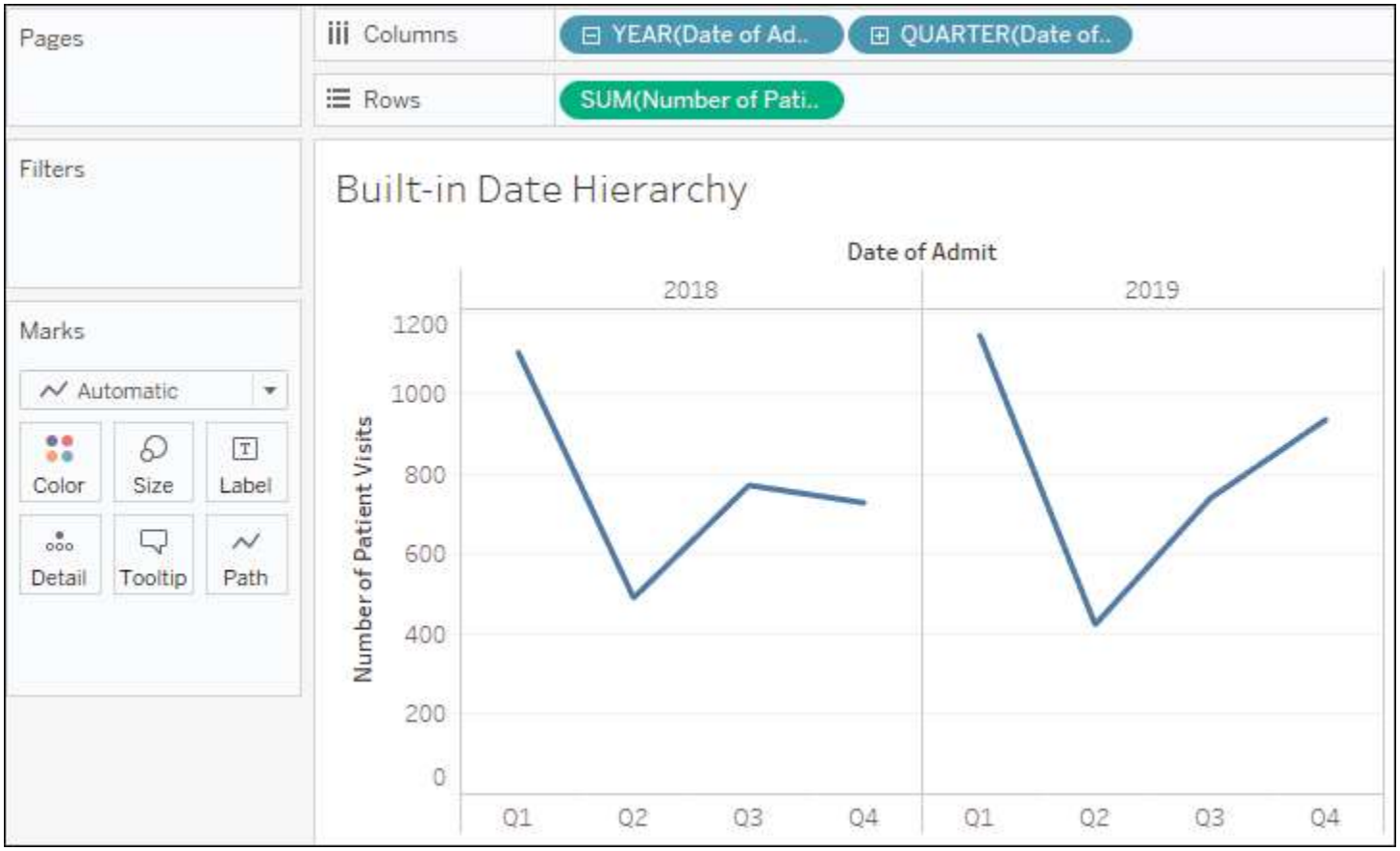
- To see this in action, continue with the lesson 3 workcourse, navigate to the Built-in Date Hierarchy sheet, and create a view similar to the one that was shown by dragging and dropping Number of Patient Visits to Rows and Date of Admit to Columns.

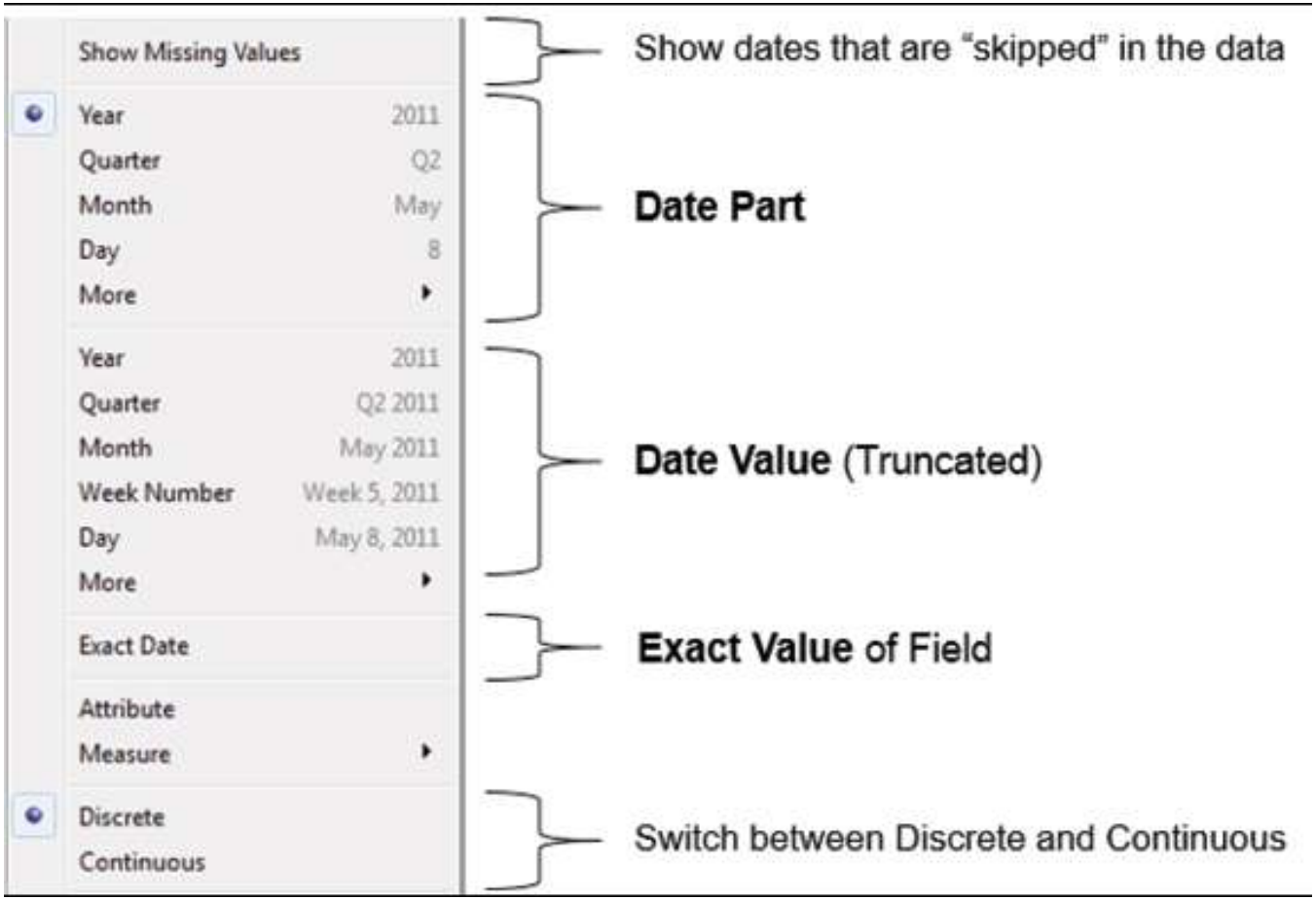
- The YEAR(Date of Admit) field on Columns will have a plus sign indicator, like this:

Date parts, date values, and exact dates

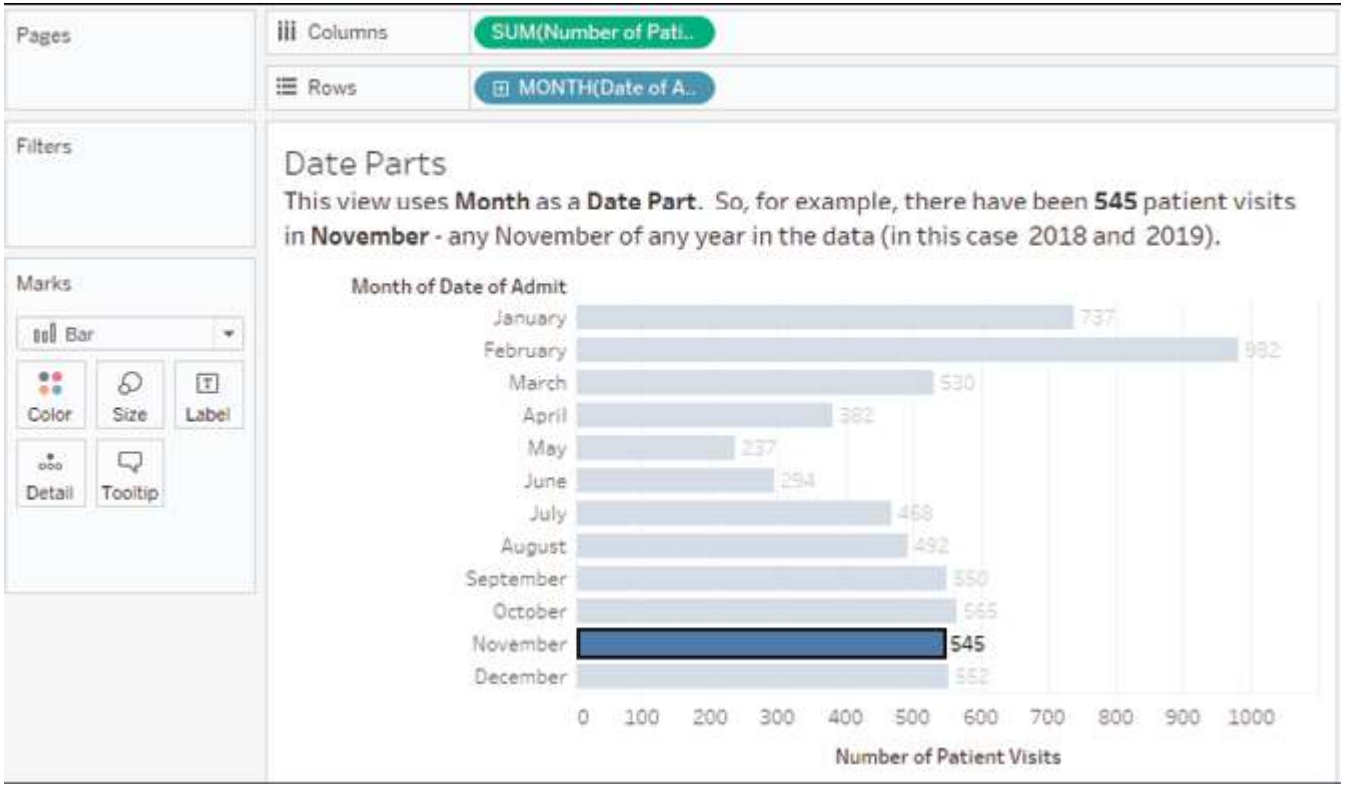
- You'll also find a plus or minus indicator as you hover over headers, like this:

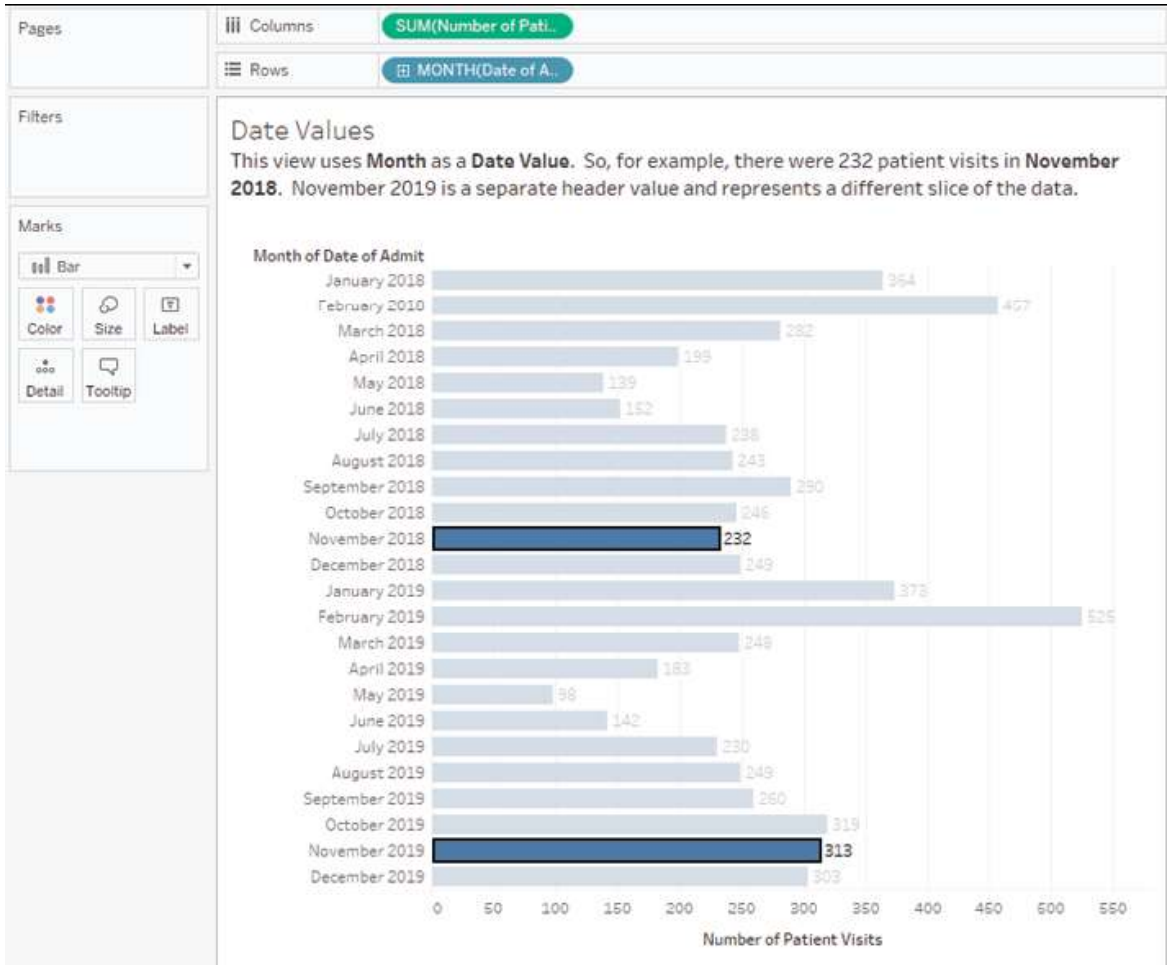



Pages
Columns
YEAR(Date of Ad..
QUARTER(Date of..
Rows
SUM(Number of Pati..
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Path
Built-in Date Hierarchy
Date of Admit
2018
2019
Number of Patient Visits
1200
1000
800
600
400
200
0
Q1
Q2
Q3
Q4
Q1
Q2
Q3
Q4

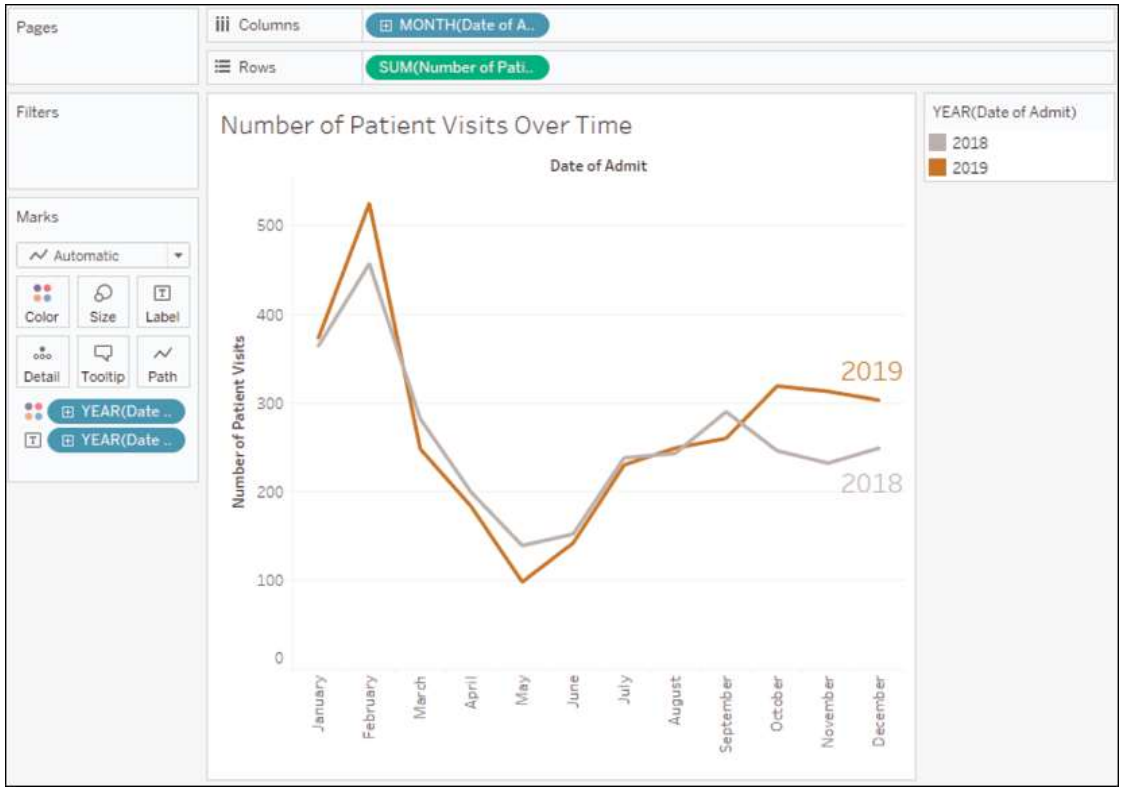

Show Missing Values
Year 2011
Quarter Q2
Month May
Day 8
More
Year 2011
Quarter Q2 2011
Month May 2011
Week Number Week 5, 2011
Day May 8, 2011
More
Exact Date
Attribute
Measure
Discrete
Continuous
Show dates that are "skipped" in the data
Date Part
Date Value (Truncated)
Exact Value of Field
Switch between Discrete and Continuous

Date parts, date values, and exact dates

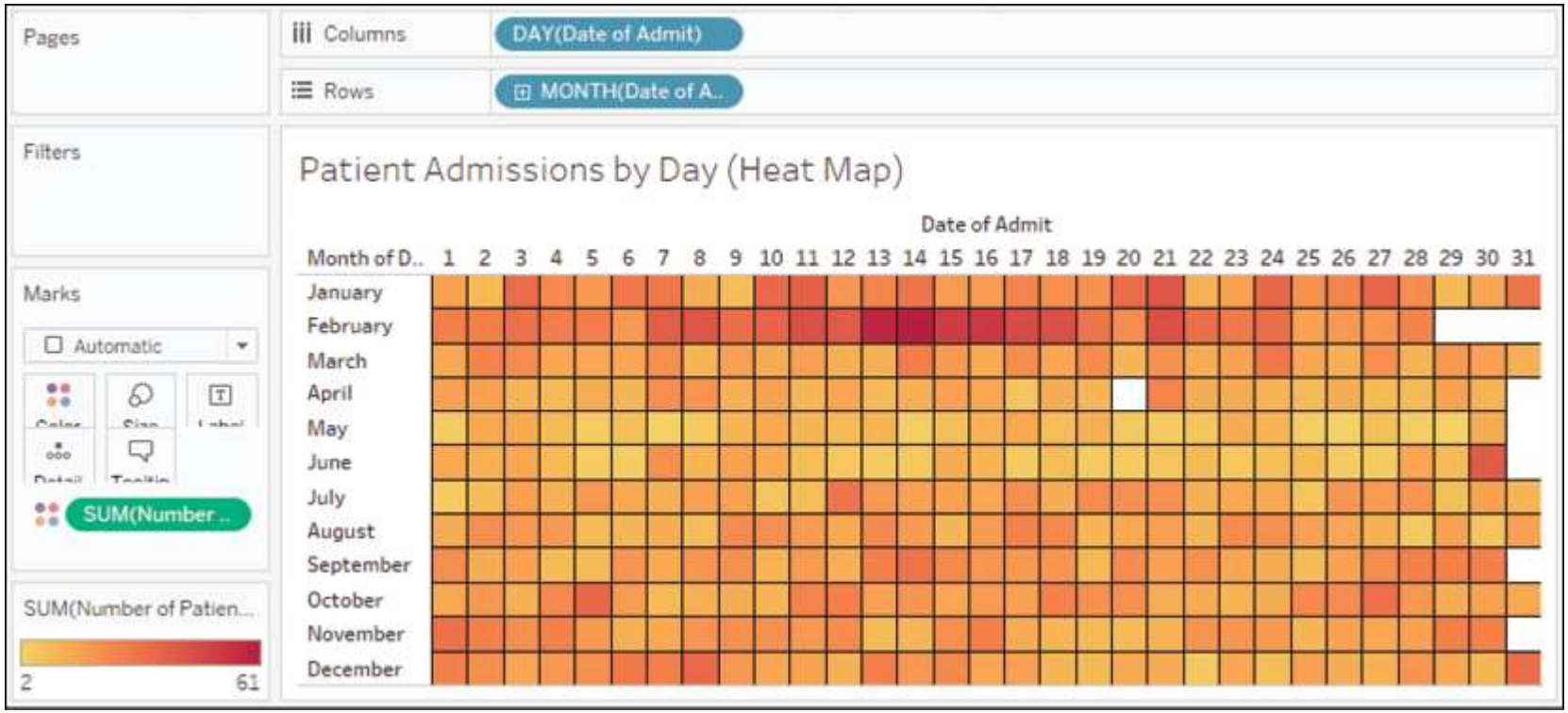



Pages
Columns
SUM(Number of Pati..
Rows
MONTH(Date of A..
Filters
Marks
Bar
Color
Size
Label
Detail
Tooltip
Date Values
This view uses Month as a Date Value. So, for example, there were 232 patient visits in November 2018. November 2019 is a separate header value and represents a different slice of the data.
Month of Date of Admit
January 2018
February 2018
March 2018
April 2018
May 2018
June 2018
July 2018
August 2018
September 2018
October 2018
November 2018
December 2018
January 2019
February 2019
March 2019
April 2019
May 2019
June 2019
July 2019
August 2019
September 2019
October 2019
November 2019
December 2019
232
313
0
50
100
150
200
250
300
350
400
450
500
550
Number of Patient Visits

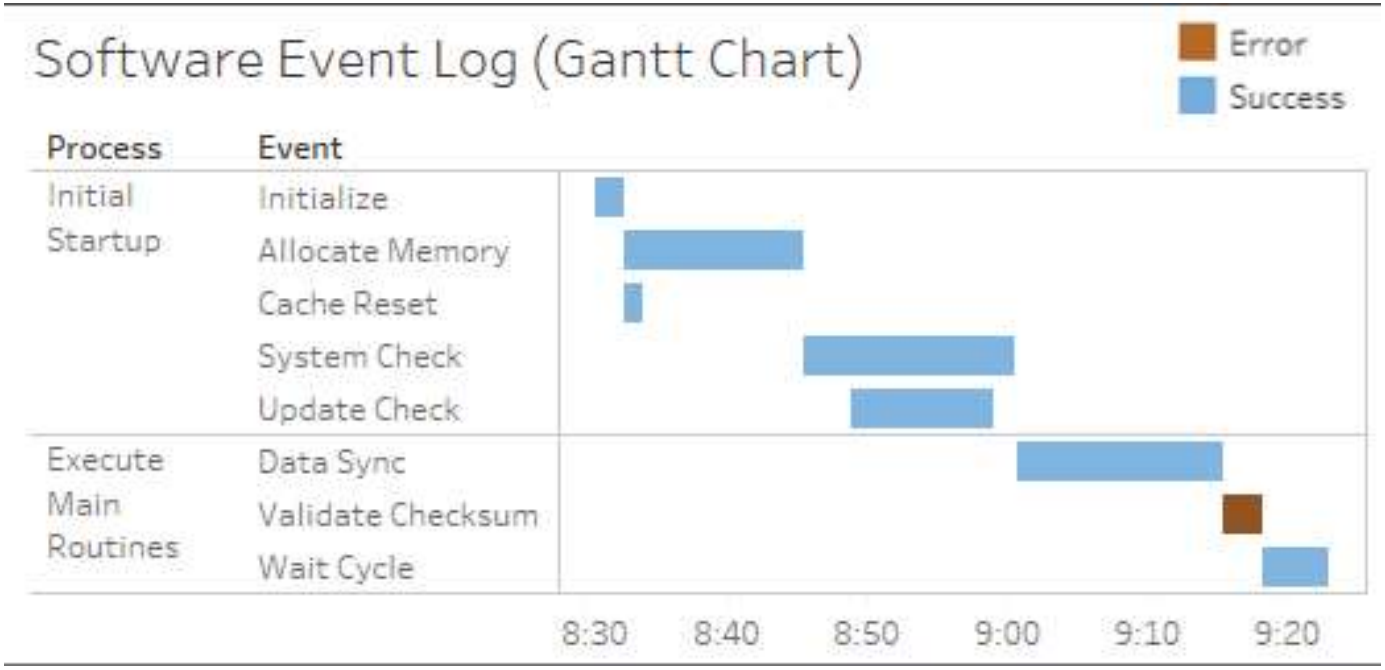
Variations of date and time visualizations



Date parts, date values, and exact dates



Gantt charts



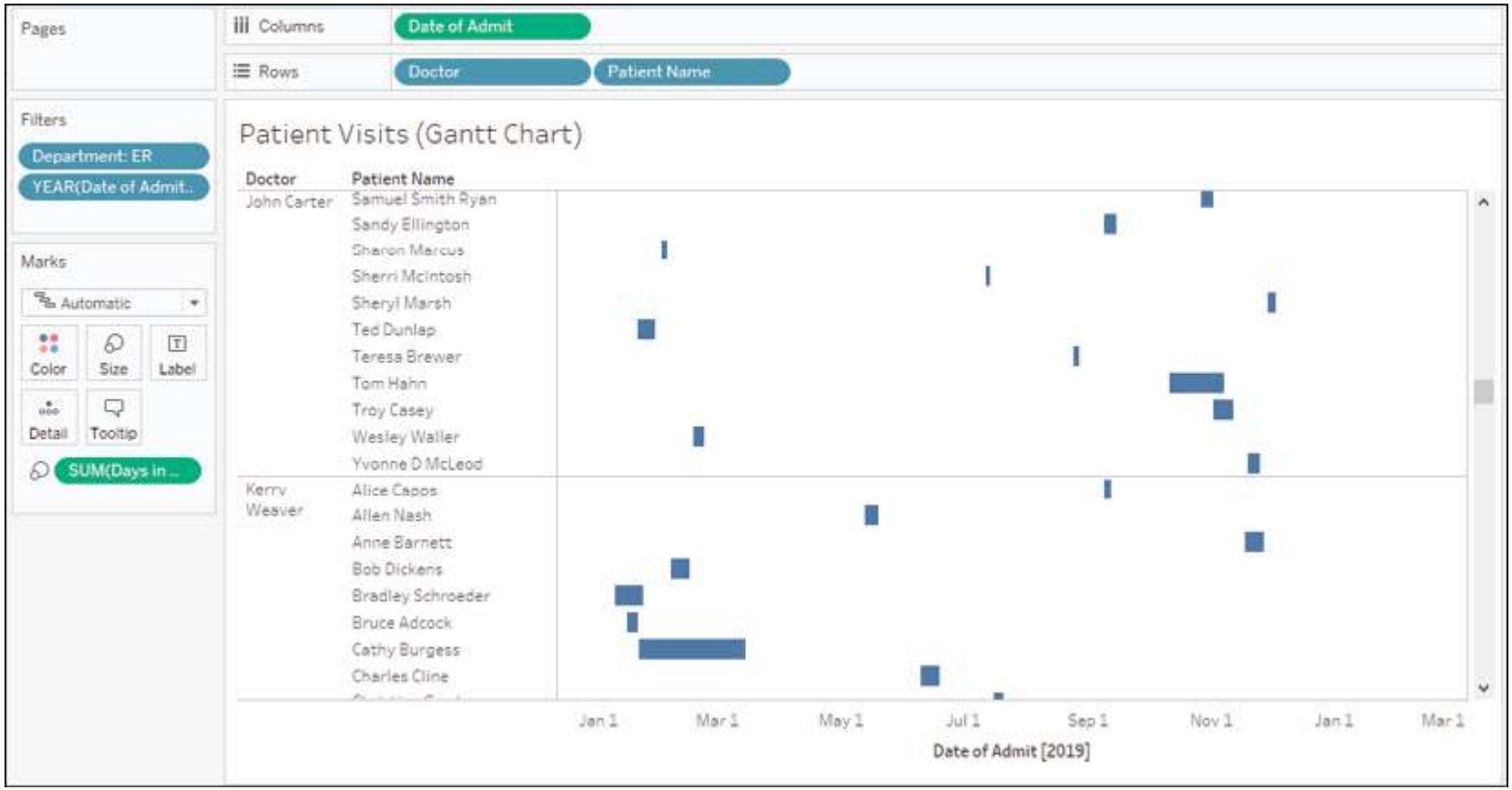
Gantt charts

- Place Department on Filters and keep only ER.
- Place Date of Admit on Filters, select Years as the option for filtering, and keep only 2019.
- Place Date of Admit on Columns as a continuous Exact Date or as a Day value (not Day part) & Notice that Tableau's automatic default for the mark type is Gantt bars:

Gantt charts

- The length of the Gantt bar is set by placing a field with a value of duration on the Size shelf. There is no such field in this dataset.
- However, we have the Date of Discharge, and we can create a calculated field for the duration. We'll cover calculations in more detail in the next lesson.
- For now, select Analysis from the menu and click Create Calculated Field.... Name the field Days in the Hospital and enter the following code:

```
DATEDIFF('day', [Date of Admit], [Date of Discharge])
```

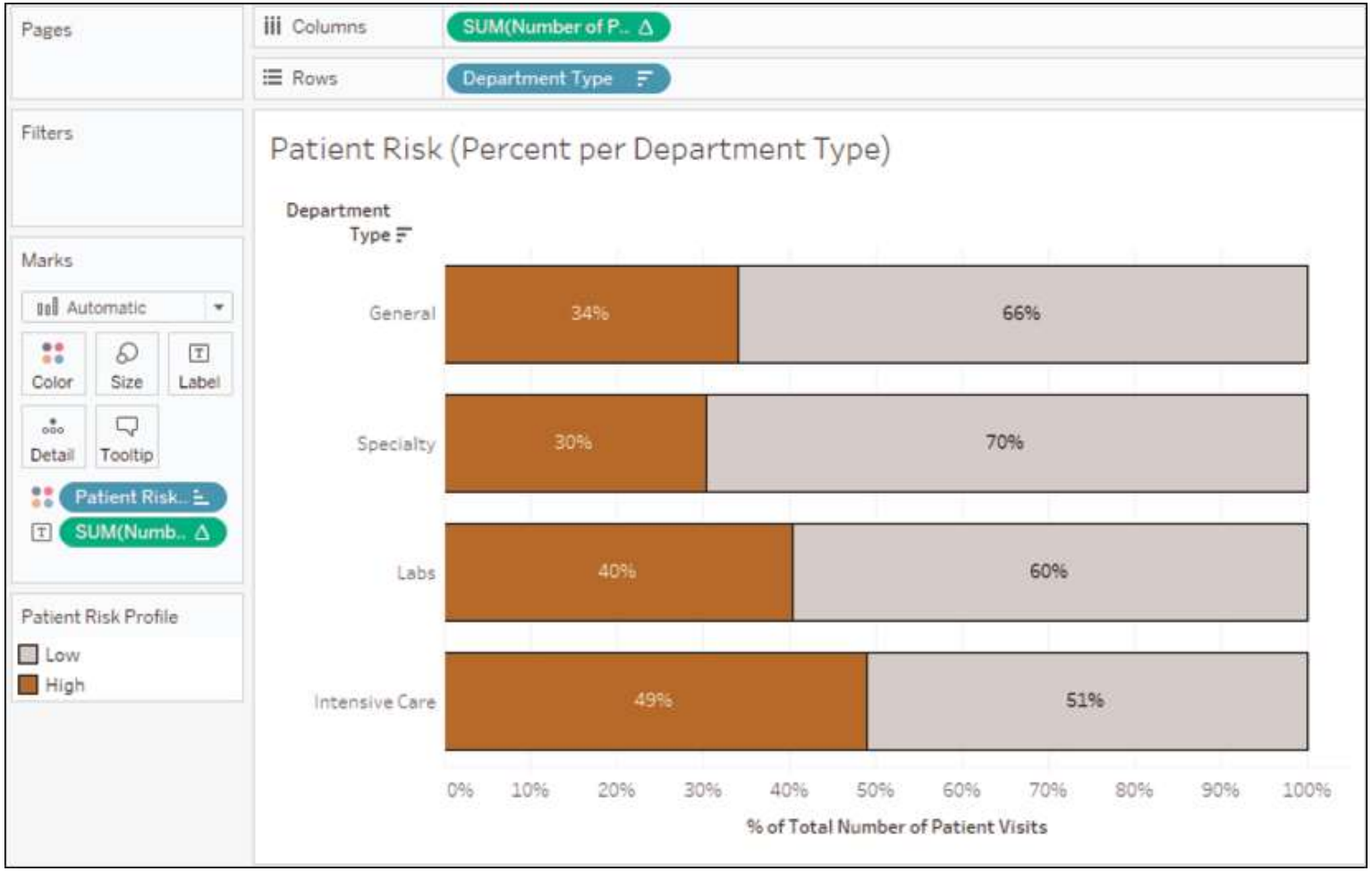

Pages
Columns
Date of Admit
Rows
Doctor
Patient Name
Filters
Department: ER
YEAR(Date of Admit..
Marks
Automatic
Color
Size
Label
Detail
Tooltip
SUM(Days in ...
Patient Visits (Gantt Chart)
Doctor
Patient Name
John Carter
Samuel Smith Ryan
Sandy Ellington
Sharon Marcus
Sherri McIntosh
Sheryl Marsh
Ted Dunlap
Teresa Brewer
Tom Hahn
Troy Casey
Wesley Waller
Yvonne D McLeod
Kerry Weaver
Alice Capps
Allen Nash
Anne Barnett
Bob Dickens
Bradley Schroeder
Bruce Adcock
Cathy Burgess
Charles Cline
Jan 1
Mar 1
May 1
Jul 1
Sep 1
Nov 1
Jan 1
Mar 1
Date of Admit [2019]

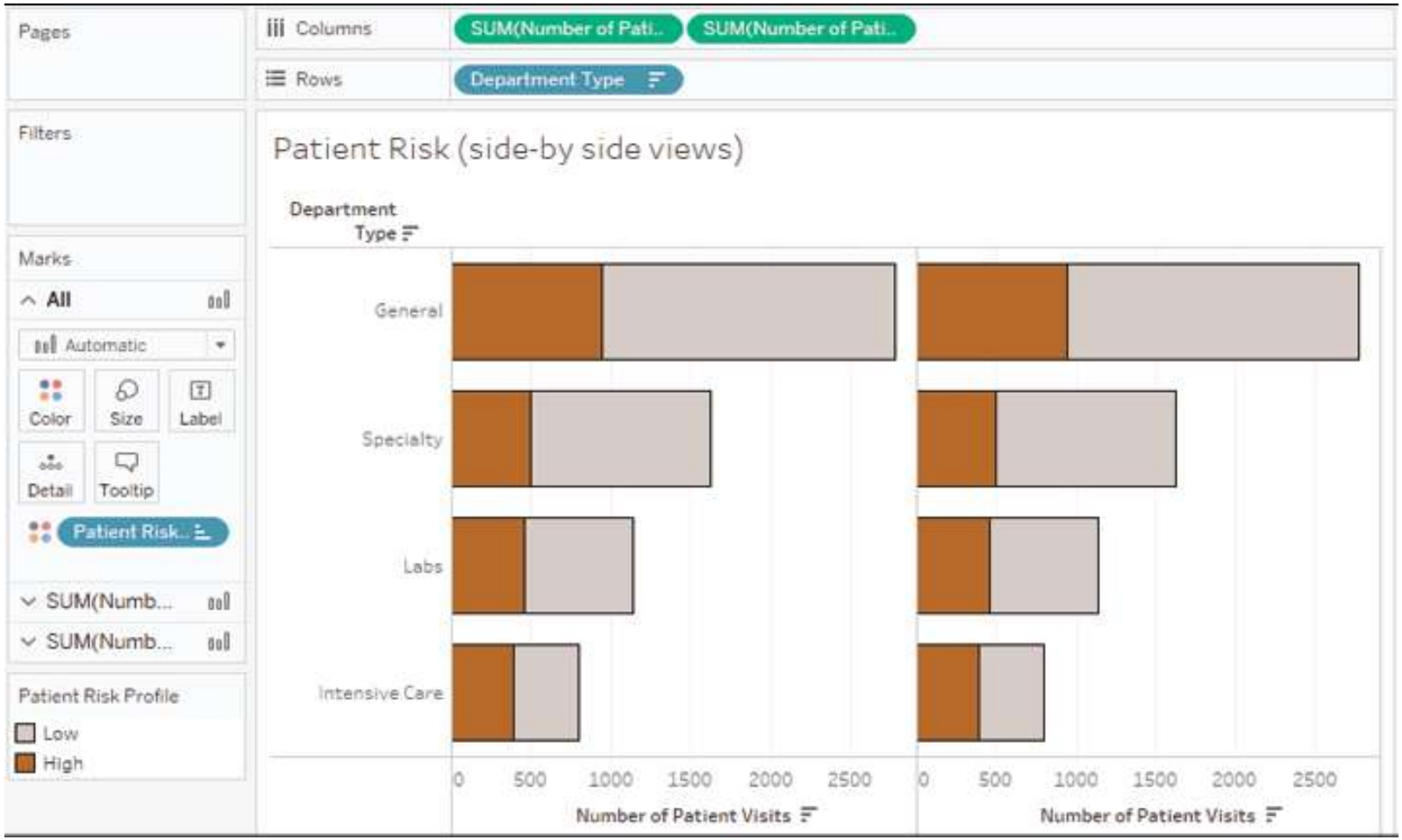
Relating parts of the data to the whole

As you explore and analyze data, you'll often want to understand how various parts add up to a whole. For example, you'll ask questions such as the following:

- How much does each electric generation method (wind, solar, coal, and nuclear) contribute to the total amount of energy produced?
- What percentage of total profit is made in each state?
- How much space does each file, subdirectory, and directory occupy on my hard disk?

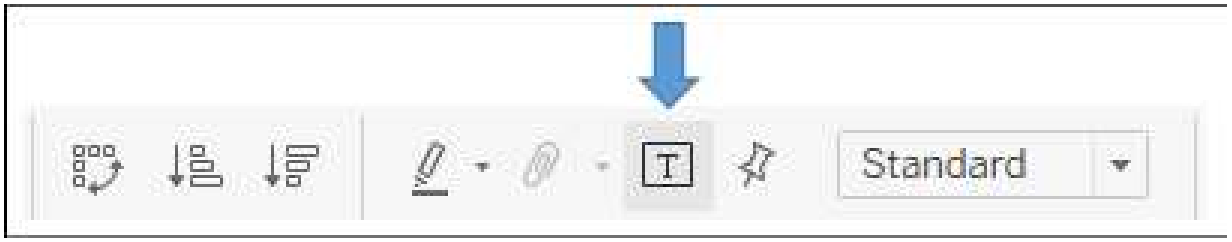
Stacked bars


Pages
Columns
SUM(Number of P.. Δ
Rows
Department Type
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Patient Risk..
SUM(Numb.. Δ
Patient Risk Profile
Low
High
Patient Risk (Percent per Department Type)
Department Type
General
34%
66%
Specialty
30%
70%
Labs
40%
60%
Intensive Care
49%
51%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Total Number of Patient Visits


Pages
Columns
SUM(Number of Pati..
SUM(Number of Pati..
Rows
Department Type
Filters
Patient Risk (side-by side views)
Department Type
Marks
All
Automatic
Color
Size
Label
Detail
Tooltip
Patient Risk..
SUM(Numb...
SUM(Numb...
Patient Risk Profile
Low
High
General
Specialty
Labs
Intensive Care
0
500
1000
1500
2000
2500
Number of Patient Visits
0
500
1000
1500
2000
2500
Number of Patient Visits

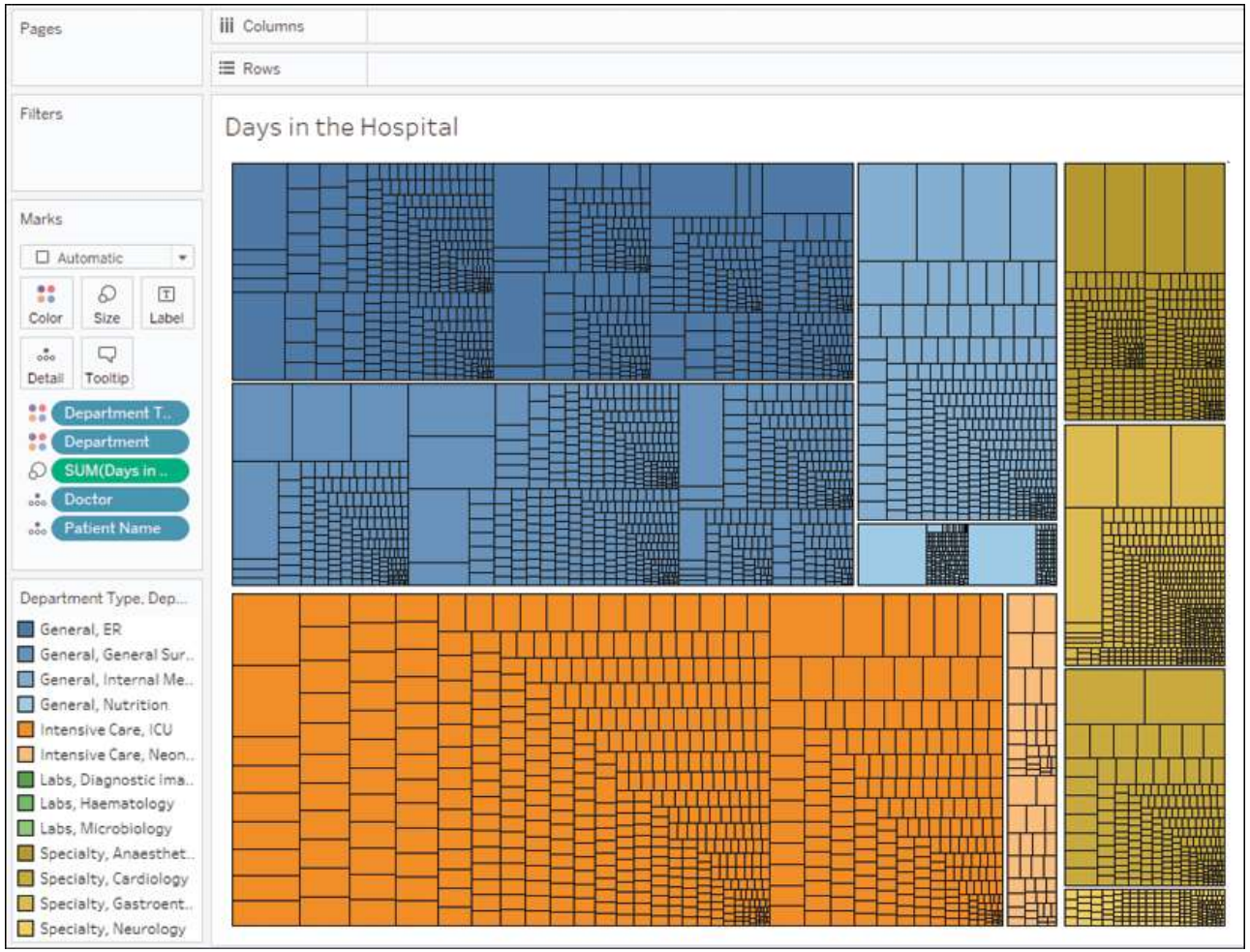
Stacked bars

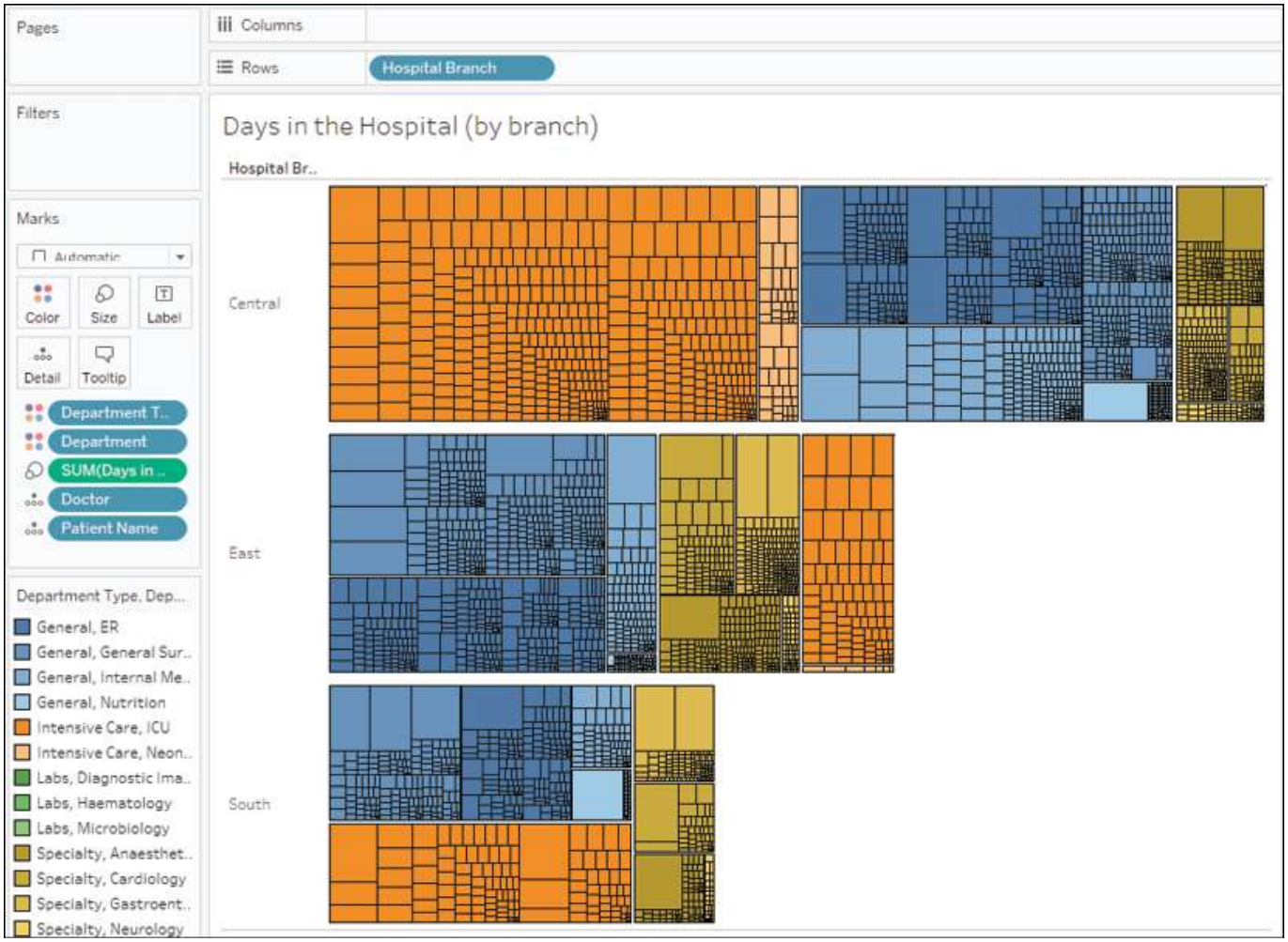
- Turn on labels by clicking the T button on the top toolbar.
- This turns on default labels for each mark:




Pages
Columns
SUM(Number of Pati..
SUM(Number of P..
Rows
Department Type
Filters
Patient Risk (side-by side views)
Department Type
Marks
All
SUM(Numb...
SUM(Num...
Automatic
Color
Size
Label
Detail
Tooltip
Patient Risk..
Patient Risk Profile
Low
High
General
Specialty
Labs
Intensive Care
945
1,829
494
1,132
460
679
389
406
34.07%
65.93%
30.38%
69.62%
40.39%
59.61%
48.93%
51.07%
0
500
1000
1500
2000
2500
Number of Patient Visits
0%
20%
40%
60%
80%
100%
% of Total Number of Patient Visits

Treemaps

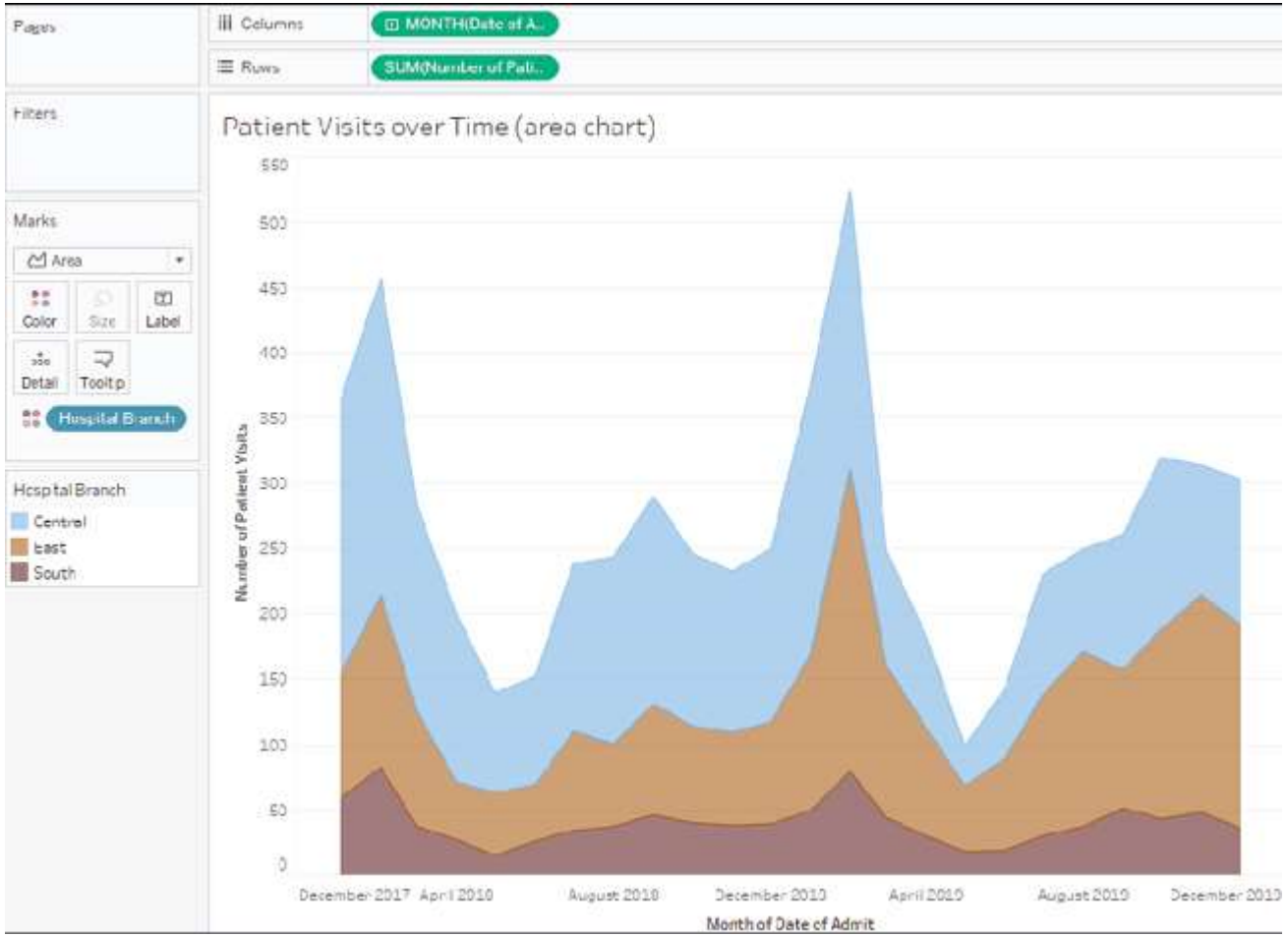

Pages
Columns
Rows
Filters
Days in the Hospital
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Department T..
Department
SUM(Days in ..
Doctor
Patient Name
Department Type, Dep...
General, ER
General, General Sur..
General, Internal Me..
General, Nutrition
Intensive Care, ICU
Intensive Care, Neon..
Labs, Diagnostic ima..
Labs, Haematology
Labs, Microbiology
Specialty, Anaesthet..
Specialty, Cardiology
Specialty, Gastroent..
Specialty, Neurology

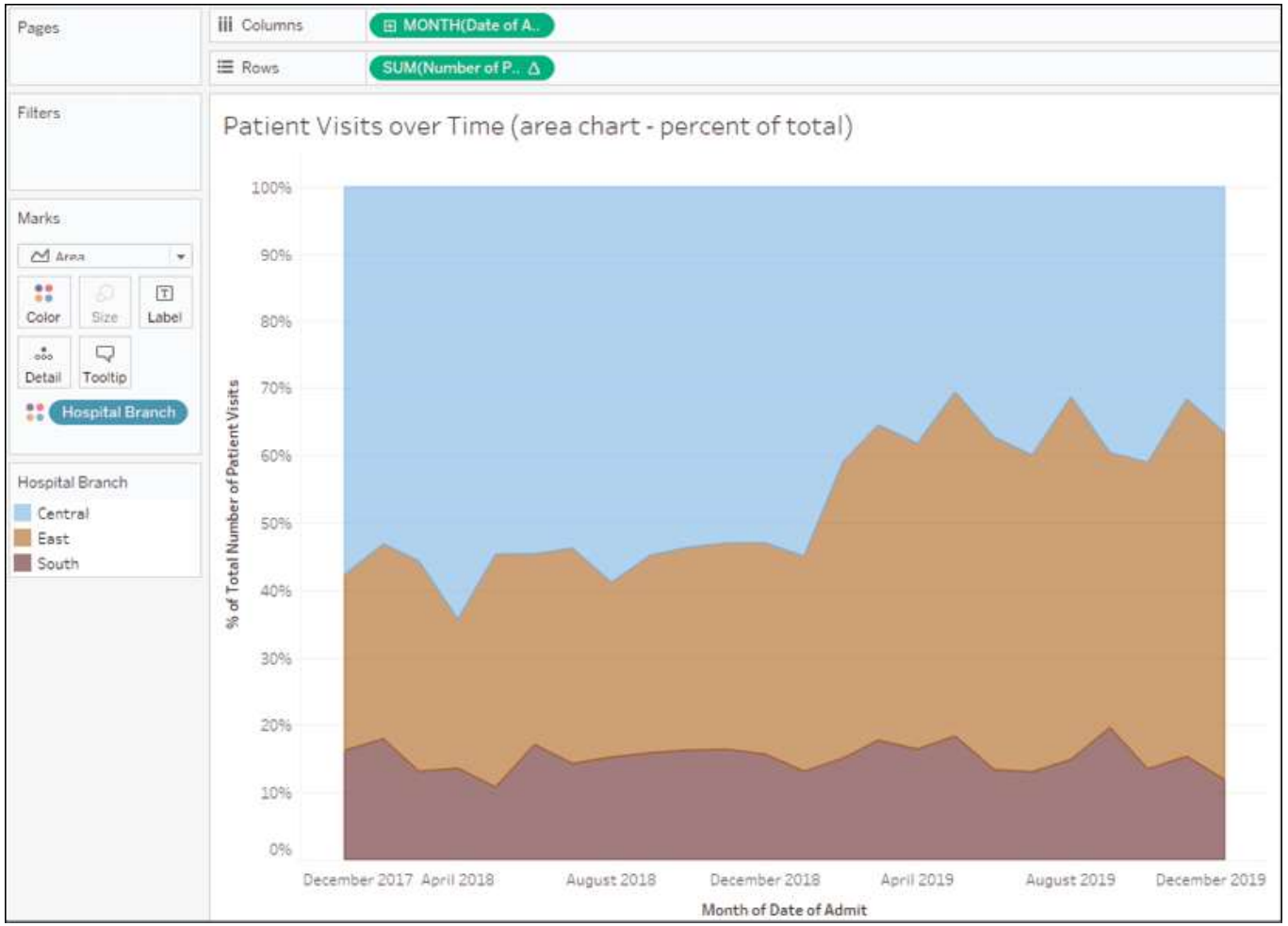

Pages
Columns
Rows
Hospital Branch
Filters
Days in the Hospital (by branch)
Hospital Br..
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Department T..
Department
SUM(Days in ..
Doctor
Patient Name
Central
East
South
Department Type, Dep...
General, ER
General, General Sur..
General, Internal Me..
General, Nutrition
Intensive Care, ICU
Intensive Care, Neon..
Labs, Diagnostic Ima..
Labs, Haematology
Labs, Microbiology
Specialty, Anaesthet..
Specialty, Cardiology
Specialty, Gastroent..
Specialty, Neurology

Treemaps

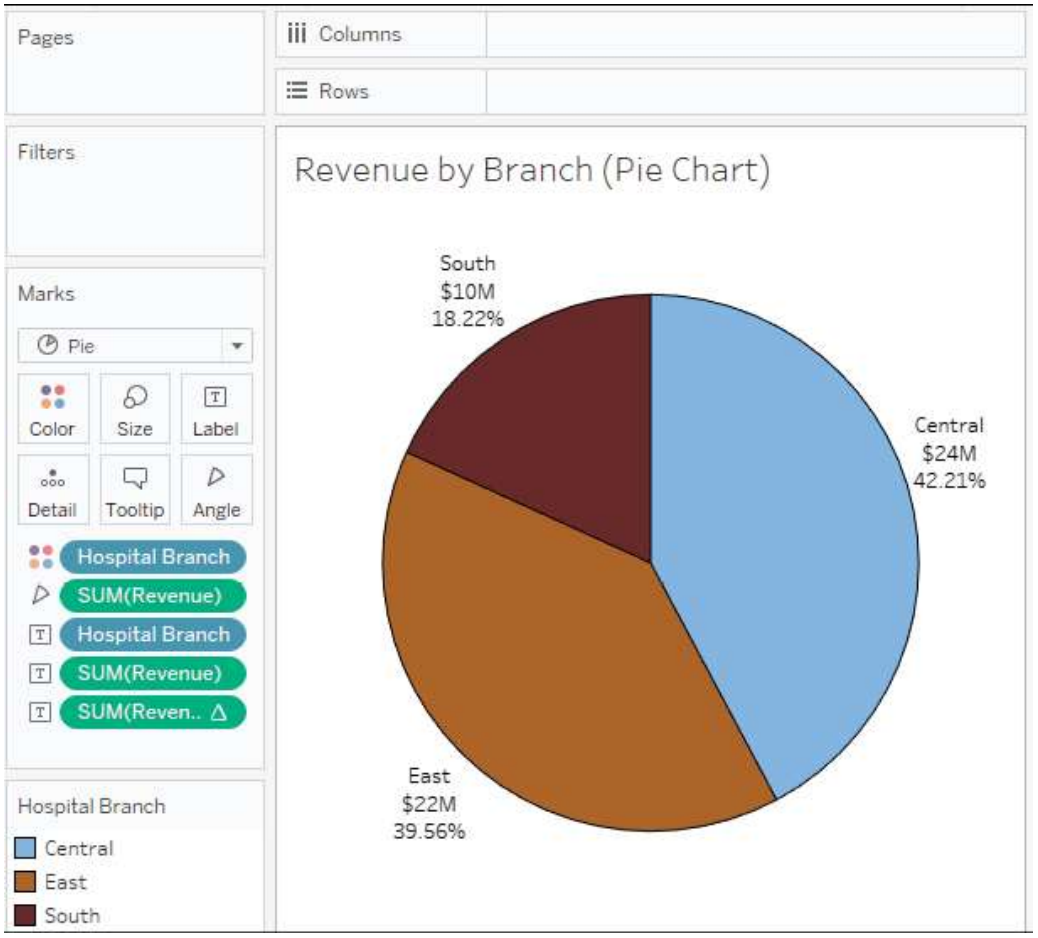
- Alternatively, the icon or space to the left of each field on the Marks card can be clicked to change which shelf is used for the field:

Area charts


Pages
Columns
MONTH(Date of A..
Rows
SUM(Number of Pati..
Filters
Marks
Area
Color
Size
Label
Detail
Tooltip
Hospital Branch
Hospital Branch
Central
East
South
Patient Visits over Time (area chart)
Number of Patient Visits
550
500
450
400
350
300
250
200
150
100
50
0
December 2017
April 2018
August 2018
December 2018
April 2019
August 2019
December 2019
Month of Date of Admit


Pages
Columns
MONTH(Date of A..
Rows
SUM(Number of P.. Δ
Filters
Marks
Area
Color
Size
Label
Detail
Tooltip
Hospital Branch
Hospital Branch
Central
East
South
Patient Visits over Time (area chart - percent of total)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% of Total Number of Patient Visits
December 2017
April 2018
August 2018
December 2018
April 2019
August 2019
December 2019
Month of Date of Admit

Pie charts

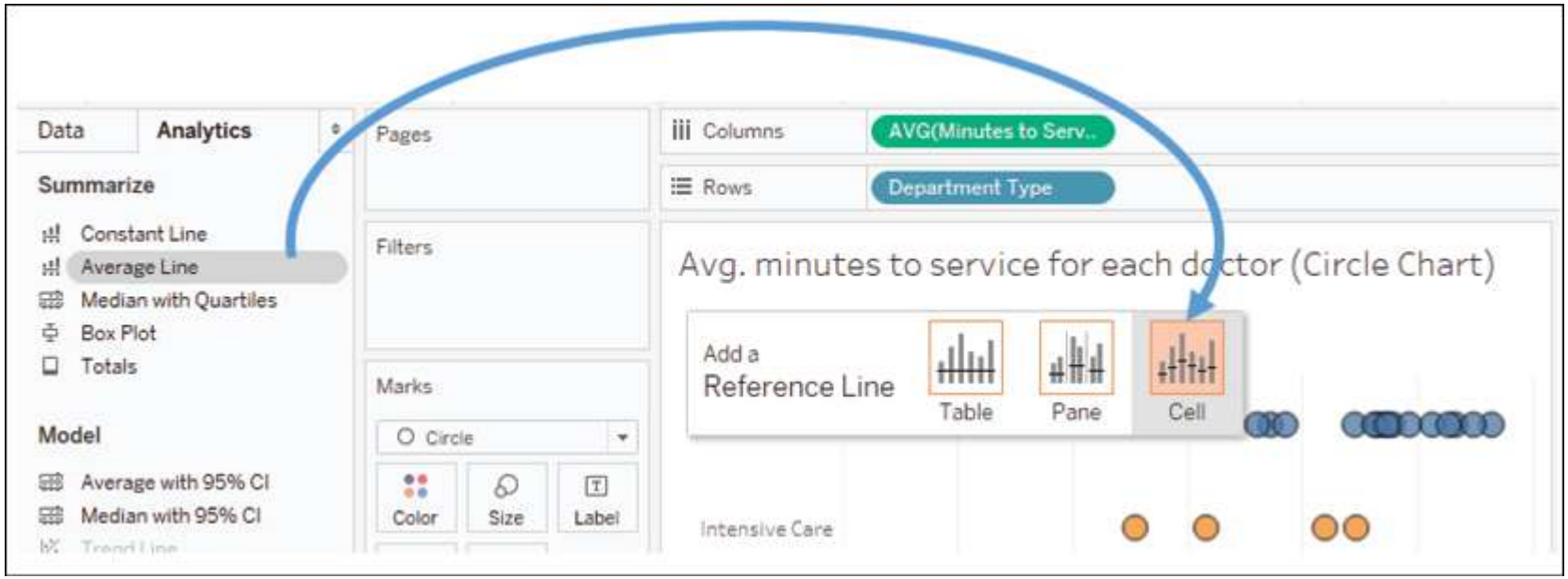

Pages
Columns
Rows
Filters
Marks
Pie
Color
Size
Label
Detail
Tooltip
Angle
Hospital Branch
SUM(Revenue)
Hospital Branch
SUM(Revenue)
SUM(Reven..
Hospital Branch
Central
East
South
Revenue by Branch (Pie Chart)
South
$10M
18.22%
Central
$24M
42.21%
East
$22M
39.56%

Visualizing distributions

- Often, simply understanding totals, sums, and even the breakdown of part-to-whole only gives a piece of the overall picture.
- Most of the time, you'll want to understand where individual items fall within a distribution of all similar items.

Circle charts

Circle charts



You may also click one of the resulting average lines and select Edit to find fine-tuning options, such as labeling.

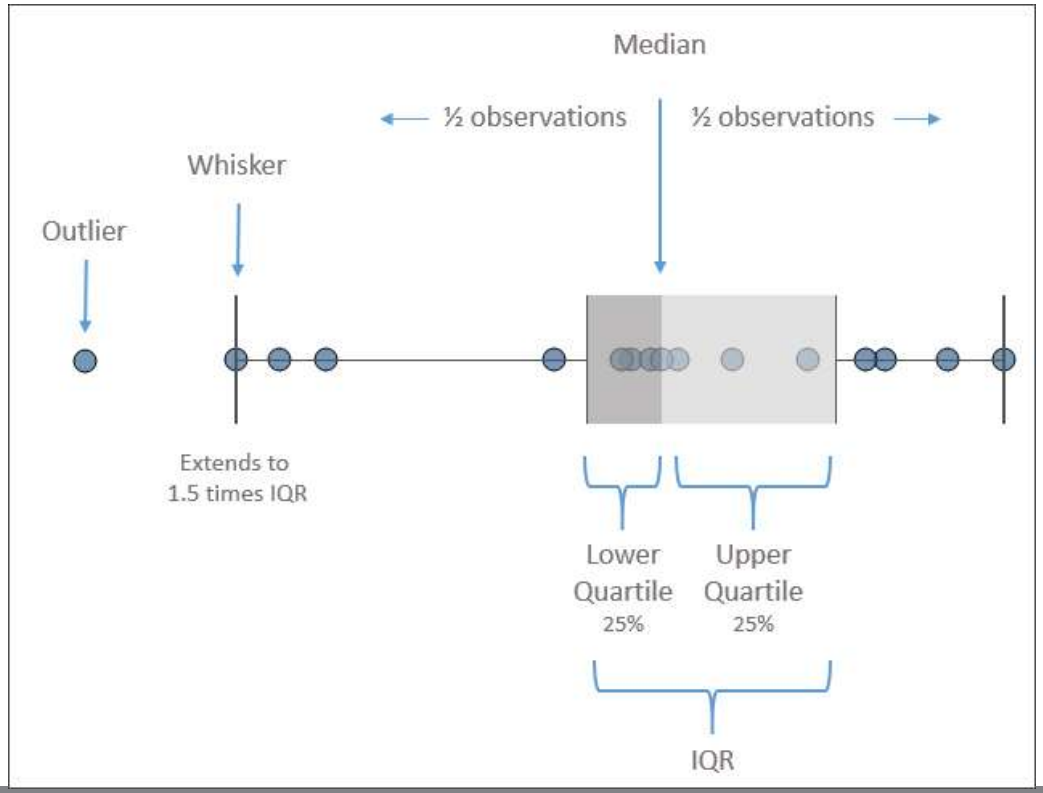
Jittering

- When using views like circle plots or other similar visualization types, you'll often see that marks overlap, which can lead to obscuring part of the true story.

- Do you know for certain, just by looking, how many doctors there are in Intensive Care who are above average? How many are below?

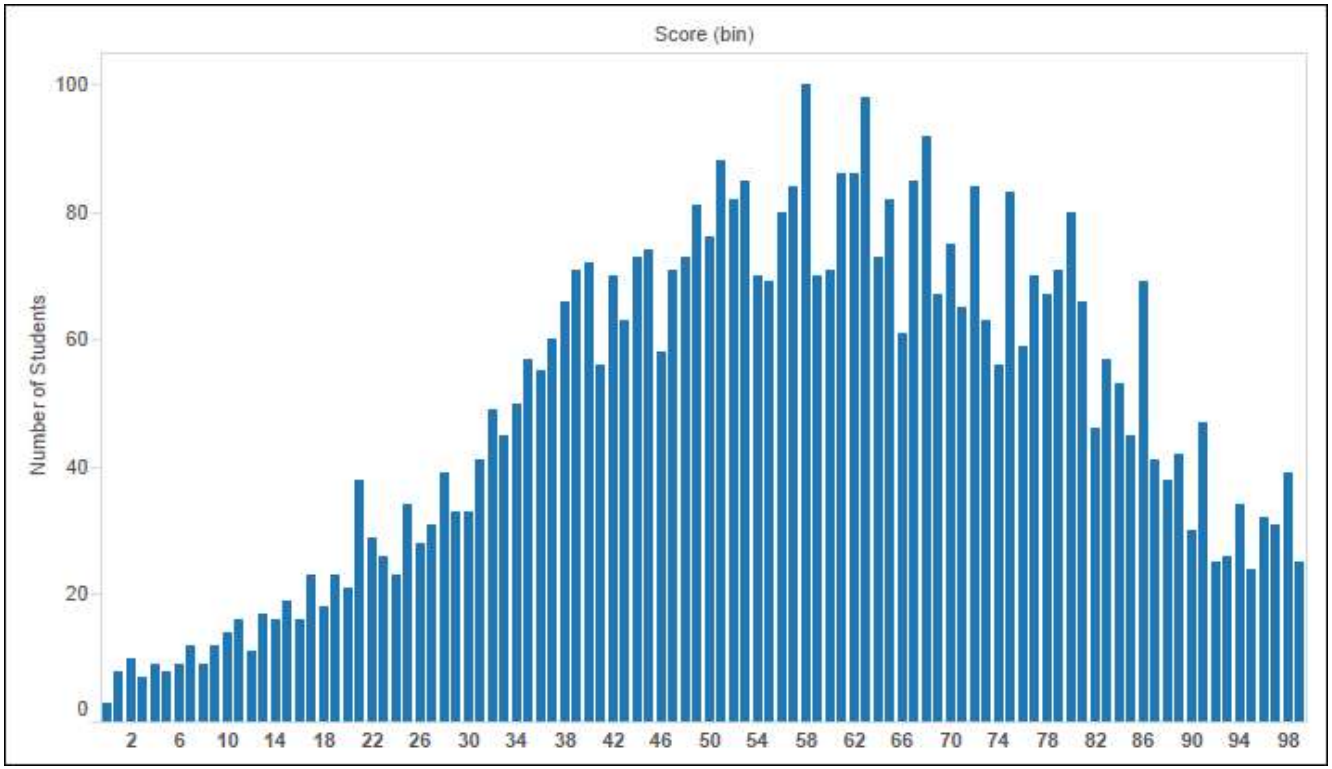

Pages
Columns
AVG(Days in Hospital)
Rows
Department Type
INDEX()
Filters
Department Type
Marks
Circle
Color
Size
Label
Detail
Tooltip
Department T..
Doctor
Department Type
General
Intensive Care
Specialty
Average Length of Stay by Doctor (jittering)
Department Type
General
Intensive Care
Specialty
Average
Average
Average
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Avg. Days in Hospital

Box and whisker plots



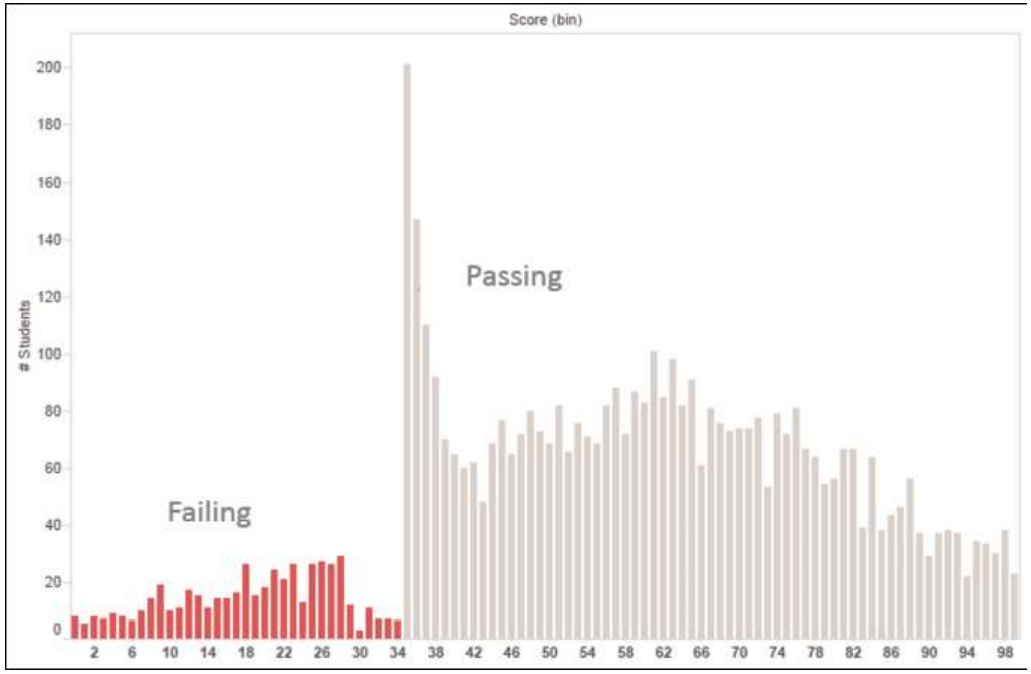

Pages
Columns
AVG(Days in Hospital)
Rows
Department Type
Filters
Department Type
Marks
Circle
Color
Size
Label
Detail
Tooltip
Department T..
Doctor
Department Type
General
Intensive Care
Specialty
Average Length of Stay by Doctor (Box Plot)
Department Type
General
Intensive Care
Specialty
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Avg. Days in Hospital

Histograms


Score (bin)
Number of Students
100
80
60
40
20
0
2
6
10
14
18
22
26
30
34
38
42
46
50
54
58
62
66
70
74
78
82
86
90
94
98

Histograms

What if auditors saw something like this?

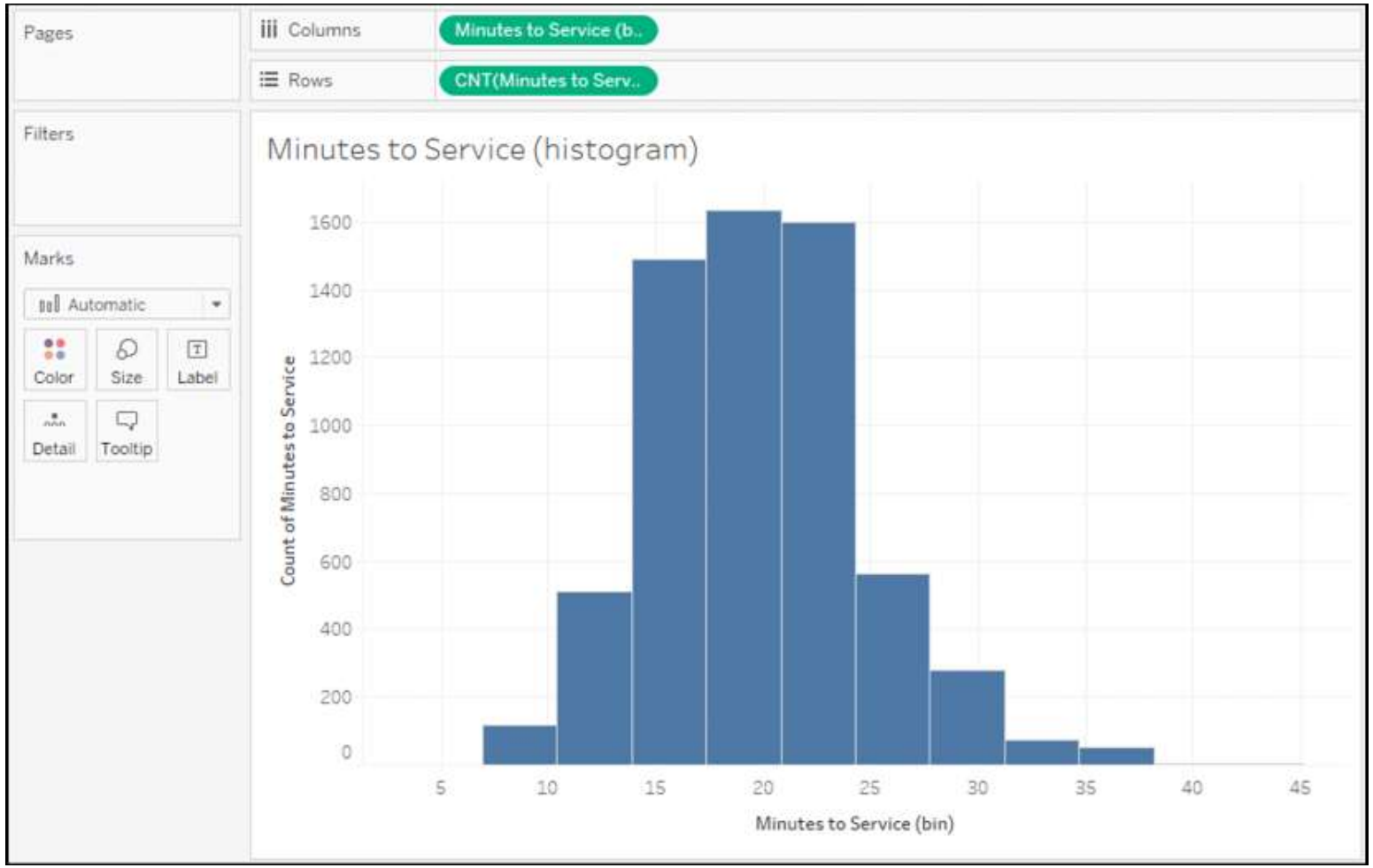


Histograms

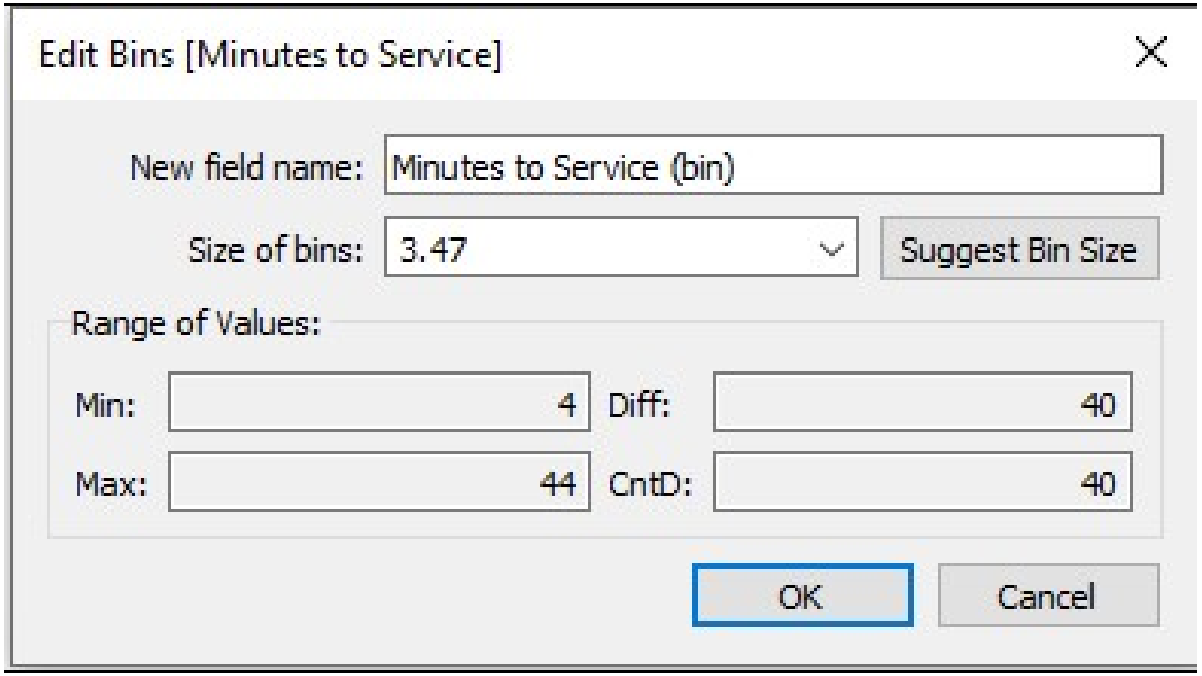
You might start with a blank view follow steps like these:

1. Click to select the Minutes to Service field under Measures in the data pane.

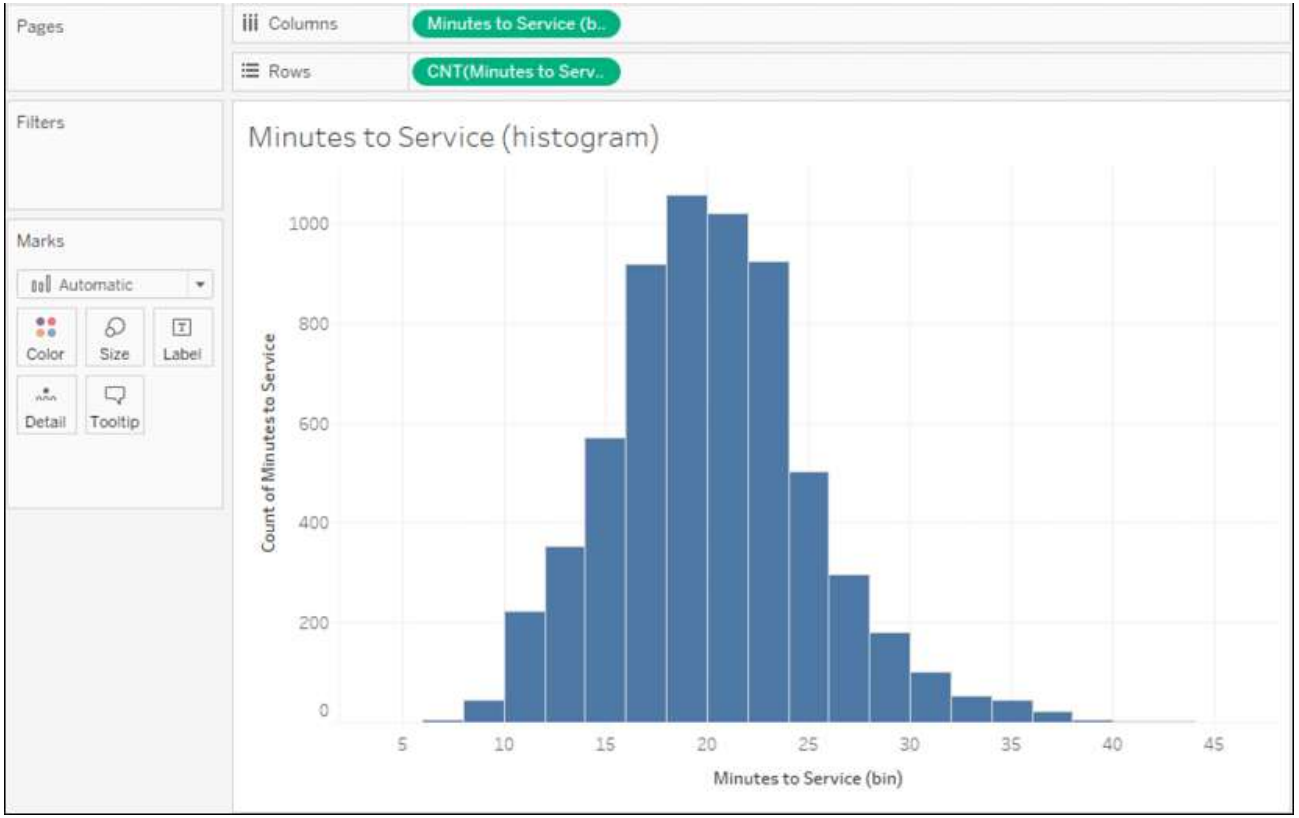
2. Expand Show Me if necessary and select the histogram.

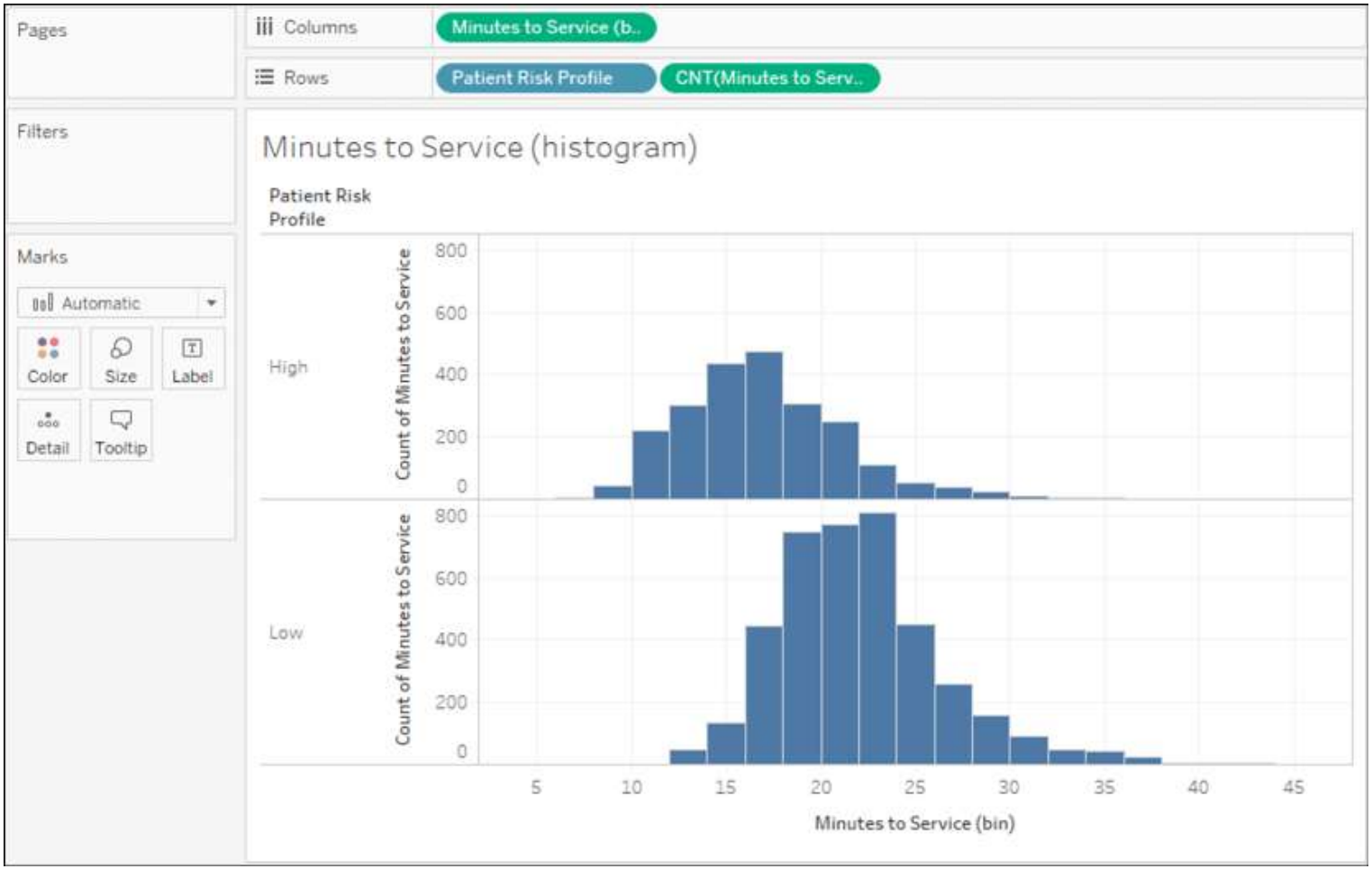

Pages
Columns
Minutes to Service (b..
Rows
CNT(Minutes to Serv..
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Minutes to Service (histogram)
Count of Minutes to Service
1600
1400
1200
1000
800
600
400
200
0
5
10
15
20
25
30
35
40
45
Minutes to Service (bin)

Histograms


Edit Bins [Minutes to Service]
New field name:
Minutes to Service (bin)
Size of bins:
3.47
Suggest Bin Size
Range of Values:
Min:
4
Diff:
40
Max:
44
CntD:
40
OK
Cancel

- Here, for example, is the same histogram with each bin sized to 2 minutes:

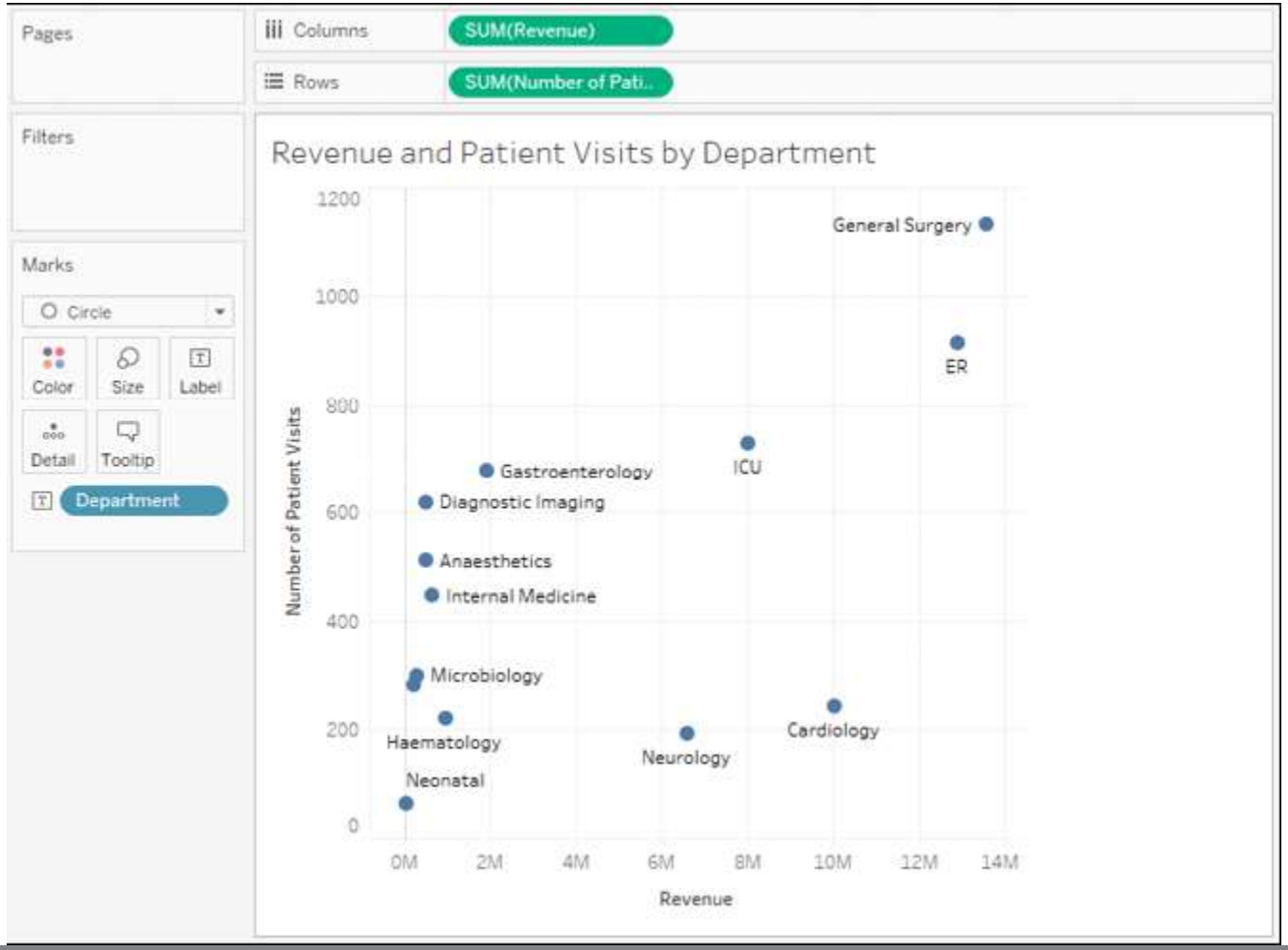



Pages
Columns
Minutes to Service (b..
Rows
Patient Risk Profile
CNT(Minutes to Serv..
Filters
Minutes to Service (histogram)
Patient Risk Profile
Marks
Automatic
Color
Size
Label
Detail
Tooltip
High
Low
Count of Minutes to Service
800
600
400
200
0
5
10
15
20
25
30
35
40
45
Minutes to Service (bin)

Scatterplot

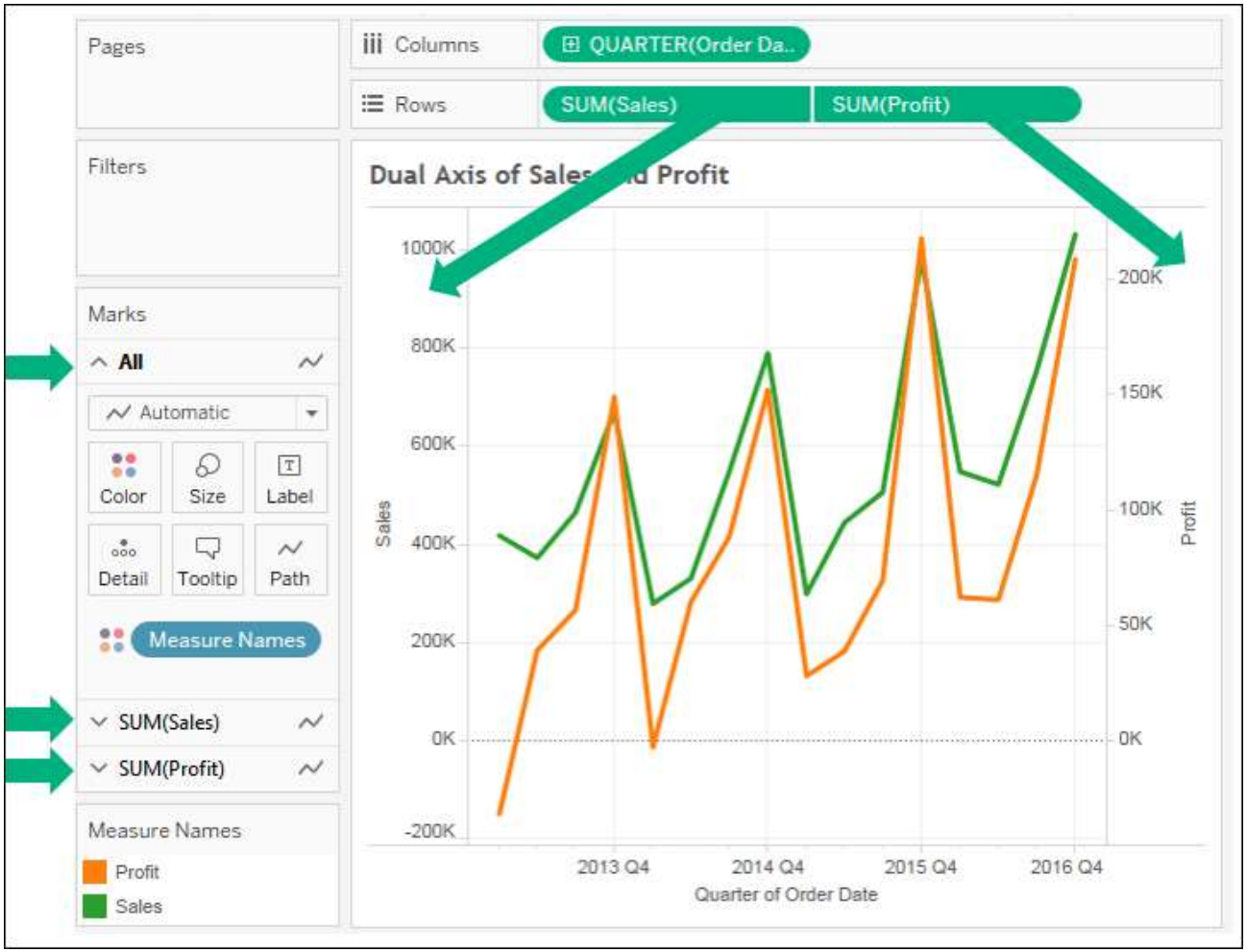
A scatterplot is an essential visualization type for understanding the relationship between two measures. Consider a scatterplot when you find yourself asking questions like the following:

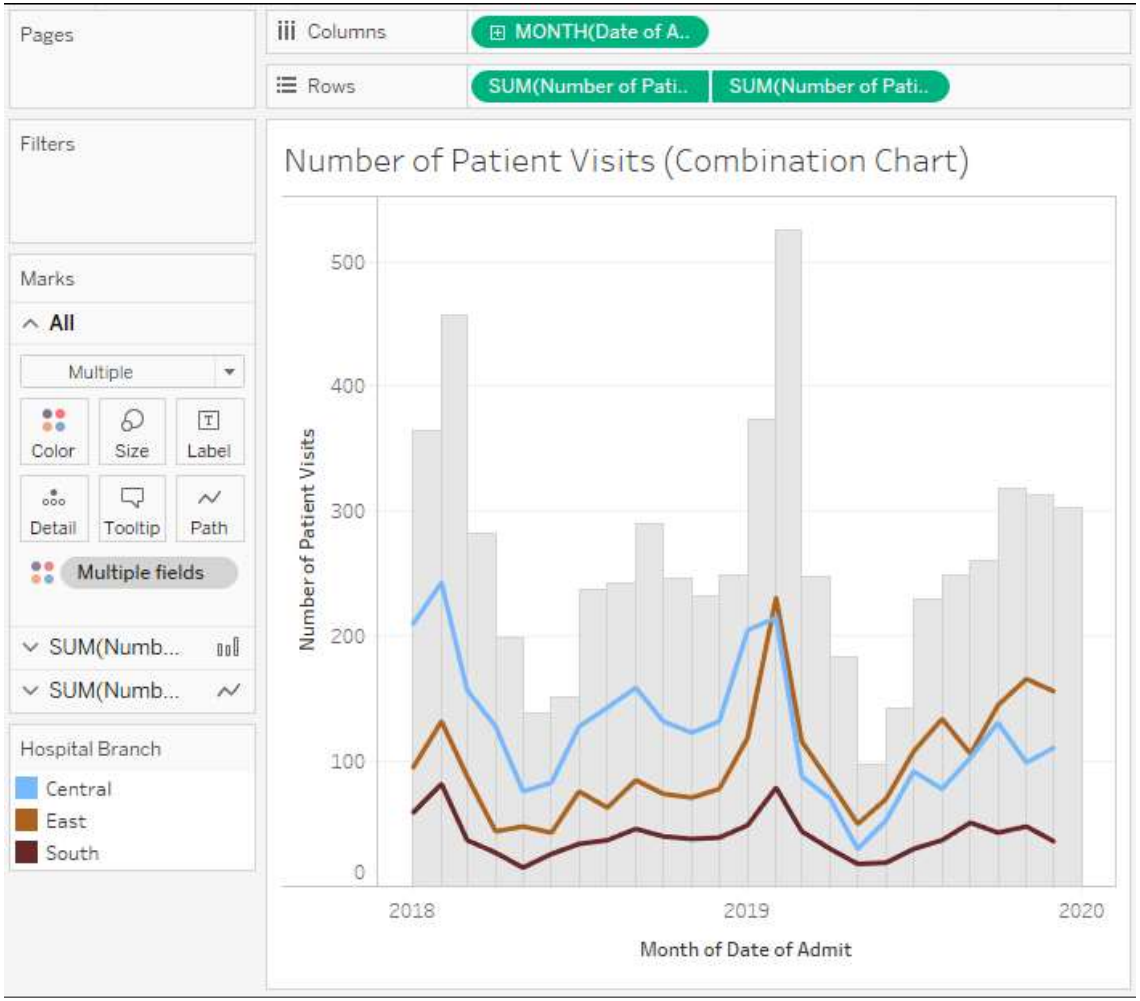
- Does how much I spend on marketing really make a difference on sales?
- How much does power consumption go up with each degree of heating/cooling?
- Is there any correlation between hours of study and test performance?


Pages
Columns
SUM(Revenue)
Rows
SUM(Number of Pati..
Filters
Marks
Circle
Color
Size
Label
Detail
Tooltip
Department
Revenue and Patient Visits by Department
Number of Patient Visits
1200
1000
800
600
400
200
0
0M
2M
4M
6M
8M
10M
12M
14M
Revenue
General Surgery
ER
ICU
Gastroenterology
Diagnostic Imaging
Anaesthetics
Internal Medicine
Microbiology
Haematology
Neonatal
Neurology
Cardiology

Dual-axis and combination charts

- One very important feature in Tableau is the ability to use a dual axis.
- Scatterplots use two axes, but they are X and Y.
- You also observed in the stacked bar example that placing multiple continuous (green) fields next to each other on Rows or Columns results in multiple side-by-side axes.

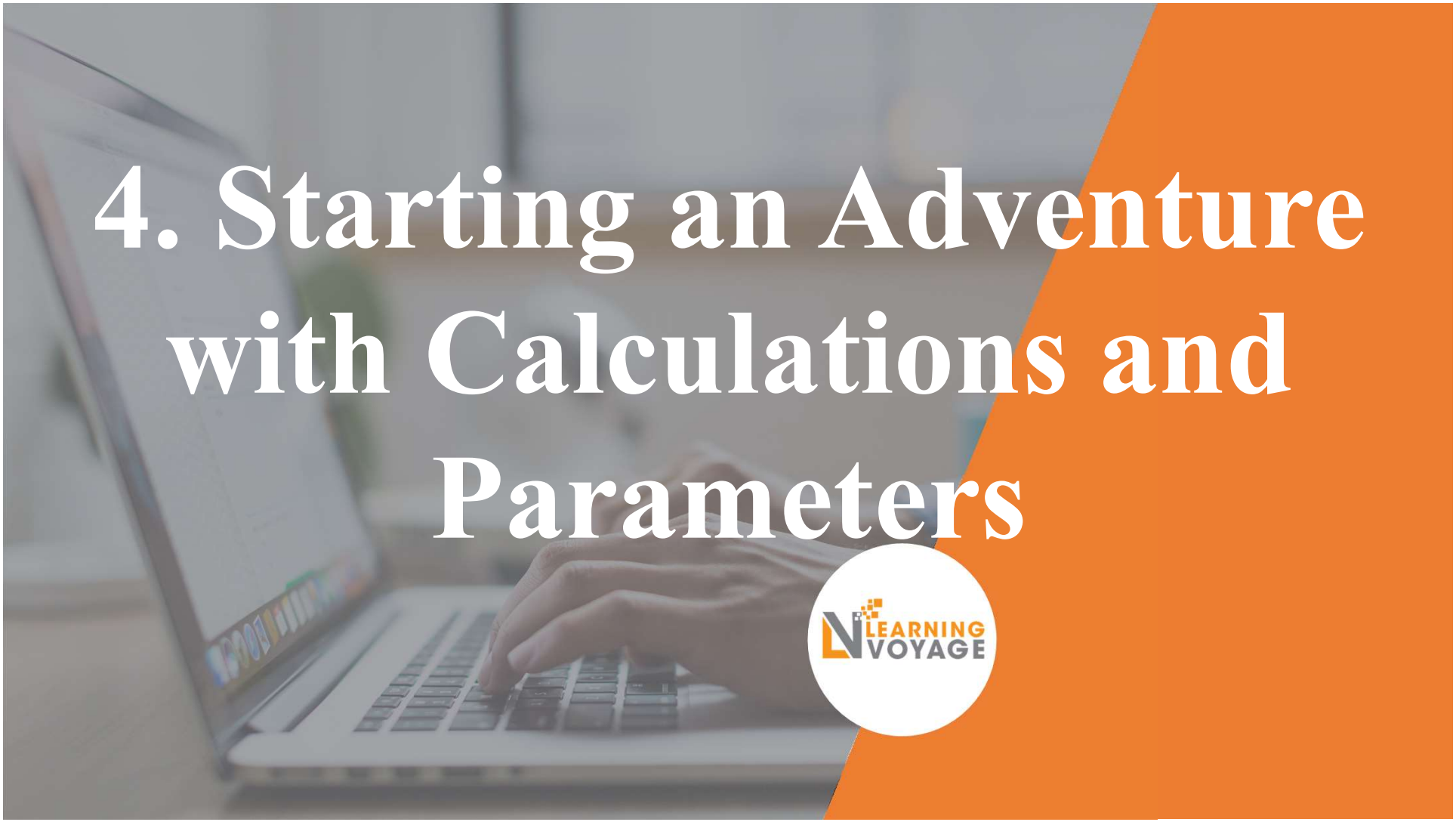

Pages
Columns
QUARTER(Order Da..
Rows
SUM(Sales)
SUM(Profit)
Filters
Dual Axis of Sales and Profit
Marks
All
Automatic
Color
Size
Label
Detail
Tooltip
Path
Measure Names
SUM(Sales)
SUM(Profit)
Measure Names
Profit
Sales
1000K
800K
600K
400K
200K
0K
-200K
Sales
200K
150K
100K
50K
0K
Profit
2013 Q4
2014 Q4
2015 Q4
2016 Q4
Quarter of Order Date


Pages
Columns
MONTH(Date of A..
Rows
SUM(Number of Pati..
SUM(Number of Pati..
Filters
Marks
All
Multiple
Color
Size
Label
Detail
Tooltip
Path
Multiple fields
SUM(Numb...
SUM(Numb...
Hospital Branch
Central
East
South
Number of Patient Visits (Combination Chart)
500
400
300
200
100
0
Number of Patient Visits
2018
2019
2020
Month of Date of Admit

Summary

- We've covered quite a bit of ground in this lesson! You should now have a good grasp of when to use certain types of visualizations.
- The types of questions you ask about data will often lead you to a certain type of view.
- You've explored how to create these various types and how to extend basic visualizations using a variety of advanced techniques, such as calculated fields, jittering, multiple mark types, and dual axis.

COMPLETE LAB 3



4. Starting an Adventure with Calculations and Parameters

LEARNING VOYAGE

Starting an Adventure with Calculations & Parameters

The topics we will study here are as follows:

- Overview of the four main types of calculations
- Creating and editing calculations
- Row-level calculation examples
- Aggregate calculation examples
- Parameters
- Practical examples
- Performance considerations

Introduction to calculations

- A calculation is often referred to as a Calculated Field in Tableau because, in most cases, when you create a calculation, it will show up as either a new measure or dimension in the data pane.

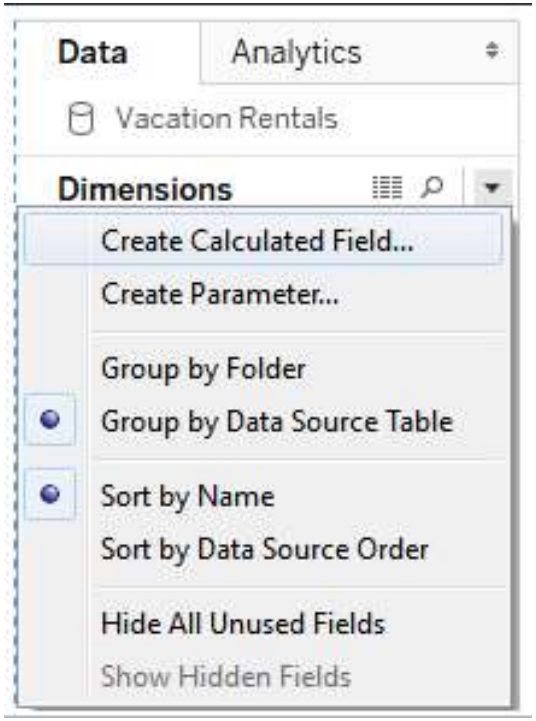
- Calculations consist of code that's made up of functions, operations, and references to other fields, parameters, constants, groups, or sets.

The four main types of calculations

- **Row-level calculations:** These calculations are performed for every row of underlying data.
- **Aggregate calculations:** These calculations are performed at an aggregate level, which is usually defined by the dimensions used in the view.
- **Level of detail calculations:** These special calculations are aggregations that are performed at a specified level of detail, with the results available at the row level.
- **Table calculations:** These calculations are performed on the table of aggregate data that has been returned by the data source to Tableau.

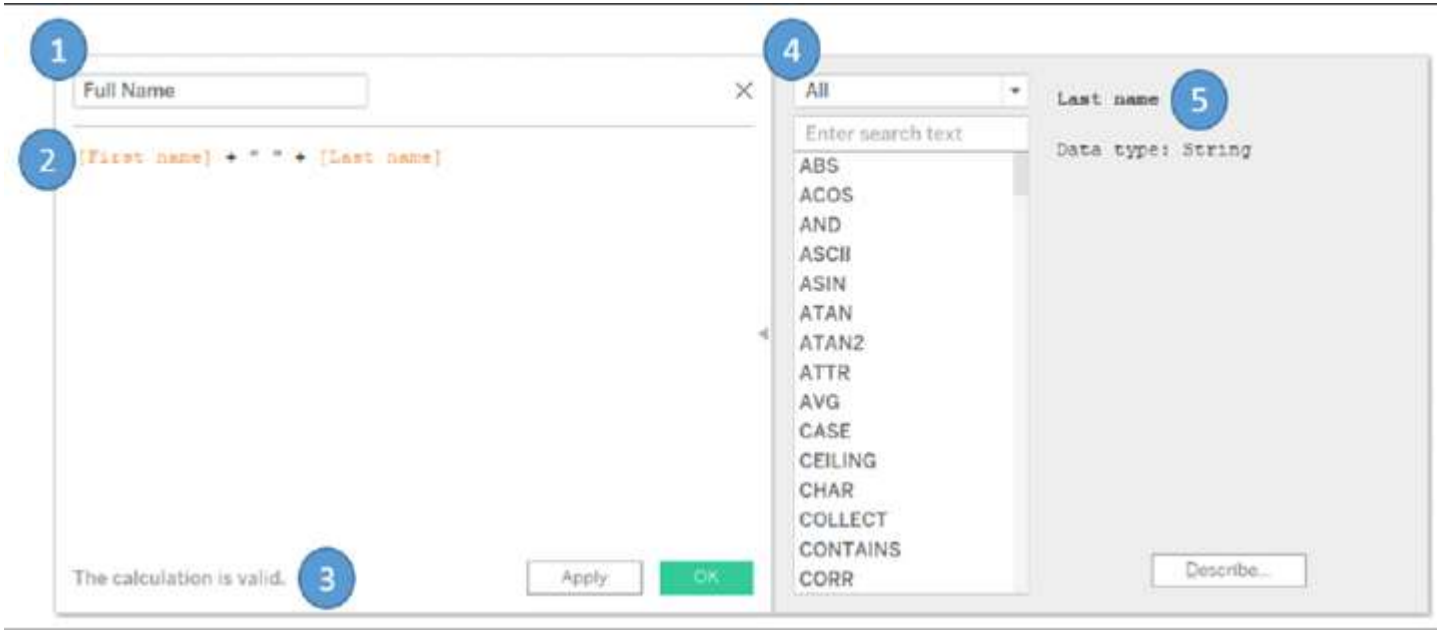
Creating and editing calculations

- Select Analysis | Create Calculated Field... from the menu.
- Use the drop-down menu next to Dimensions in the Data pane:



Creating and editing calculations

- The interface for creating and editing calculations looks like this:



Data types

- Fundamental to the concept of calculations are data types, which describe the kind of information stored by a field, parameter, or returned by a function.
- Tableau distinguishes six types of data:
- Number (decimal),Number (whole), Date and Time, Date, String, Boolean & Spatial etc.

Additional functions and operators

Operator / Keyword	Description
AND	Logical *and* between two Boolean (true/false) values or statements
OR	Logical *or* between two Boolean values or statements
NOT	Logical *not* to negate a Boolean value or statement
= or ==	Logical *equals to* work course test the equality of two statements or values (single or double equal signs are equivalent in Tableau's syntax)
+	Addition of numeric or date values or the concatenation of strings
-	Subtraction of numeric or date values
*	Multiplication of numeric values
/	Division of numeric values
^	Raise to a power with numeric values
( )	Parentheses to define the order of operations or enclose function arguments
[ ]	Square brackets to enclose field names
{ }	Curly braces to enclose the level of detail calculations
//	Double slash to start a comment

Example data

Rental Property	First	Last	Start	End	Discount	Rent	Tax per Night
112-Asbury Atoll	Mary	Slessor	Dec 2	Dec 9	150	1,500	15
112-Asbury Atoll	Amy	Carmichael	Dec 9	Dec 15	0	1,500	15
155-Beach Breeze	Charles	Ryrie	Dec 2	Dec 9	260	1,300	10
155-Beach Breeze	Dwight	Pentecost	Dec 16	Dec 23	280	1,400	10
207-Beach Breeze	Lewis	Chafer	Dec 9	Dec 23	280	2,800	10
207-Beach Breeze	John	Walvoord	Dec 2	Dec 9	60	1,500	10

Row-level calculations

- We'll walk through several examples of row-level calculations in this section.

- You'll find the completed calculations in the Complete workcourse, but you might prefer to start from scratch in the Starter workcourse.

Simple example

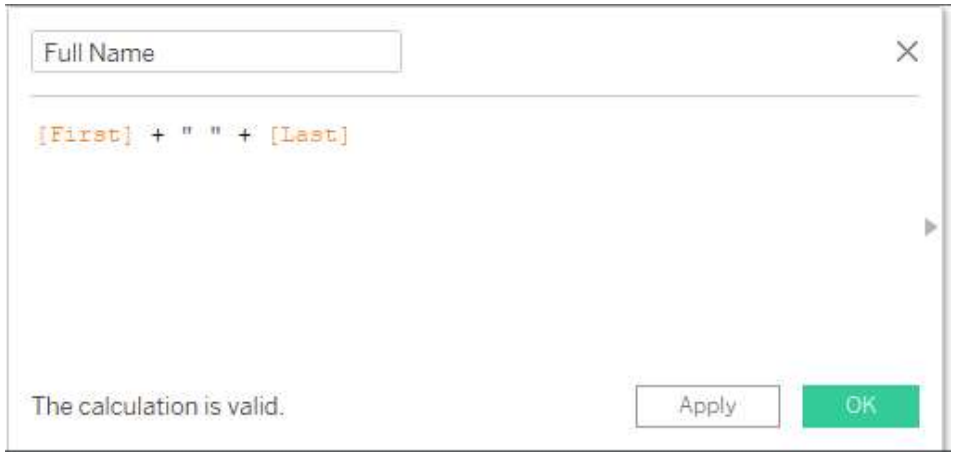
- We'll start with a very simple example and then build up in complexity.

- In the lesson 04 workcourse, create a new calculated field called Full Name with the following code:

```
[First] + " " + [Last]
```

Simple example

- Previous code concatenates the strings of First and Last with a space in-between them.
- Your calculation editor should look something like the following:



More complex examples

- Name the first Room with the following code:

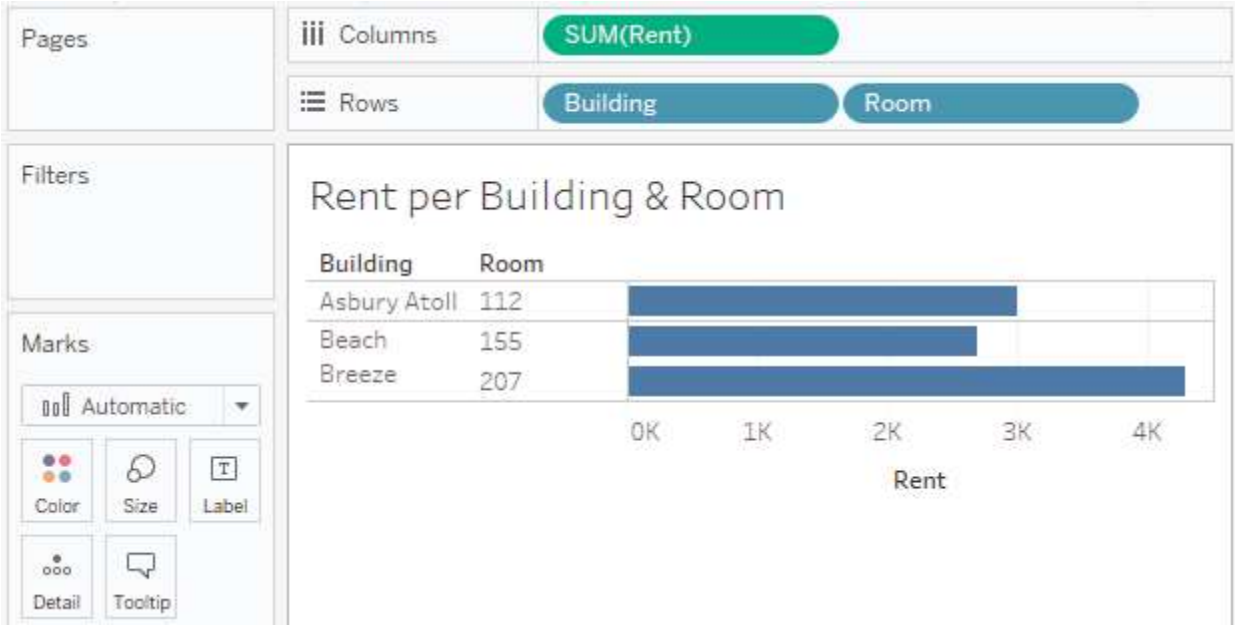
SPLIT([Rental Property], "-", 1)

- Then, create another calculated field named Building with the following code:

SPLIT([Rental Property], "-", 2)

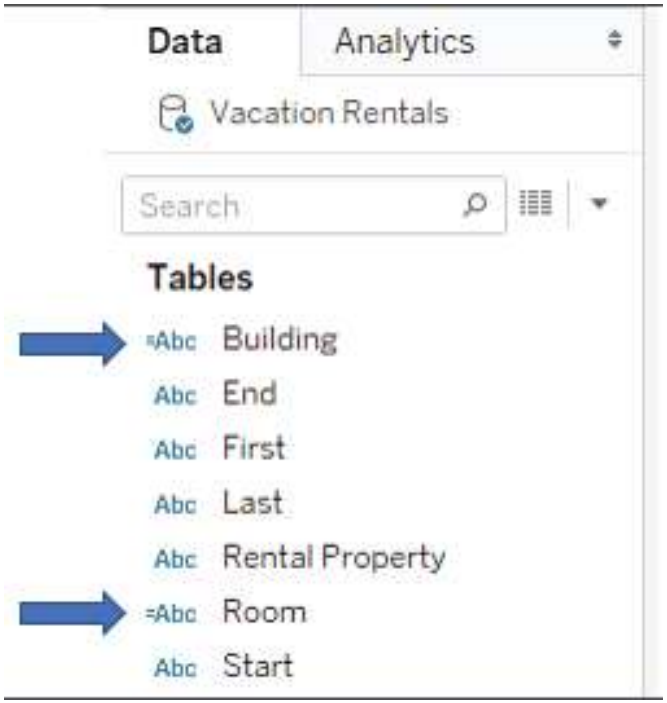
More complex examples

- Using the two calculated fields, create a bar chart of Rent per Building & Room, like this:



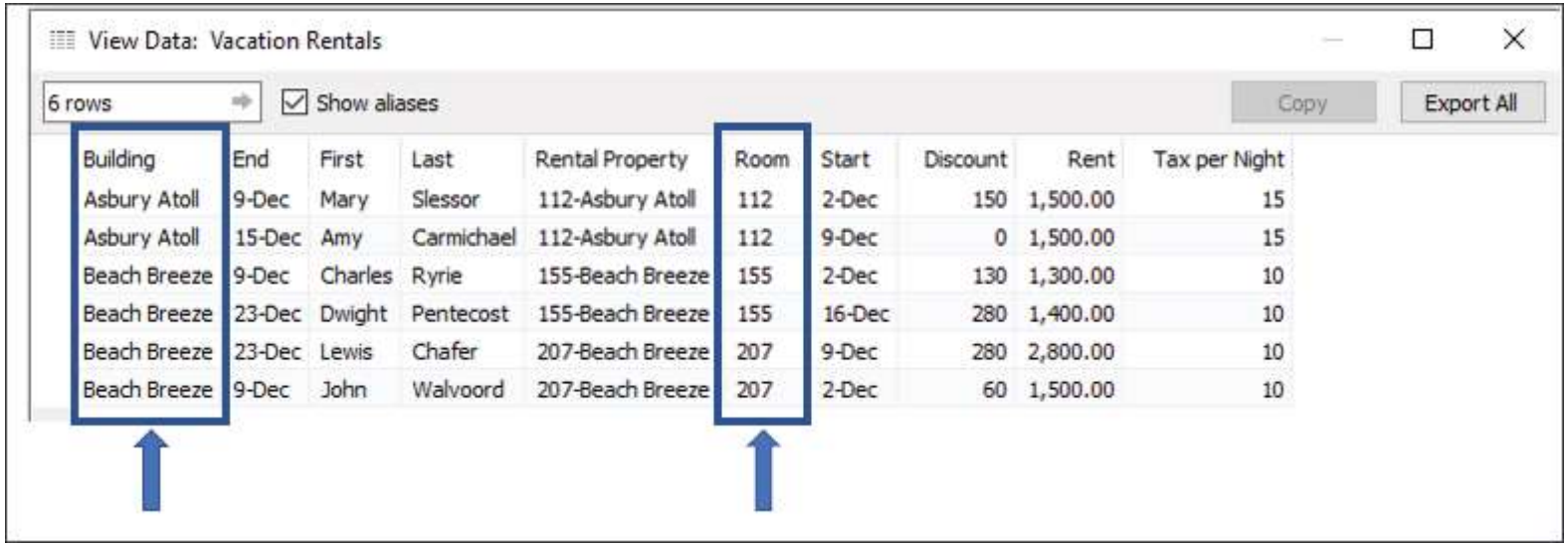
More complex examples

- Note that Tableau adds a small equals sign to the icon of the fields in the data pane to indicate that they are calculated fields:



More complex examples

- Here, the new fields of Building and Unit, along with the row-level values, can be clearly seen:



Building	End	First	Last	Rental Property	Room	Start	Discount	Rent	Tax per Night
Asbury Atoll	9-Dec	Mary	Slessor	112-Asbury Atoll	112	2-Dec	150	1,500.00	15
Asbury Atoll	15-Dec	Amy	Carmichael	112-Asbury Atoll	112	9-Dec	0	1,500.00	15
Beach Breeze	9-Dec	Charles	Ryrie	155-Beach Breeze	155	2-Dec	130	1,300.00	10
Beach Breeze	23-Dec	Dwight	Pentecost	155-Beach Breeze	155	16-Dec	280	1,400.00	10
Beach Breeze	23-Dec	Lewis	Chafer	207-Beach Breeze	207	9-Dec	280	2,800.00	10
Beach Breeze	9-Dec	John	Walvoord	207-Beach Breeze	207	2-Dec	60	1,500.00	10

Extending the example

- We'll extend the example a bit more and assume you know that the floor of a room is indicated by its number.
- Rooms 100 through 199 are on the first floor, and 200 through 299 are on the second.
- You'd like to have that information available for analysis.

More complex examples

- Instead, you can create a row-level calculation in Tableau to extend the data.
- To do so, create a calculated field named Floor with the following code:

```
IF LEFT([Room], 1) = "1"
THEN "First Floor"
ELSEIF LEFT([Room], 1) = "2"
THEN "Second Floor"
END
```

Planning for data variations

- To account for additional cases, we might simplify our calculation to the following:

```
LEFT([Room], 1)
```

- This code simply returns the leftmost character of the room number.

Planning for data variations

- We'll get 3 for 306 and 8 for 822. But what if we have room numbers such as 1056 on the tenth floor, and 1617 on the sixteenth?

- We'd have to consider other options, such as the following:

```
MID([Room], 0, LEN([Room]) - 2)
```

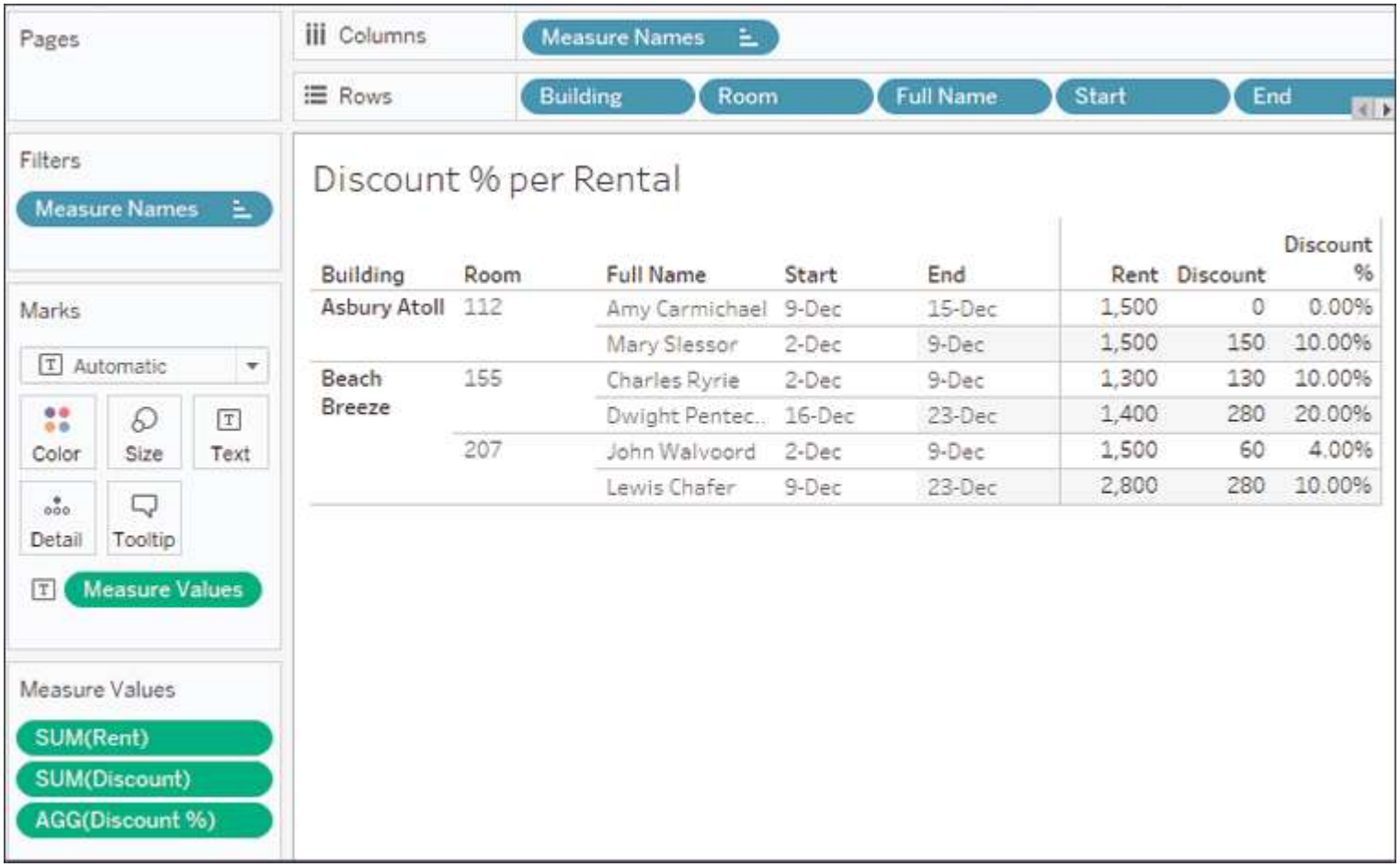
Aggregate calculations

- We've already considered aggregations such as sum, min, and max in Tableau.
- Often, you'll use fields as simple aggregations in the view.
- But sometimes, you'll want to use aggregations in more complex calculations.
- For example, you might be curious to explore the percentage of the rent that was discounted, There is no such field in the data.

Aggregate calculations

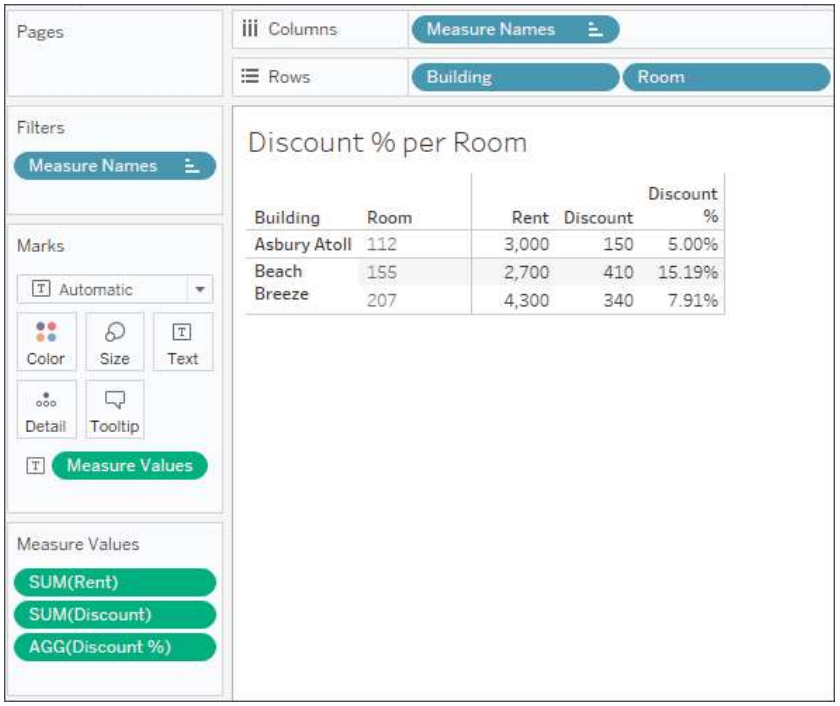
- Let's create a calculation named Discount % with the following code:

```
SUM([Discount]) / SUM([Rent])
```


Pages
Columns
Measure Names
Rows
Building
Room
Full Name
Start
End
Filters
Measure Names
Marks
Automatic
Color
Size
Text
Detail
Tooltip
Measure Values
Measure Values
SUM(Rent)
SUM(Discount)
AGG(Discount %)
Discount % per Rental
Building
Room
Full Name
Start
End
Rent
Discount
Discount %
Asbury Atoll
112
Amy Carmichael
9-Dec
15-Dec
1,500
0
0.00%
Mary Slessor
2-Dec
9-Dec
1,500
150
10.00%
Beach Breeze
155
Charles Ryrie
2-Dec
9-Dec
1,300
130
10.00%
Dwight Pentec..
16-Dec
23-Dec
1,400
280
20.00%
207
John Walvoord
2-Dec
9-Dec
1,500
60
4.00%
Lewis Chafer
9-Dec
23-Dec
2,800
280
10.00%

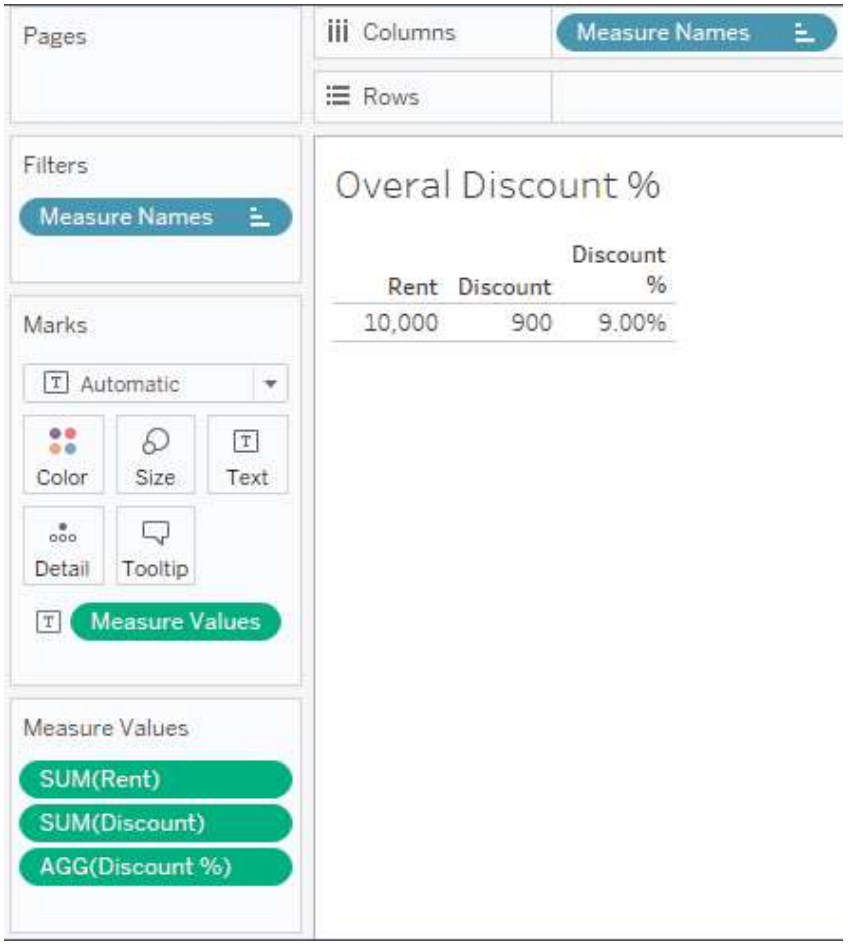
Aggregate calculations

- You can see the percentage given by way of discount for each rental period.
- However, notice how the values change when you remove all fields except Building and Room:



Aggregate calculations

- Notice that the values change again, as expected, if you look at the overall dataset without slicing by any dimensions:



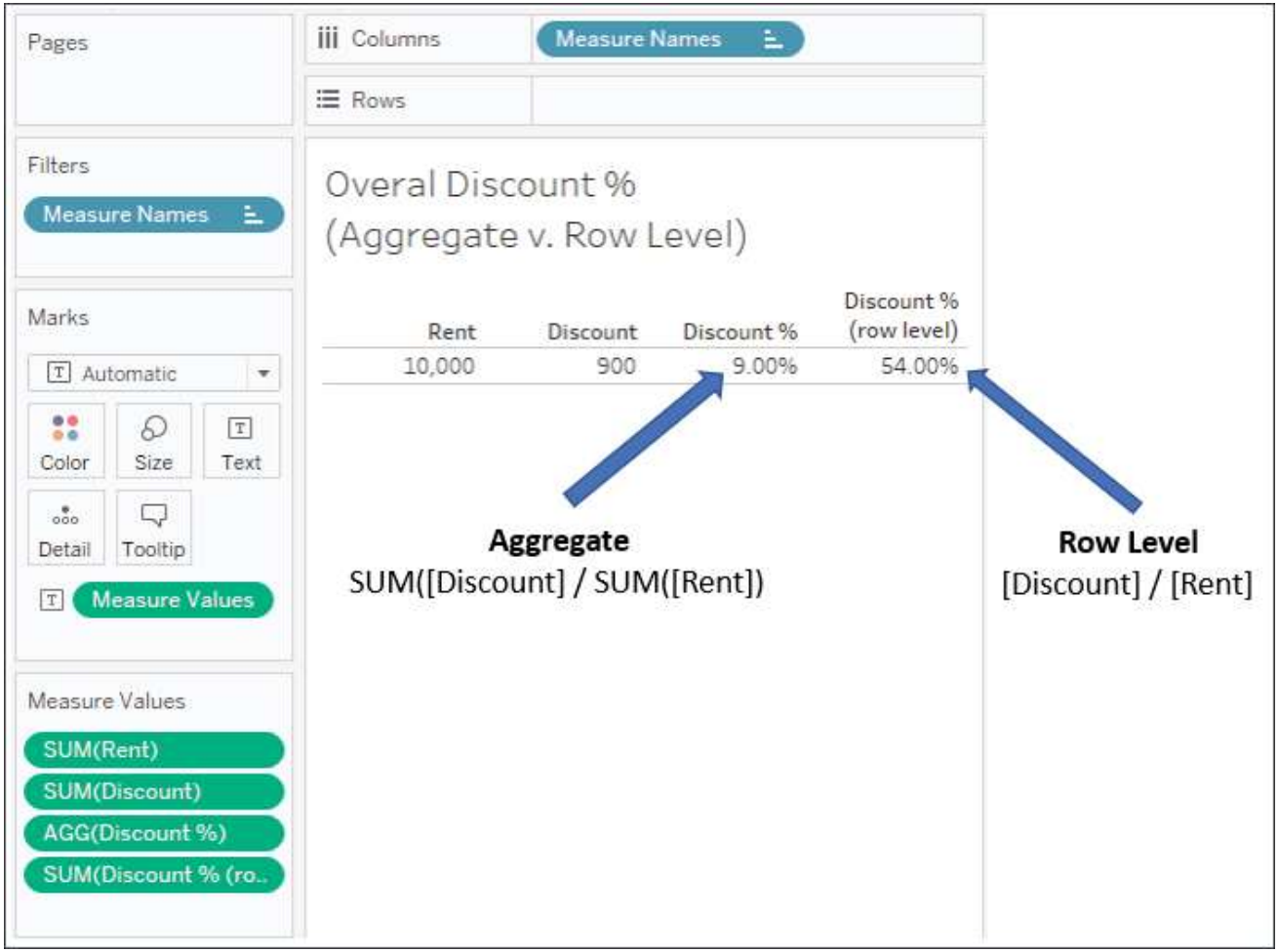
Why the row level versus aggregate difference matters

- Let's say you created a Discount % (row level) calculation with the following code:

[Discount]/[Rent]

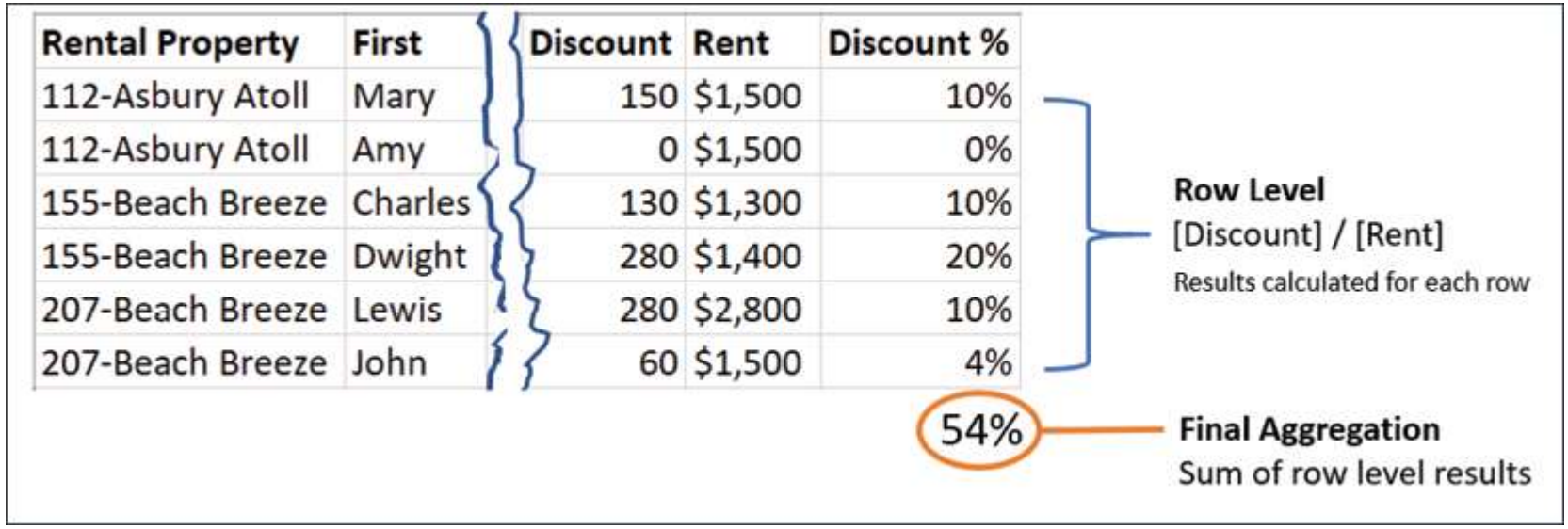
- The code differs from the aggregate calculation you created previously, which had the following code:

SUM([Discount])/SUM([Rent])

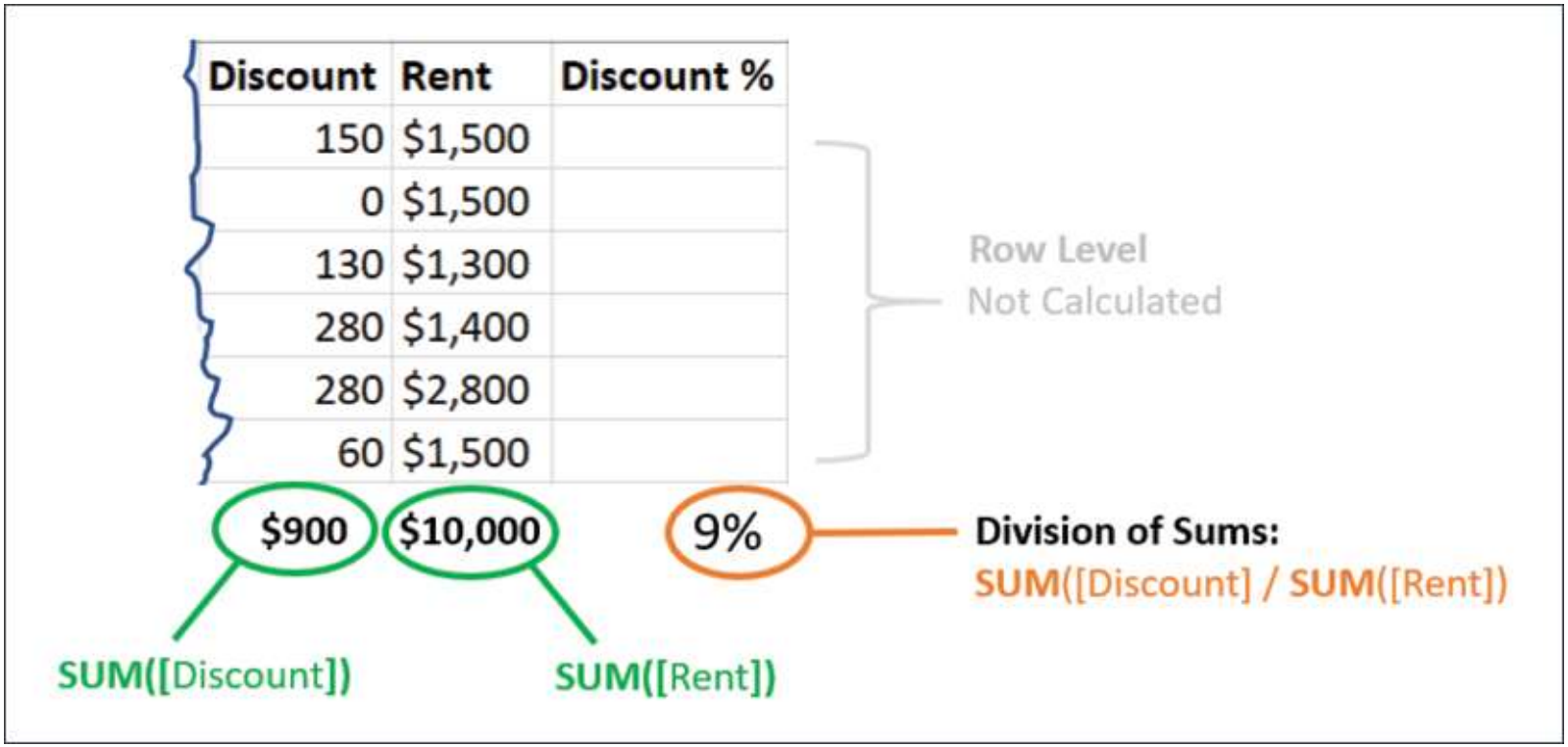

Pages
Columns
Measure Names
Rows
Filters
Measure Names
Marks
Automatic
Color
Size
Text
Detail
Tooltip
Measure Values
Measure Values
SUM(Rent)
SUM(Discount)
AGG(Discount %)
SUM(Discount % (ro..
Overal Discount %
(Aggregate v. Row Level)
Rent
Discount
Discount %
Discount % (row level)
10,000
900
9.00%
54.00%
Aggregate
SUM([Discount] / SUM([Rent])
Row Level
[Discount] / [Rent]

Why the row level versus aggregate difference matters

- In fact, the row-level calculation and the final aggregation is performed like this:



Why the row level versus aggregate difference matters



Parameters

- Before moving to some additional examples of row-level and aggregate calculations, let's take a little side trip to examine parameters, given that they can be used in incredible ways in calculations.
- A parameter in Tableau is a placeholder for a single, global value such as a number, date, or string.
- Parameters may be shown as controls (such as sliders, drop-down lists, or type-in text boxes) to end users of dashboards or views, giving them the ability to change the current value of the parameter.

Parameters

- Alter the results of a calculation
- Change the size of bins
- Change the number of top or bottom items in a top n filter or top n set
- Set the value of a reference line or band
- Change the size of bins
- Pass values to a custom SQL statement that's used in a data source

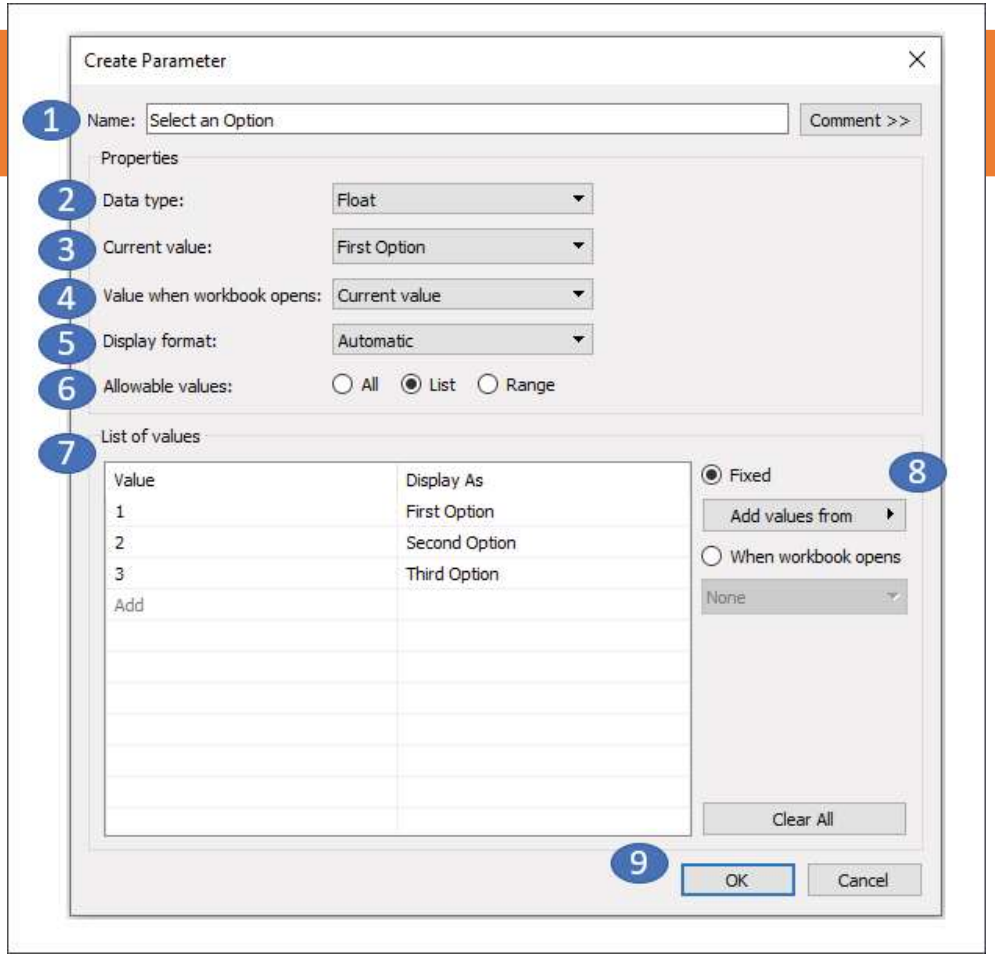
Creating parameters

Creating a parameter is similar to creating a calculated field & there are multiple ways to create a parameter in Tableau:

- Use the drop-down menu next to Dimensions in the data pane and select Create Parameter.
- Right-click an empty area in the data pane and select Create Parameter.
- Use the drop-down menu on a field, set, or parameter already in the data pane and select Create | Parameter....

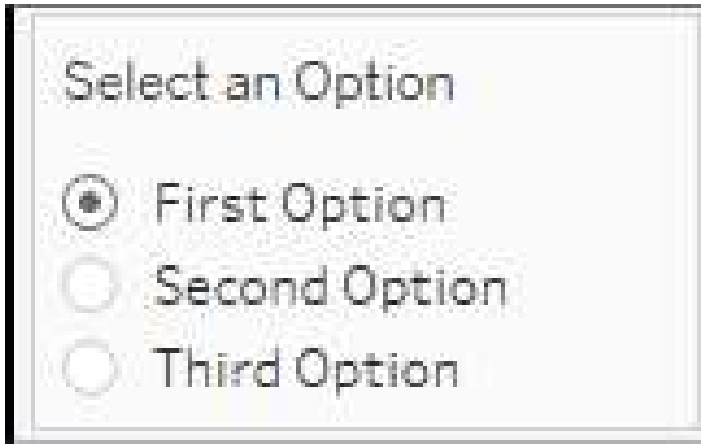
Creating parameters

- When you first create a parameter (or subsequently edit an existing parameter), Tableau will present an interface like this:



Creating parameters

- The parameter control, shown as a single value list, for the parameter we created earlier:



Practical examples of calculations and parameters

- Let's turn our attention to some practical examples of row-level and aggregate calculations.
- The goal is to learn and understand some of what is possible with calculations.
- You will be able to build on these examples as you embark on your analysis and visualization journey.

Fixing data issues

- Often, data is not entirely clean. That is, it has problems that need to be corrected before meaningful analysis can be accomplished.
- For example, dates may be incorrectly formatted, or fields may contain a mix of numeric values and character codes that need to be separated into multiple fields.
- Calculated fields can often be used to fix these kinds of issues.

Fixing data issues

- We'll continue working with the Vacation Rentals data.
- You'll recall that the start and end dates looked something like this:

Start	End
Dec 2	Dec 9
Dec 9	Dec 15
Dec 16	Dec 23

Fixing data issues

- Here is the code for getting the start date:

```
DATE([Start] + ", 2020")
```

- And here is the code for getting the end date:

```
DATE([End] + ", 2020")
```

Fixing data issues

- A quick check in Tableau reveals the expected results: