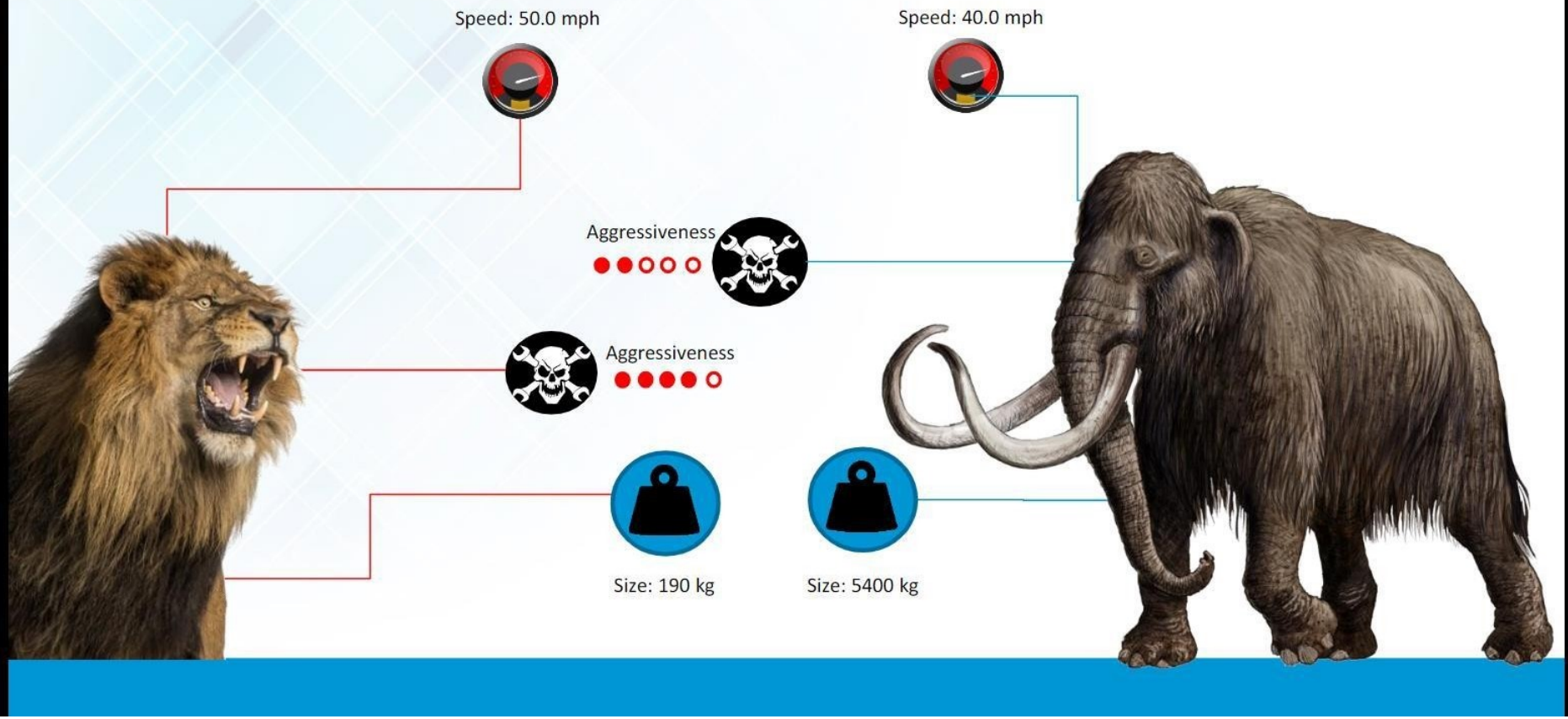
Data Visualization

Why Data Visualization ?

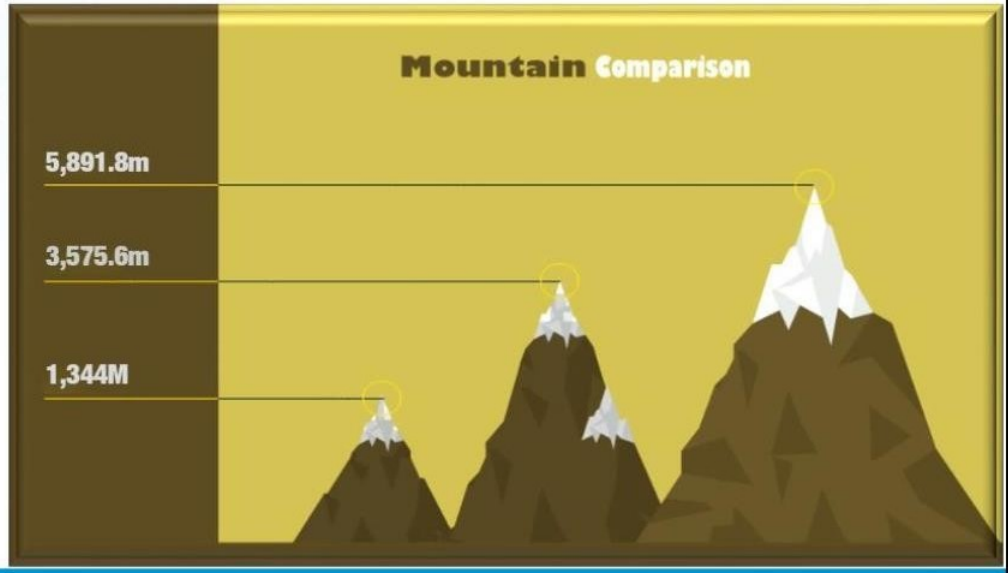
- Visualization allows **visual access** to huge amounts of **data** in easily digestible visuals
- Well designed **data** graphics are usually the simplest and at the same time, the most powerful

Data Visualization Example

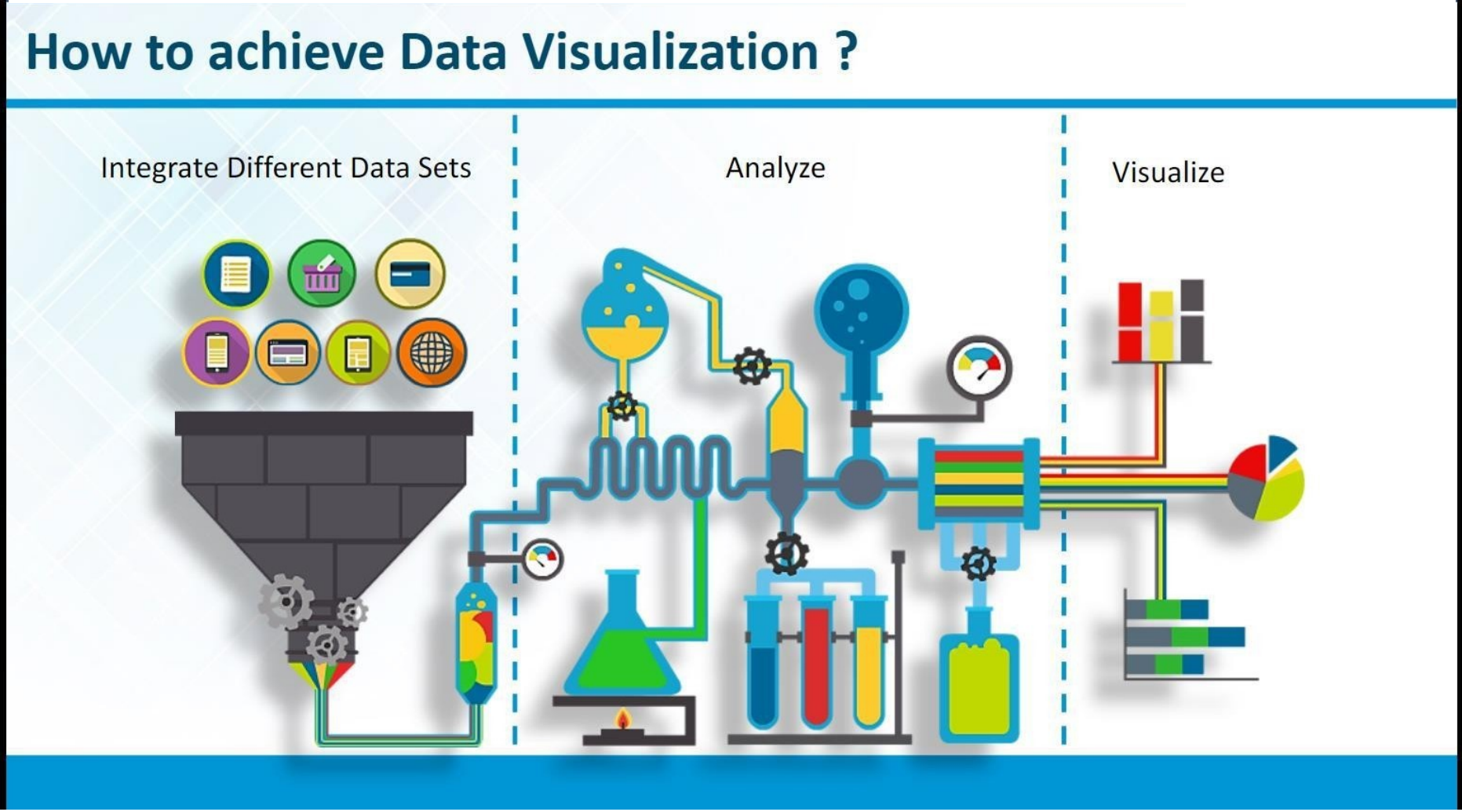


What is Data Visualization?

- In simple words, **Data visualization** is the presentation of **data** *(from one or many sources)* in a **pictorial or graphical format**.
- It enables decision makers to see analytics presented visually, so they can grasp difficult concepts or identify new patterns.



How to achieve Data Visualization ?



Popular Data Visualization Tools

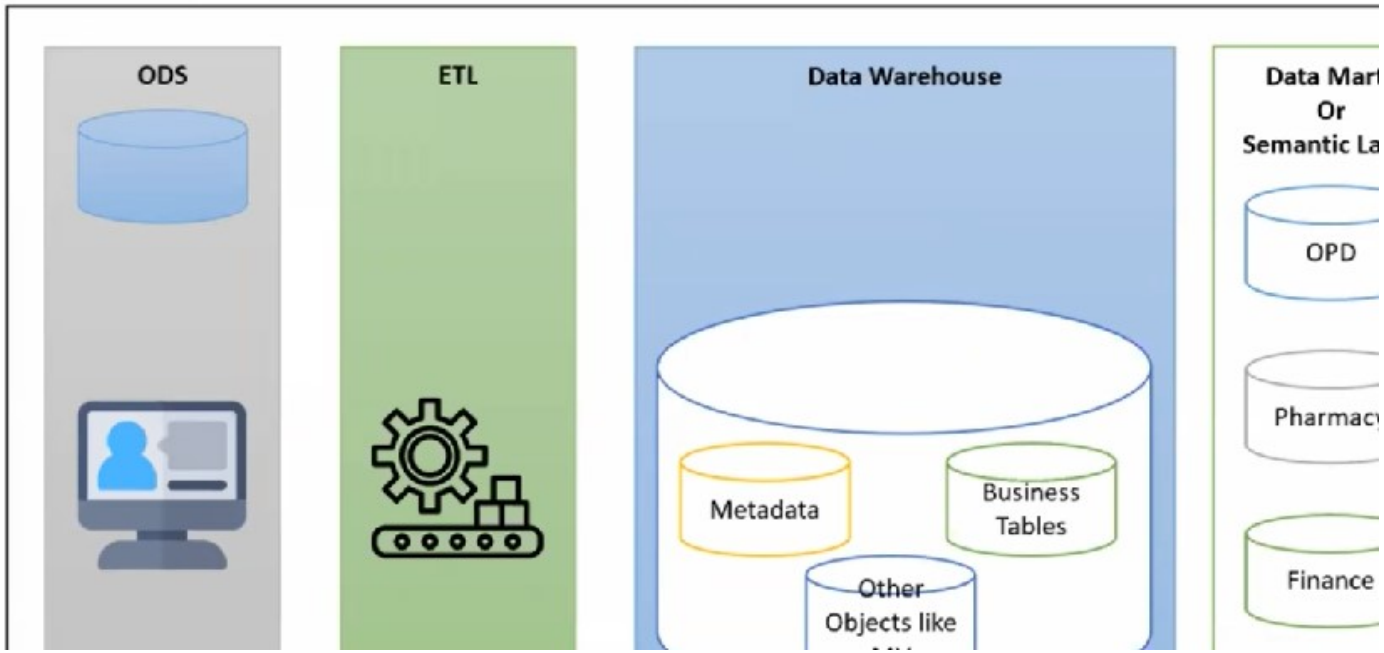
Power BI

QlikView

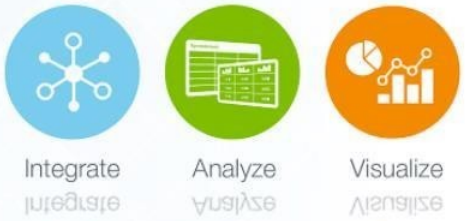
GoodData

MICROSTRATEGY
ANALYTICS DESKTOP

Data warehouse Architecture



Tableau



- Tableau was founded in Mountain View, California in January 2003, by **Chris Stolte, Christian Chabot and Pat Hanrahan**
- Tableau helps the world's largest organizations unleash the power of their most valuable assets: **their data and their people**
- Tableau empowers users to see and understand their data. It harnesses people's natural ability to spot visual patterns quickly, revealing everyday opportunities and eureka moments alike
- It allows the customers to spend more time on **data analysis** and less on "data wrangling"

Products of Tableau

- **Tableau Desktop** is the authoring and publishing tool that is used to create shared views on Tableau Server
- **Tableau Server** is a business analytics platform that can scale up to thousands of users. It is mainly designed to publish, store and schedule automatic refreshes on the web
- **Tableau Online** is hosted in cloud version of SaaS
- **Tableau Public** is a free product from Tableau, allowing visualization enthusiast to play with data with some restrictions
- **Tableau Reader** is a free application that lets anyone view and interact with Tableau packaged workbooks

Note: Tableau Desktop is used to create the visualization and if you need it to be shared among 1000's of user you can publish it on tableau server (tableau server which looks like a web page).

Why tableau SOFTWARE ?

- **Access to Multiple Data Connection**
  - Tableau connects easily to nearly any data source, be it corporate Data Warehouse, Microsoft Excel or web-based data
- **Live Analysis**
  - Tableau allows you to connect to your live data and perform various analysis on it
- **Maps**
  - Most tools requires an extreme amount of work to make map data work correctly. Tableau made it pretty seamless

Why tableau SOFTWARE ?

- **Shelves Section**
  - Want to filter? Drag the column into the filter shelf. Want to see the rows of data? Drag it to the rows shelf.

    Tableau has made it simple and easy to understand even for the non technical people

- **Show Me Tool**
  - Tableau is awesome at recommending which visualization to use. Just hitting the *ShowMe* tool from the toolbar menu helps you get best possible suggestion for the selected Dimension and Measure

Note: "All these features are available in other tools, but not all together in a single tool."

Products of Tableau

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Tableau Architecture

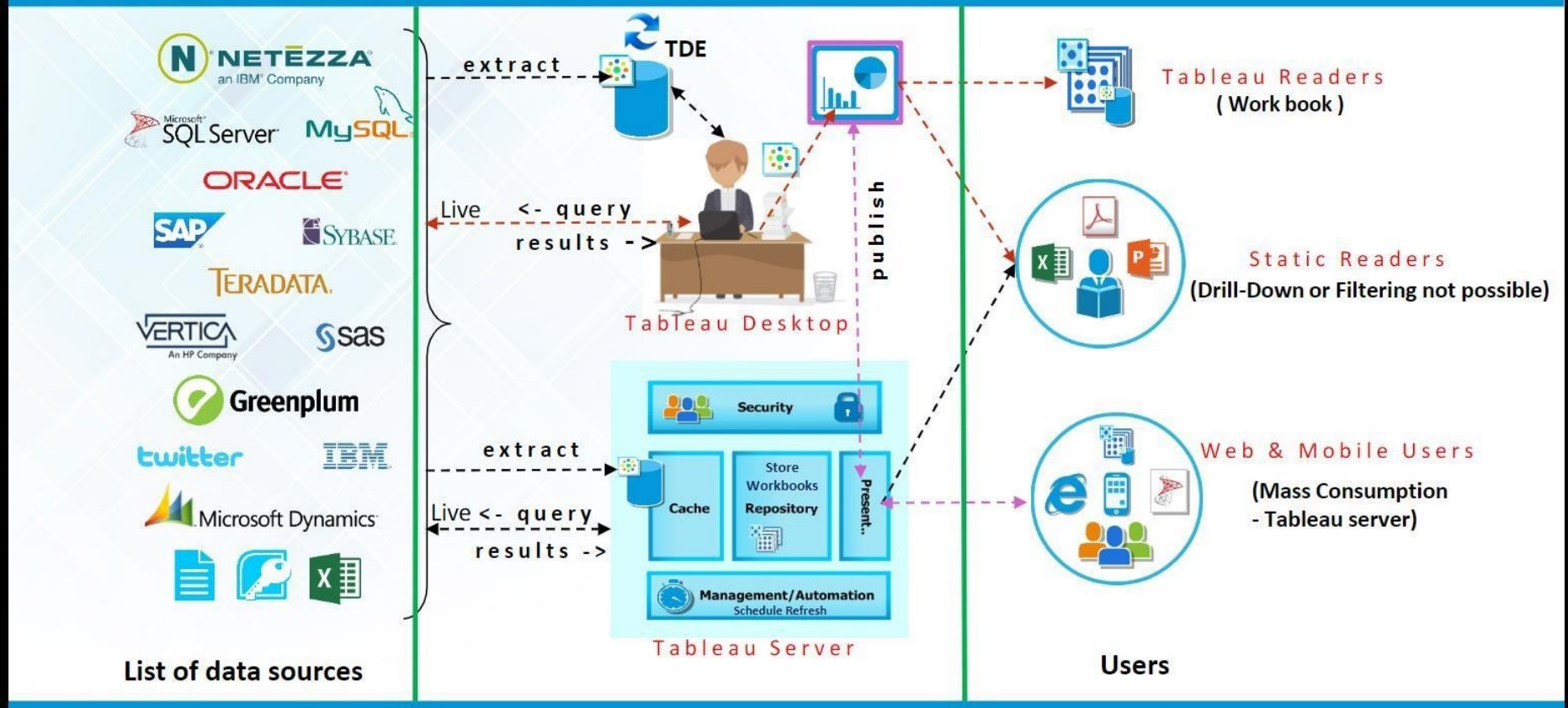
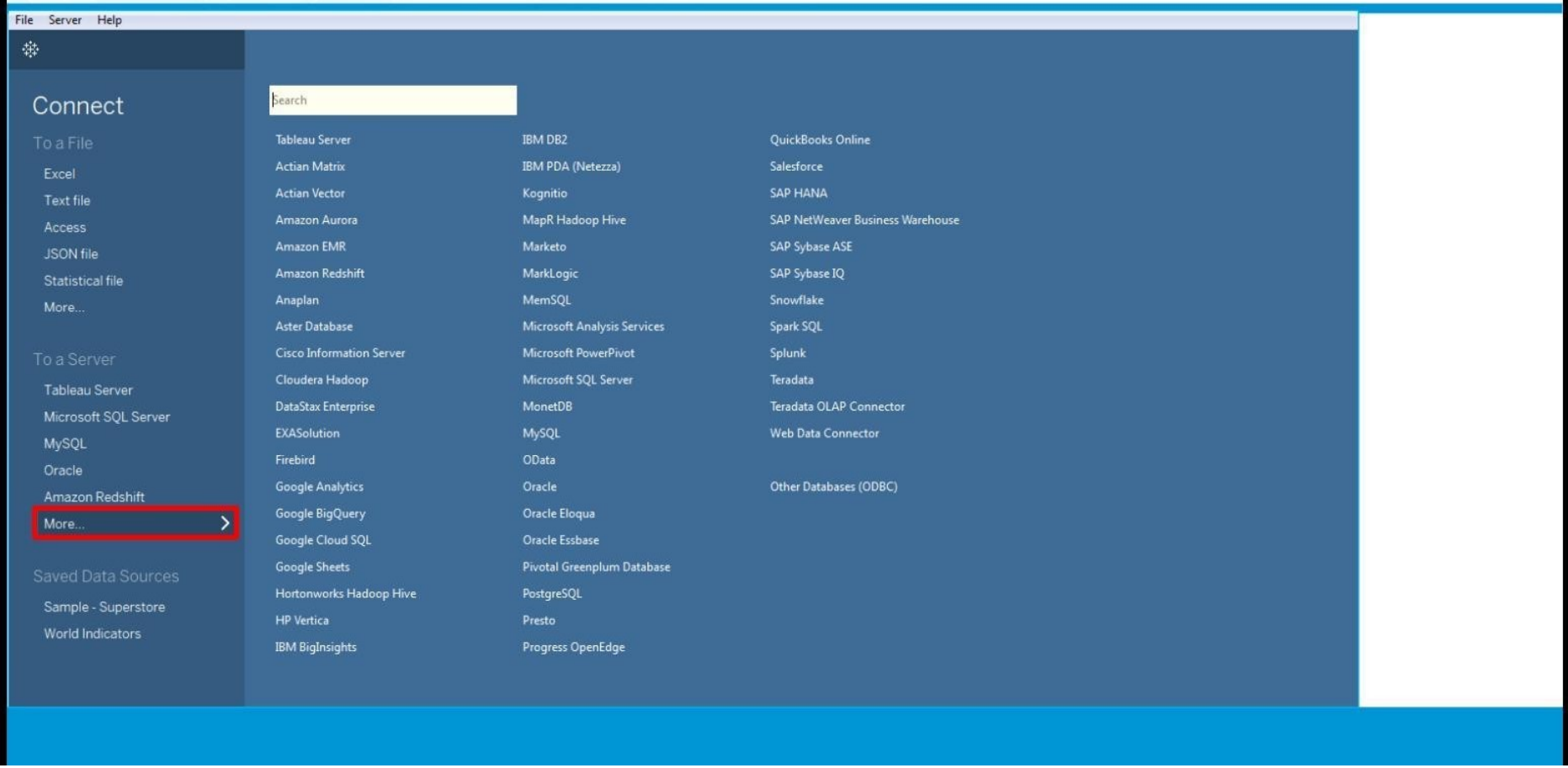


Tableau
First Look

Home Screen


File Server Help
Connect
To a File
Excel
Text file
Access
JSON file
Statistical file
More...
To a Server
Tableau Server
Microsoft SQL Server
MySQL
Oracle
Amazon Redshift
More...
Saved Data Sources
Sample - Superstore
World Indicators
Open
Open a Workbook
Book2
managing_meta...
Book1
Sample Workbooks
More Samples
Superstore
Regional
World Indicators
Discover
Training
Getting Started
Connecting to Data
Visual Analytics
Understanding Tableau
More training videos...
VIZ OF THE WEEK
Scottish Index of Multiple Deprivation (2012) ⟶
241 Datazones
Blog - How to add an animated GIF to your Tableau viz (and make it rain)
Tableau Conference 2017
Forums

Various Servers available

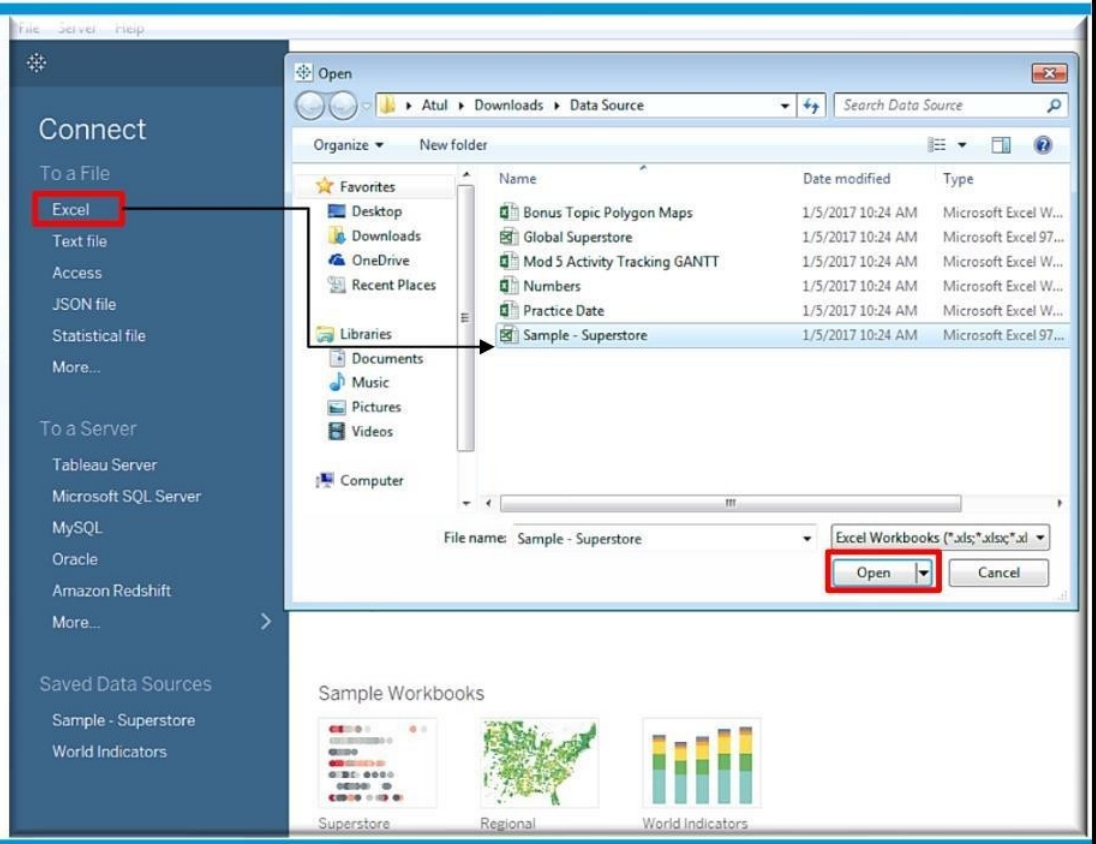


Connect To a File

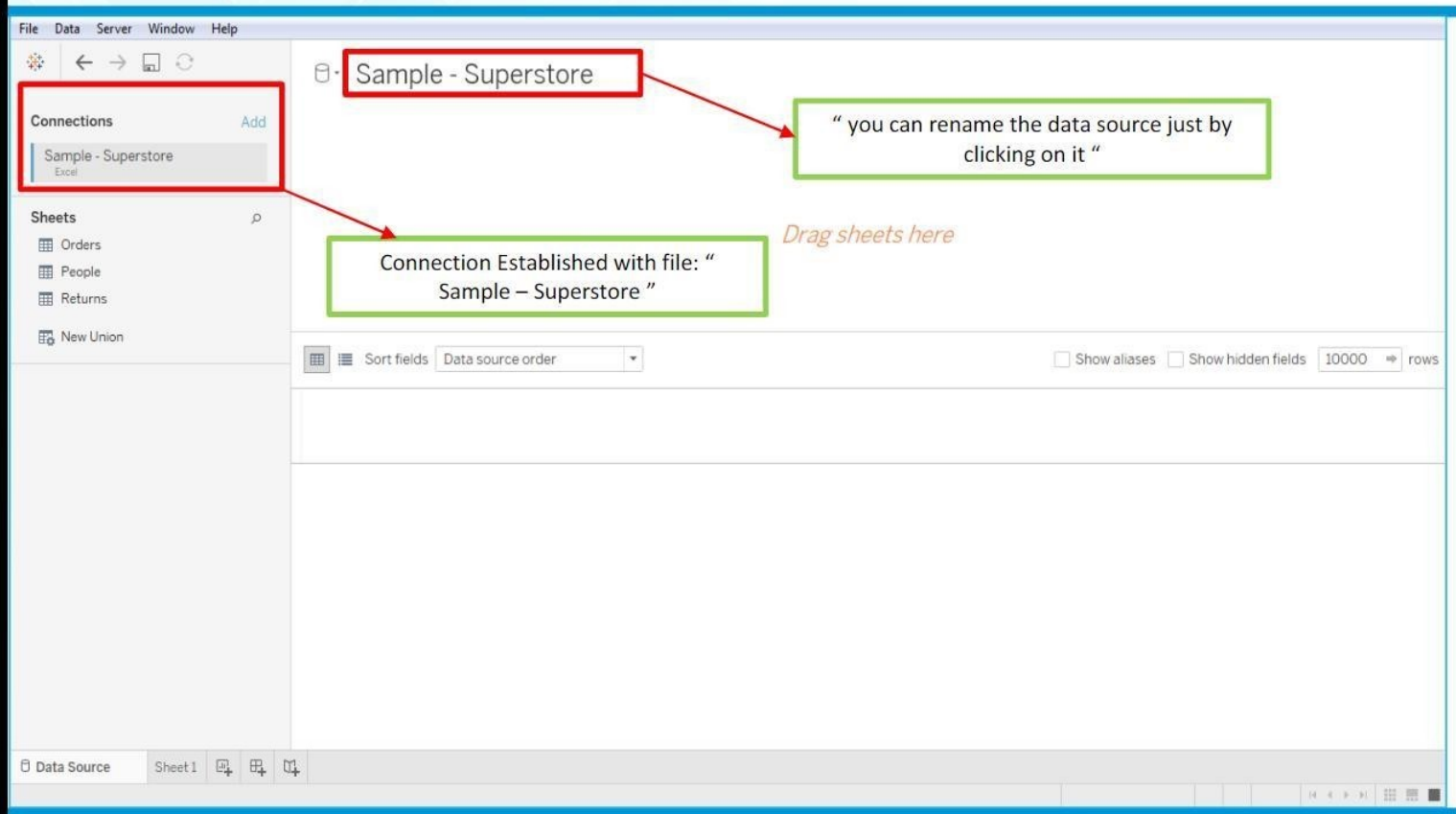
Multiple file options are available for establishing a connection.

Just for reference we are taking a excel file

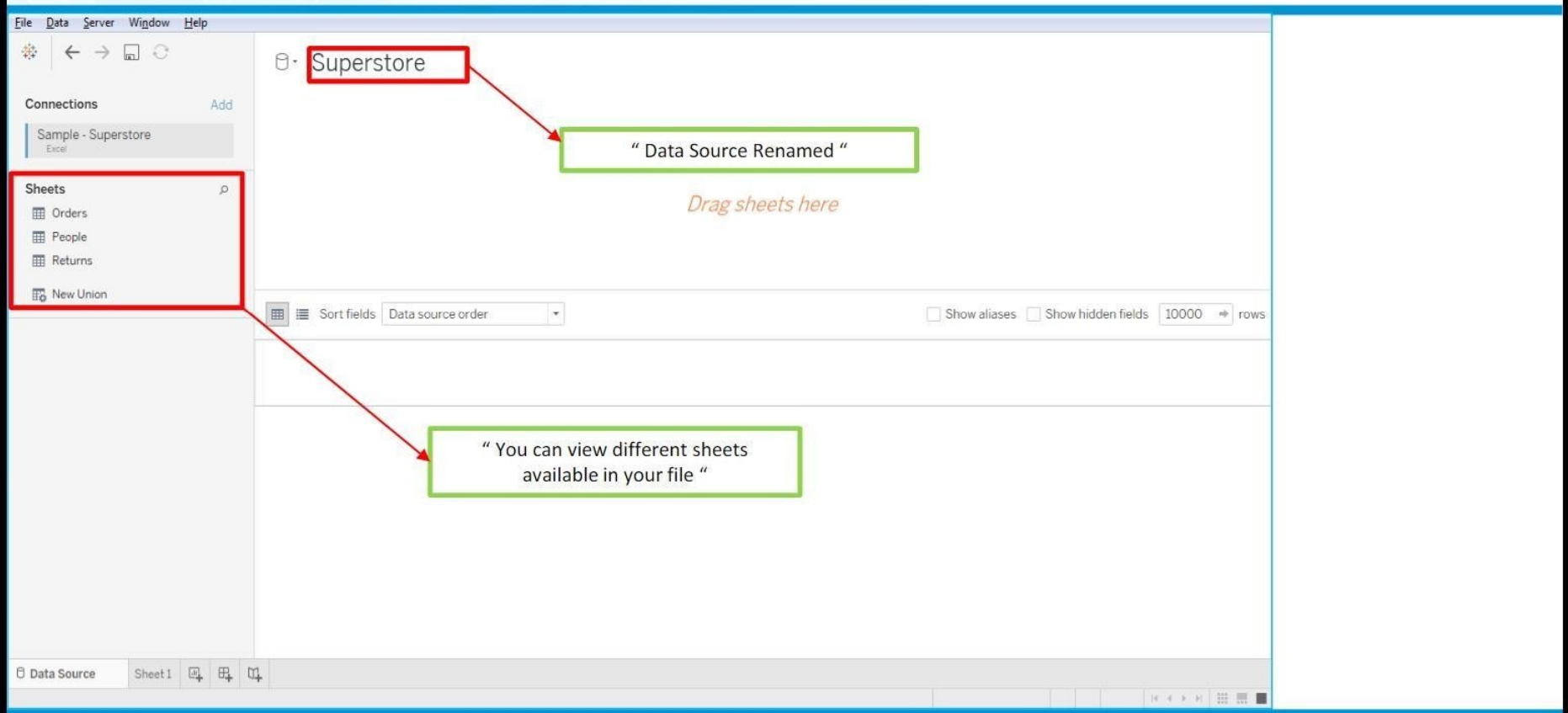
- Connect
  - To a File
    - Select Excel
      - Select File Name



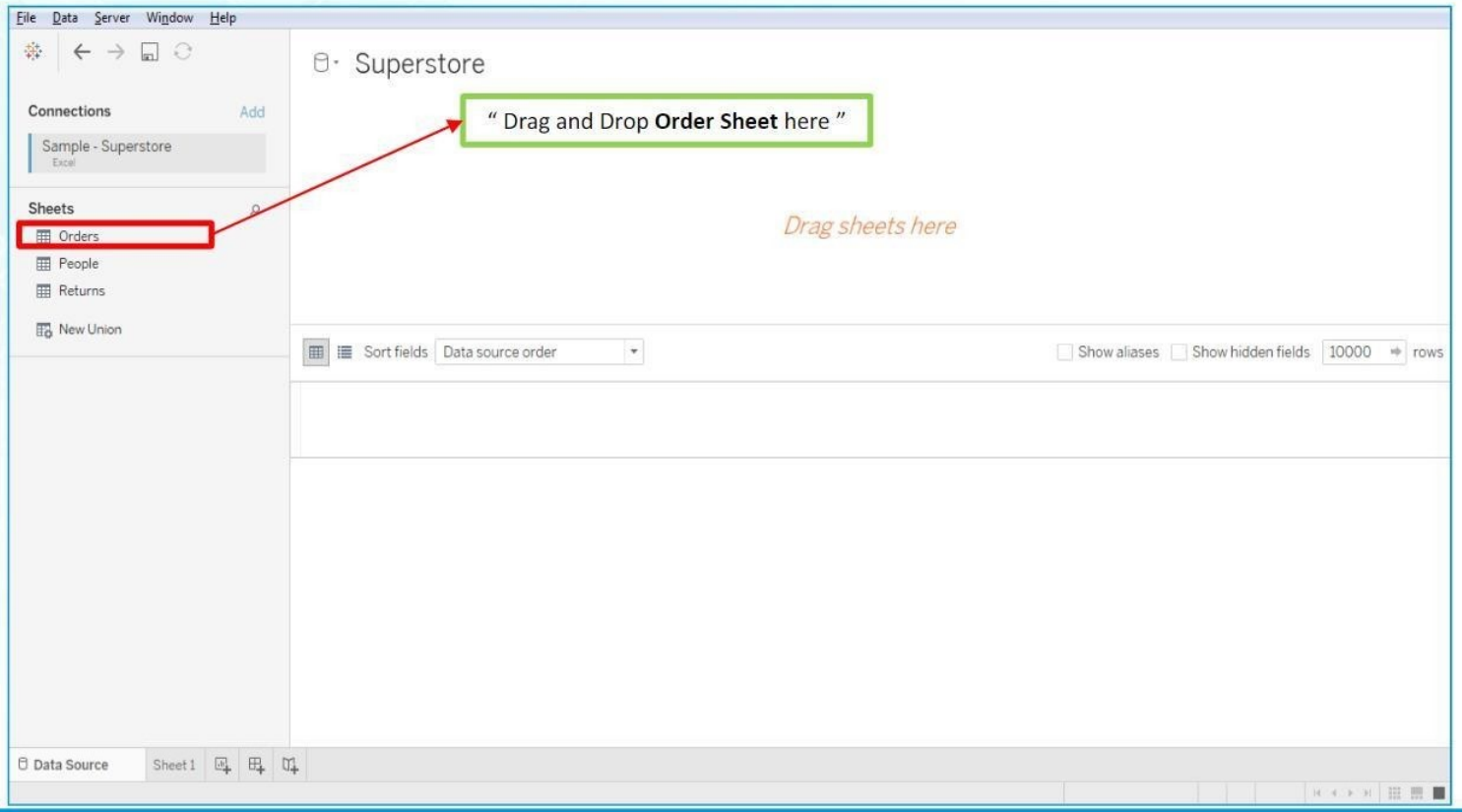
Connect To a File contd…



Connect To a File contd...



Connect To a File contd…



Connect To a File contd…

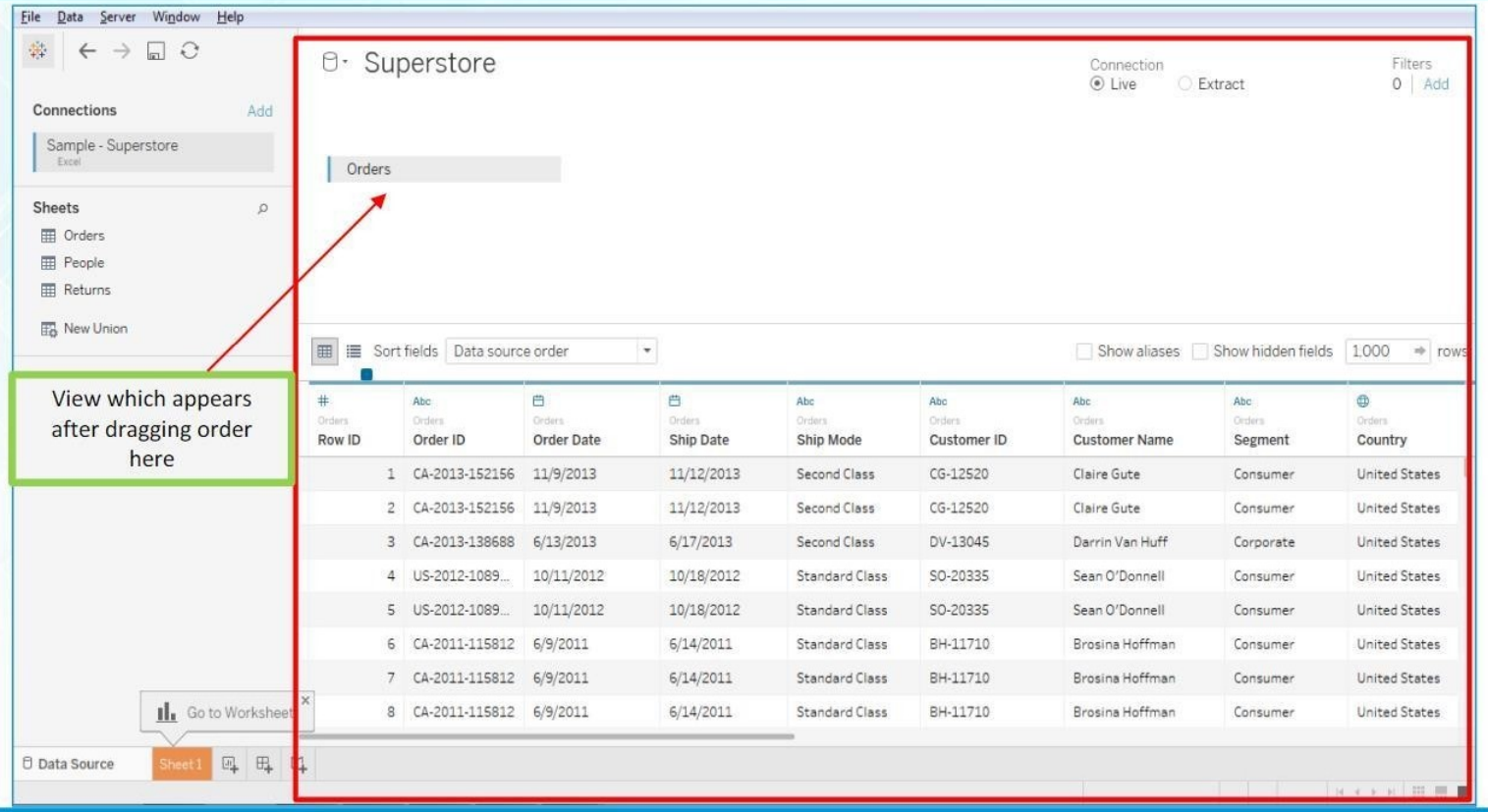
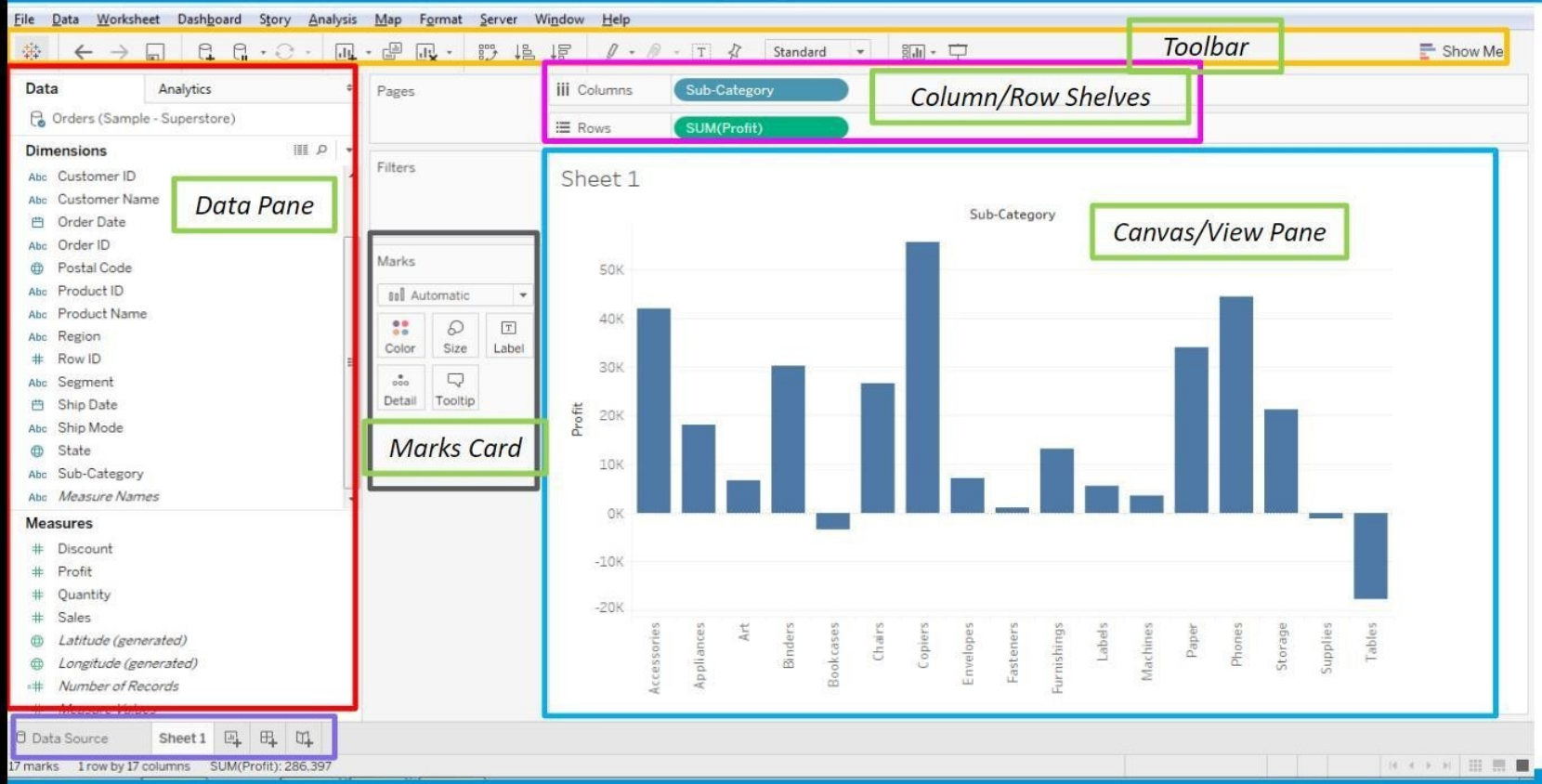
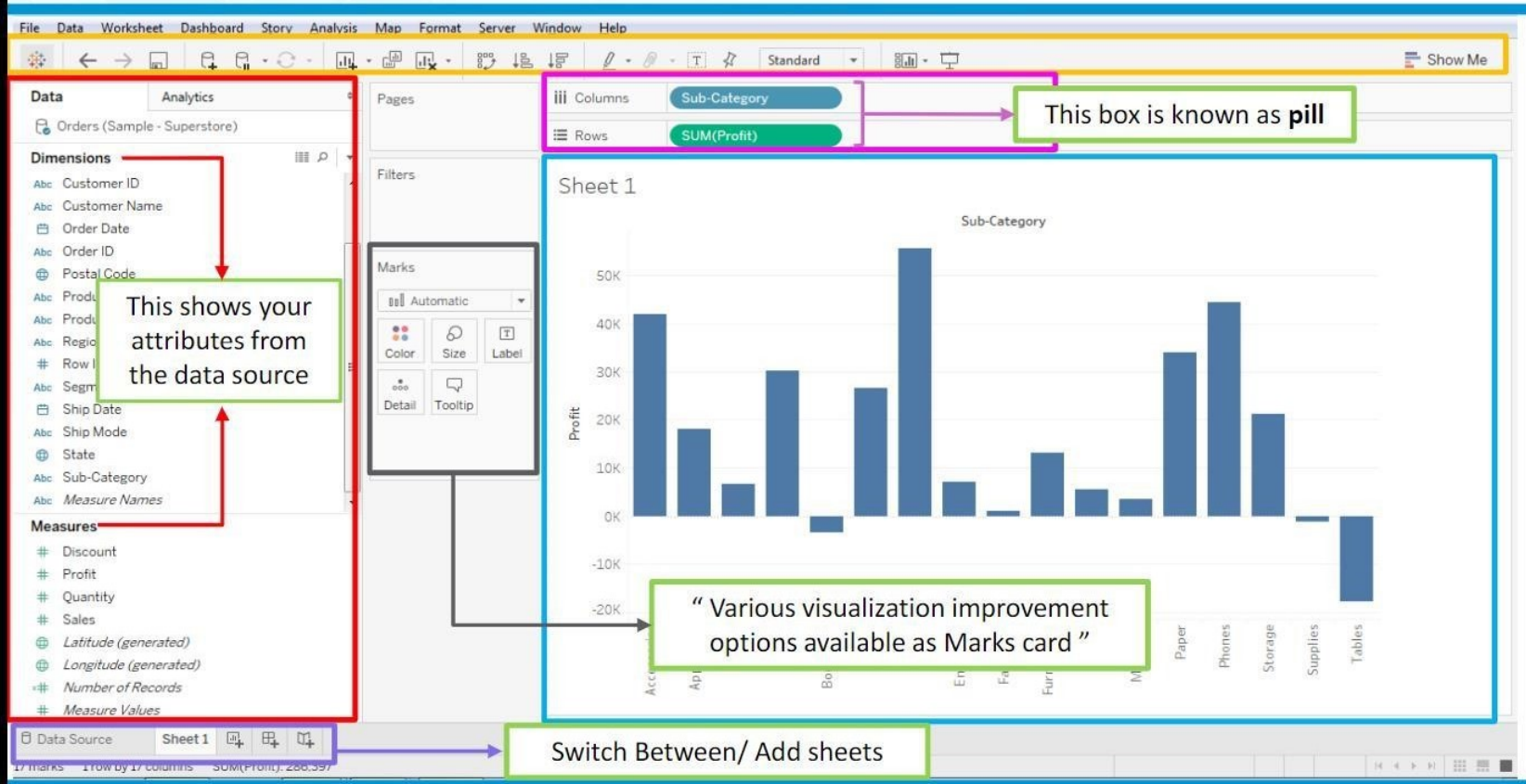


Tableau
UI Components

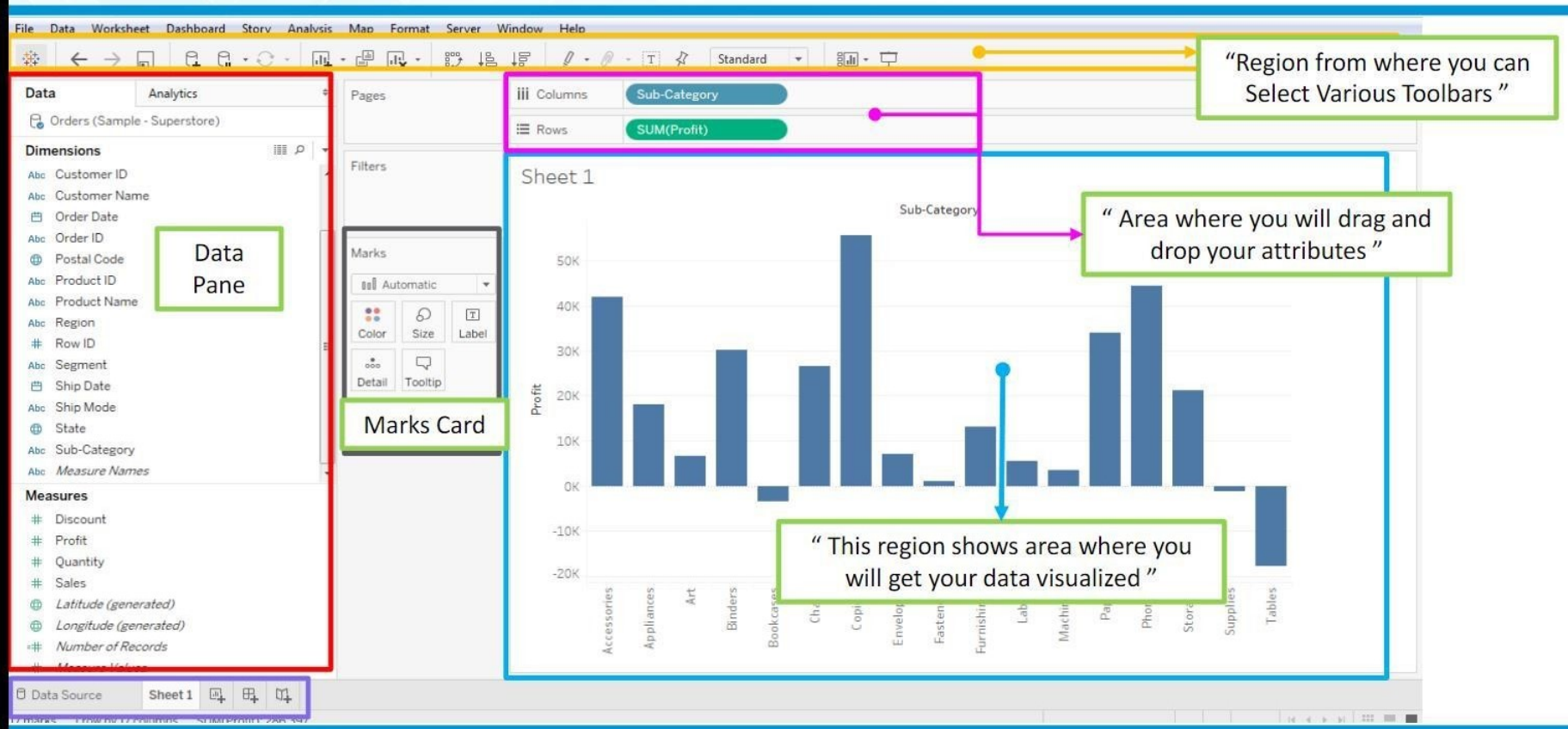
Tableau's UI


File Data Worksheet Dashboard Story Analysis Map Format Server Window Help
Standard
Show Me
Toolbar
Data
Analytics
Orders (Sample - Superstore)
Dimensions
Abc Customer ID
Abc Customer Name
Order Date
Abc Order ID
Postal Code
Abc Product ID
Abc Product Name
Abc Region
Row ID
Abc Segment
Ship Date
Abc Ship Mode
State
Abc Sub-Category
Abc Measure Names
Measures
Discount
Profit
Quantity
Sales
Latitude (generated)
Longitude (generated)
Number of Records
Data Pane
Pages
Filters
Marks
Automatic
Color
Size
Label
Detail
Tooltip
Marks Card
Columns
Sub-Category
Rows
SUM(Profit)
Column/Row Shelves
Sheet 1
Sub-Category
Canvas/View Pane
Profit
50K
40K
30K
20K
10K
0K
-10K
-20K
Accessories
Appliances
Art
Binders
Bookcases
Chairs
Copiers
Envelopes
Fasteners
Furnishings
Labels
Machines
Paper
Phones
Storage
Supplies
Tables
Data Source
Sheet 1
17 marks
1 row by 17 columns
SUM(Profit): 286,397

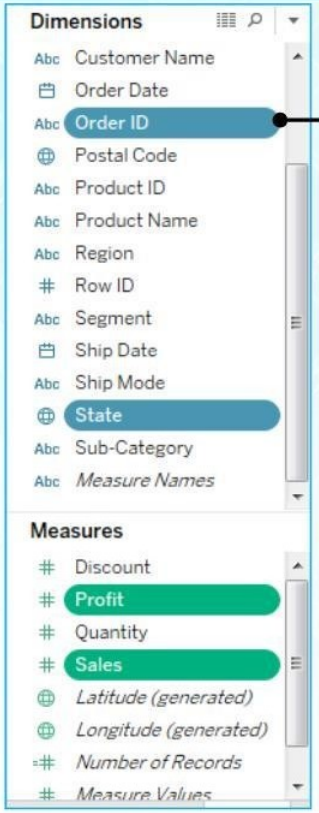
Tableau's UI contd…



Tableau's UI contd...



Tableau's UI – Show Me



Select fields in the **Data** pane that you want to analyze. Hold the Ctrl key to make multiple selections

Theory

Show Me smartly highlights view types (graphs) that work best with the field types (Attributes) in your data

Open Show Me by clicking Show Me on the toolbar 

Tableau – Data Type

Icon	Data type
Abc	Text (string) values
	Date values
	Date & Time values
#	Numerical values
T|F	Boolean values (relational only)
	Geographic values (used with maps)

Tableau – File Types

File Type	File Extension	Use
Tableau Workbook	.twb	It contains information on each sheet and dashboard that is present in a workbook
Tableau Packaged Workbook	.twbx	This file format contains the details of workbook as well as the local data that is used in the analysis. Its purpose is to be share with other Tableau desktop or Tableau reader
Tableau Data source	.tds	The details of the connection used to create the tableau report are stored in this file. In the connection details it stores the source type(excel/relational/sap etc.) as well as the data types of the columns

Understanding MetaData

Real Data

(Earth)
Physical Appearance of earth

Meta Data

(political globe with information about earth)

Latitudes, Longitudes, States-Name, Ocean Name

MetaData Contd…

Meta Data

- Name of the Book
- Author of the Book
- Publisher of the Book
- Price of the Book
- ISBN
- Page numbers

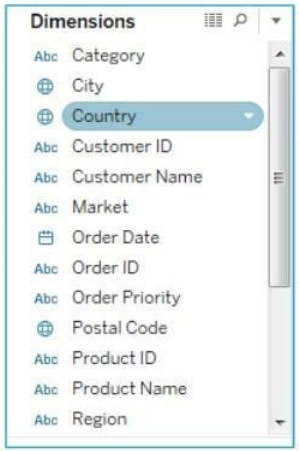
Data and MetaData in Tableau

Orders

Real Data

Sort fields | Data source order | Show aliases

Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name
32298	CA-2012-124891	7/31/2012	7/31/2012	Same Day	RH-19495	Rick Hansen
26341	IN-2013-77878	2/5/2013	2/7/2013	Second Class	JR-16210	Justin Ritter
25330	IN-2013-71249	10/17/2013	10/18/2013	First Class	CR-12730	Craig Reiter
13524	ES-2013-15793...	1/28/2013	1/30/2013	First Class	KM-16375	Katherine Murray
47221	SG-2013-4320	11/5/2013	11/6/2013	Same Day	RH-9495	Rick Hansen
22732	IN-2013-42360	6/28/2013	7/1/2013	Second Class	JM-15655	Jim Mitchum
30570	IN-2011-81826	11/7/2011	11/9/2011	First Class	TS-21340	Toby Swindell
31192	IN-2012-86369	4/14/2012	4/18/2012	Standard Class	MB-18085	Mick Brown



Metadata in Tableau

What is Visual Analytics?

Visual analytics is an interactive graphical display of data which is used to generate analytical results and insights.

Why use Visual Analytics ?

Aggregating and Disaggregating Data

Data Aggregation

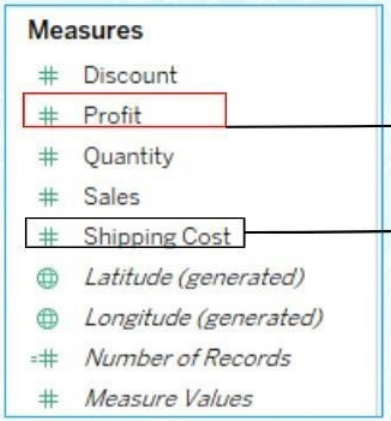
Information is gathered and expressed in a summary form. Generally used for statistical analytics

Ex: Cluster

Data Disaggregation

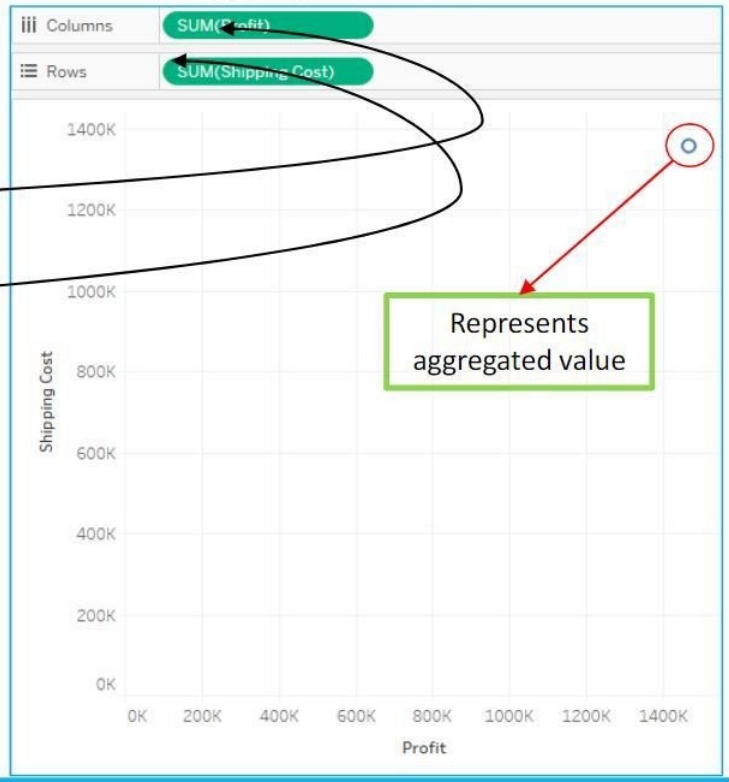
Disaggregate means to separate (an aggregate or mass) into its component parts

Aggregating Data in Tableau

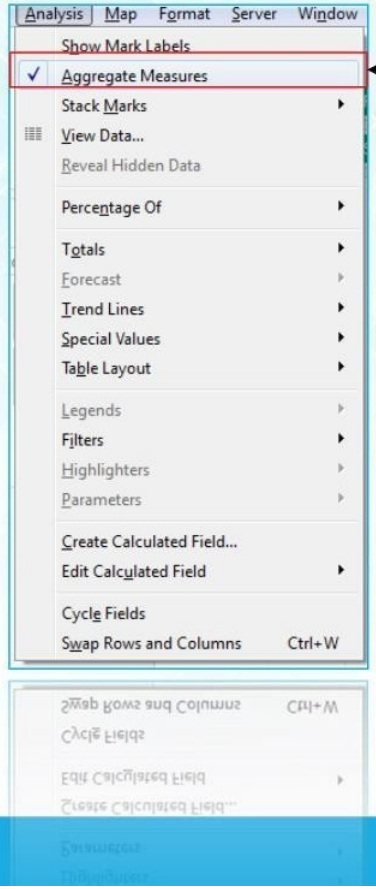


On selecting two measures for the analysis data aggregation is done by default

Aggregated Result

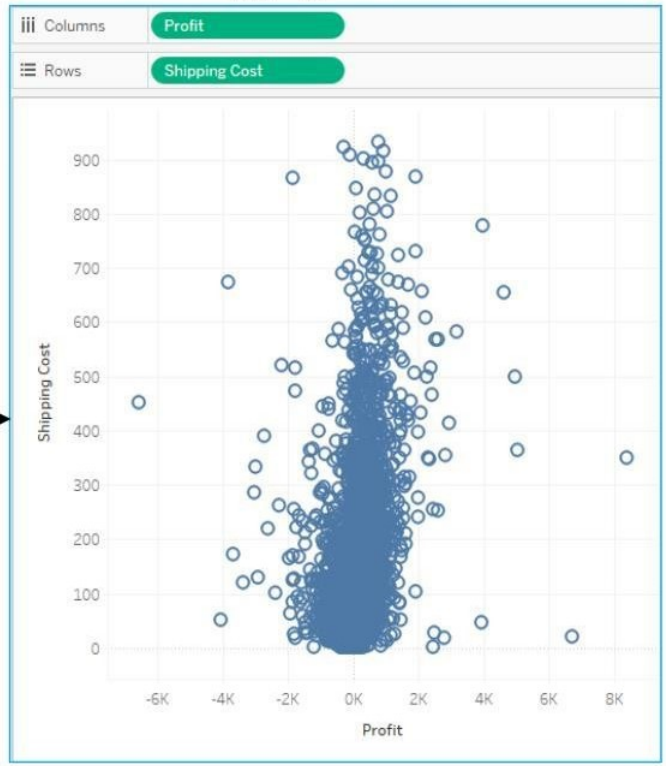


Disaggregating Data



Uncheck the Aggregated Measures to view Disaggregated Result

Disaggregated Result



Data Granularity

Using Marks Card

Data Granularity

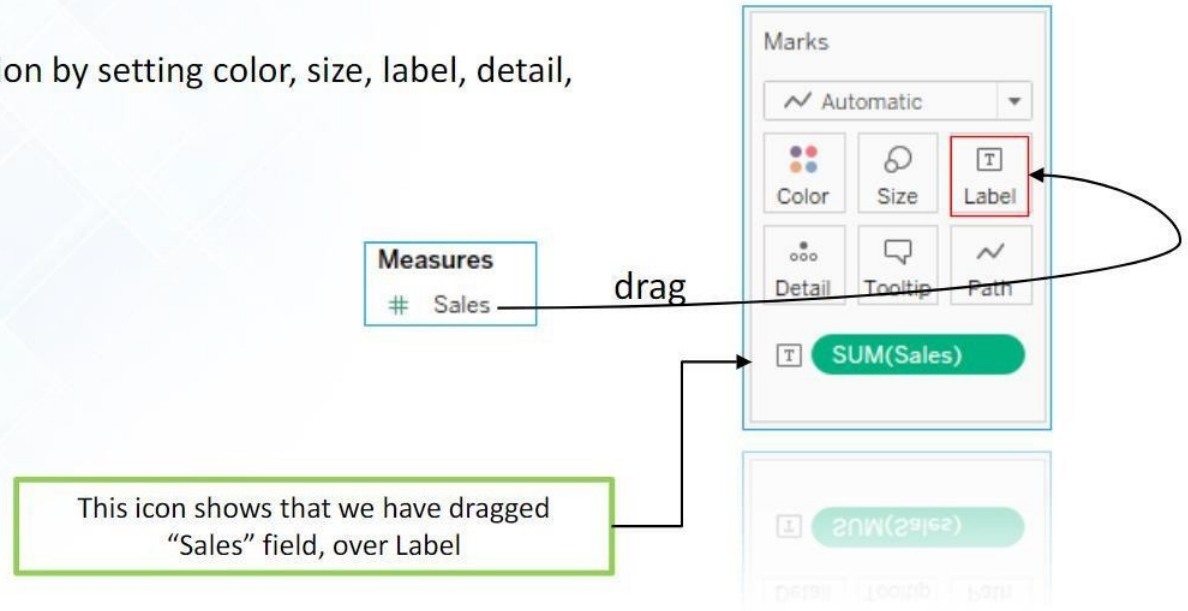
- **Granularity** is the level of depth represented by the data, in a fact or dimension table

  - **High granularity** means a detailed view of data and transactions
  - **Low granularity** zooms out into a summary view of data and transactions

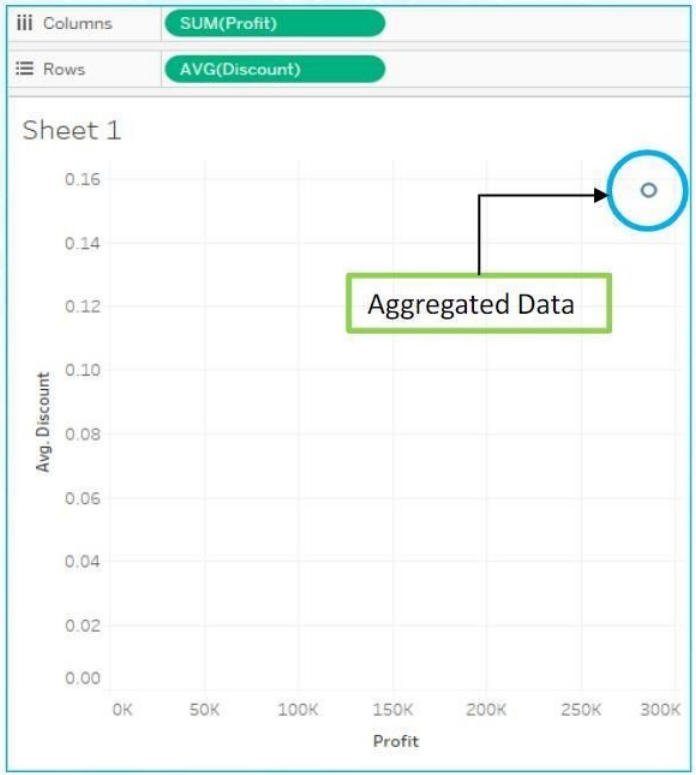
- In Tableau, Measures, are automatically aggregated to the granularity of the view

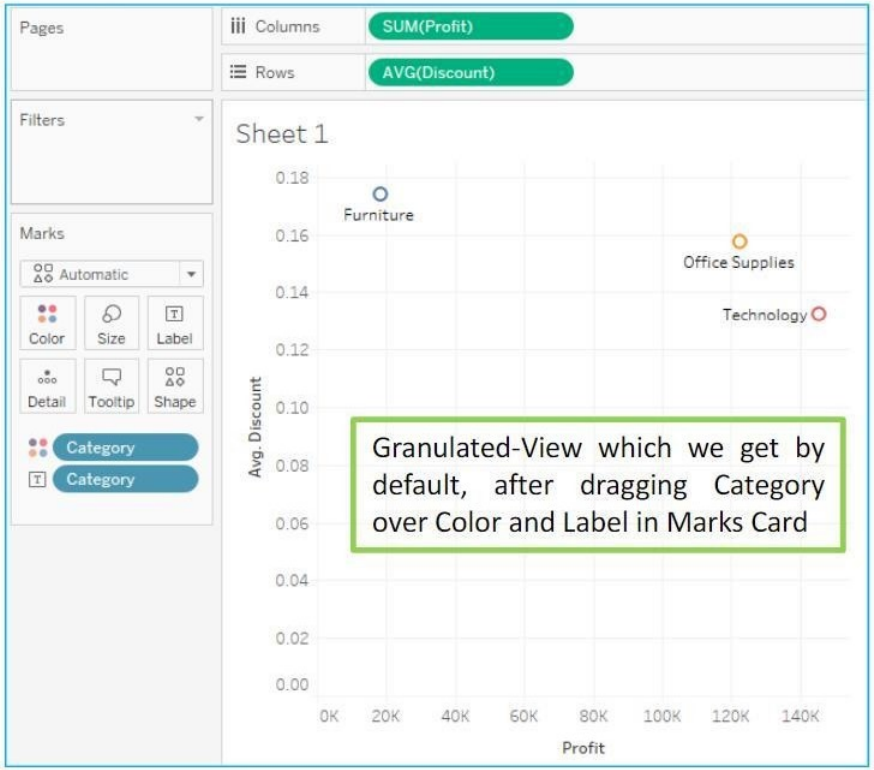
Marks Card in Tableau

- It is a region in Tableau where you can drag your fields to set mark properties
- It helps you in enhancing visualization by setting color, size, label, detail, path or shapes

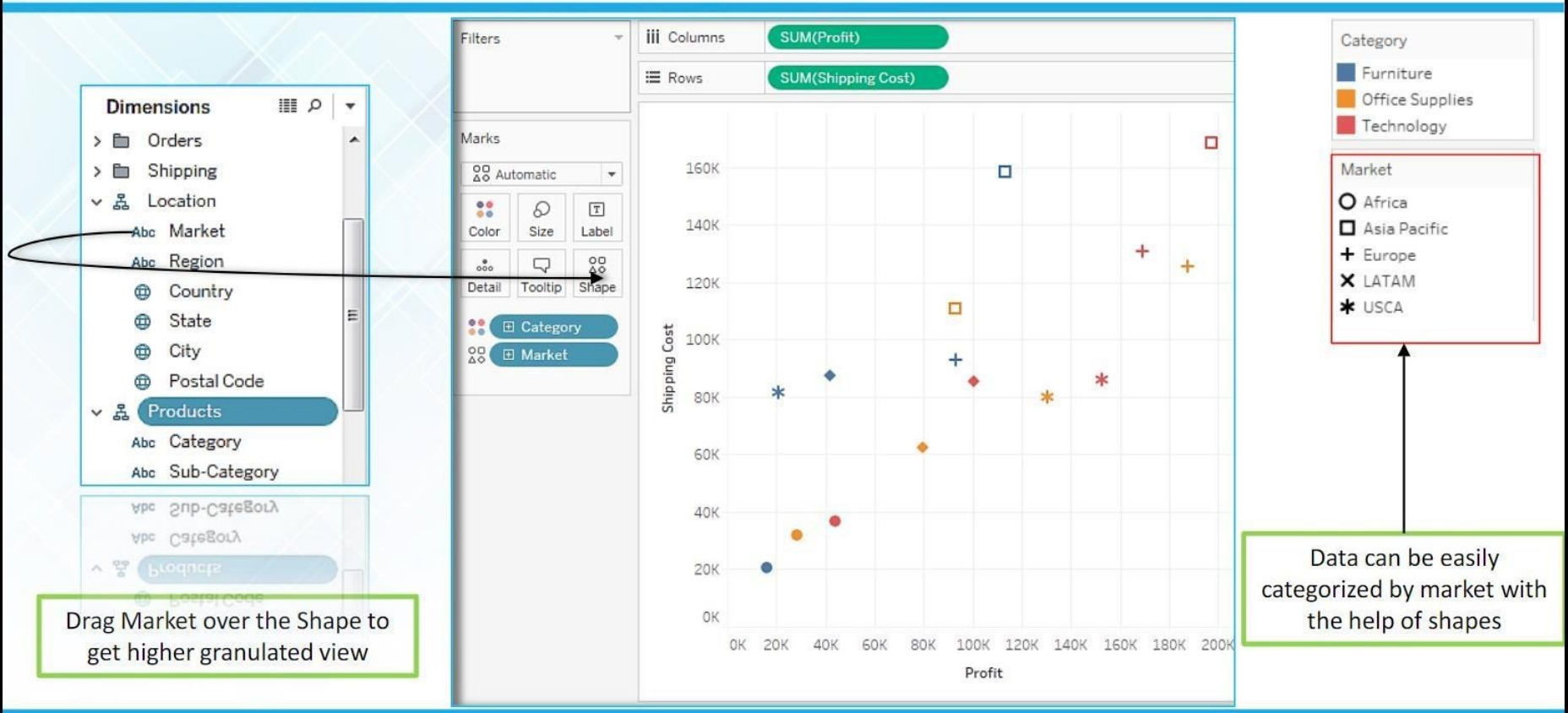


Data Granularity in Tableau





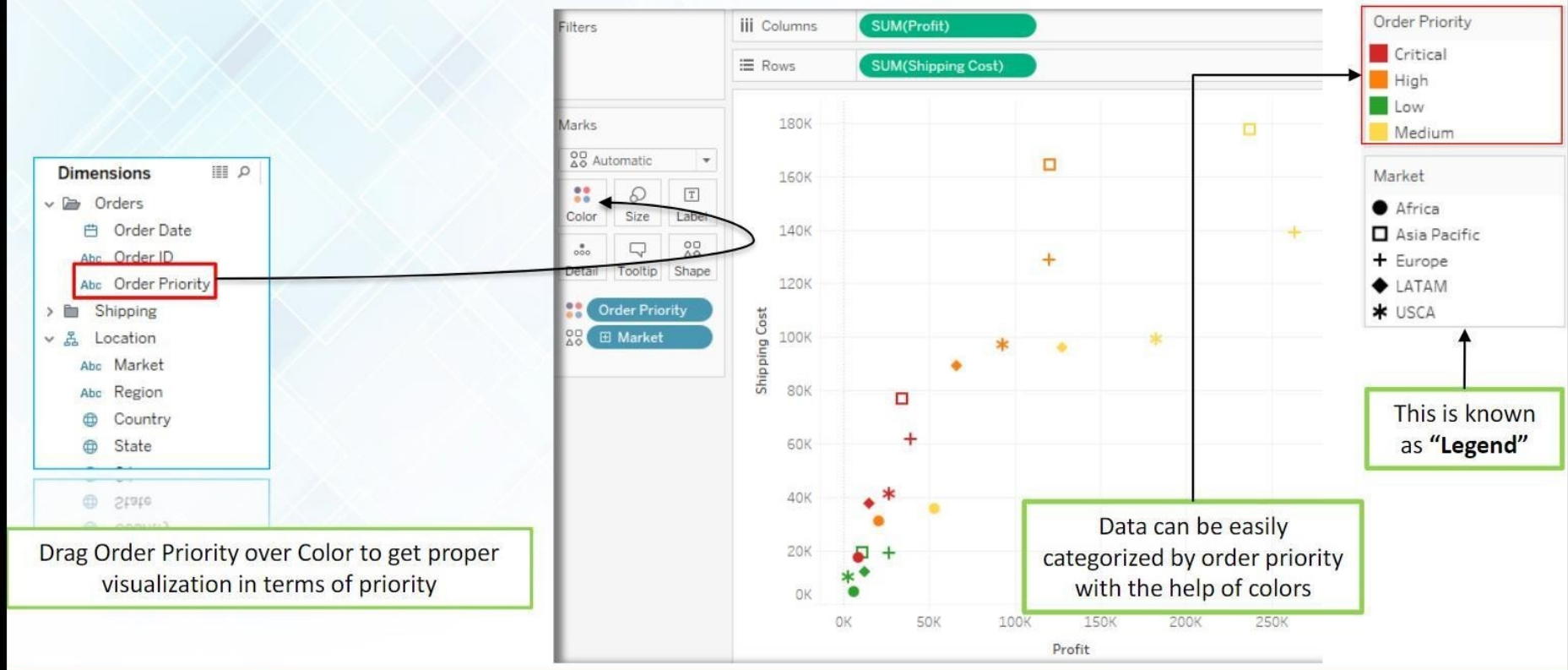
Data Granularity in Tableau - Shapes



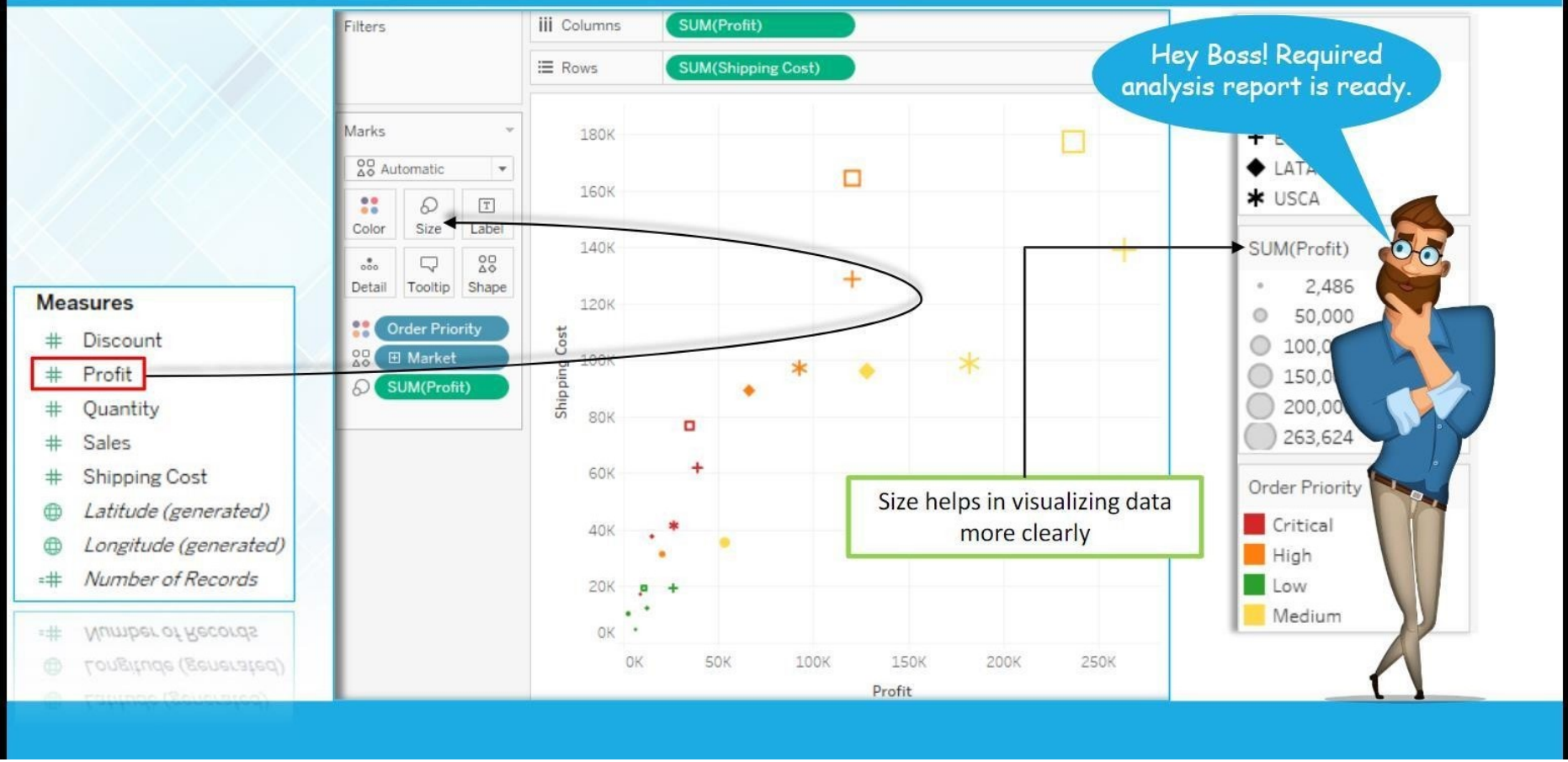
Drag Market over the Shape to get higher granulated view

Data can be easily categorized by market with the help of shapes

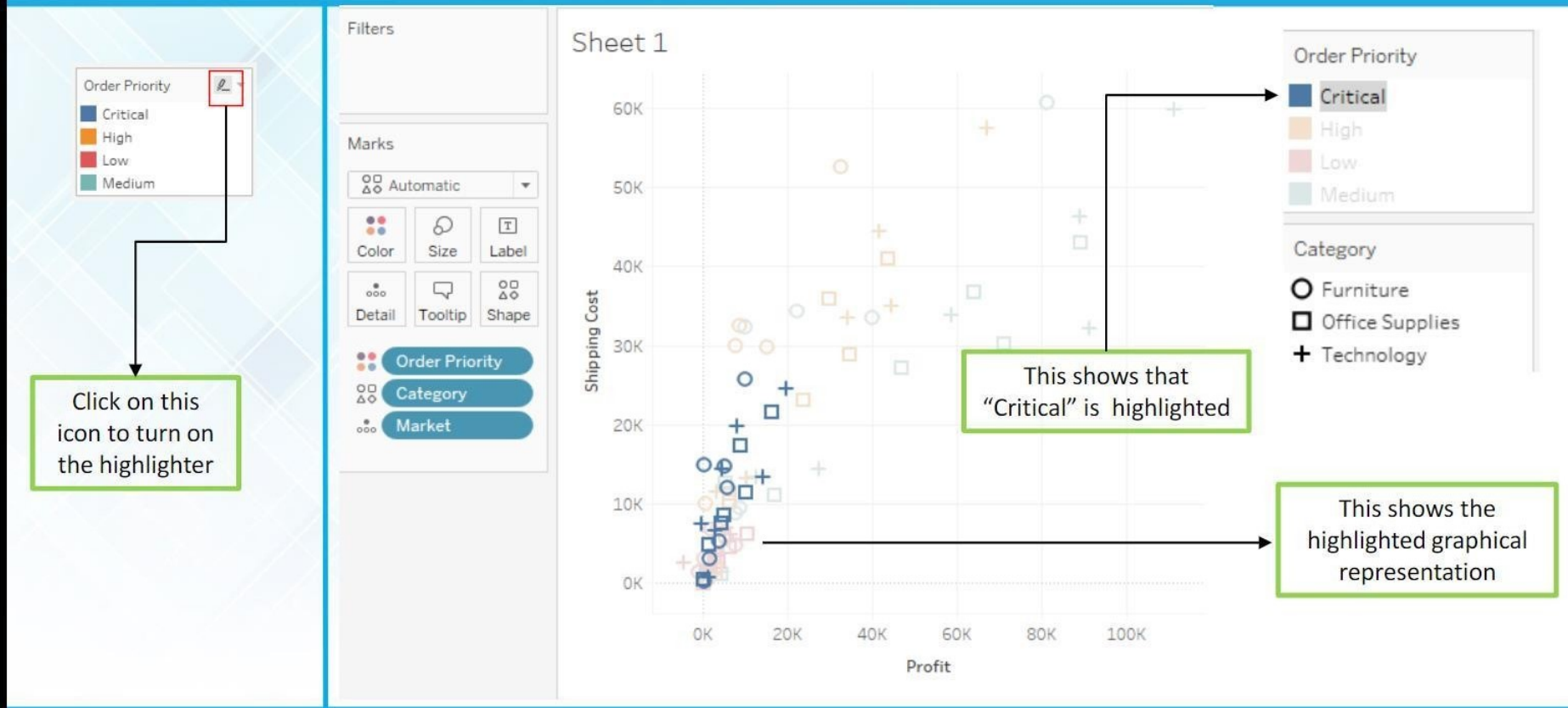
Data Granularity in Tableau - Colors



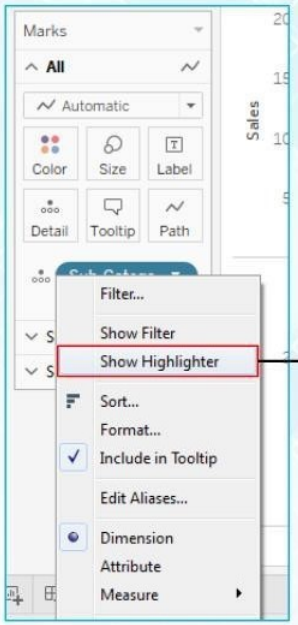
Data Granularity in Tableau - Size

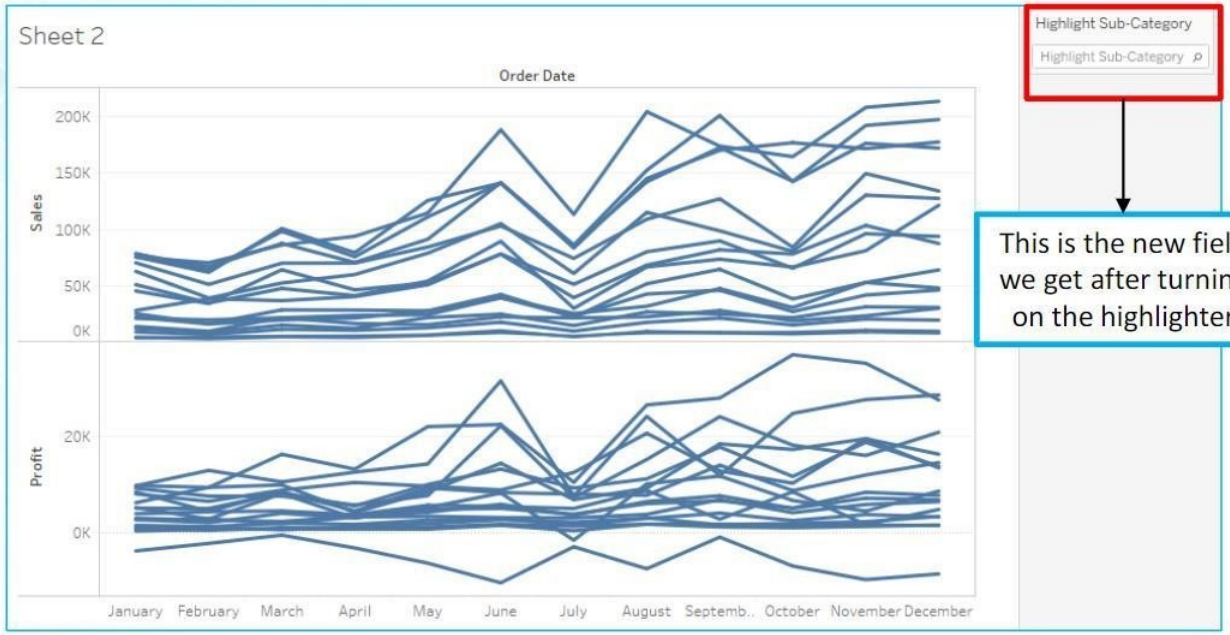


Highlighting – using legend



Highlighting Solution

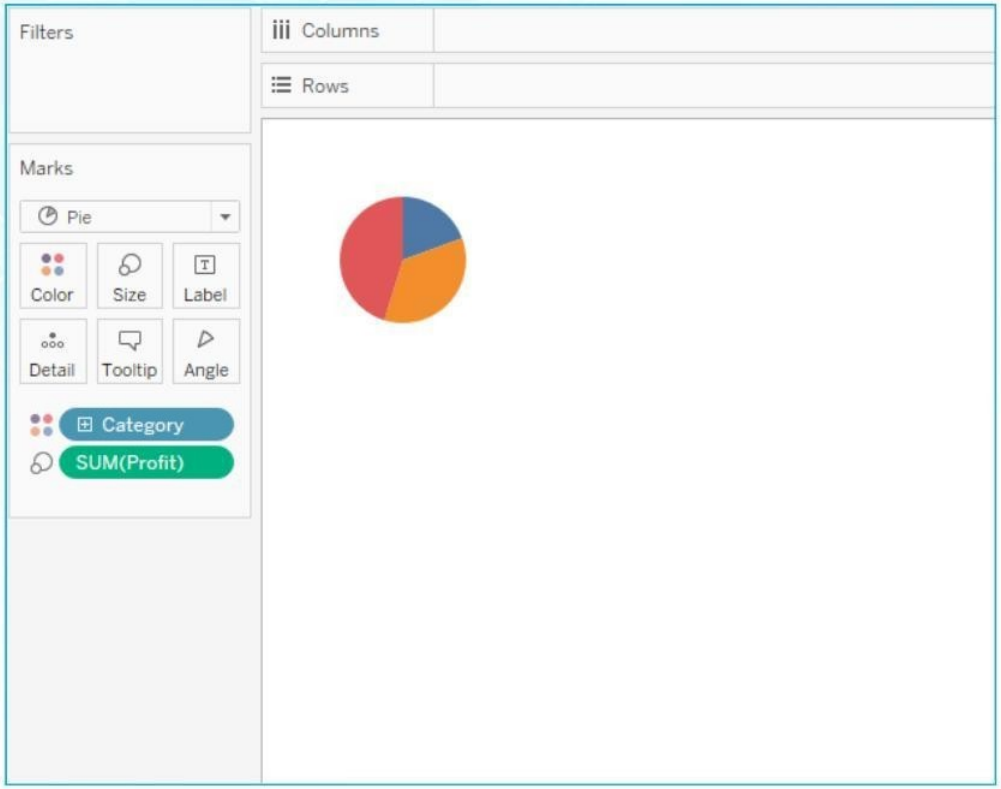




This is the new field we get after turning on the highlighter

Click the option to turn on the Highlighter

Pie Chart



Pie charts are best to use when you are trying to compare parts of a whole

Pie Chart do not show changes over time.

Representing negative value is one of its drawback

Business Problem

Operations you can do with

1. Take data from multiple sources
2. Clean the data
3. Transform data
4. Create new calculations

Business Problem:

It's the end of tough year and somehow business manage to earn some profit. Mar
that as it was a tough year so the bonus will be based on the performance of the e
the slab of Bonus based on the performance. (Performance is based on total sales i

Sales	%Bonus
$5001+	30%
$2000 – $5000	20%
Less than $2000	10%

Business Problem

Business Problem:

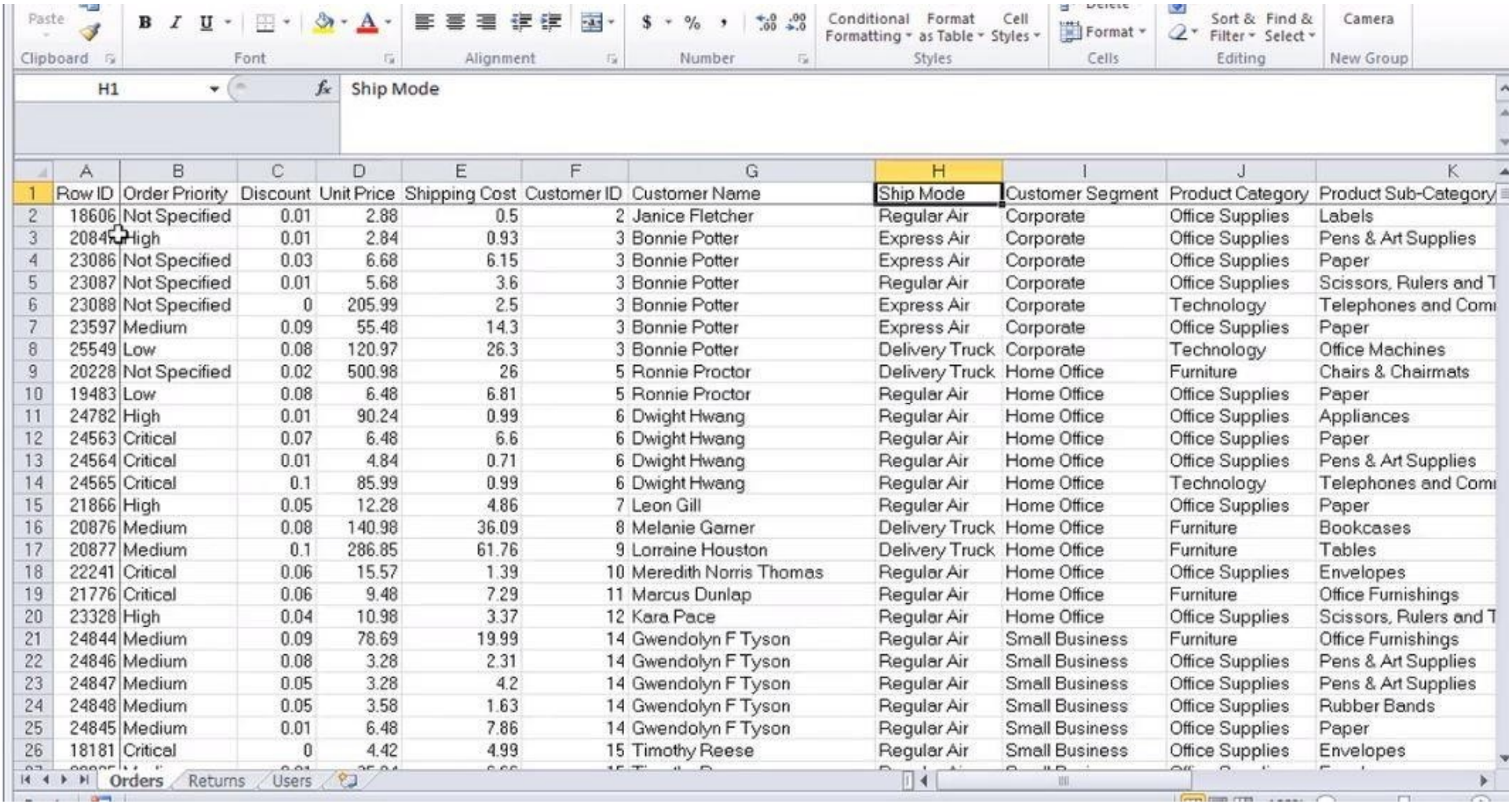
One of the retail chains in USA looking to implement Tableau as its business intellig
However, they have following requirements which they want to know if that is pos
Tableau.

The requirements are as follows:

1. Business looking for a quick reporting solution and as per them their data will g
   basis but that refresh will happen after 15 hours after the previous load. Now t
   that they does not want to have the connection with the live data and they wa
   which can be used while reporting.

2. One of the requirements is they need to filter the data at the very start so that
   different reports for different types of user, lets say if you are a manager of Eas

Business Problem
Show Profitability by Region

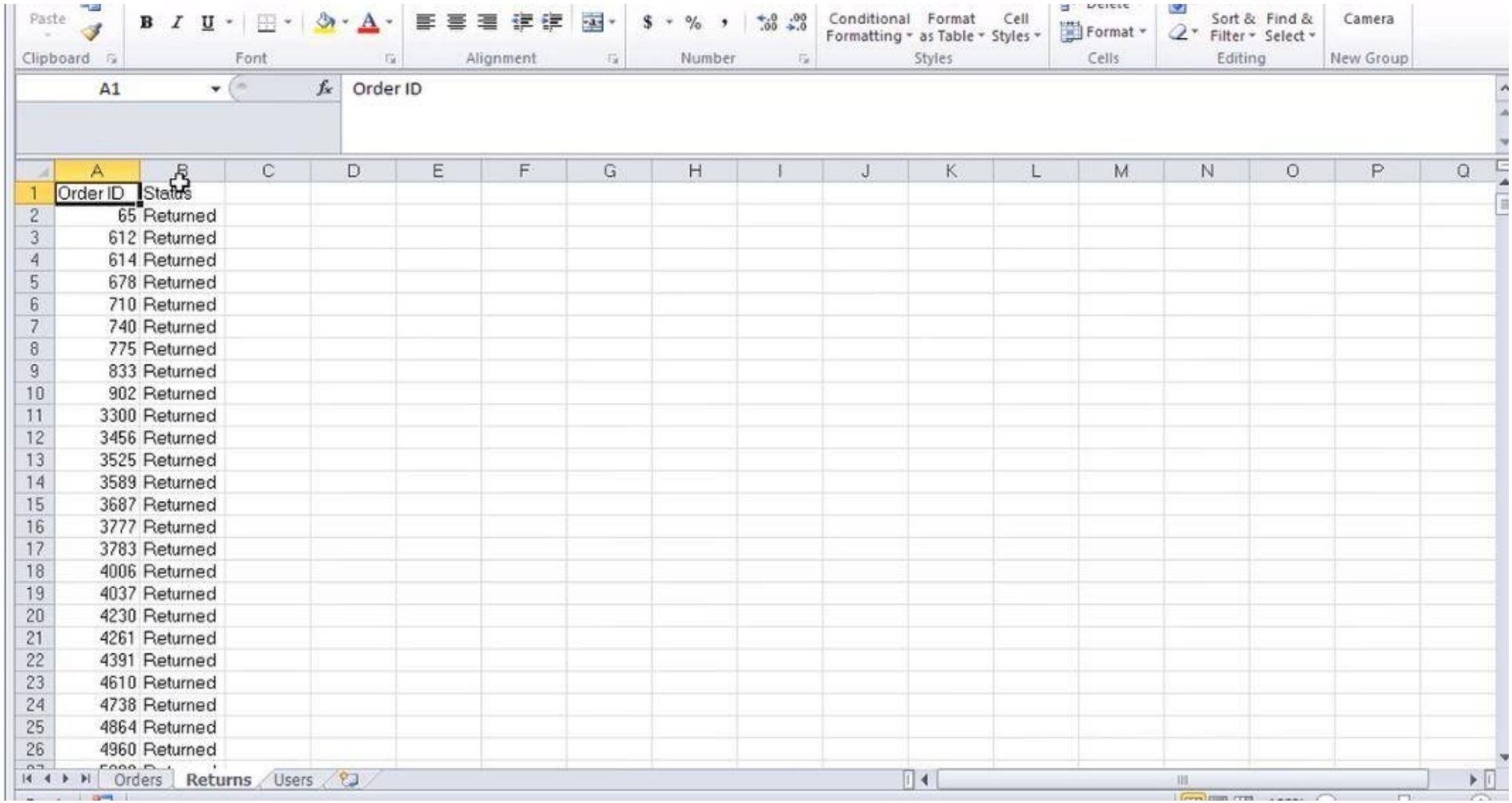


Paste | Clipboard | Font | Alignment | Number | Conditional Formatting | Format as Table | Cell Styles | Format | Sort & Filter | Find & Select | Camera | New Group

H1 | Ship Mode

	A	B	C	D	E	F	G	H	I	J	K
1	Row ID	Order Priority	Discount	Unit Price	Shipping Cost	Customer ID	Customer Name	Ship Mode	Customer Segment	Product Category	Product Sub-Category
2	18606	Not Specified	0.01	2.88	0.5	2	Janice Fletcher	Regular Air	Corporate	Office Supplies	Labels
3	2084	High	0.01	2.84	0.93	3	Bonnie Potter	Express Air	Corporate	Office Supplies	Pens & Art Supplies
4	23086	Not Specified	0.03	6.68	6.15	3	Bonnie Potter	Express Air	Corporate	Office Supplies	Paper
5	23087	Not Specified	0.01	5.68	3.6	3	Bonnie Potter	Regular Air	Corporate	Office Supplies	Scissors, Rulers and T
6	23088	Not Specified	0	205.99	2.5	3	Bonnie Potter	Express Air	Corporate	Technology	Telephones and Comi
7	23597	Medium	0.09	55.48	14.3	3	Bonnie Potter	Express Air	Corporate	Office Supplies	Paper
8	25549	Low	0.08	120.97	26.3	3	Bonnie Potter	Delivery Truck	Corporate	Technology	Office Machines
9	20228	Not Specified	0.02	500.98	26	5	Ronnie Proctor	Delivery Truck	Home Office	Furniture	Chairs & Chairmats
10	19483	Low	0.08	6.48	6.81	5	Ronnie Proctor	Regular Air	Home Office	Office Supplies	Paper
11	24782	High	0.01	90.24	0.99	6	Dwight Hwang	Regular Air	Home Office	Office Supplies	Appliances
12	24563	Critical	0.07	6.48	6.6	6	Dwight Hwang	Regular Air	Home Office	Office Supplies	Paper
13	24564	Critical	0.01	4.84	0.71	6	Dwight Hwang	Regular Air	Home Office	Office Supplies	Pens & Art Supplies
14	24565	Critical	0.1	85.99	0.99	6	Dwight Hwang	Regular Air	Home Office	Technology	Telephones and Comi
15	21866	High	0.05	12.28	4.86	7	Leon Gill	Regular Air	Home Office	Office Supplies	Paper
16	20876	Medium	0.08	140.98	36.09	8	Melanie Garner	Delivery Truck	Home Office	Furniture	Bookcases
17	20877	Medium	0.1	286.85	61.76	9	Lorraine Houston	Delivery Truck	Home Office	Furniture	Tables
18	22241	Critical	0.06	15.57	1.39	10	Meredith Norris Thomas	Regular Air	Home Office	Office Supplies	Envelopes
19	21776	Critical	0.06	9.48	7.29	11	Marcus Dunlap	Regular Air	Home Office	Furniture	Office Furnishings
20	23328	High	0.04	10.98	3.37	12	Kara Pace	Regular Air	Home Office	Office Supplies	Scissors, Rulers and T
21	24844	Medium	0.09	78.69	19.99	14	Gwendolyn F Tyson	Regular Air	Small Business	Furniture	Office Furnishings
22	24846	Medium	0.08	3.28	2.31	14	Gwendolyn F Tyson	Regular Air	Small Business	Office Supplies	Pens & Art Supplies
23	24847	Medium	0.05	3.28	4.2	14	Gwendolyn F Tyson	Regular Air	Small Business	Office Supplies	Pens & Art Supplies
24	24848	Medium	0.05	3.58	1.63	14	Gwendolyn F Tyson	Regular Air	Small Business	Office Supplies	Rubber Bands
25	24845	Medium	0.01	6.48	7.86	14	Gwendolyn F Tyson	Regular Air	Small Business	Office Supplies	Paper
26	18181	Critical	0	4.42	4.99	15	Timothy Reese	Regular Air	Small Business	Office Supplies	Envelopes

Orders | Returns | Users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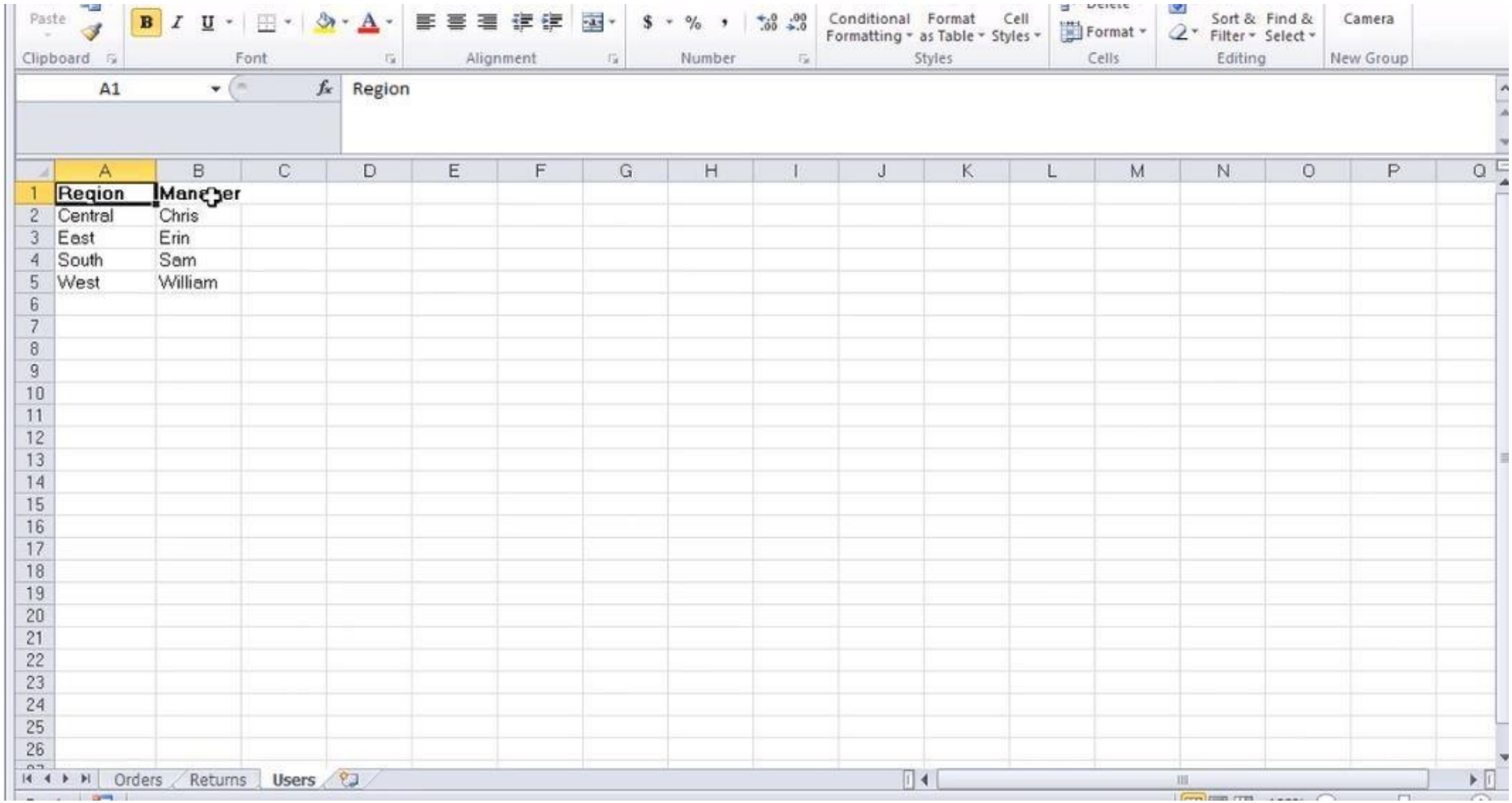
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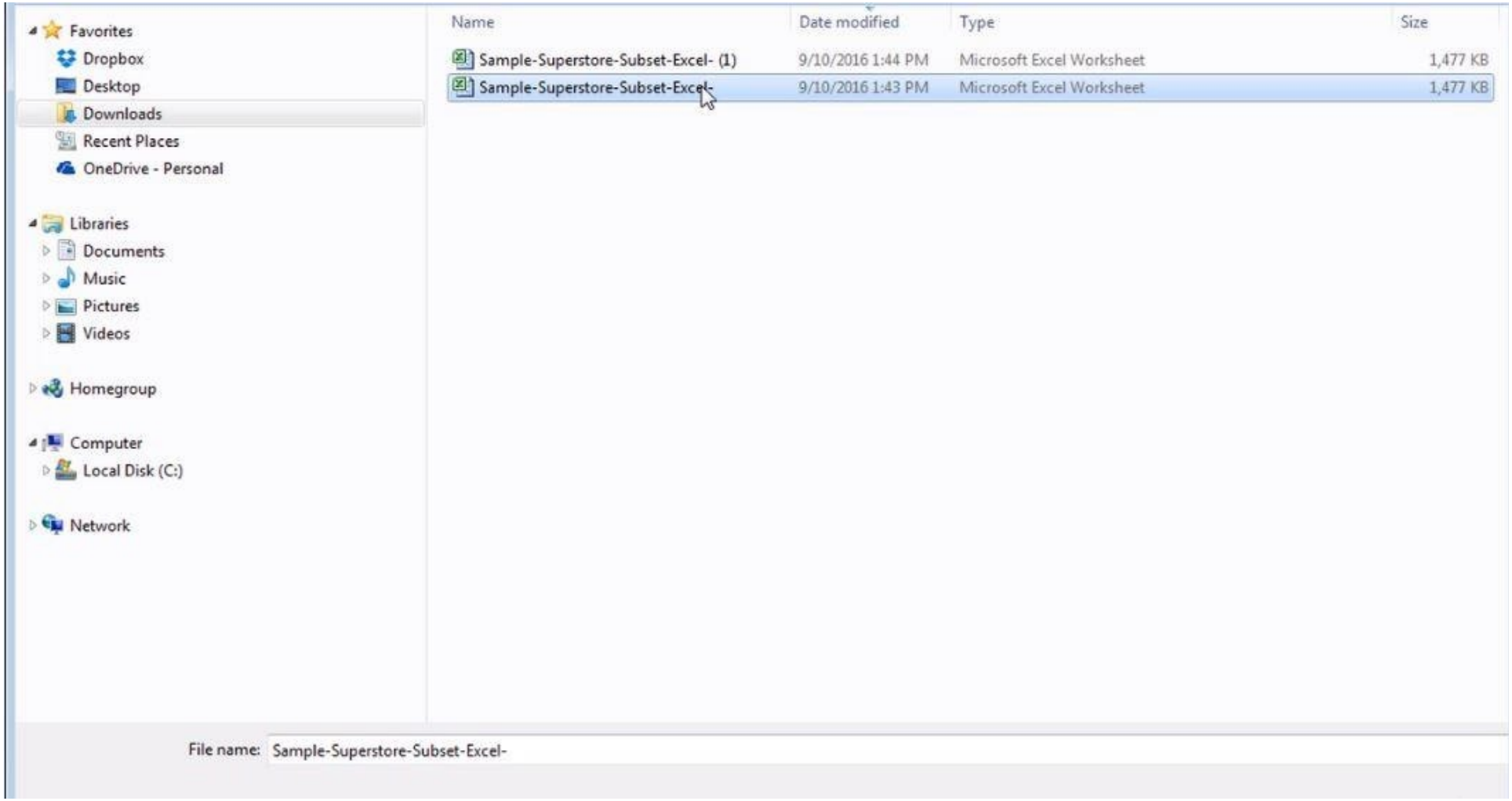
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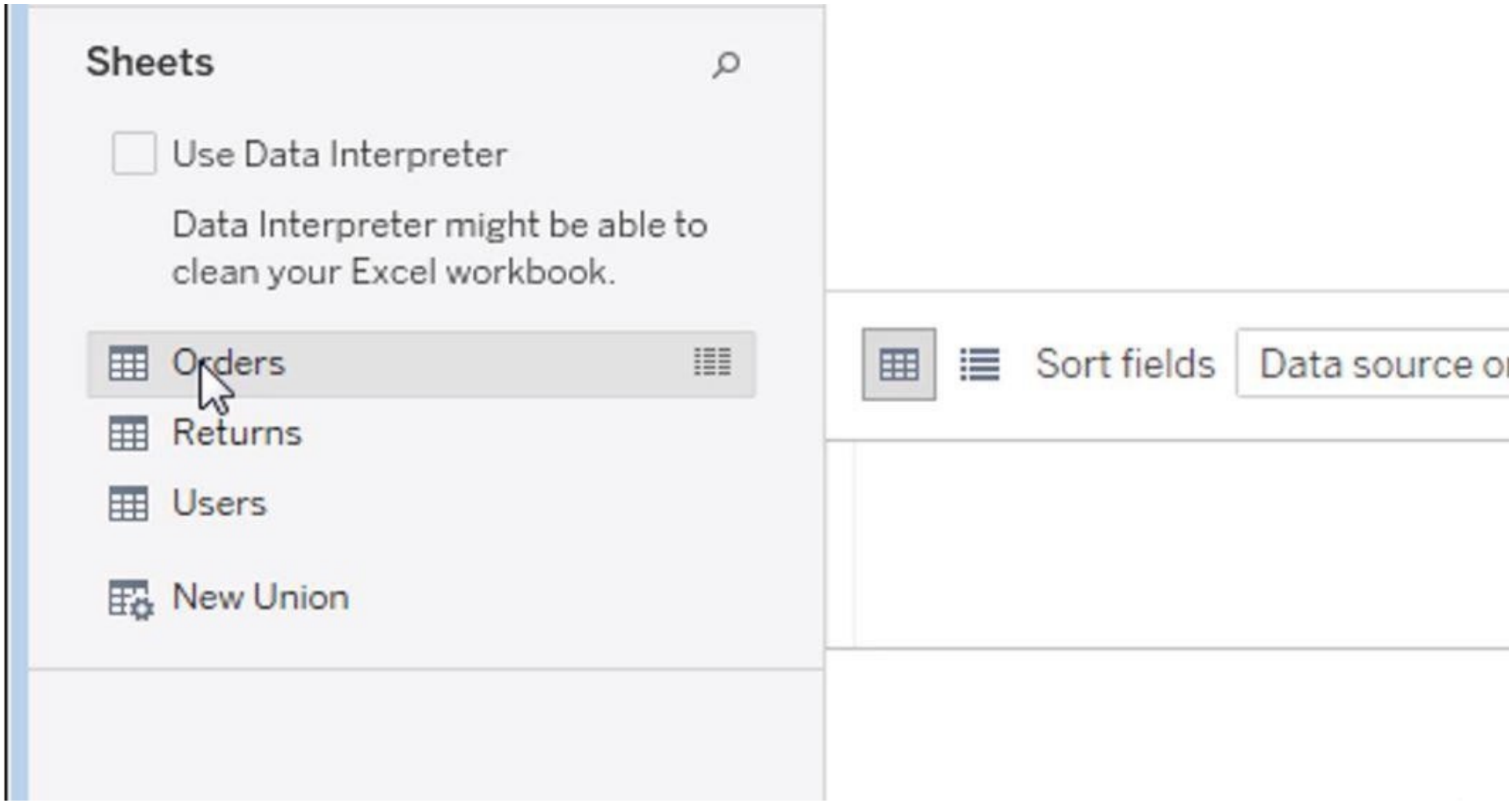
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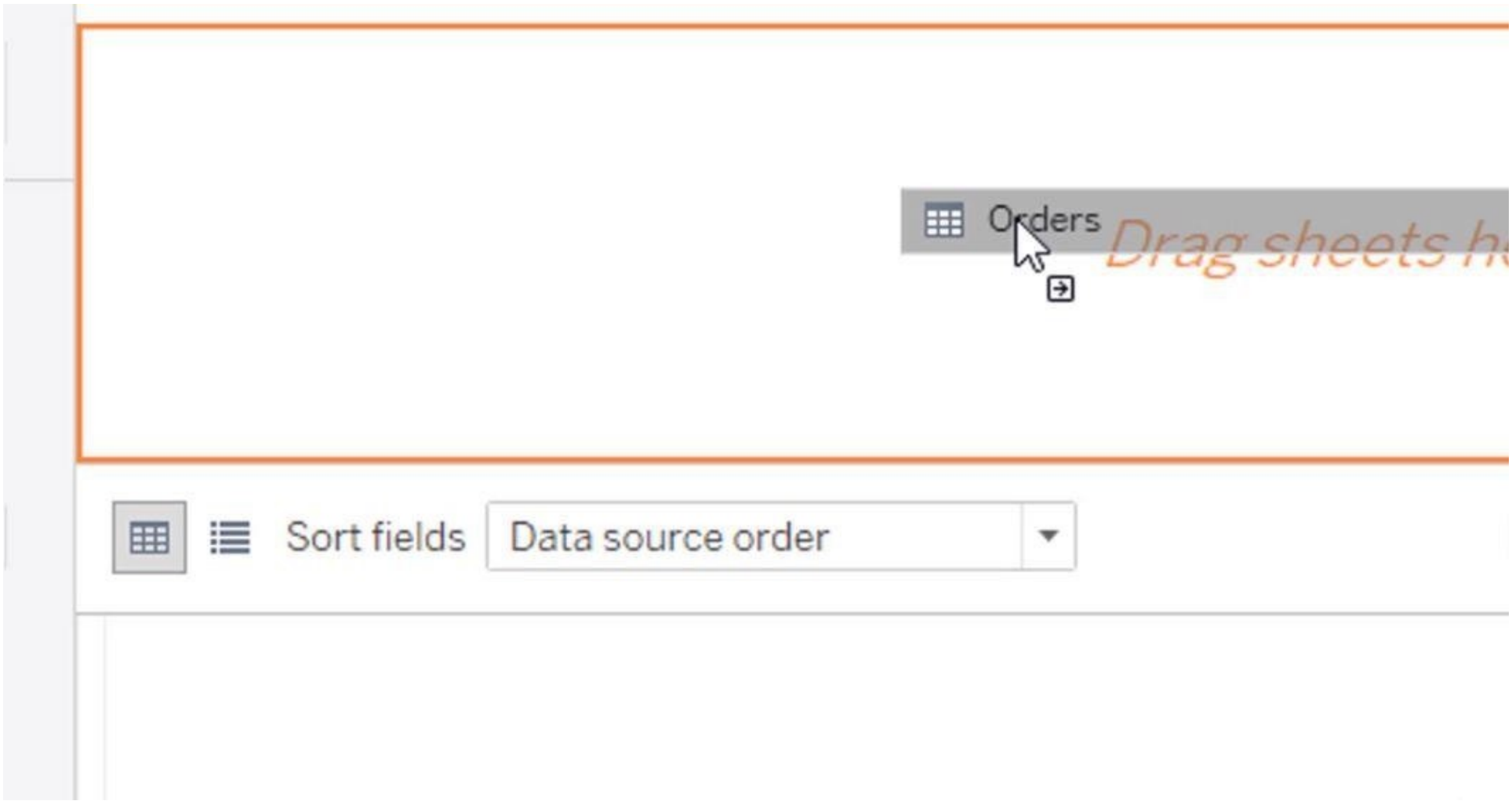
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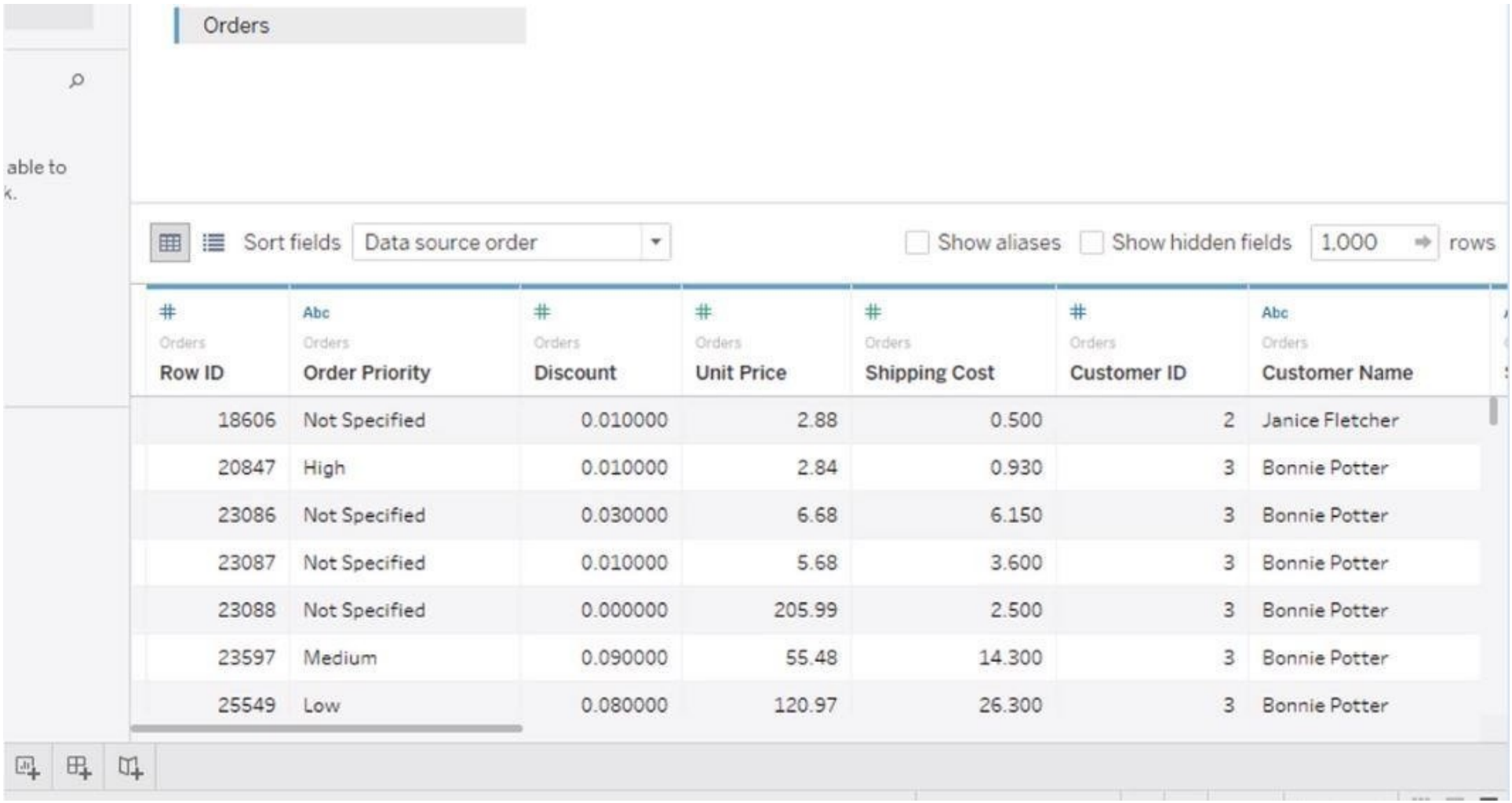

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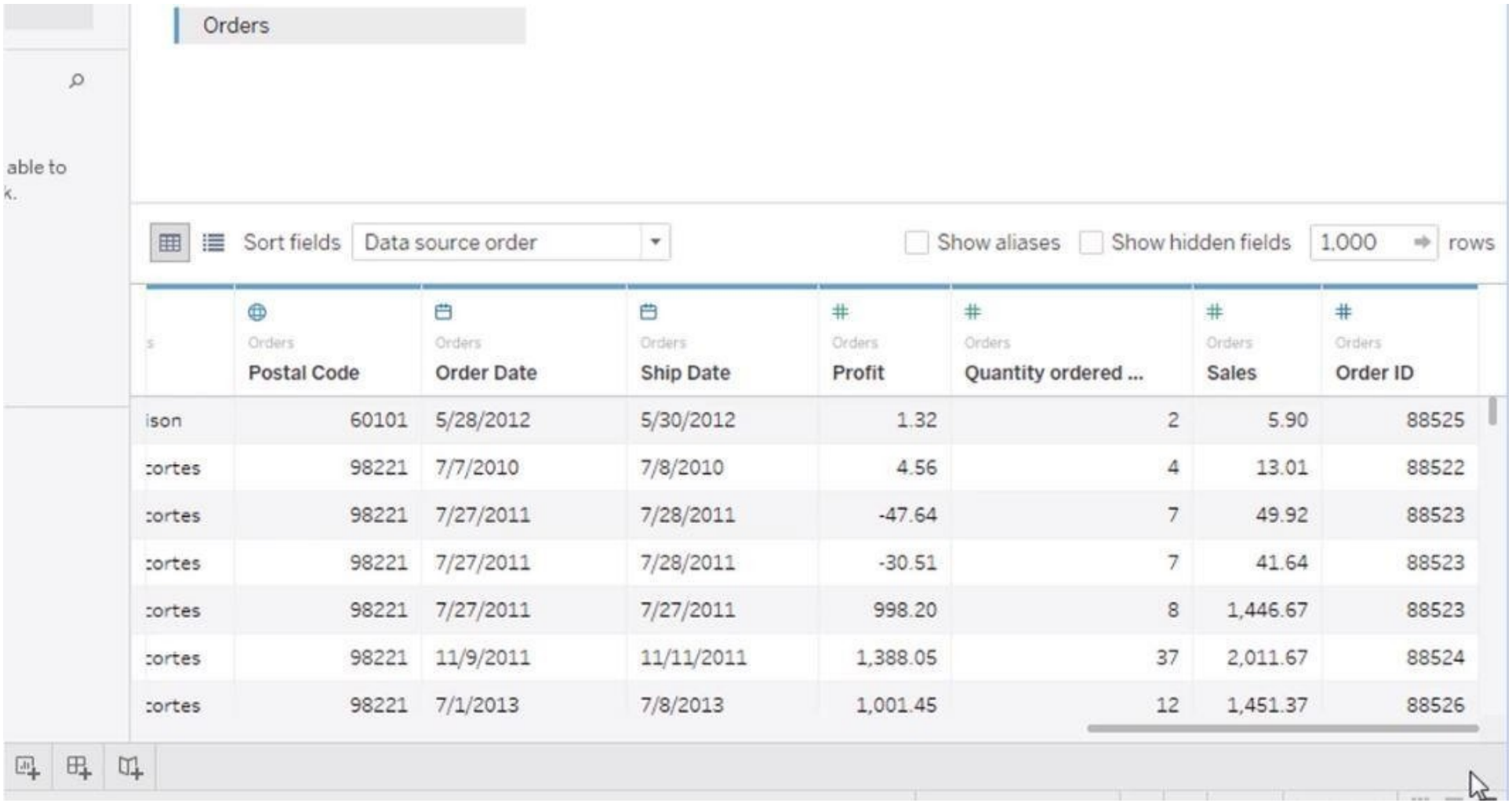
20847	High	0.010000	2.84	0.930	3	Bonnie Potter
23086	Not Specified	0.030000	6.68	6.150	3	Bonnie Potter
23087	Not Specified	0.010000	5.68	3.600	3	Bonnie Potter
23088	Not Specified	0.000000	205.99	2.500	3	Bonnie Potter
23597	Medium	0.090000	55.48	14.300	3	Bonnie Potter
25549	Low	0.080000	120.97	26.300	3	Bonnie Potter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:ortes 98221 7/27/2011 7/28/2011 -47.64 7 49.92 88523
:ortes 98221 7/27/2011 7/28/2011 -30.51 7 41.64 88523
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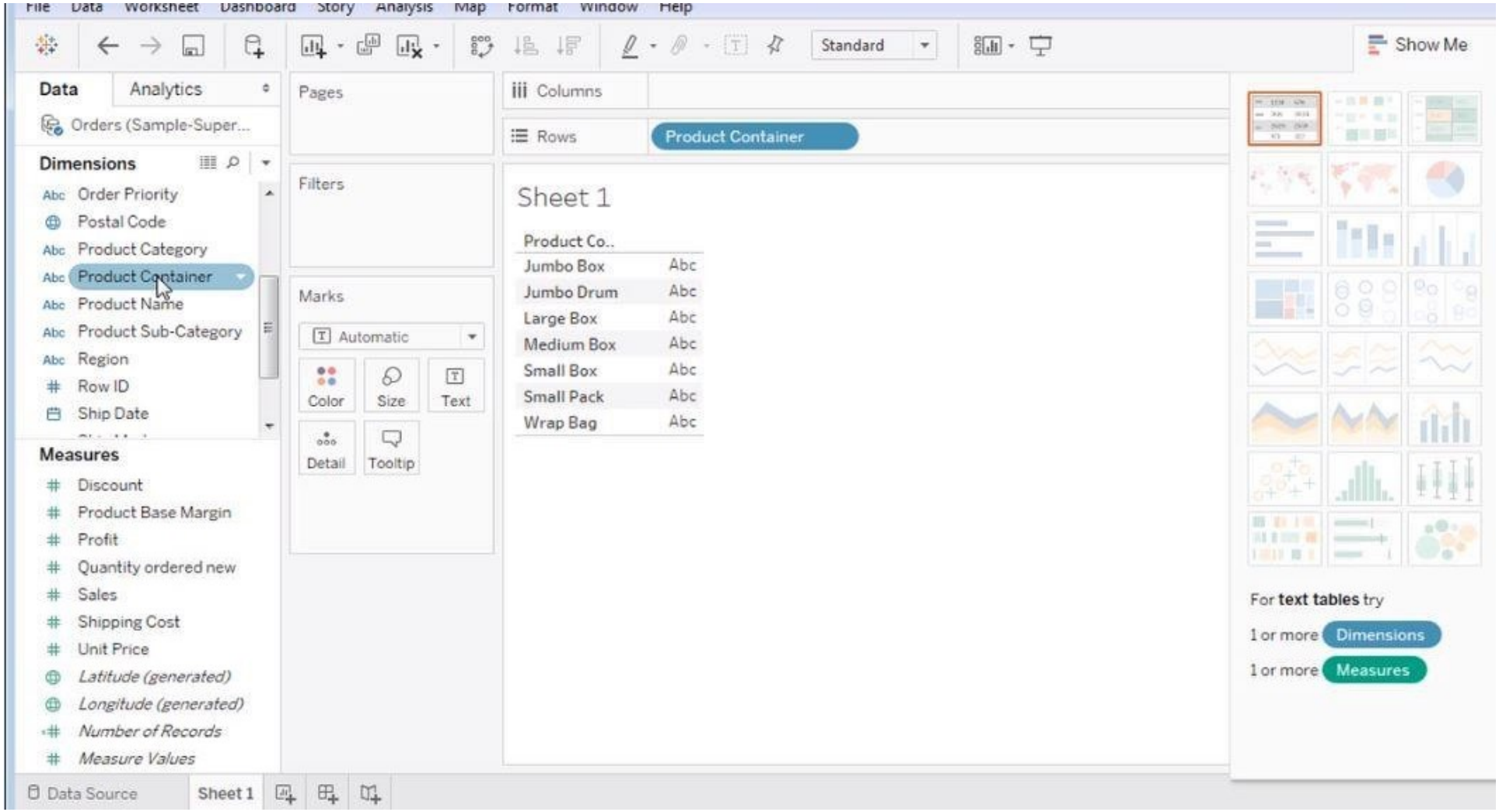
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Jumbo Drum Abc
Large Box Abc
Medium Box Abc
Small Box Abc
Small Pack Abc
Wrap Bag Abc
For text tables try
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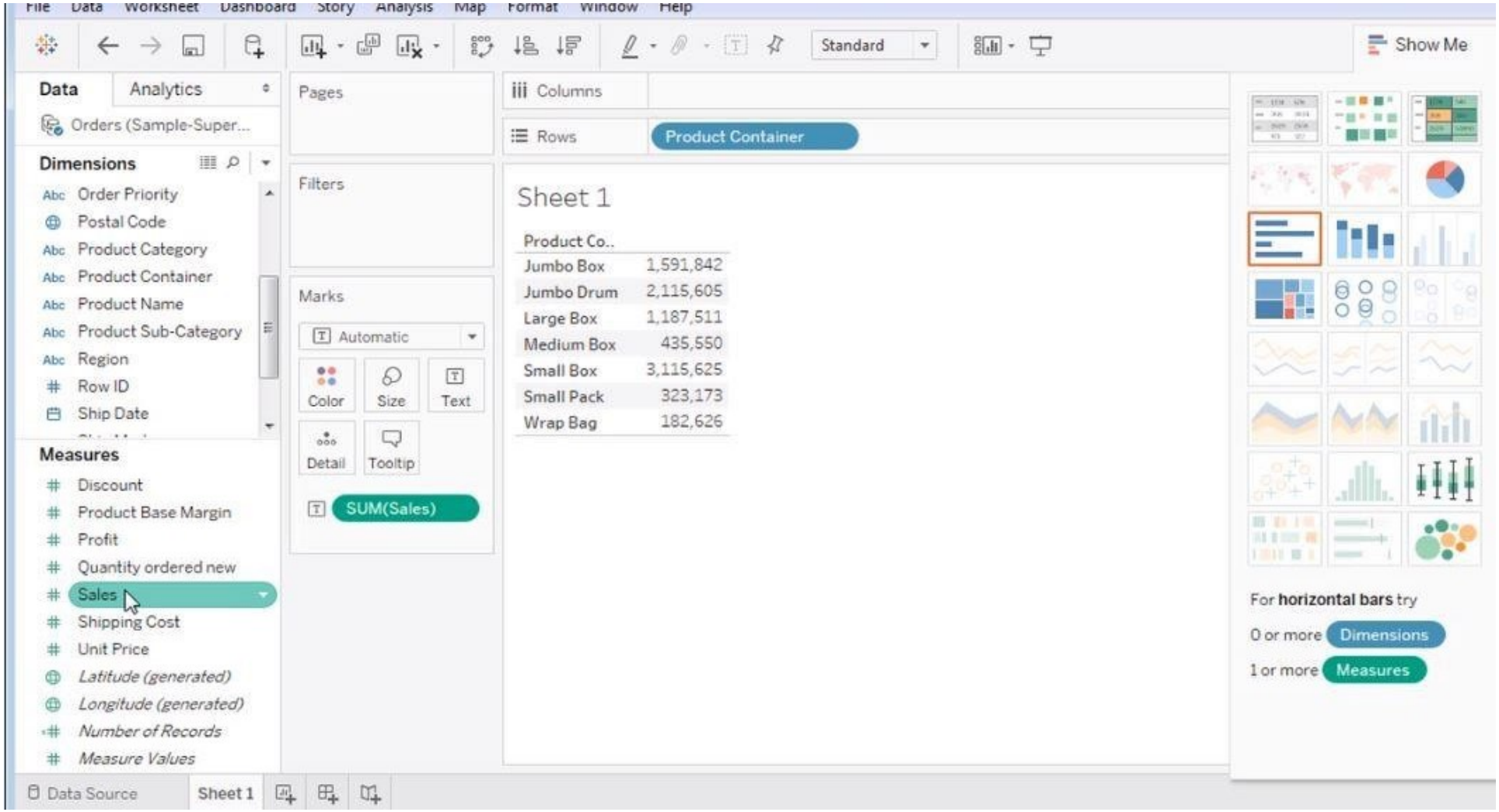
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Product Container
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Jumbo Drum 2,115,605
Large Box 1,187,511
Medium Box 435,550
Small Box 3,115,625
Small Pack 323,173
Wrap Bag 182,626
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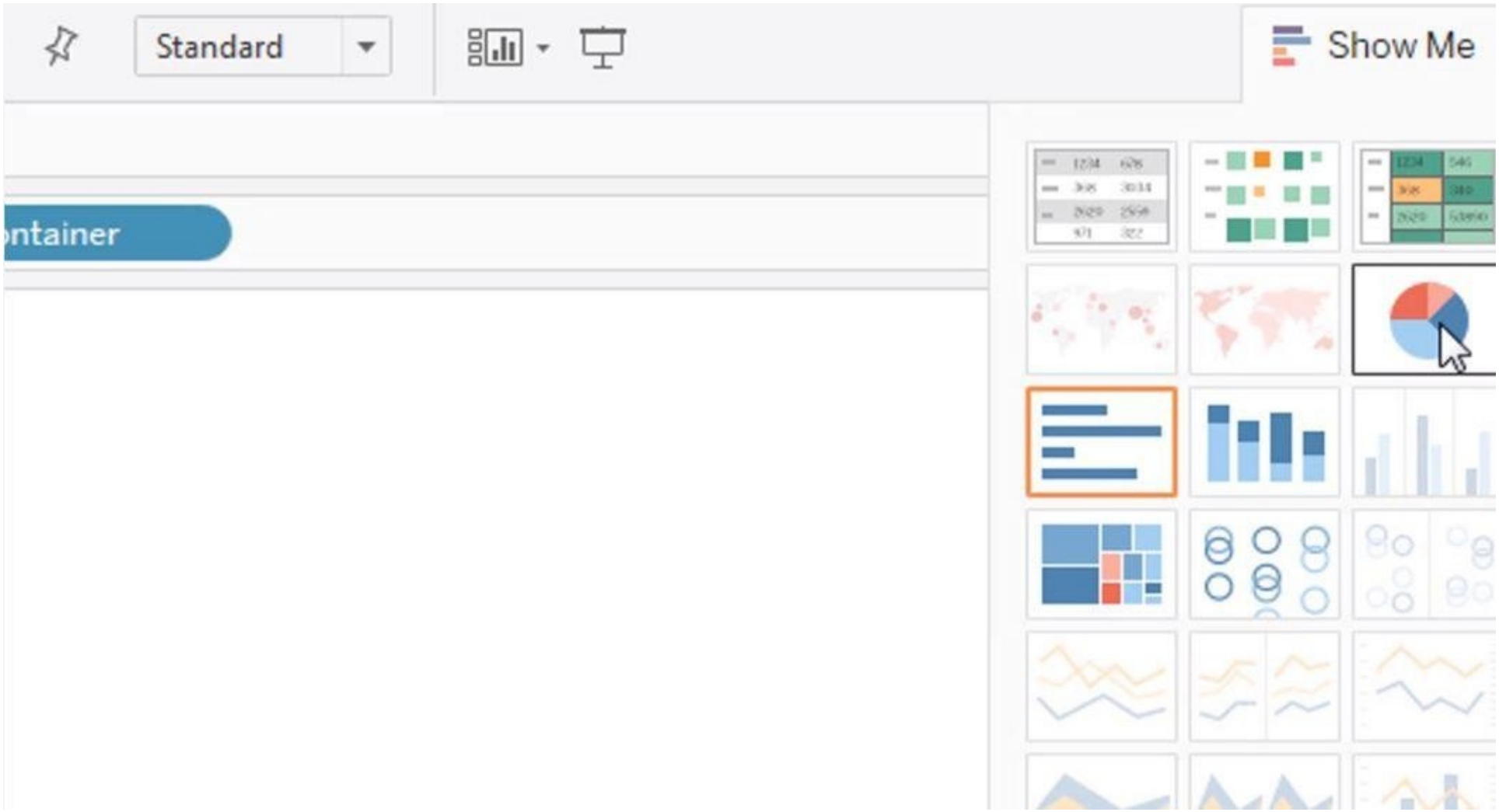
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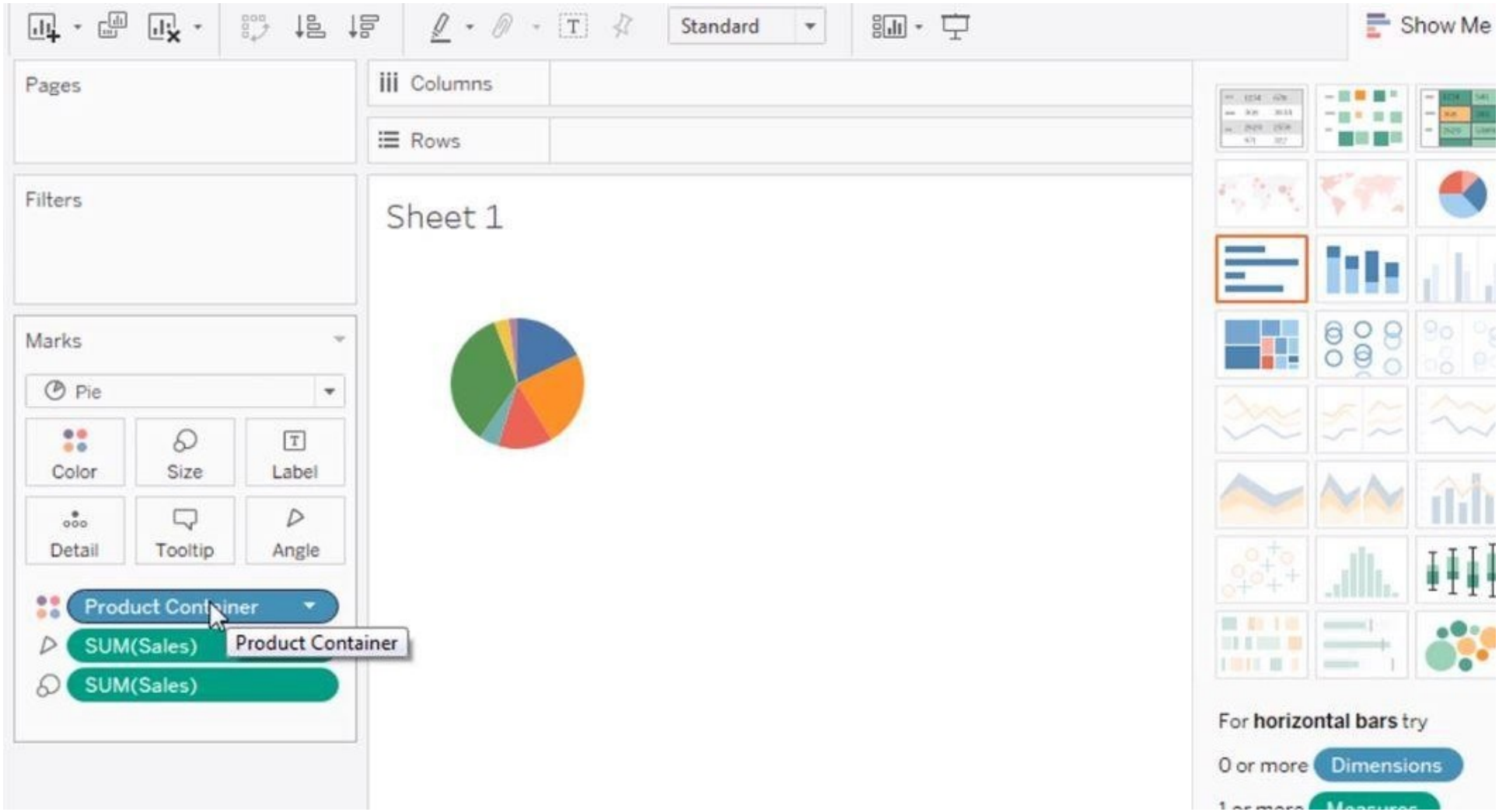
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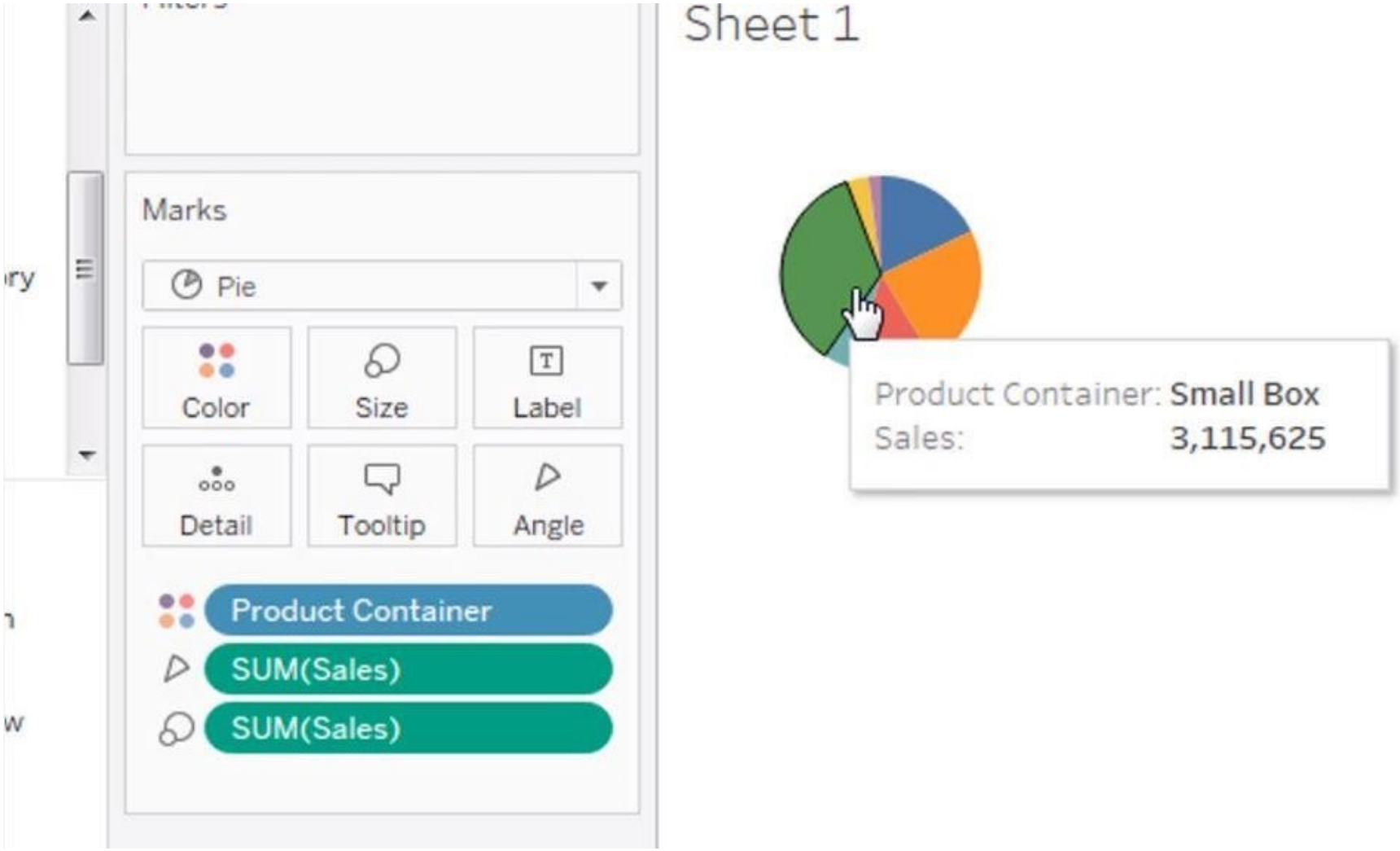
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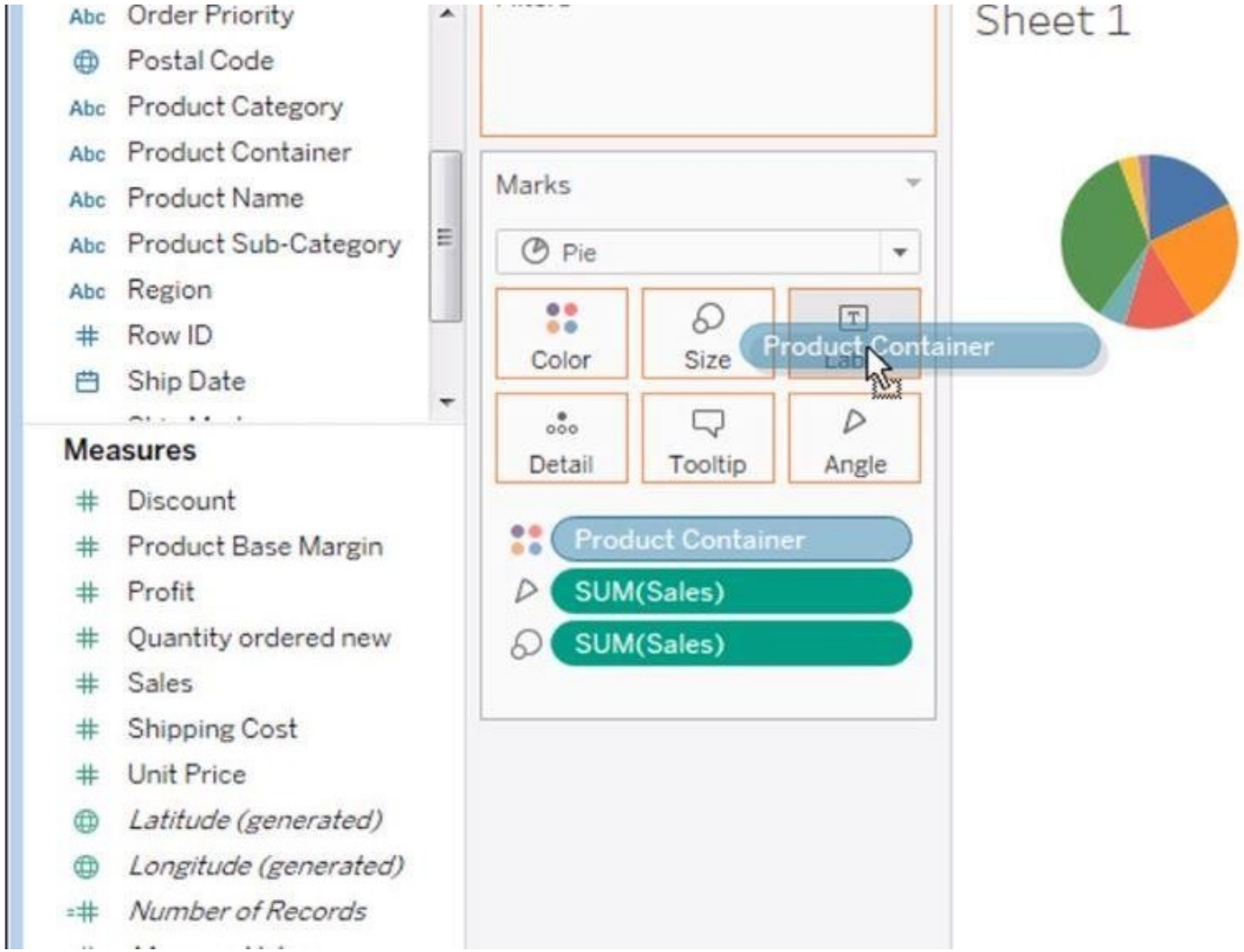
Sales: 3,115,625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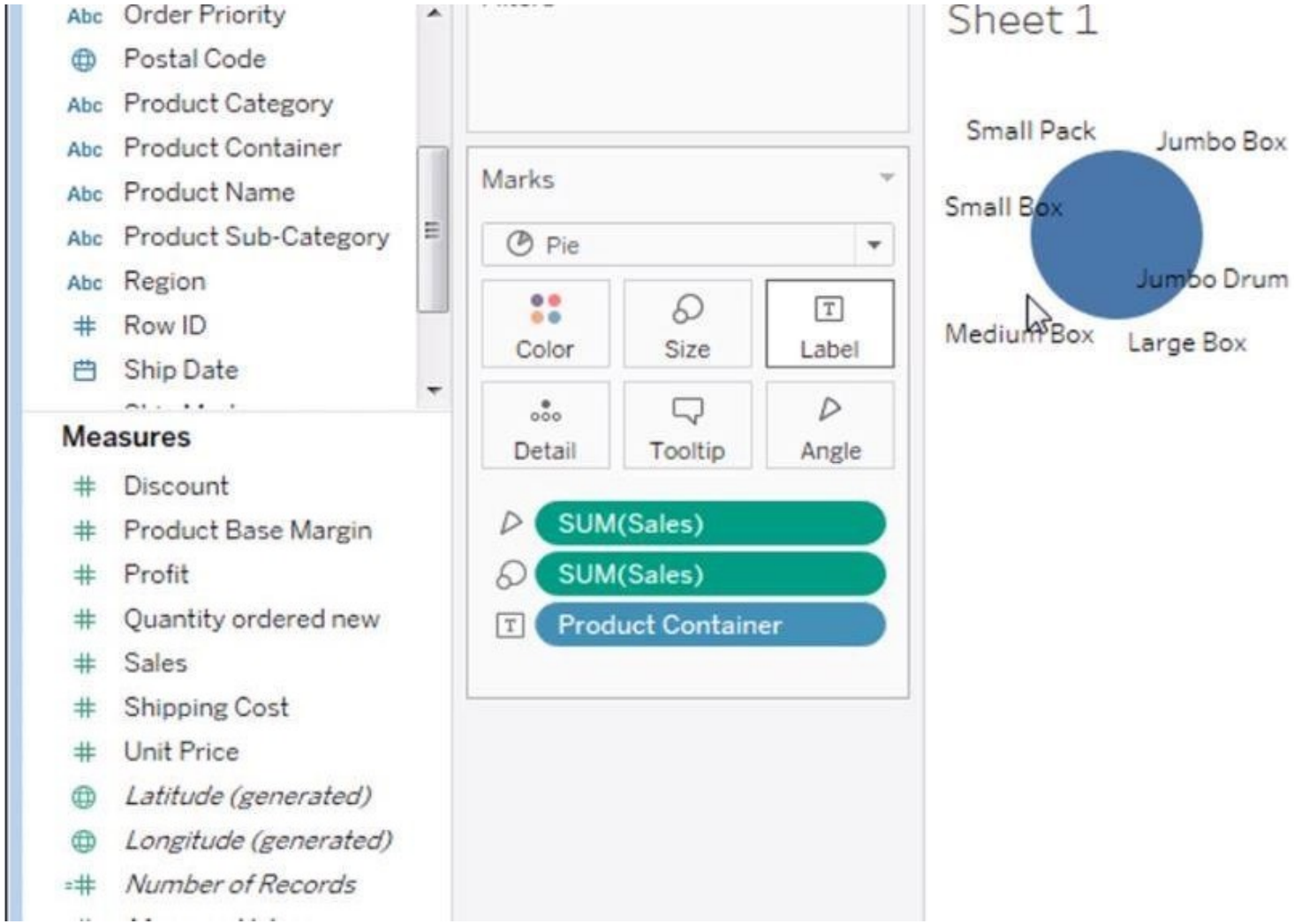
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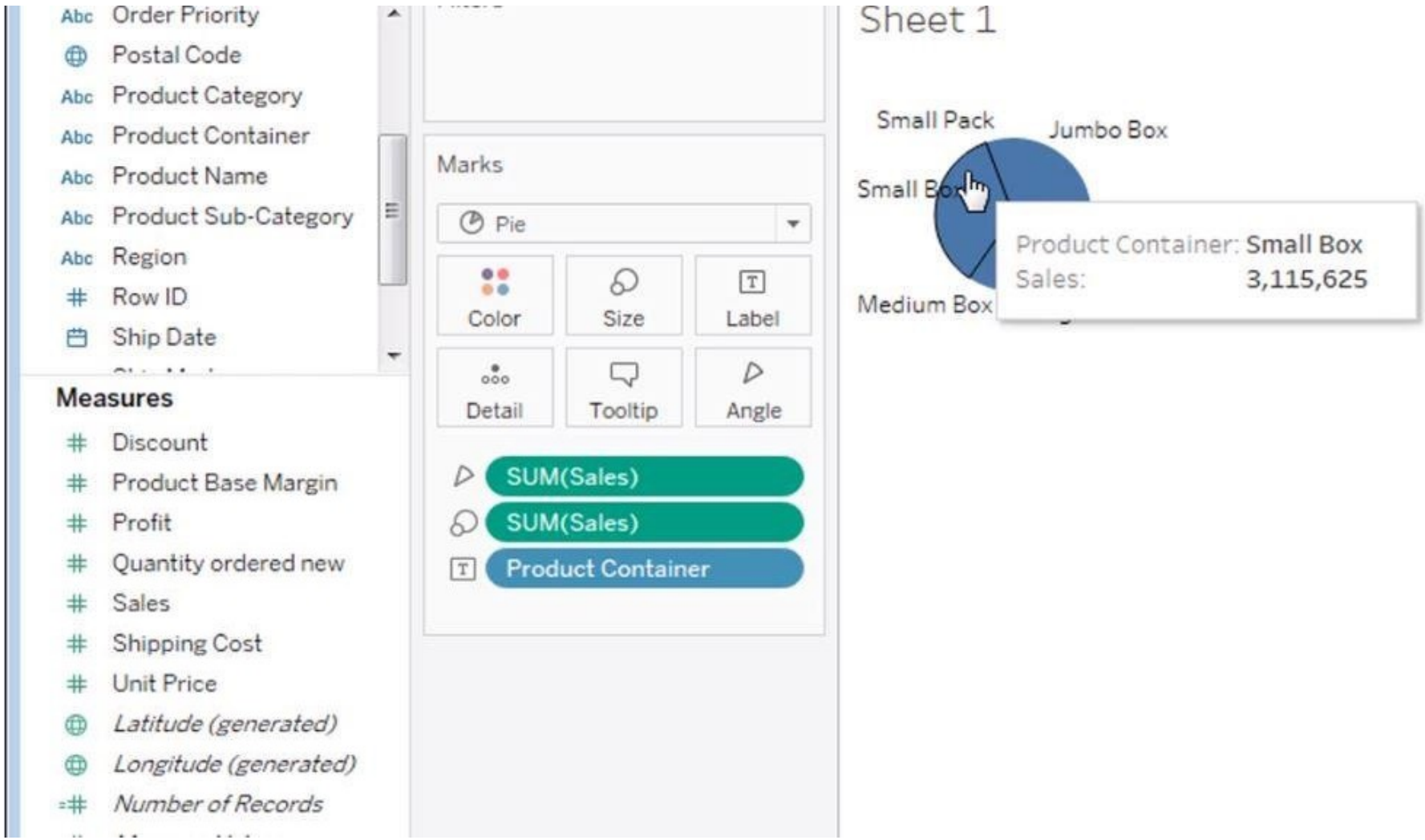
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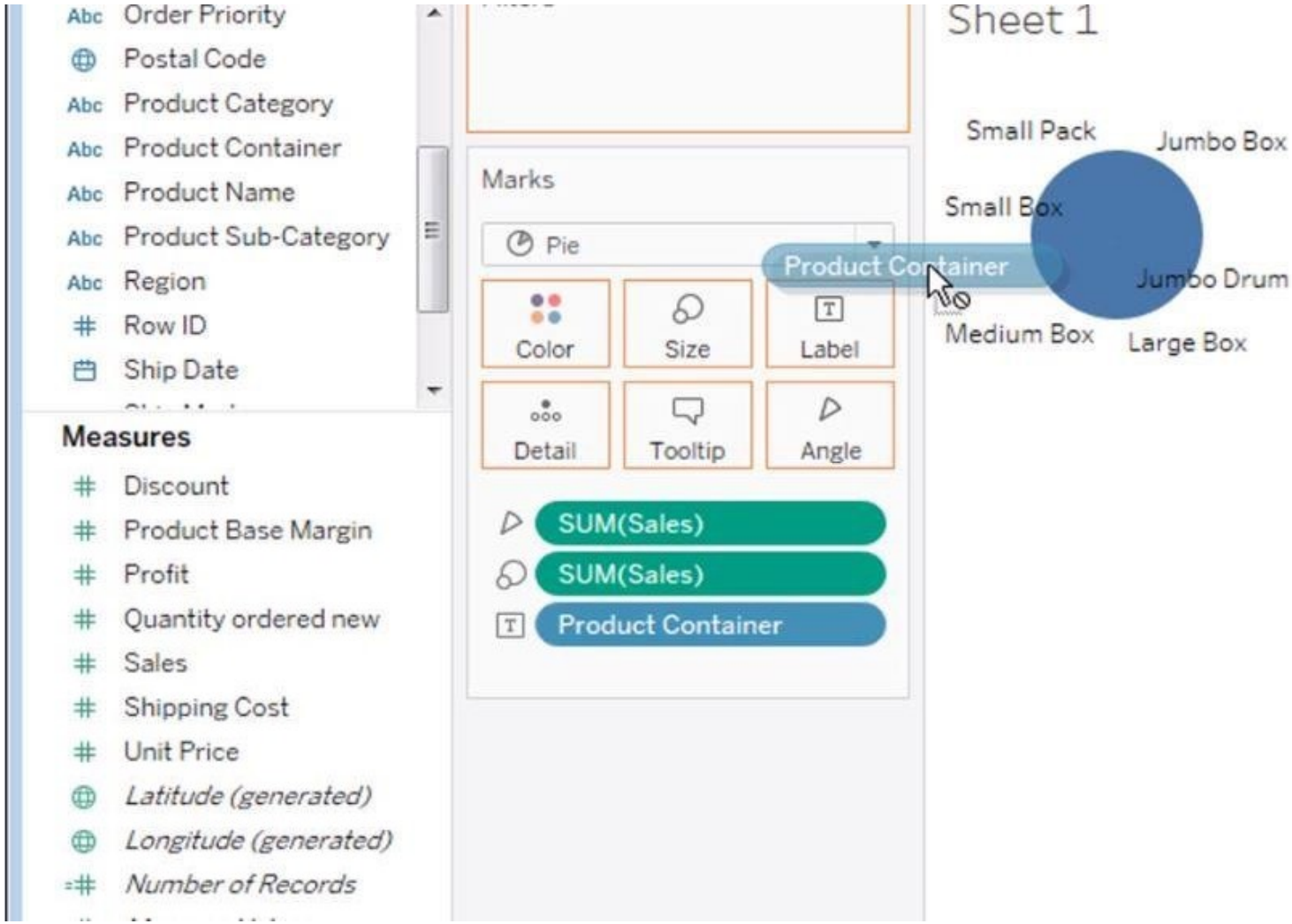
Product Container: Small Box
Sales: 3,115,625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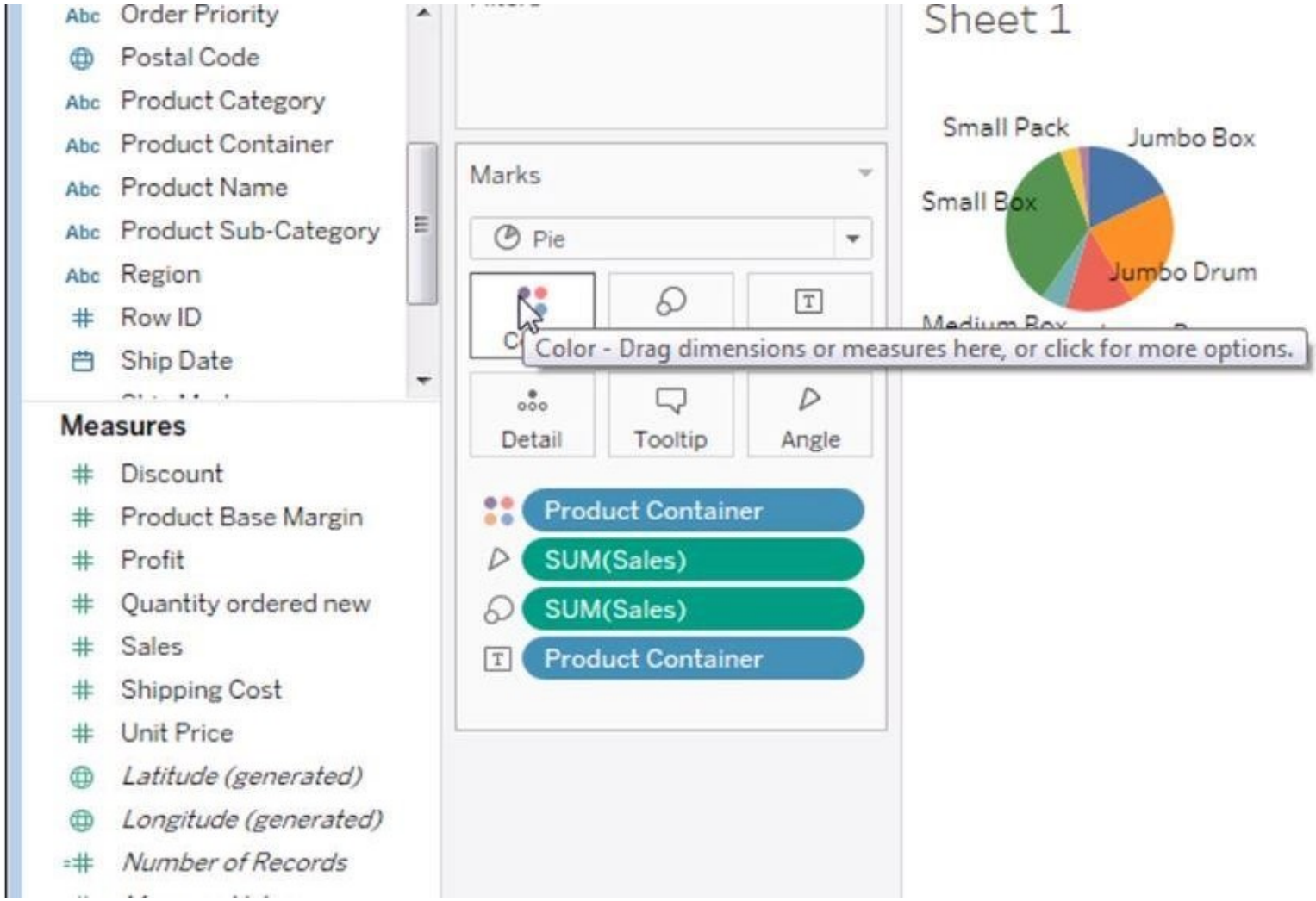
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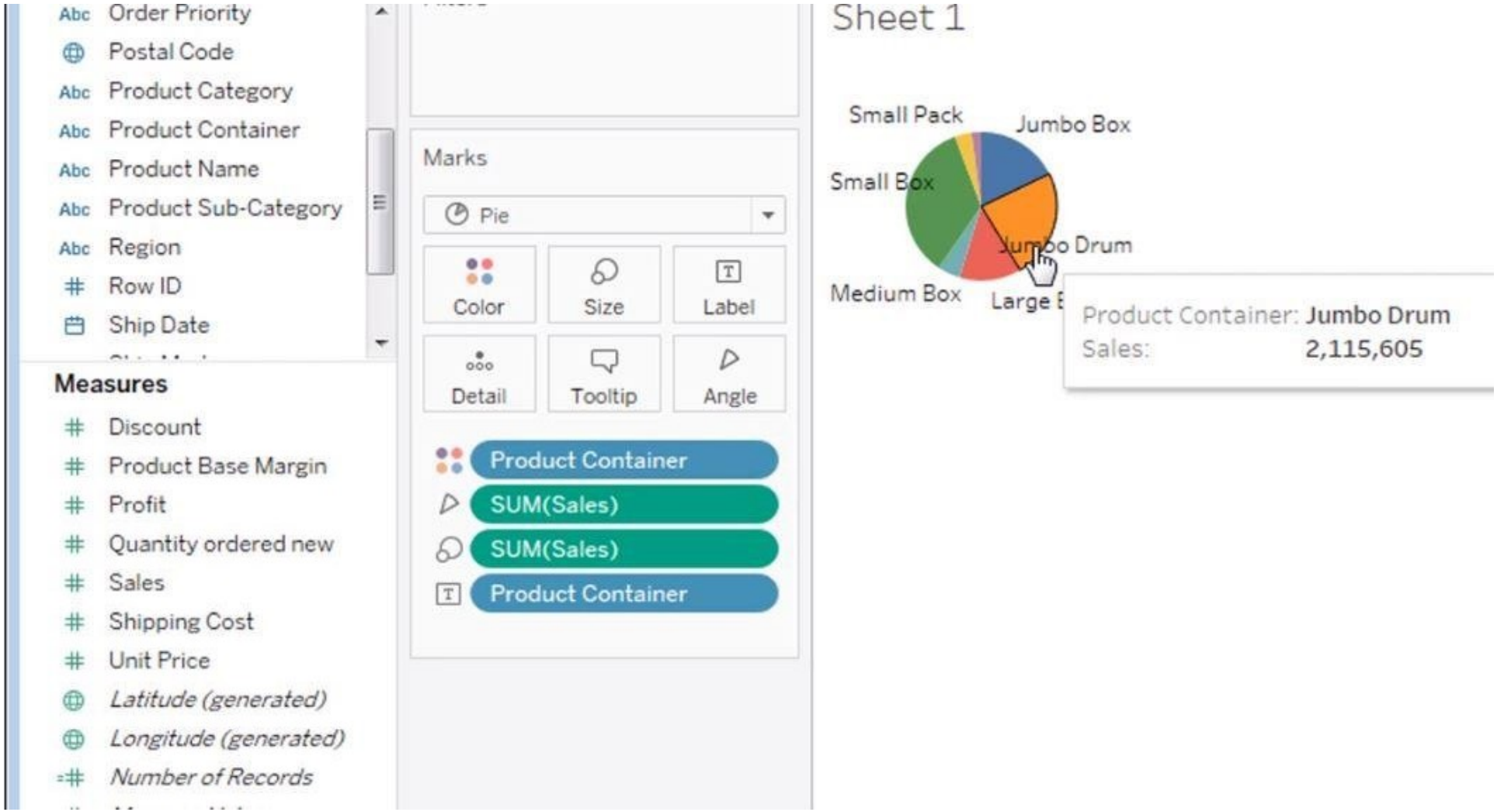
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Product Container: Jumbo Drum
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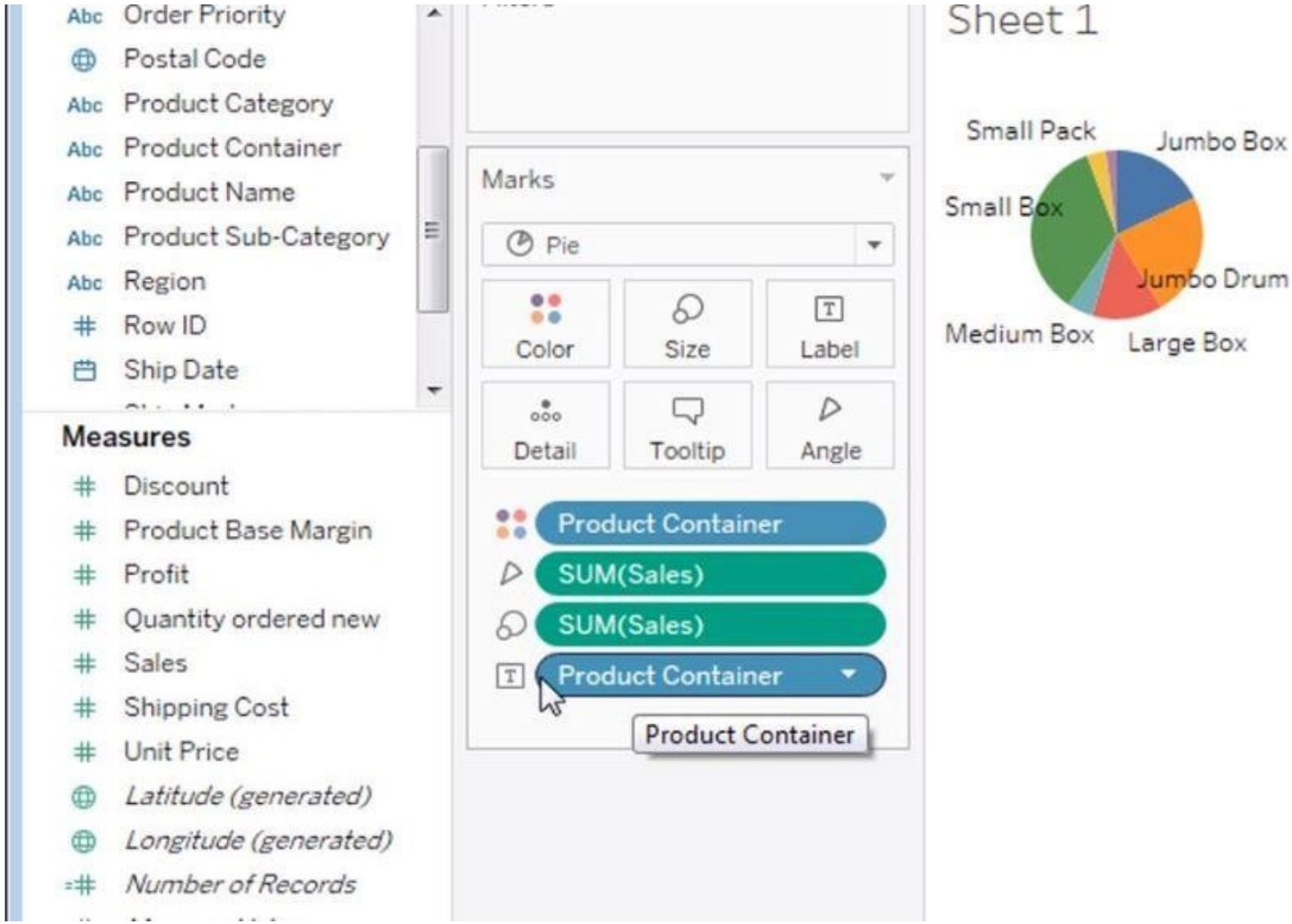
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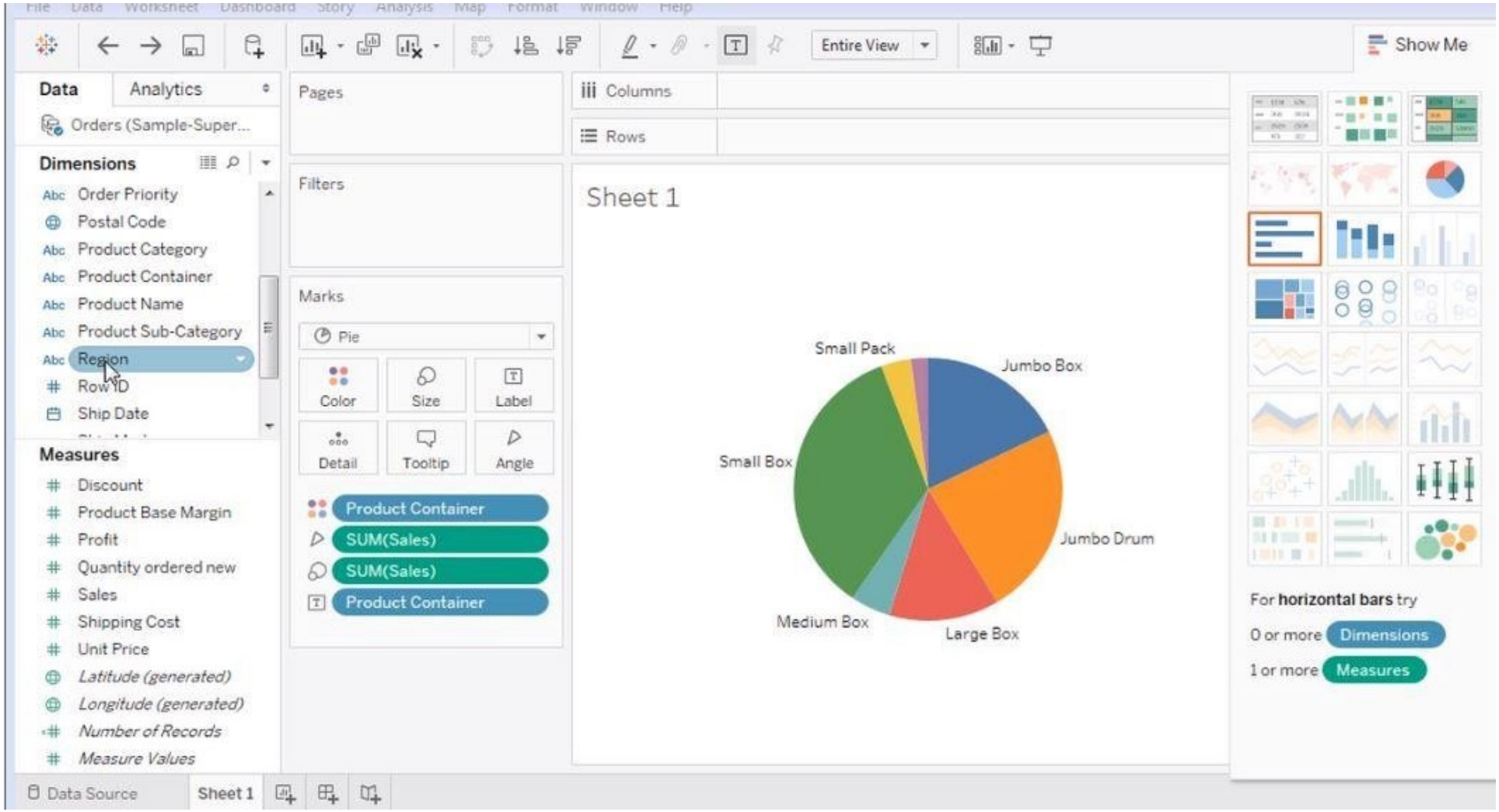
Medium Box
Large Box

See a separate pie chart for each region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For horizontal bars try
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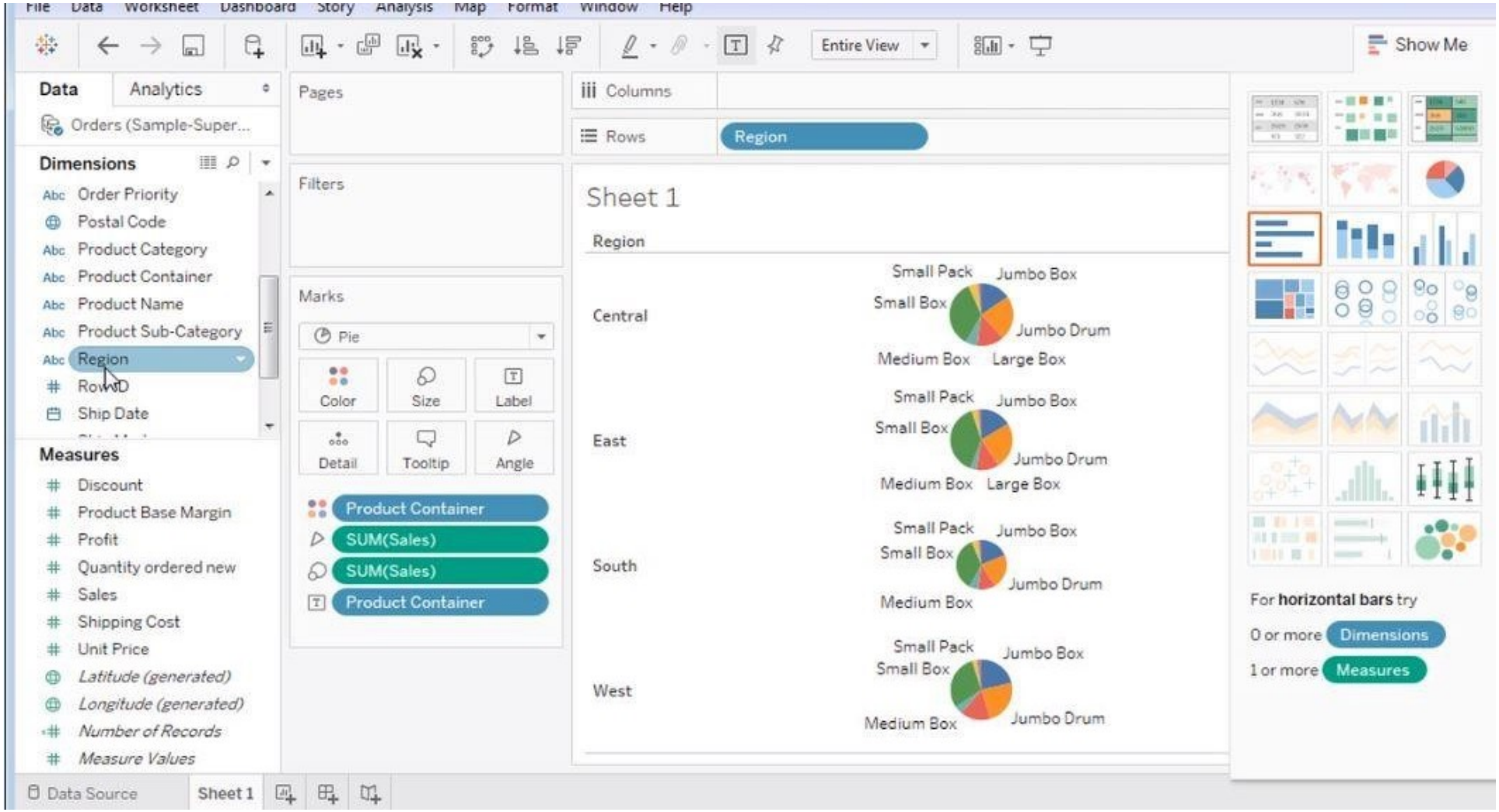
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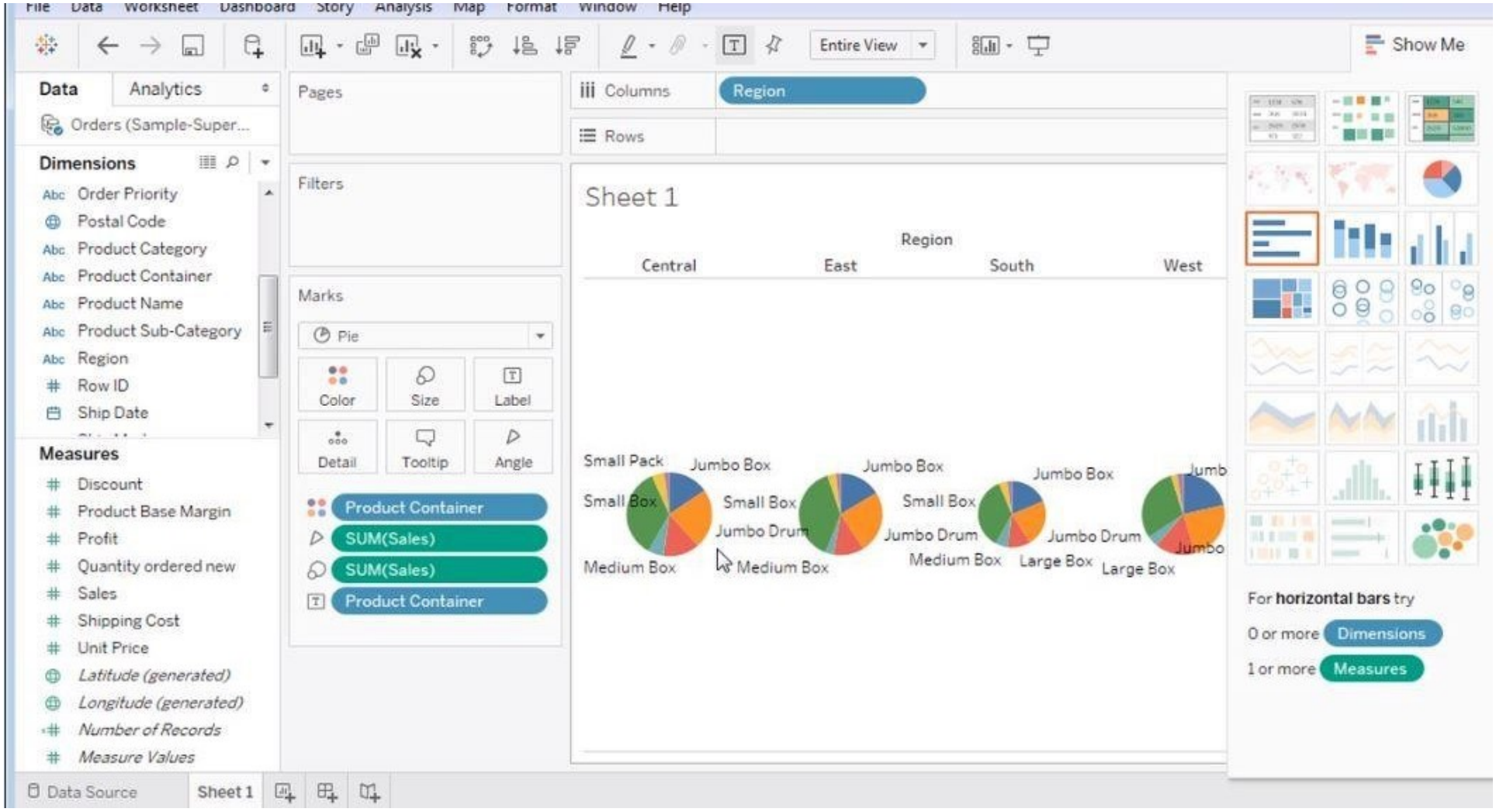
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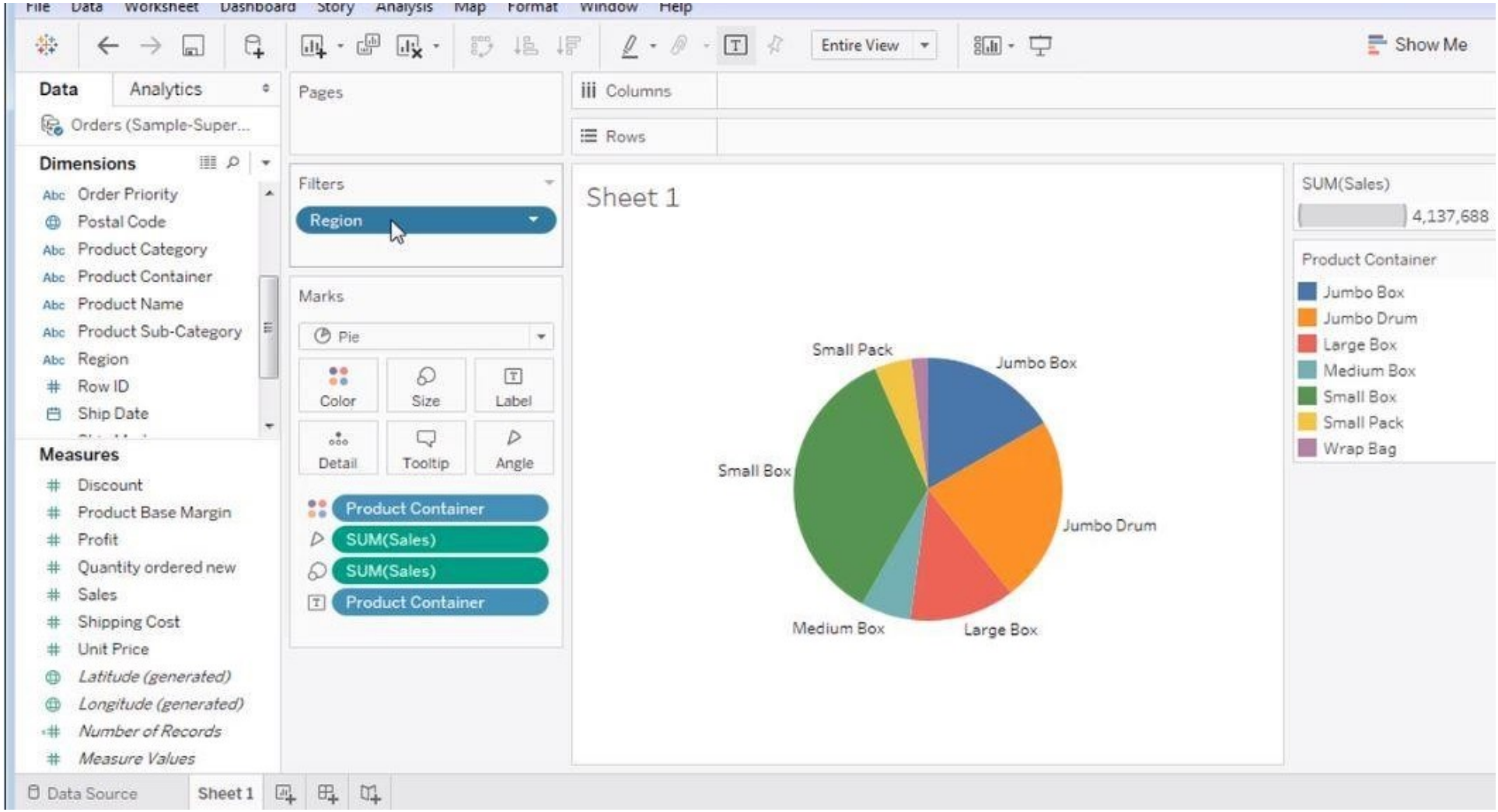
Sheet 1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Product Container
SUM(Sales)
SUM(Sales)
Product Container
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Sheet 1
Small Pack
Jumbo Box
Small Box
Jumbo Drum
Medium Box
Large Box
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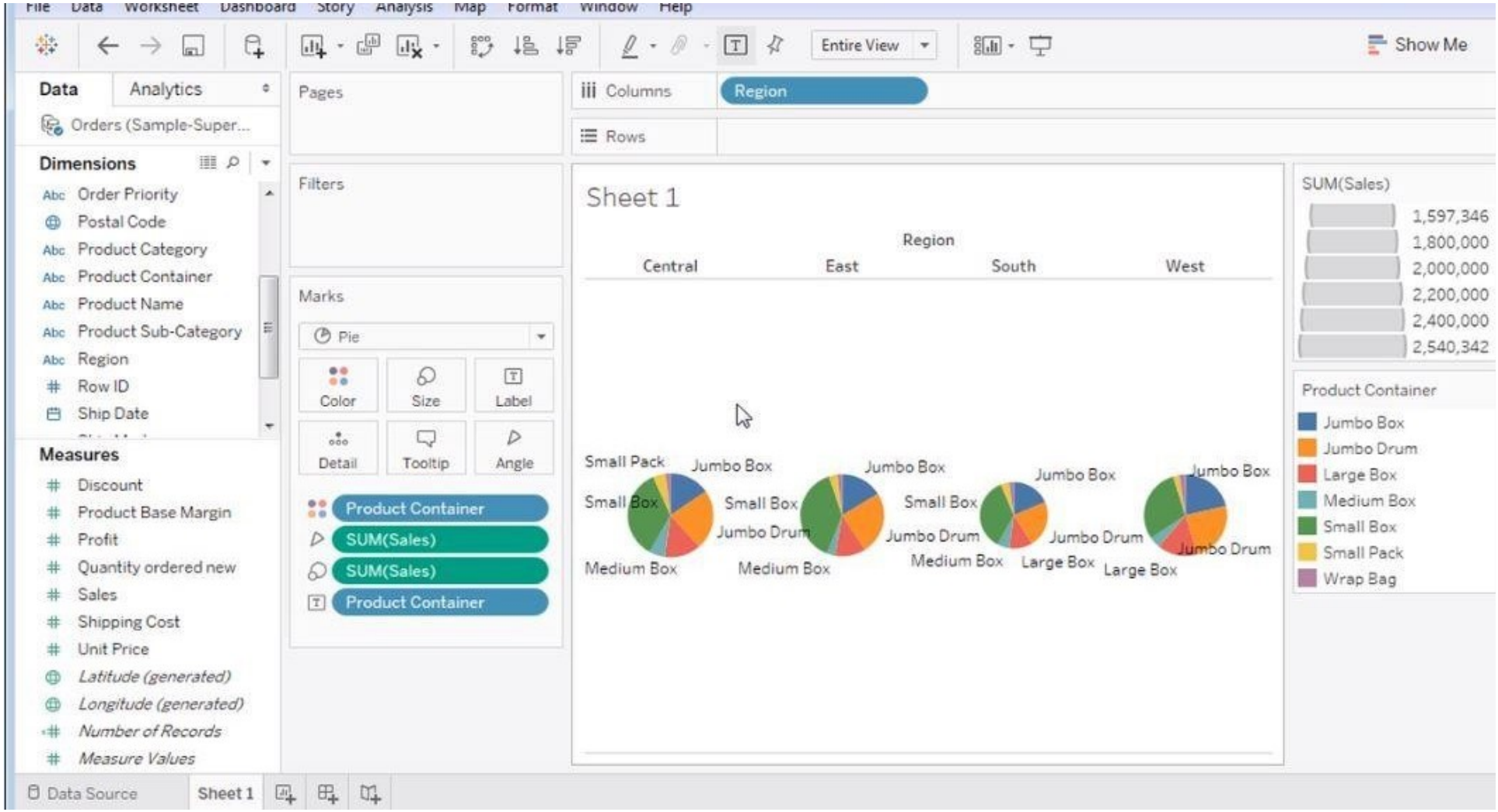
Large Box
Medium Box
Small Box
Small Pack
Wrap Bag
Data Source
Sheet 1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2,400,000
2,540,342
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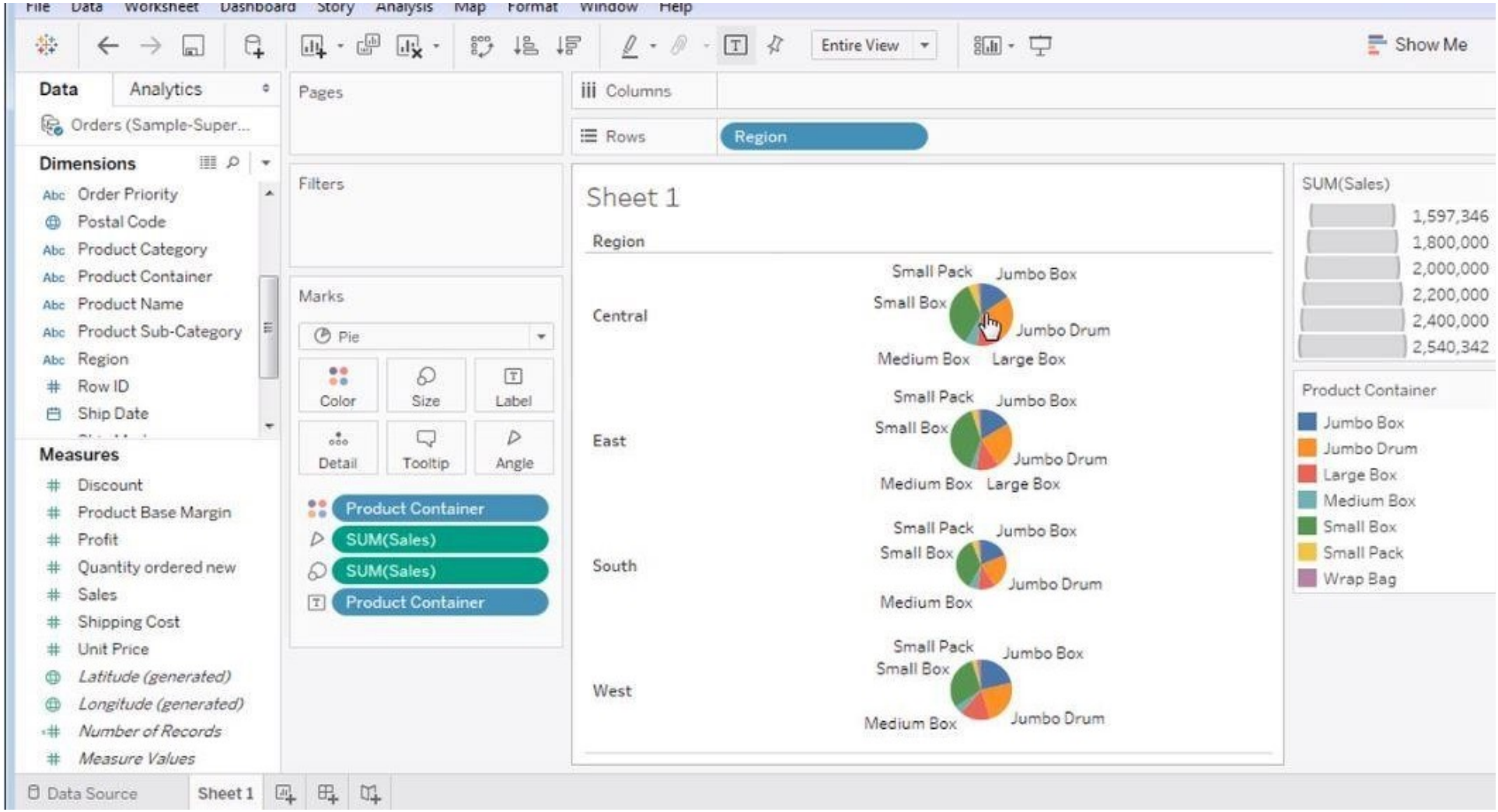
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Sheet 1
Region
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West
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Jumbo Drum
Medium Box
Large Box
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2,000,000
2,200,000
2,400,000
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Medium Box
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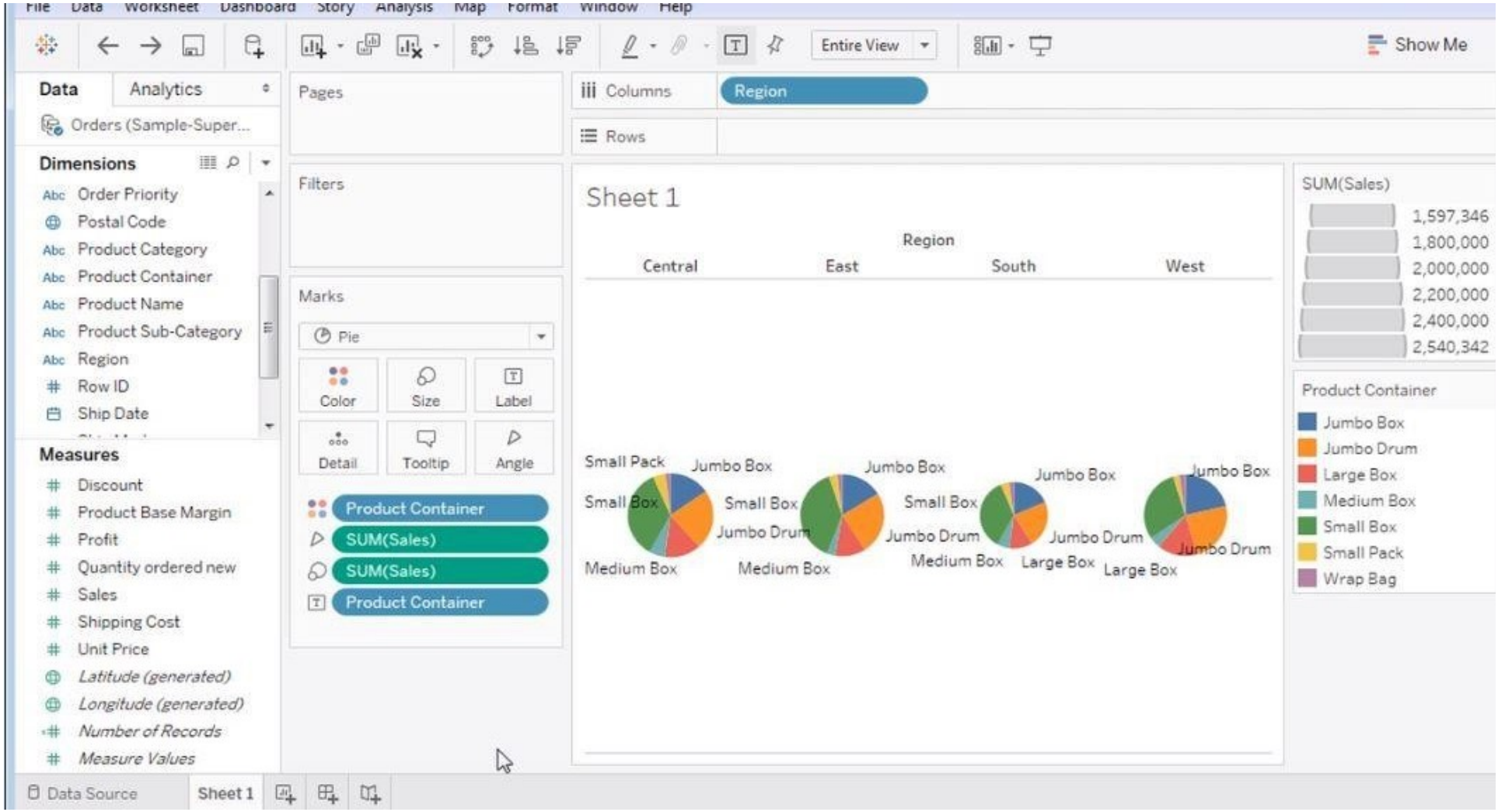
Small Pack
Wrap Bag
Data Source
Sheet 1


Control-Z will undo
your previous change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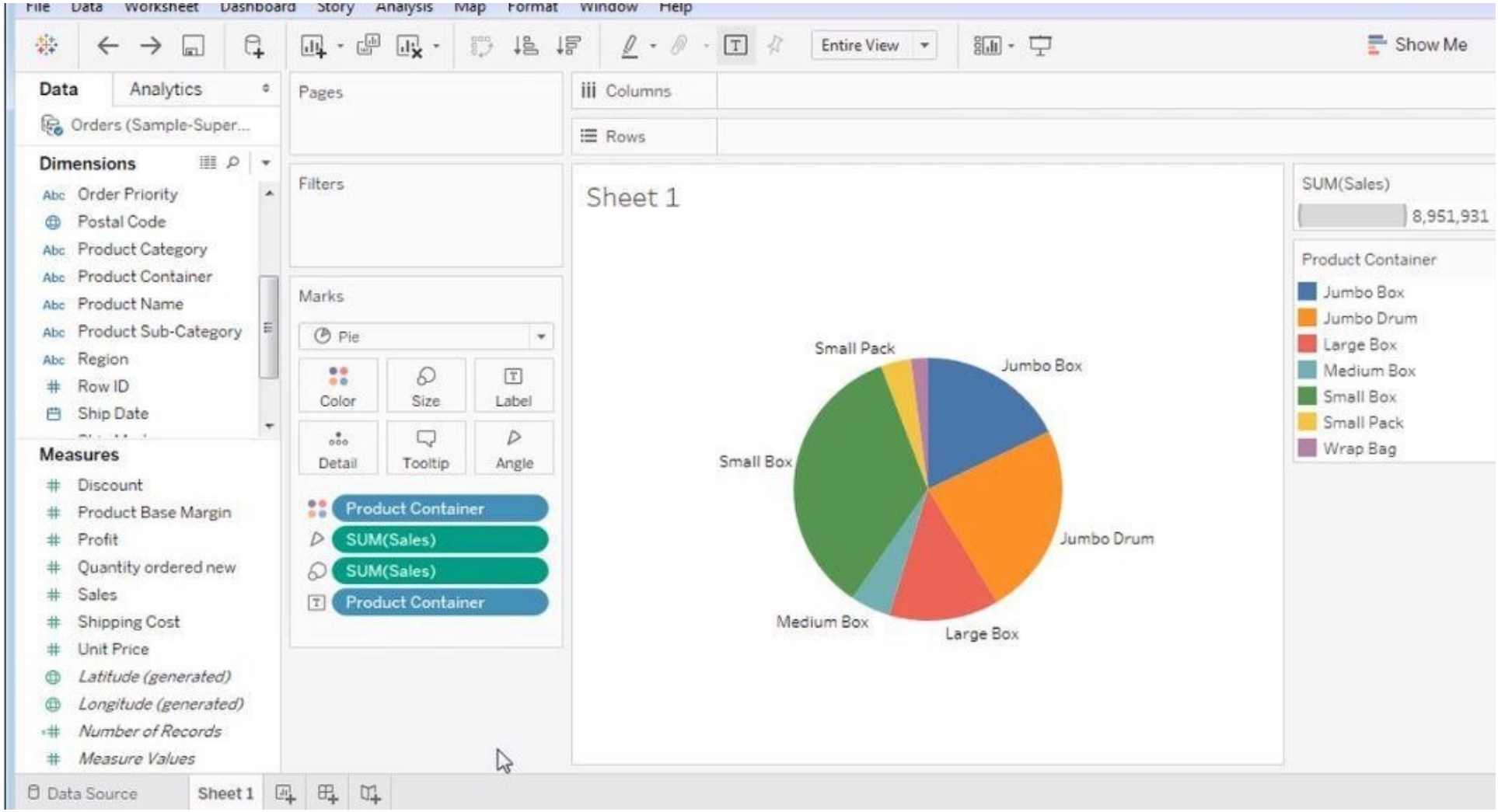
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Medium Box
Large Box
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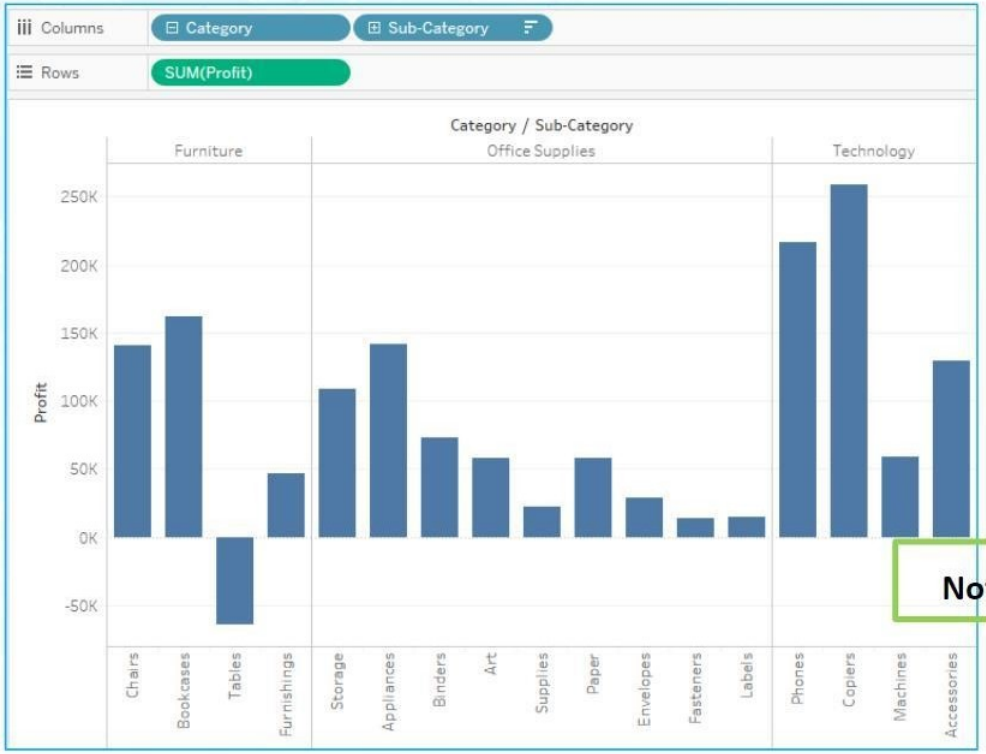
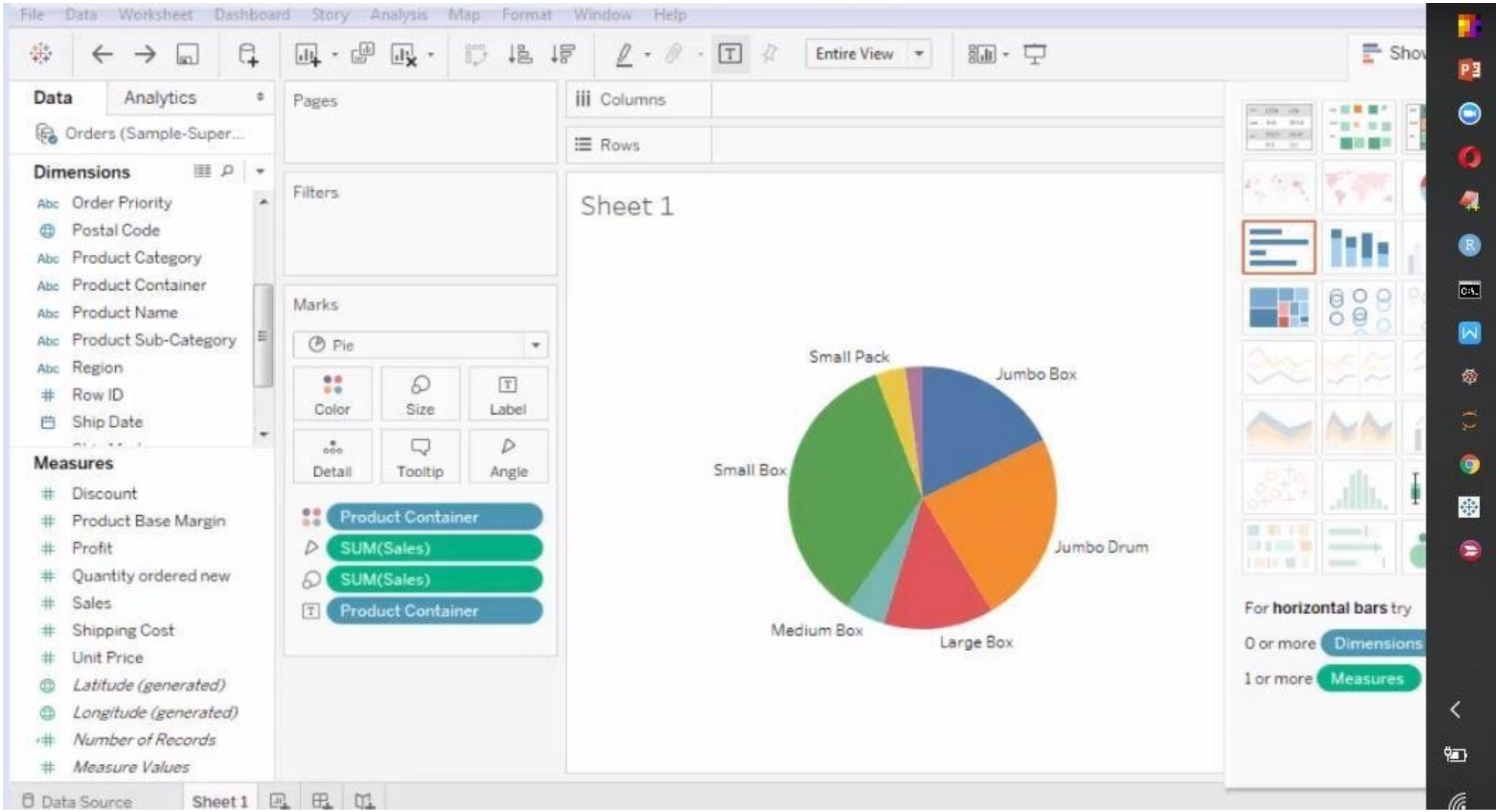
Small Pack
Wrap Bag
Data Source
Sheet 1

Bar Graph



Bar graphs are better for comparing larger changes or differences in data among groups

Note: bar graphs are best when the changes are larger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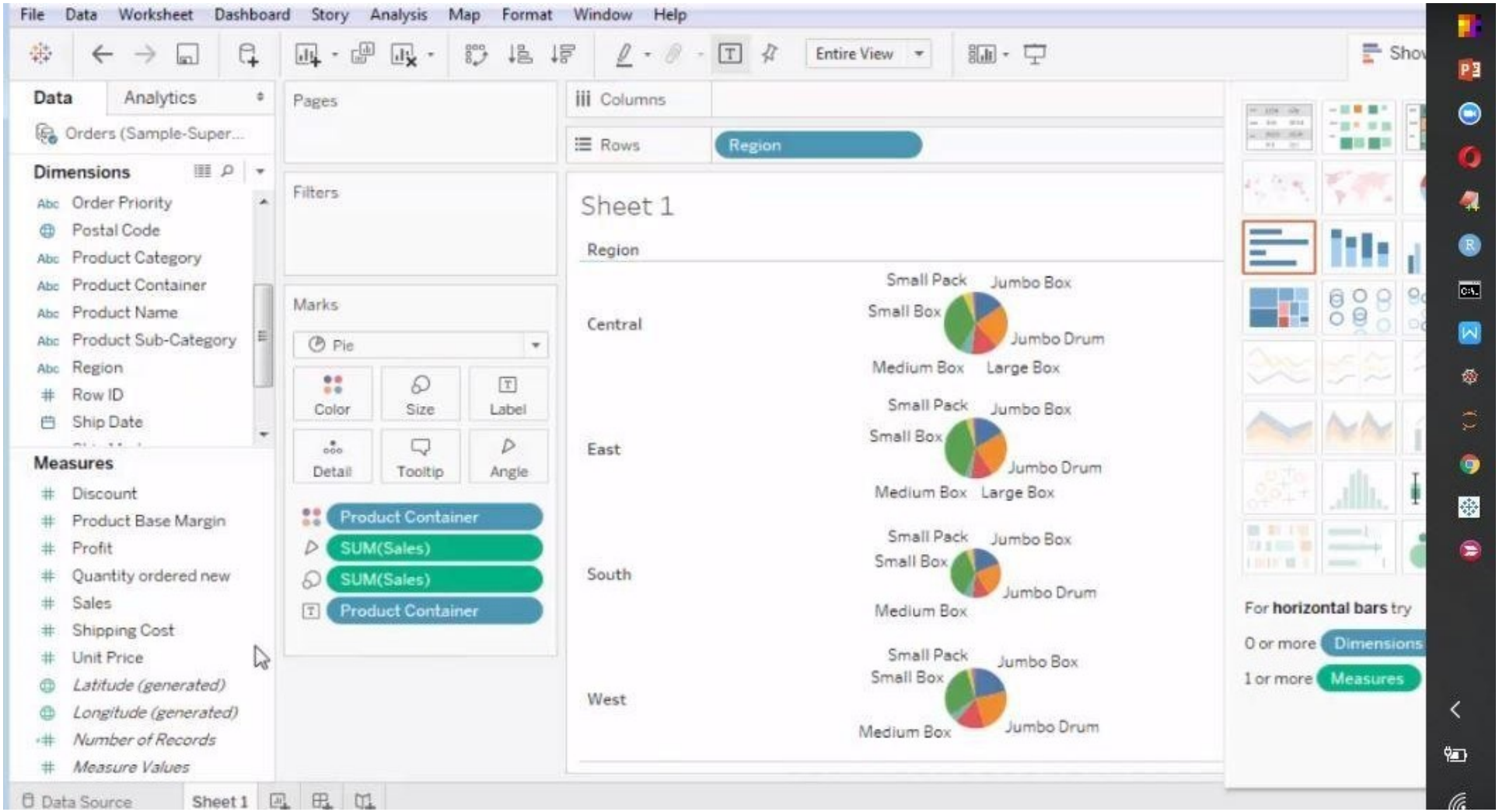
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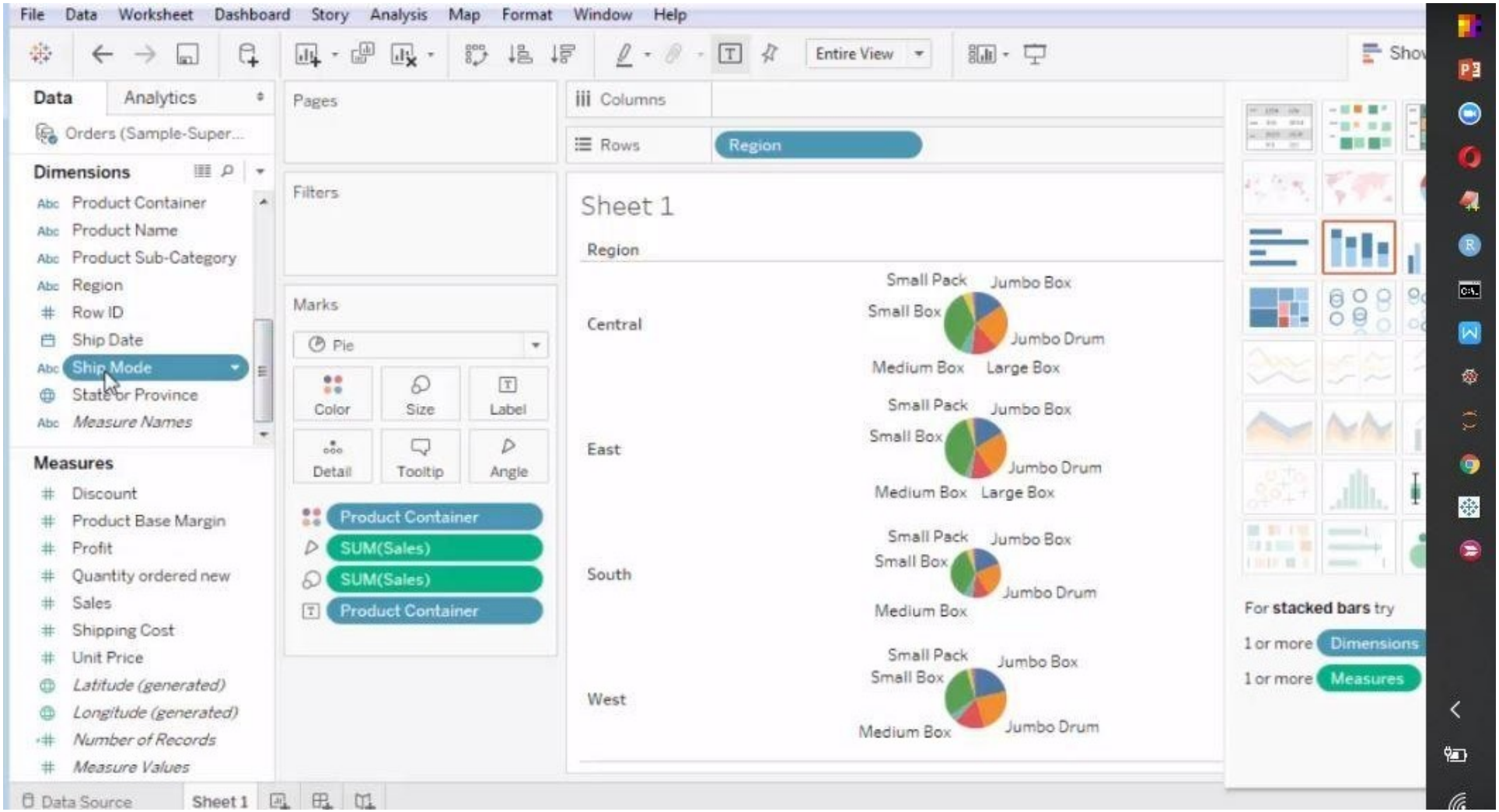
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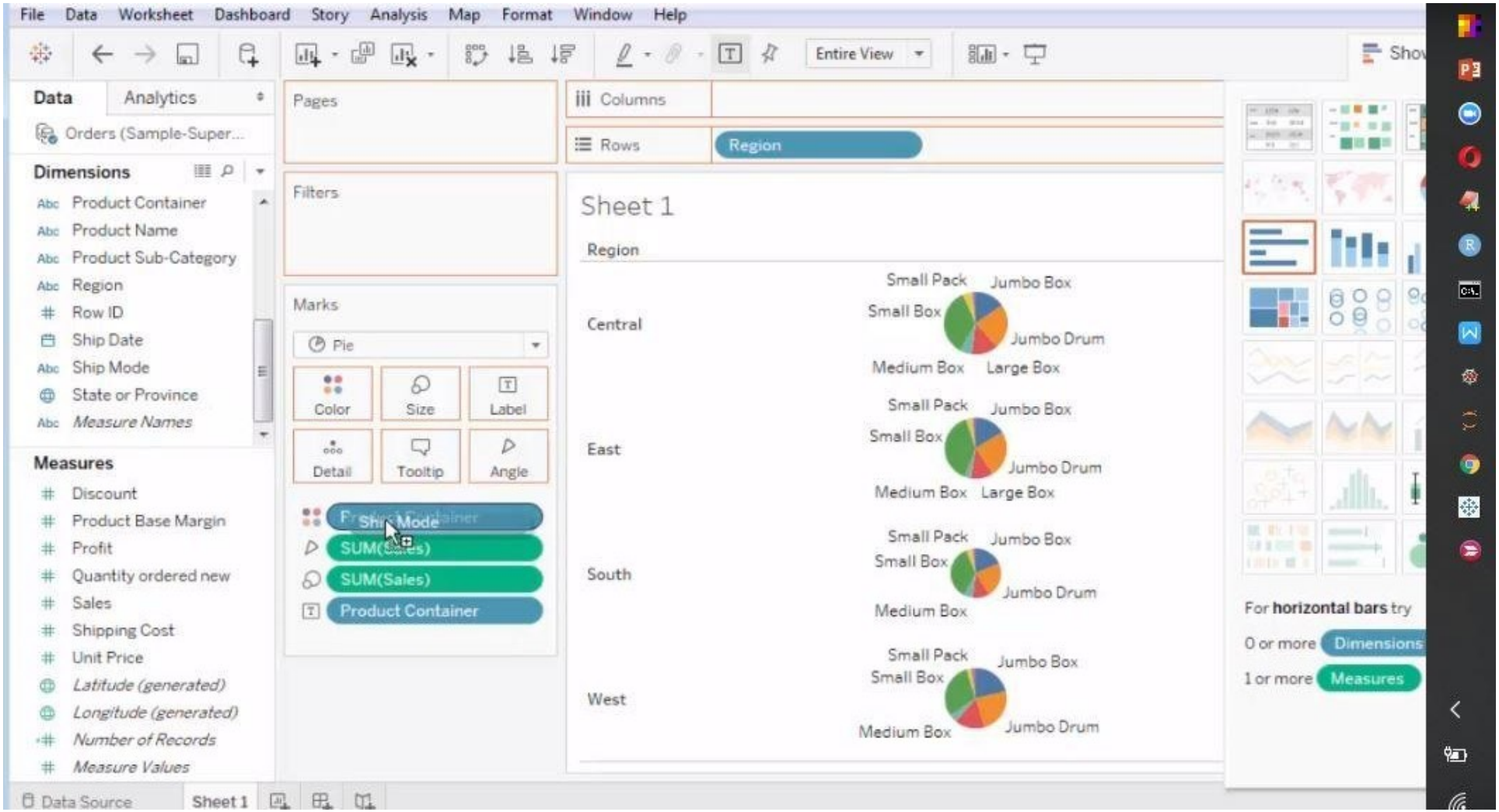
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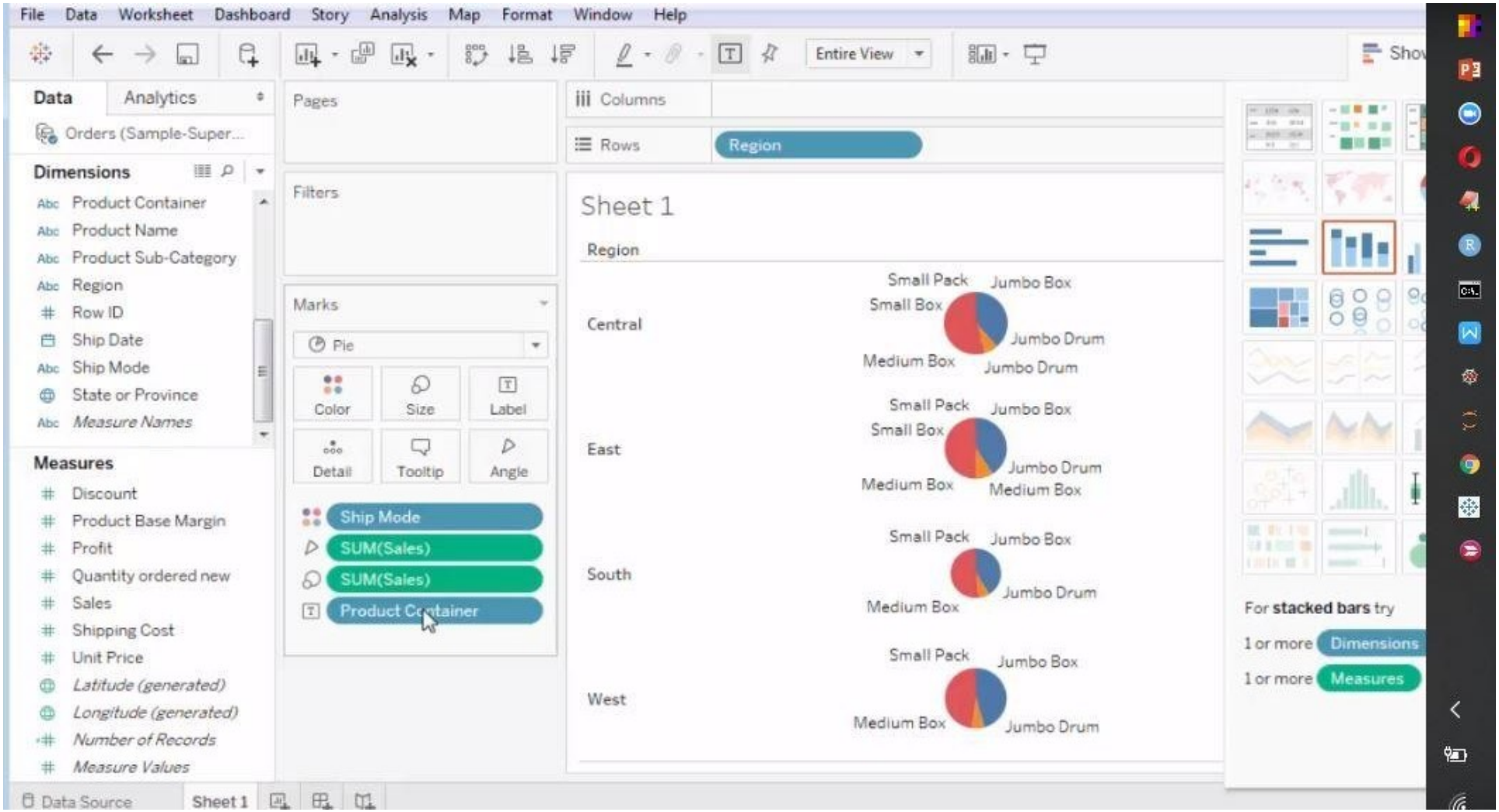
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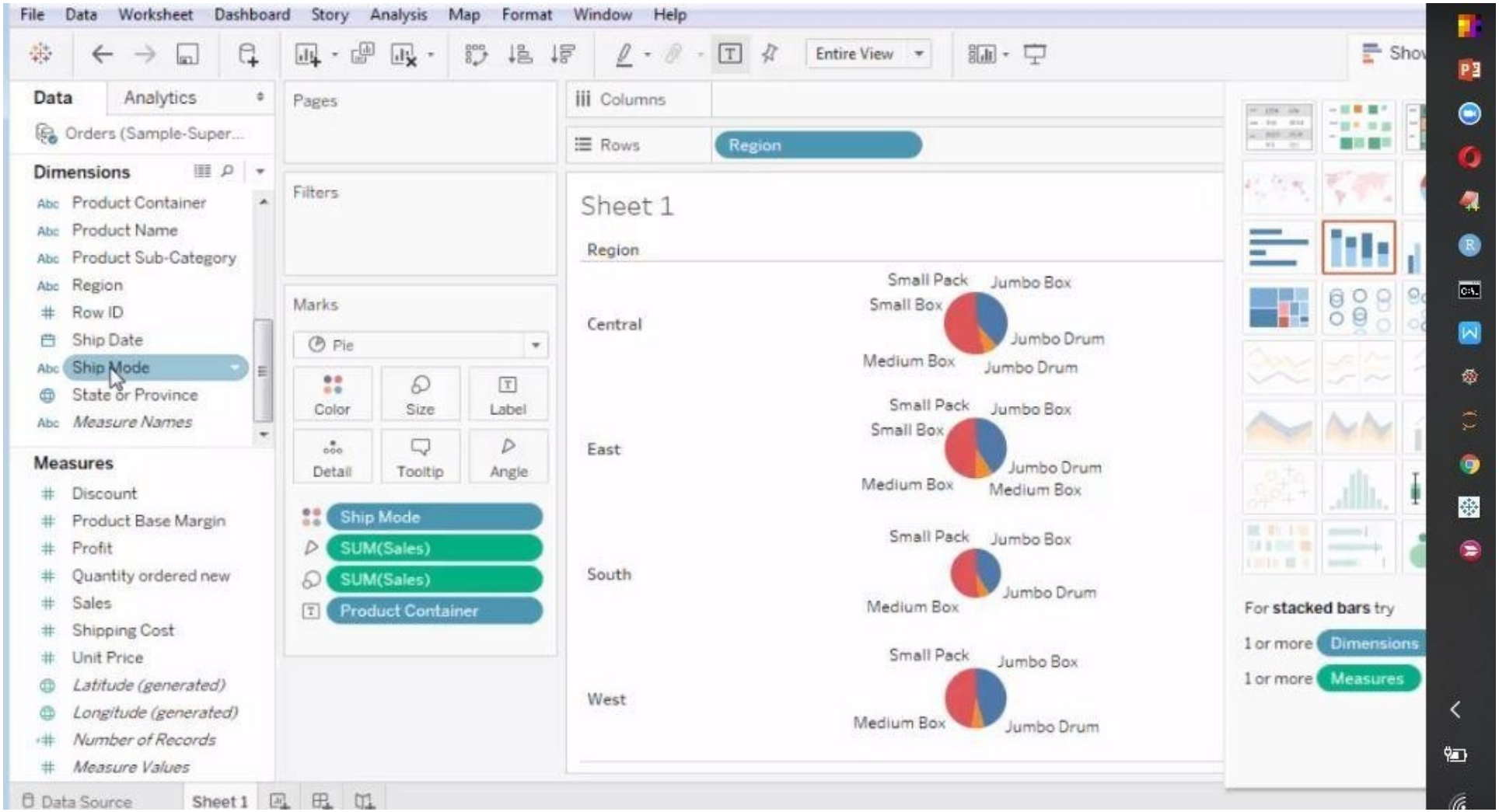
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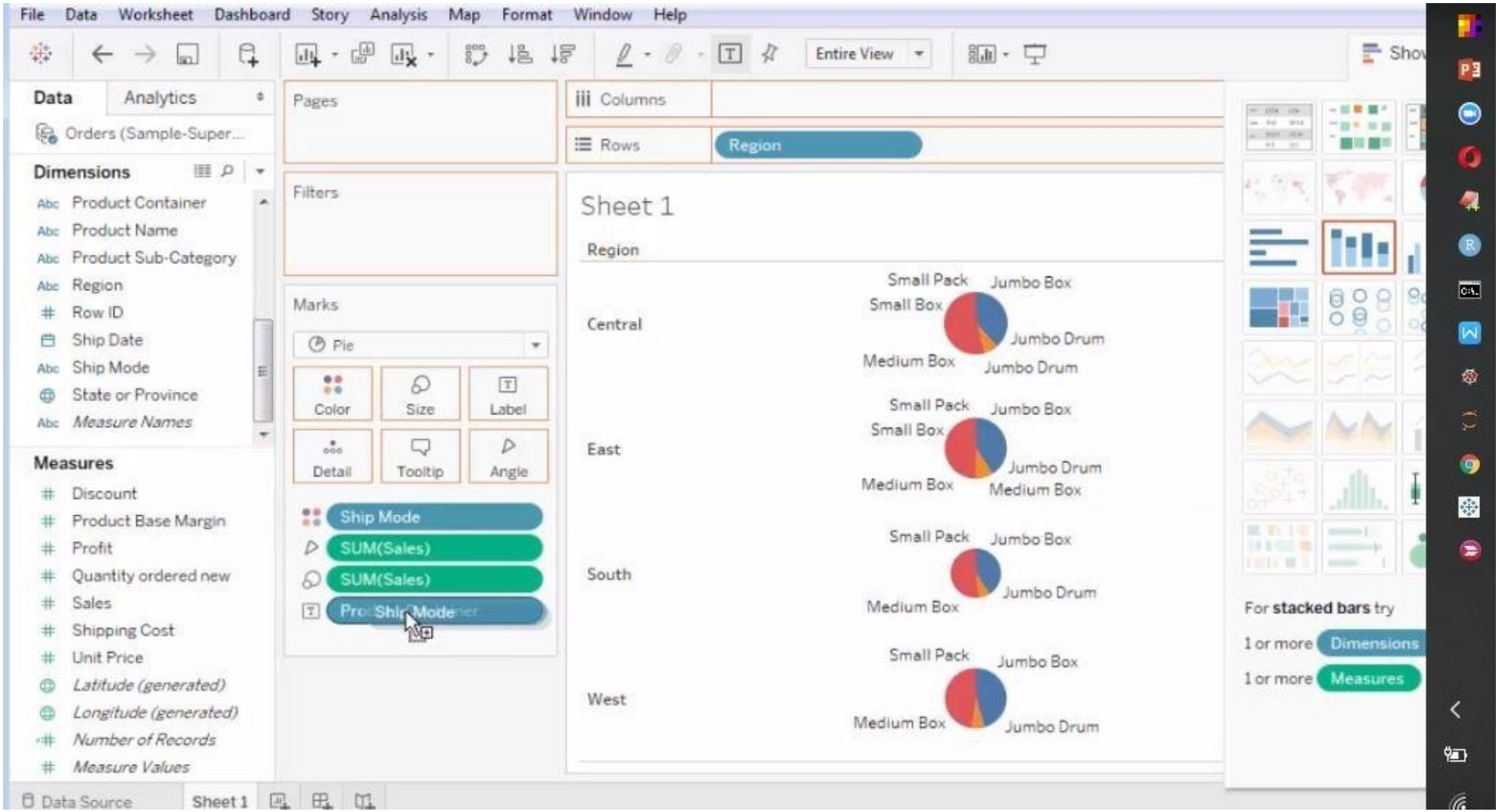
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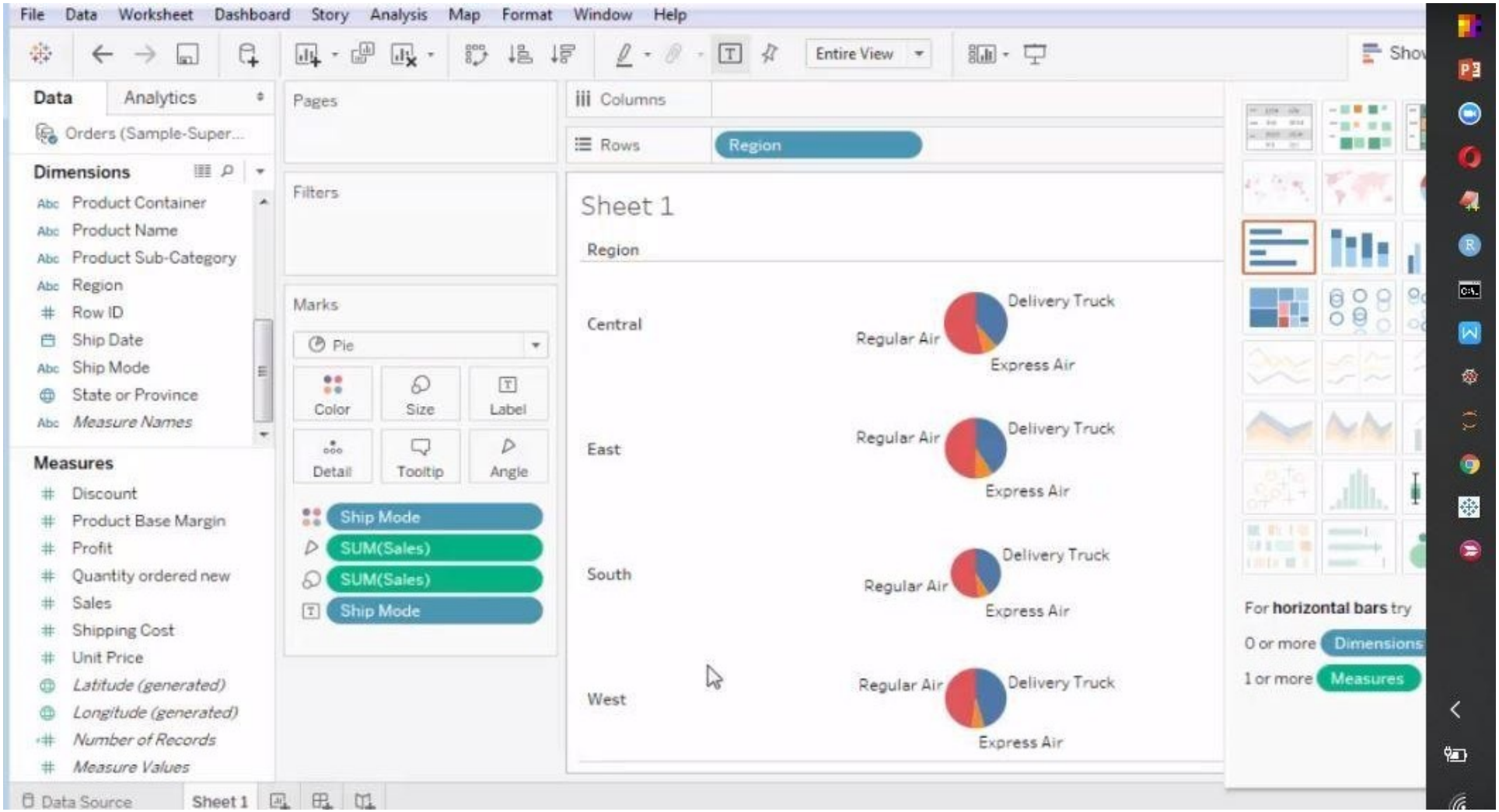
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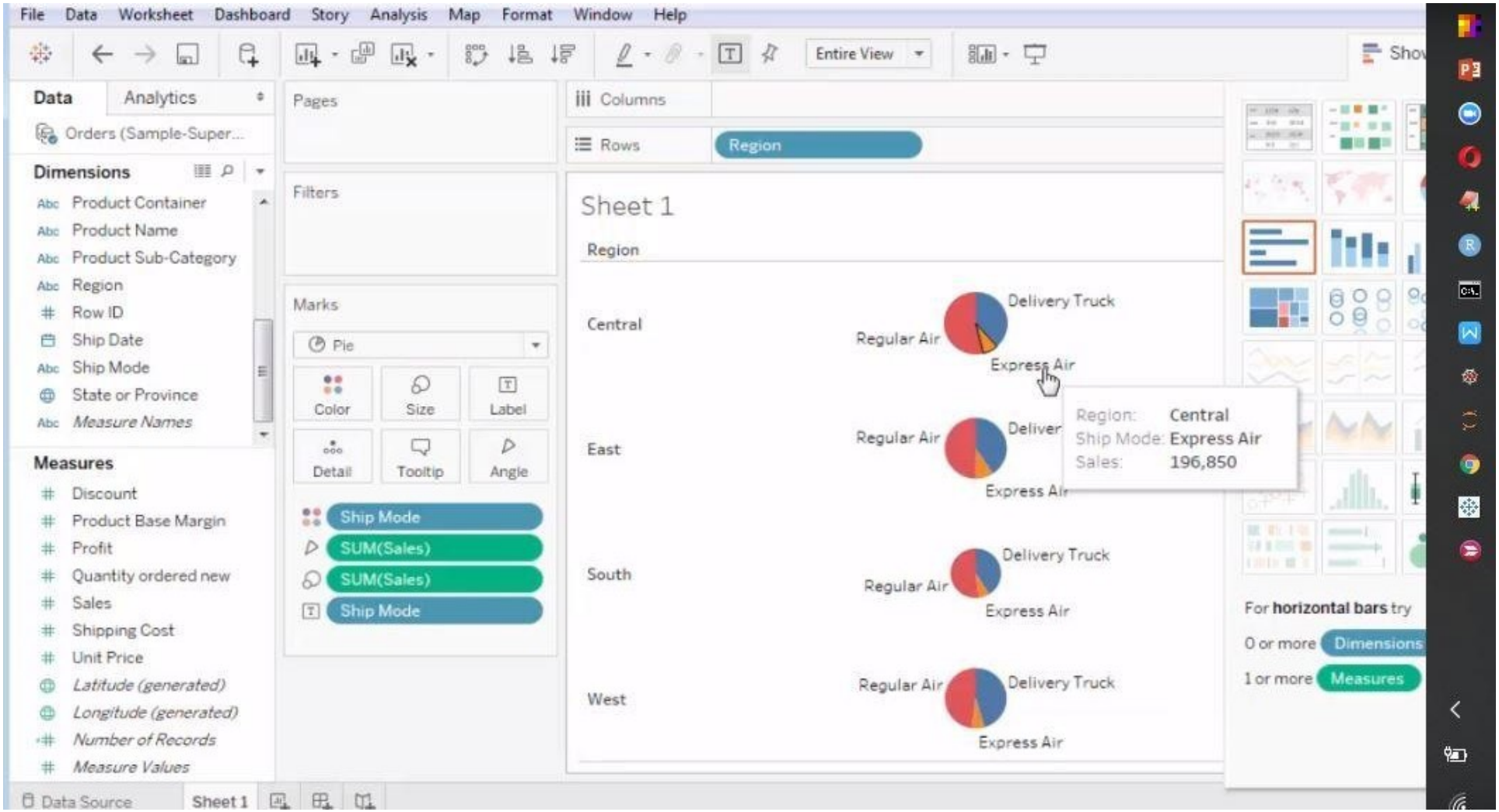
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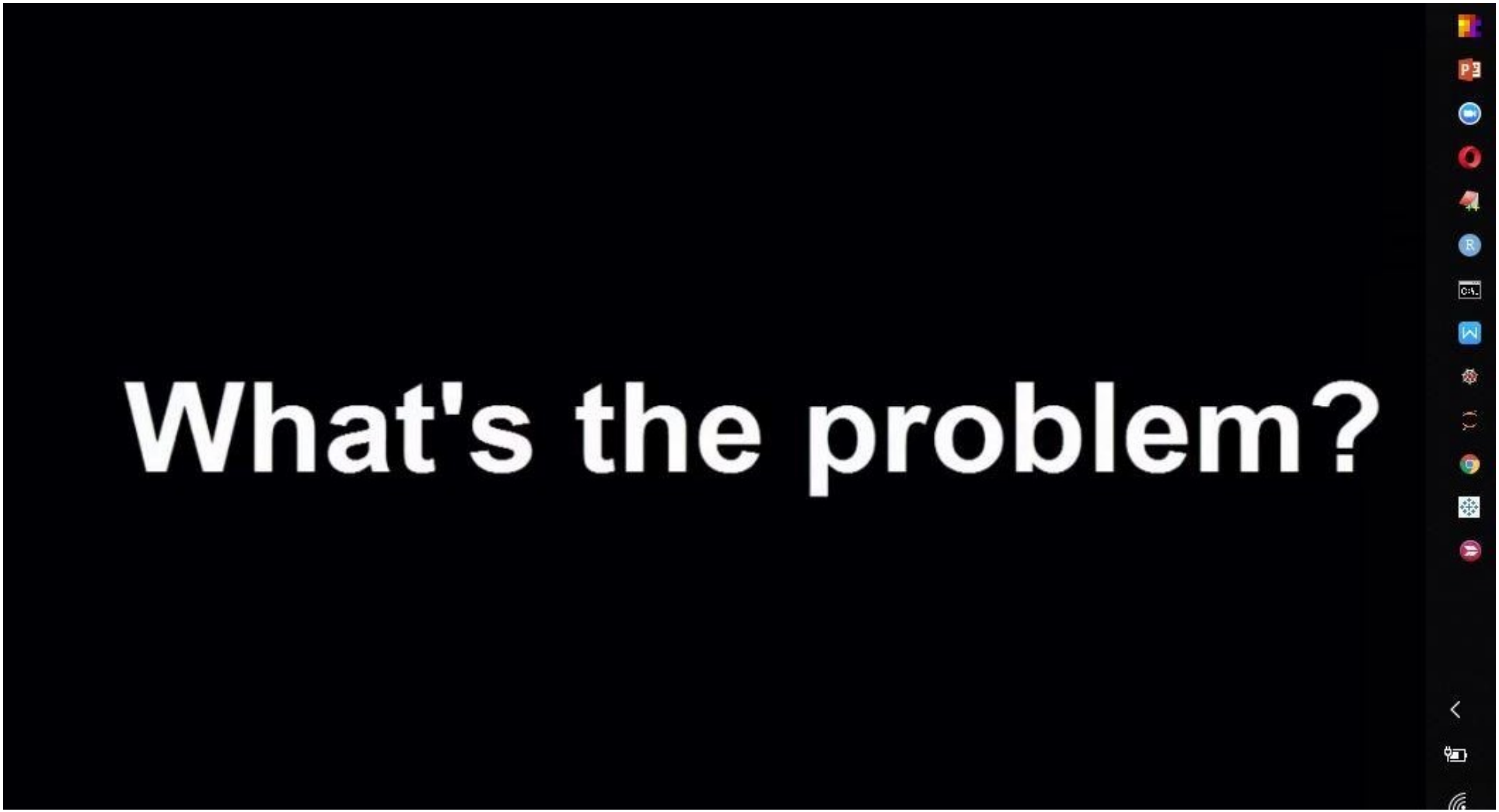
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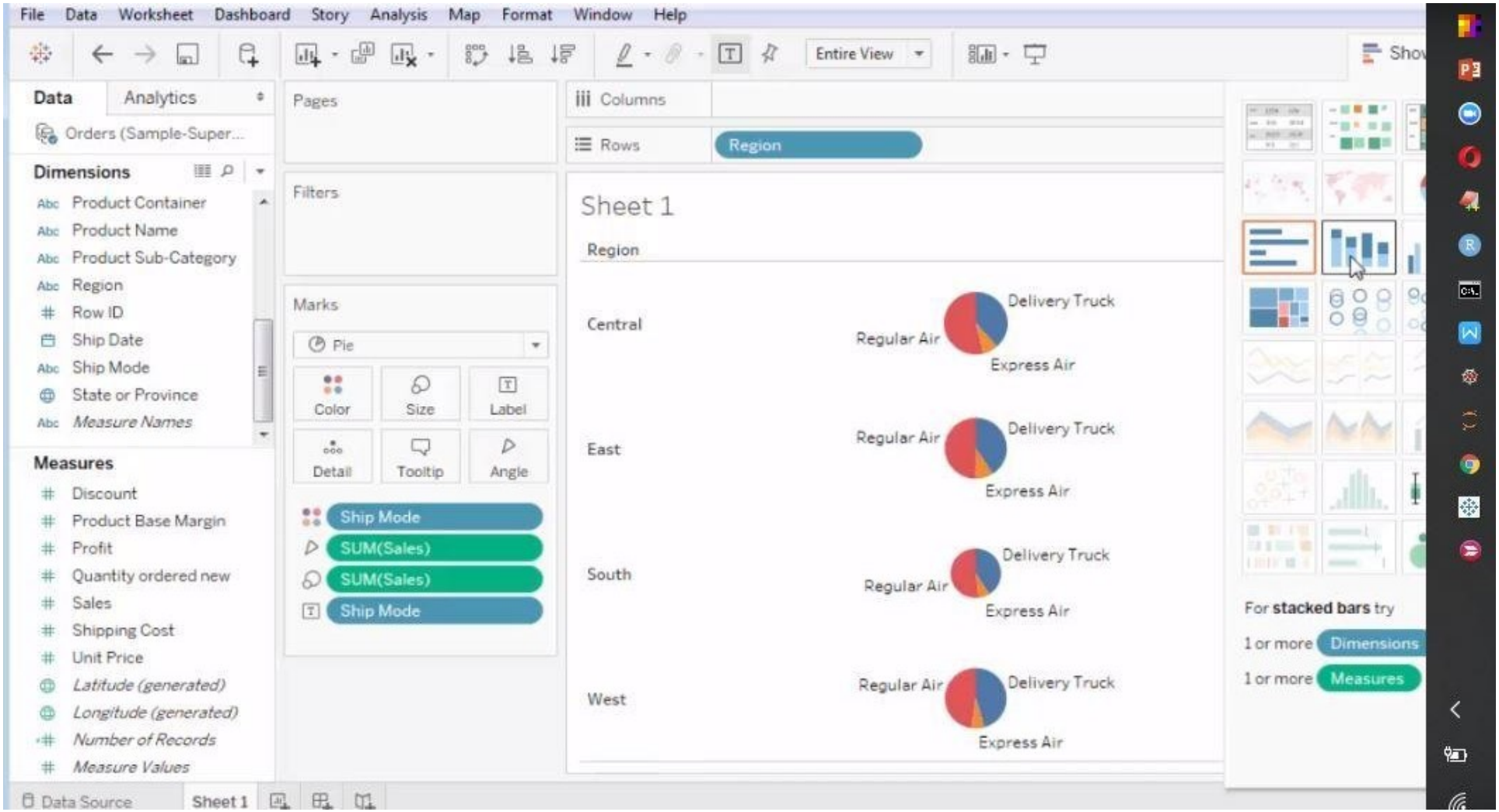
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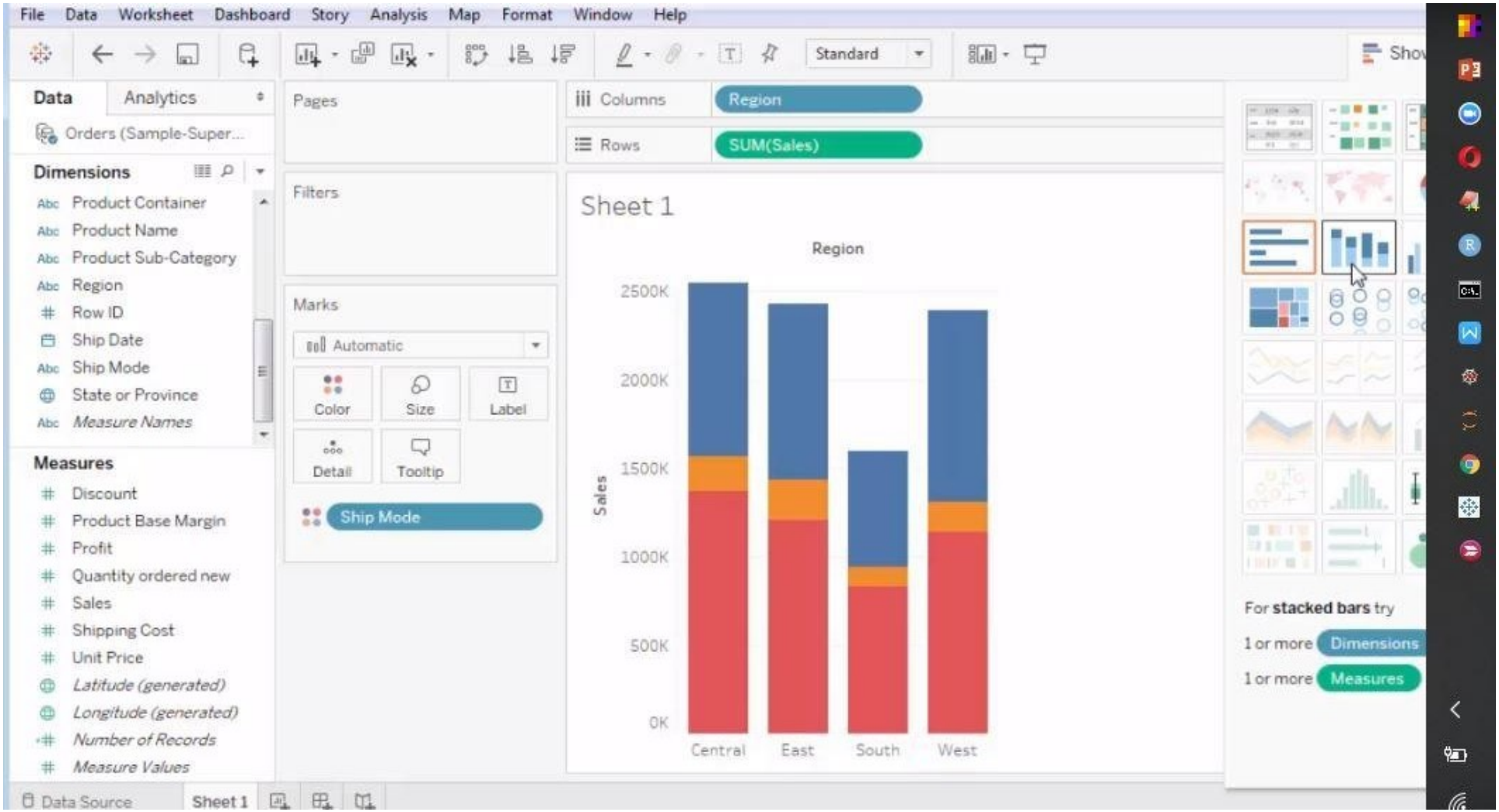
1 or more Measures
Data Source
Sheet 1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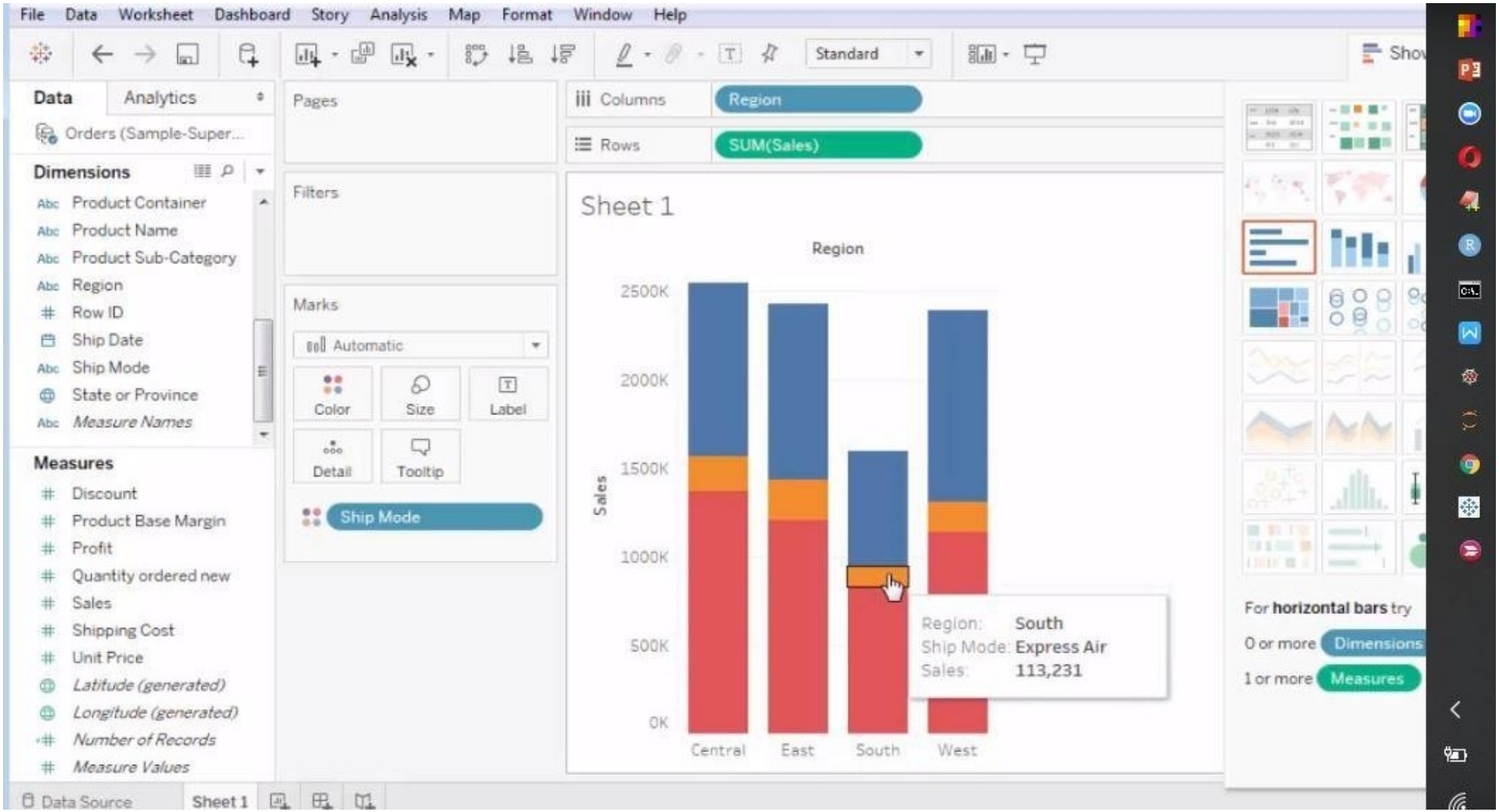
1 or more Measures
Data Source
Sheet 1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For horizontal bars try
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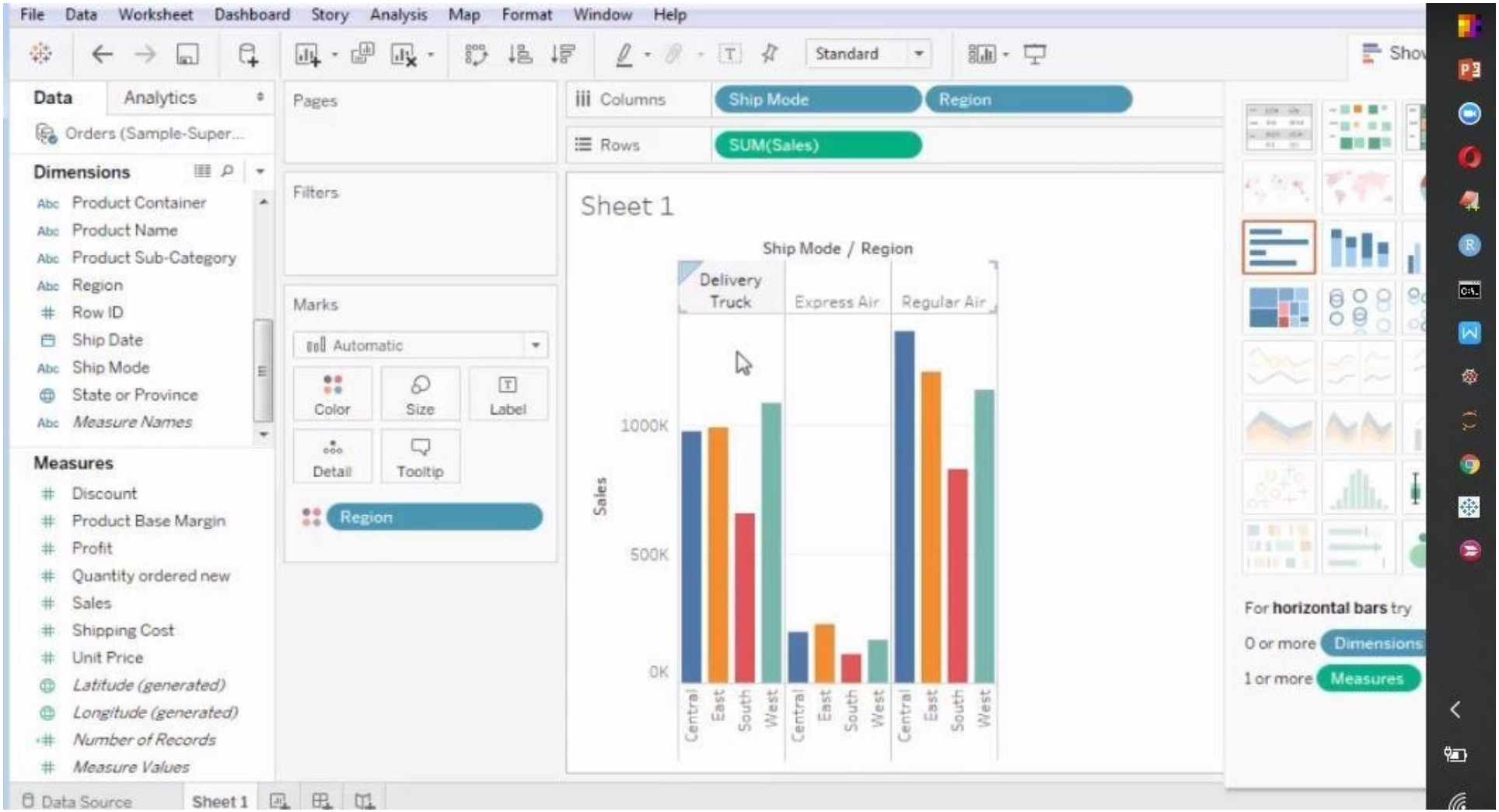
Sheet 1

Side-by-Side Bars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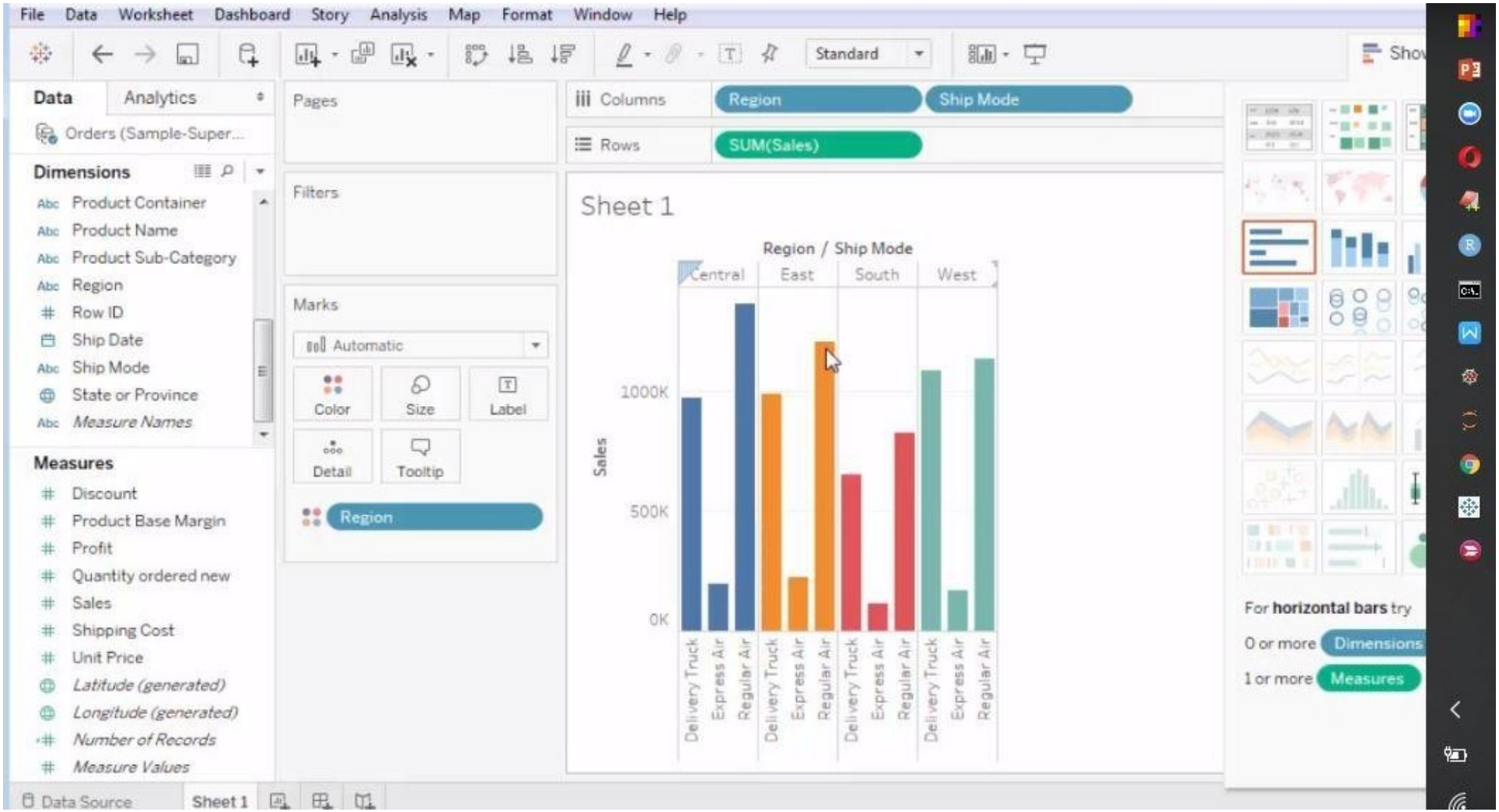
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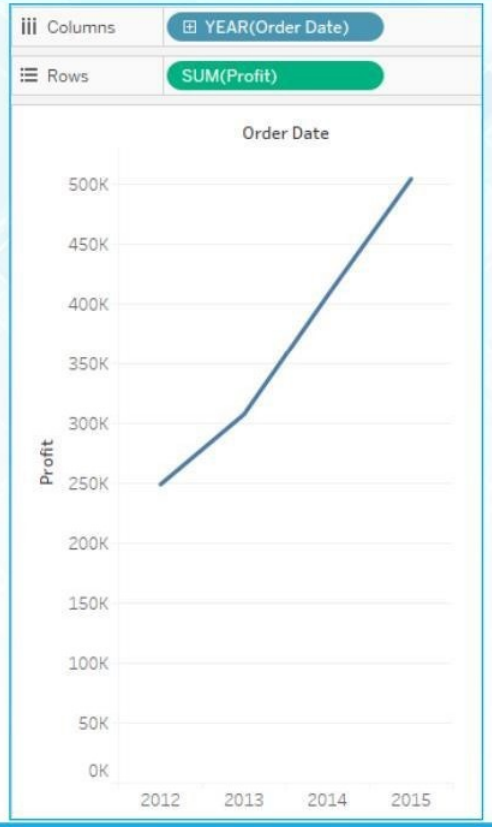
Sheet 1

Line Graph

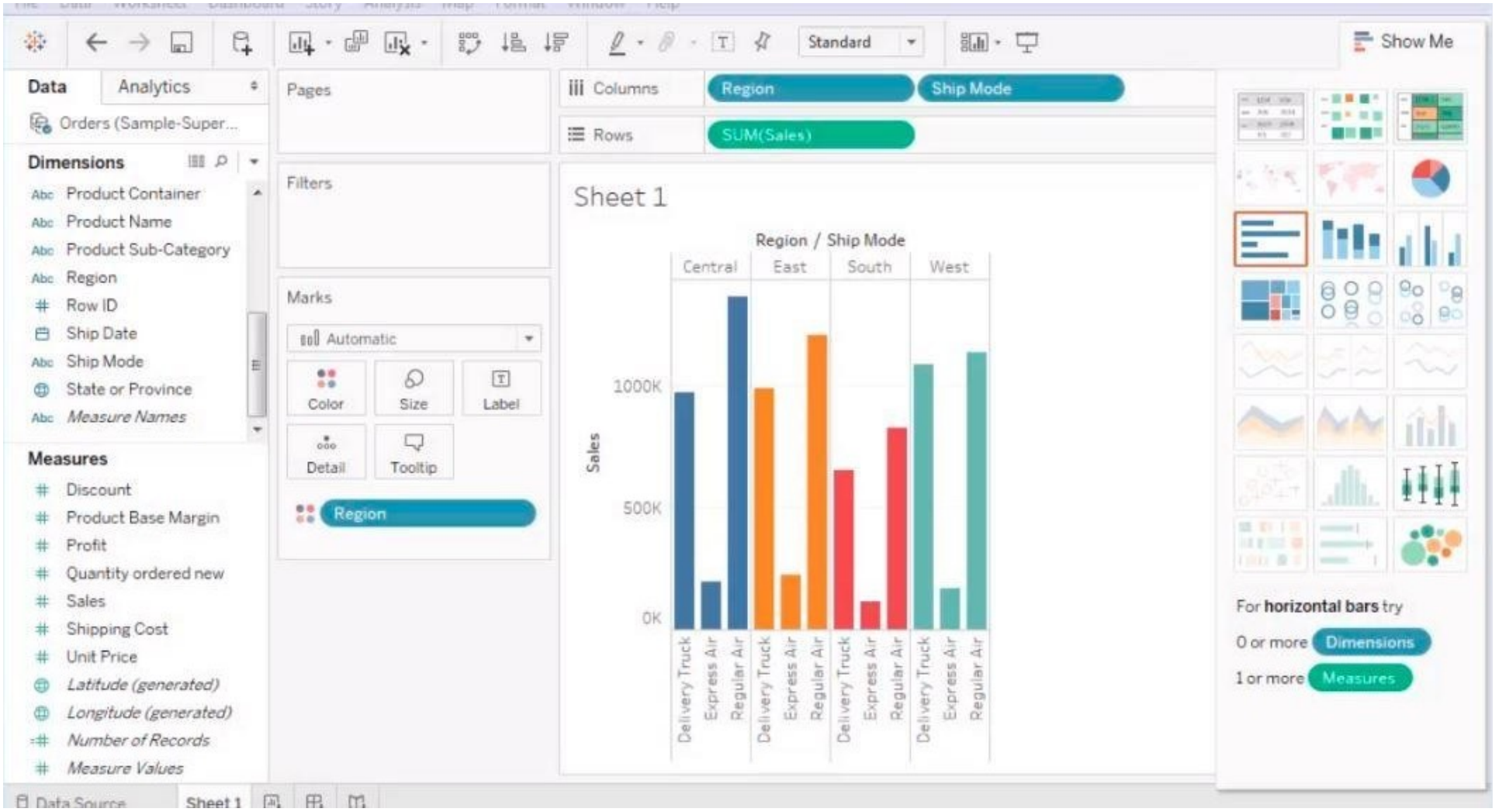


Line graphs are generally used to show time series data. It shows how one or more variables vary over a continuous period of time

Note: When smaller changes exist, line graphs are better to use than bar graphs

Bar Charts show how
a measure varies by
one or more dimension

Line and Area Charts
Can be used to show
How a numeric
Variable changes
Over time.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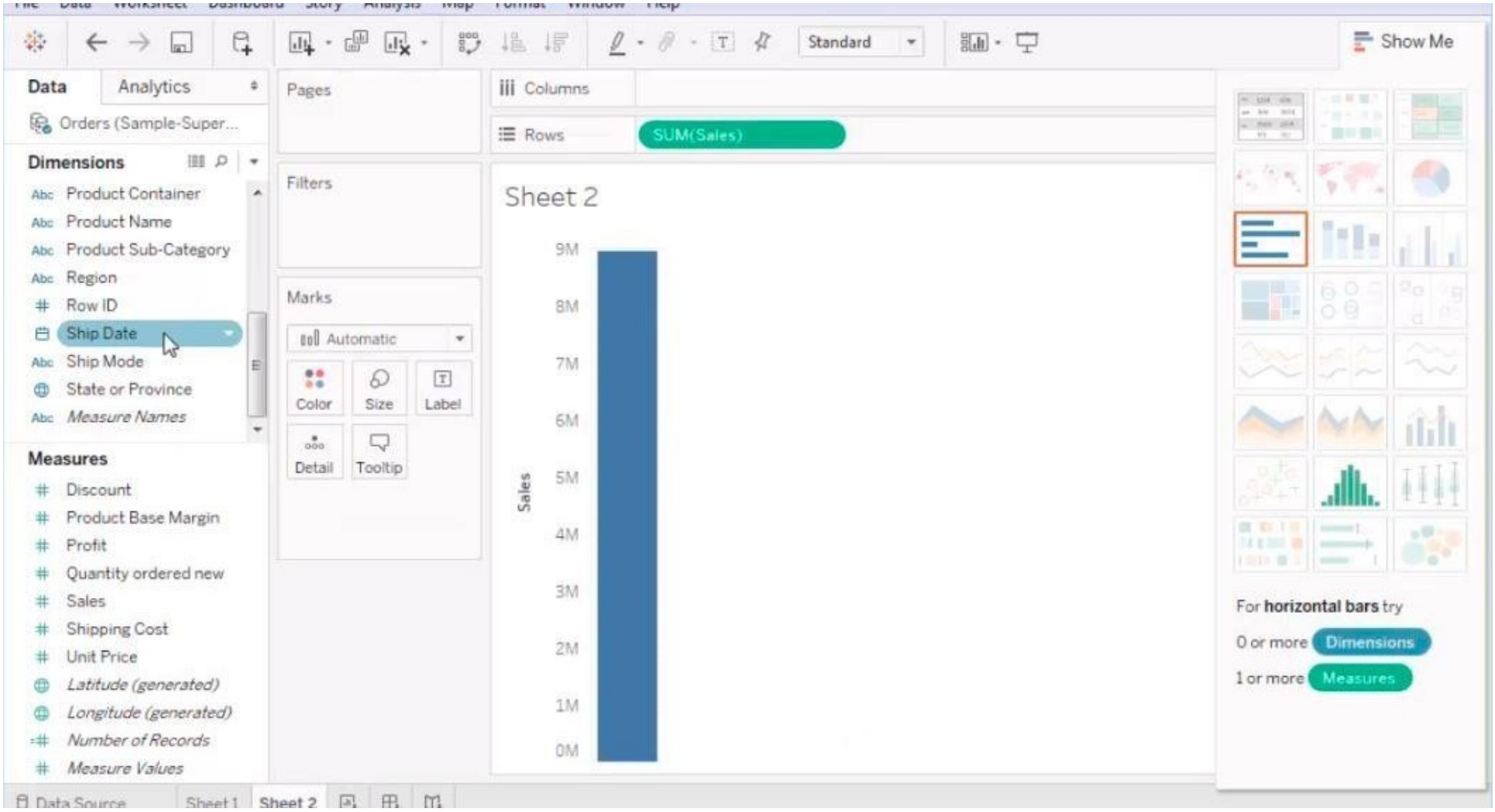
Express Air
Regular Air
For horizontal bars try
0 or more Dimensions
1 or more Measures
Data Source
Sheet 1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Product Base Margin
Profit
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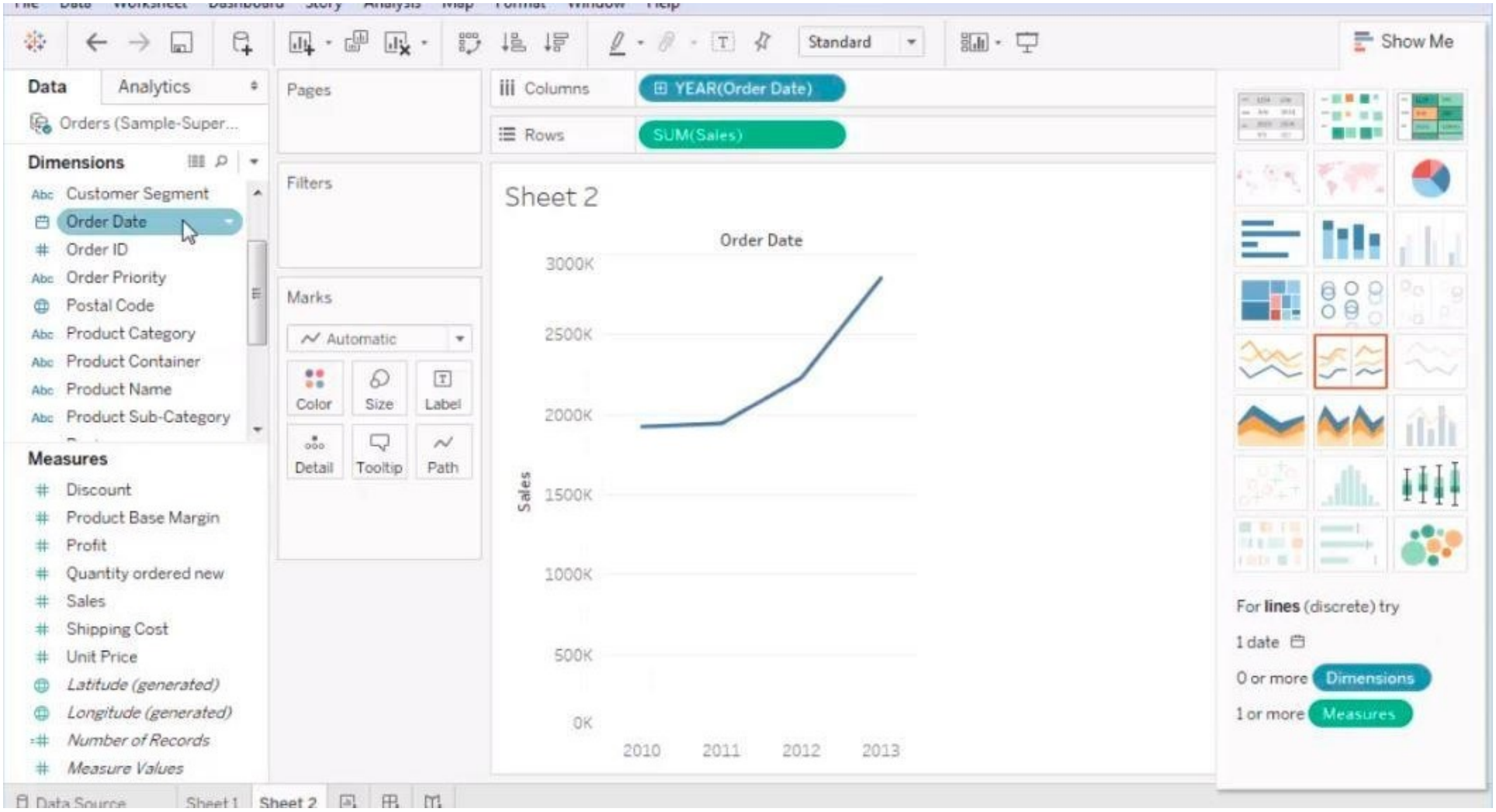
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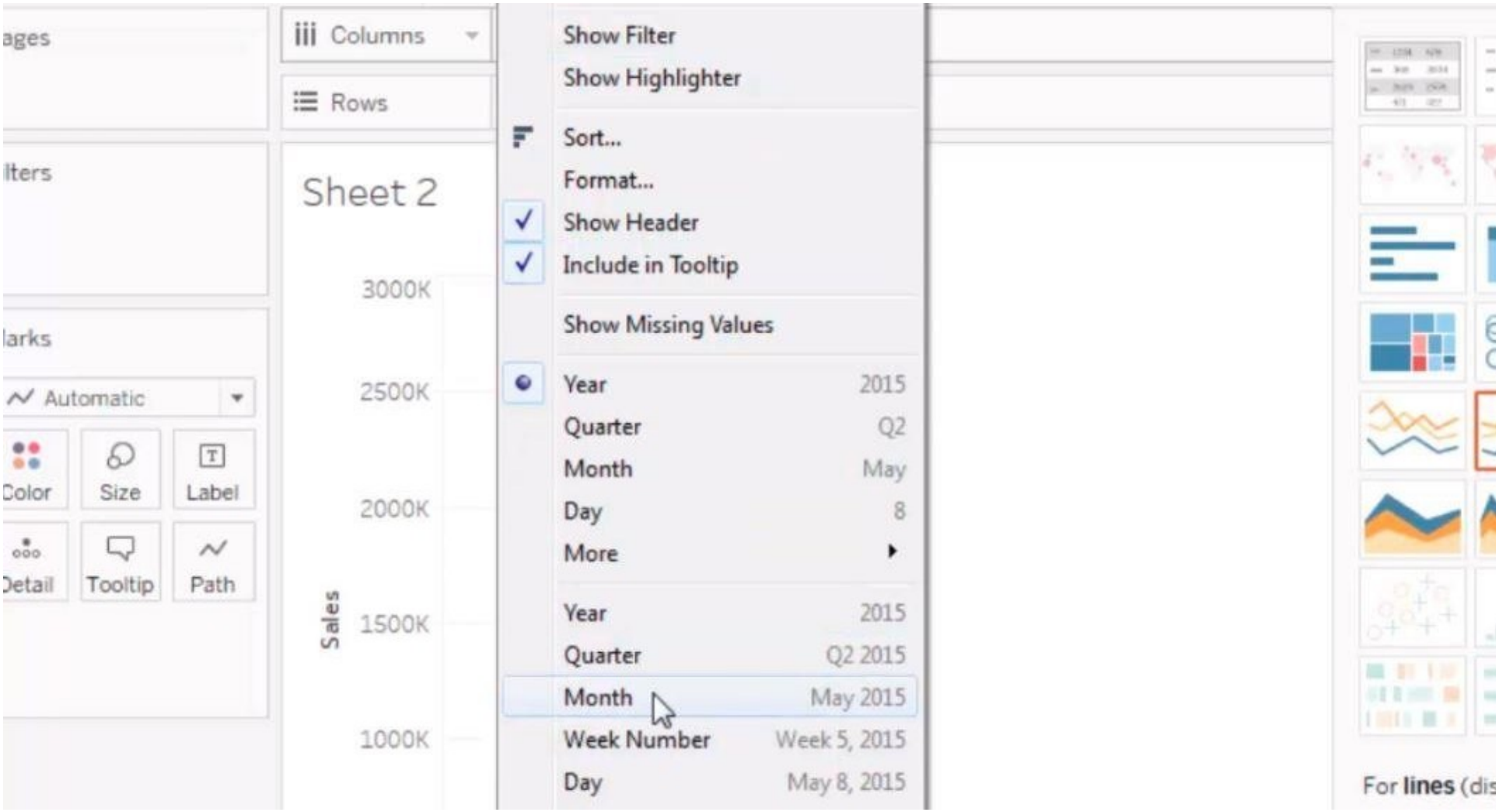
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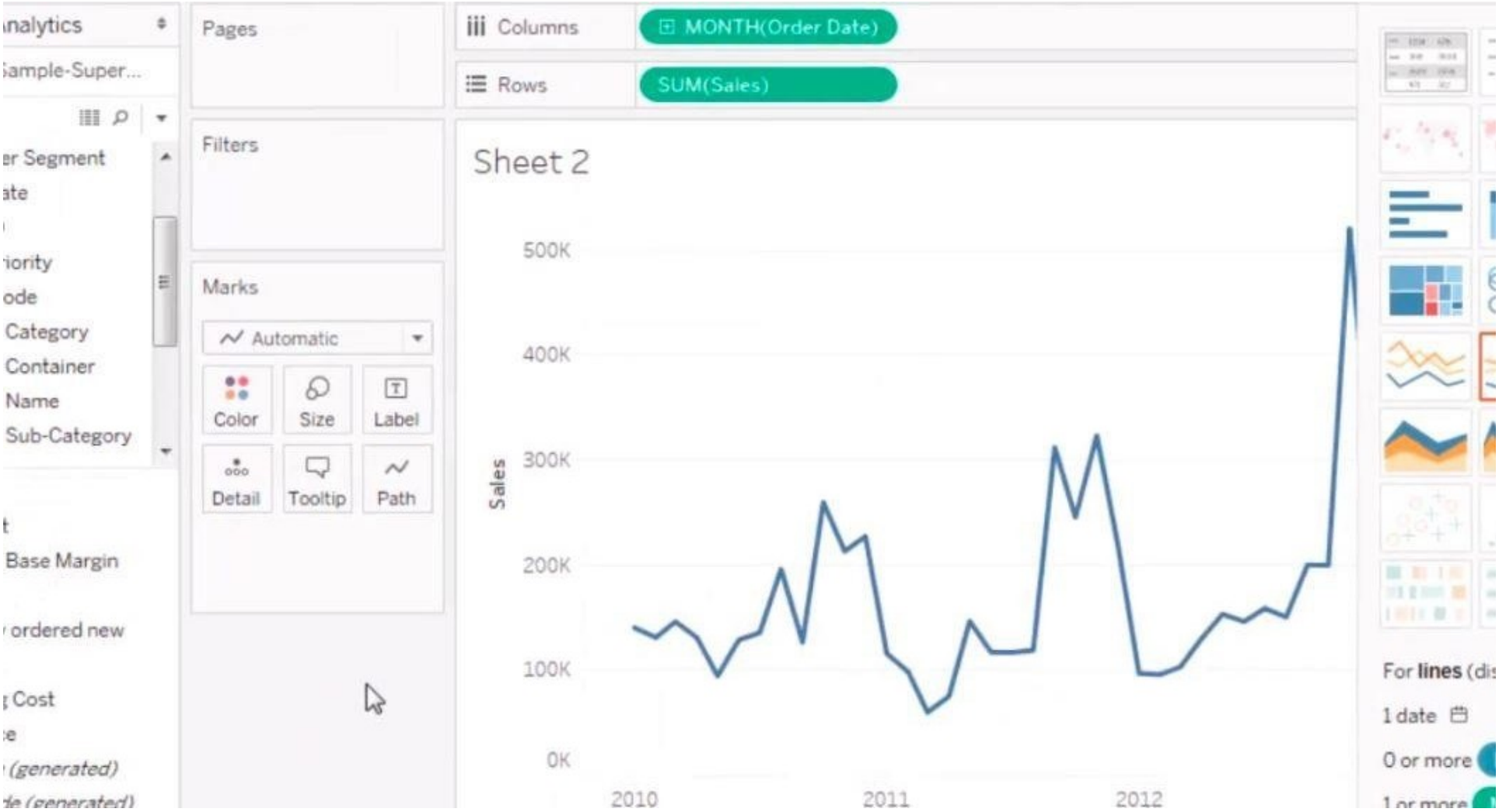
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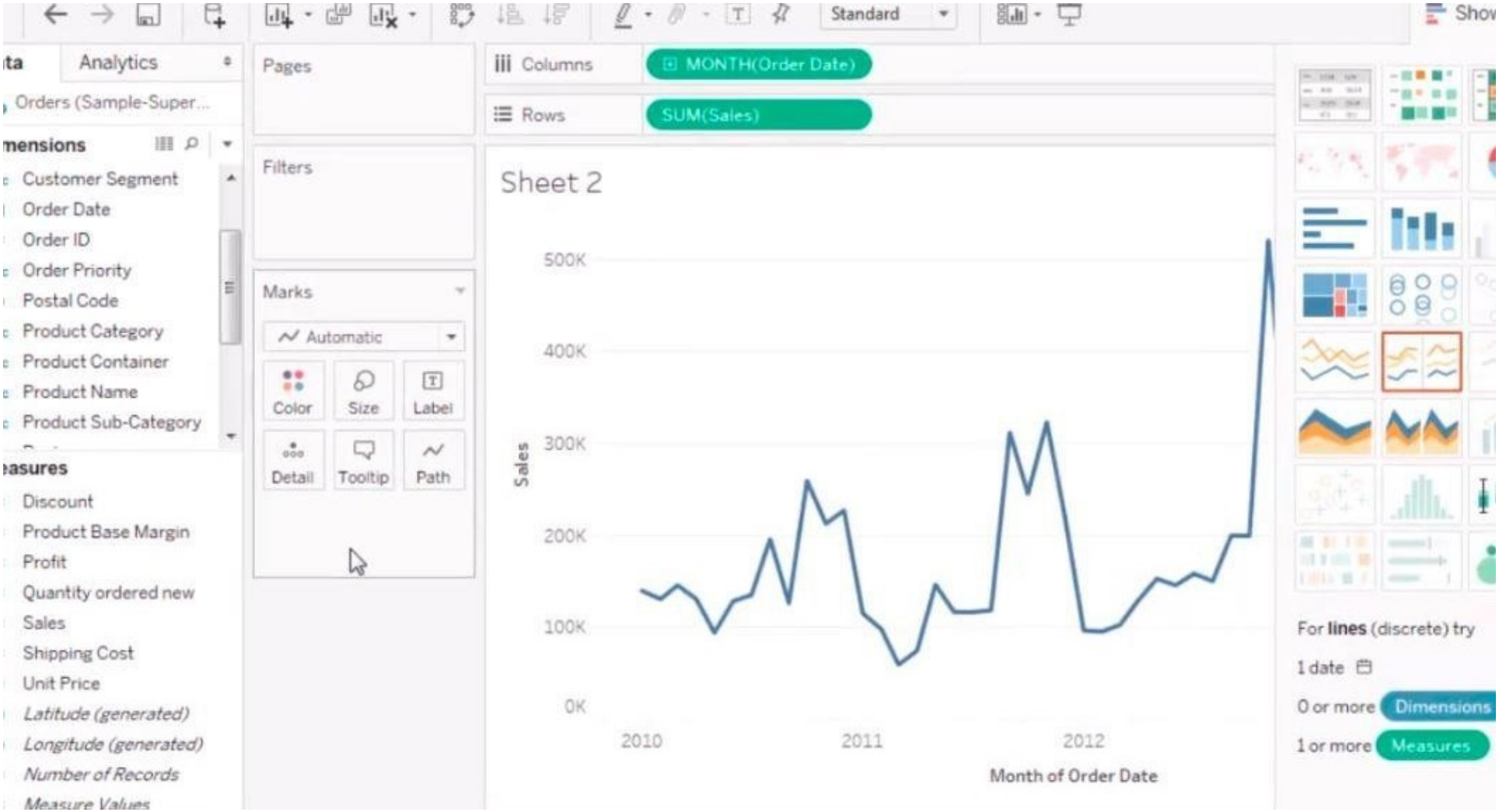
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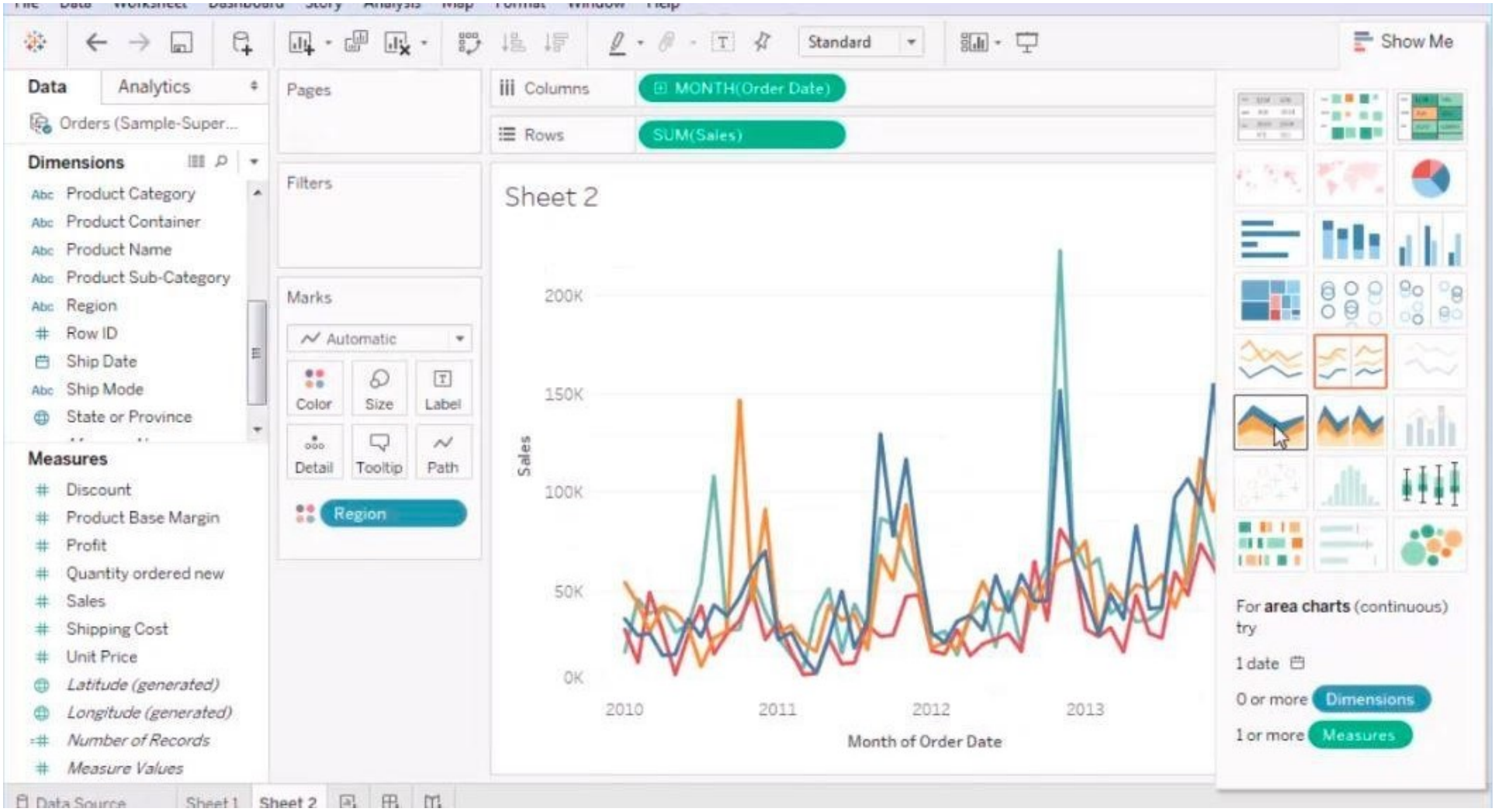
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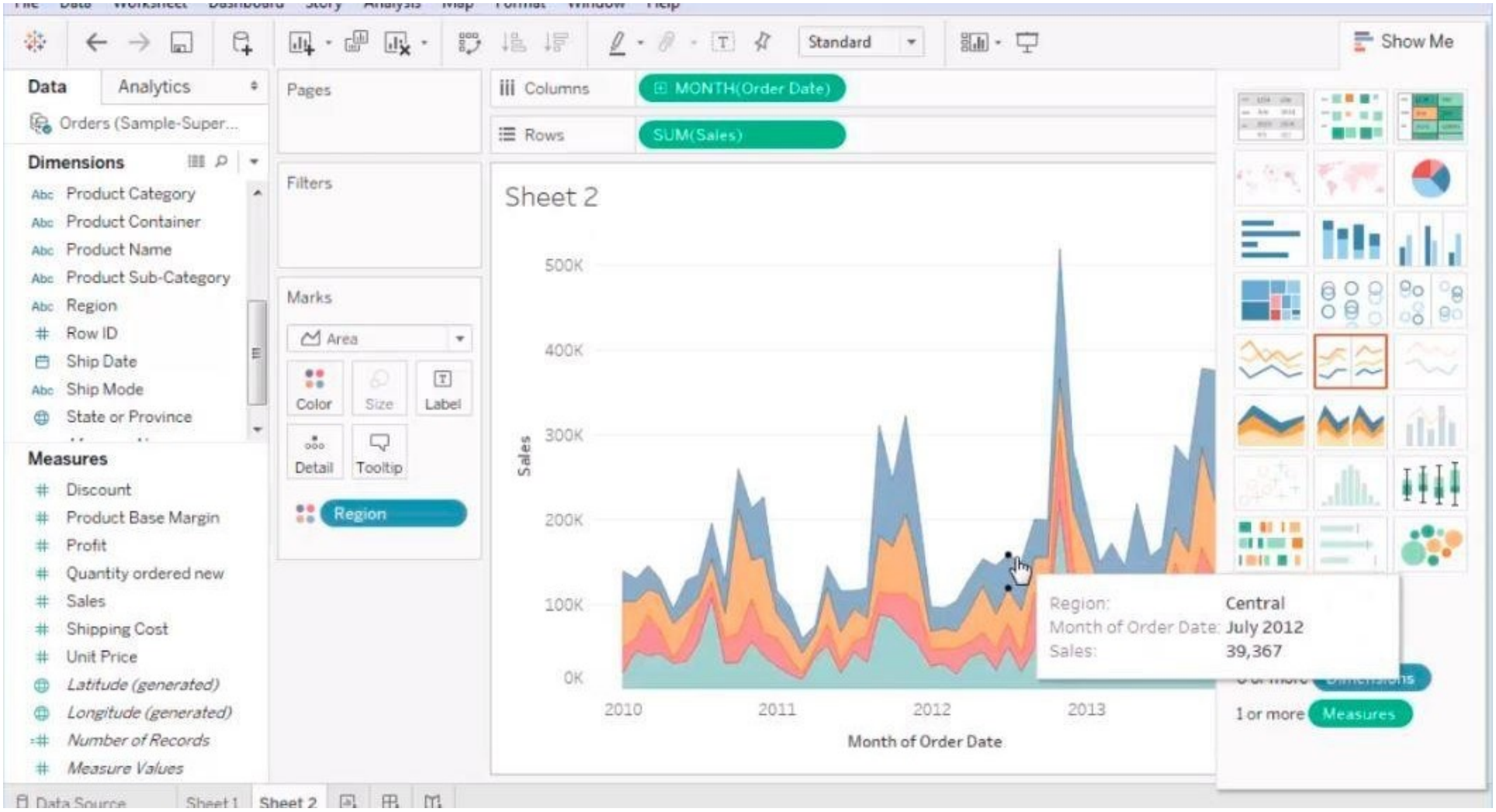
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Region: Central
Month of Order Date: July 2012
Sales: 39,367
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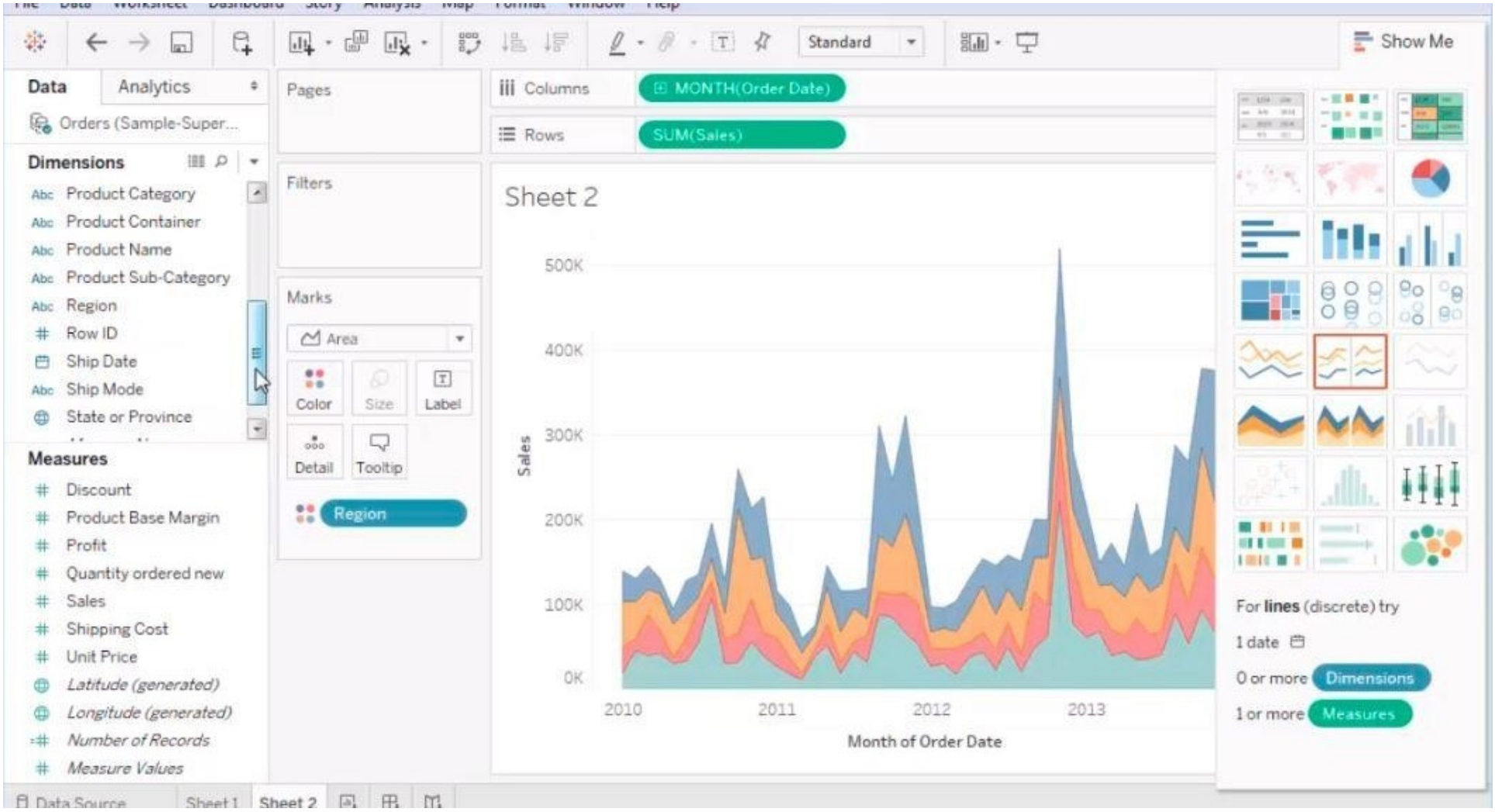
Sheet 2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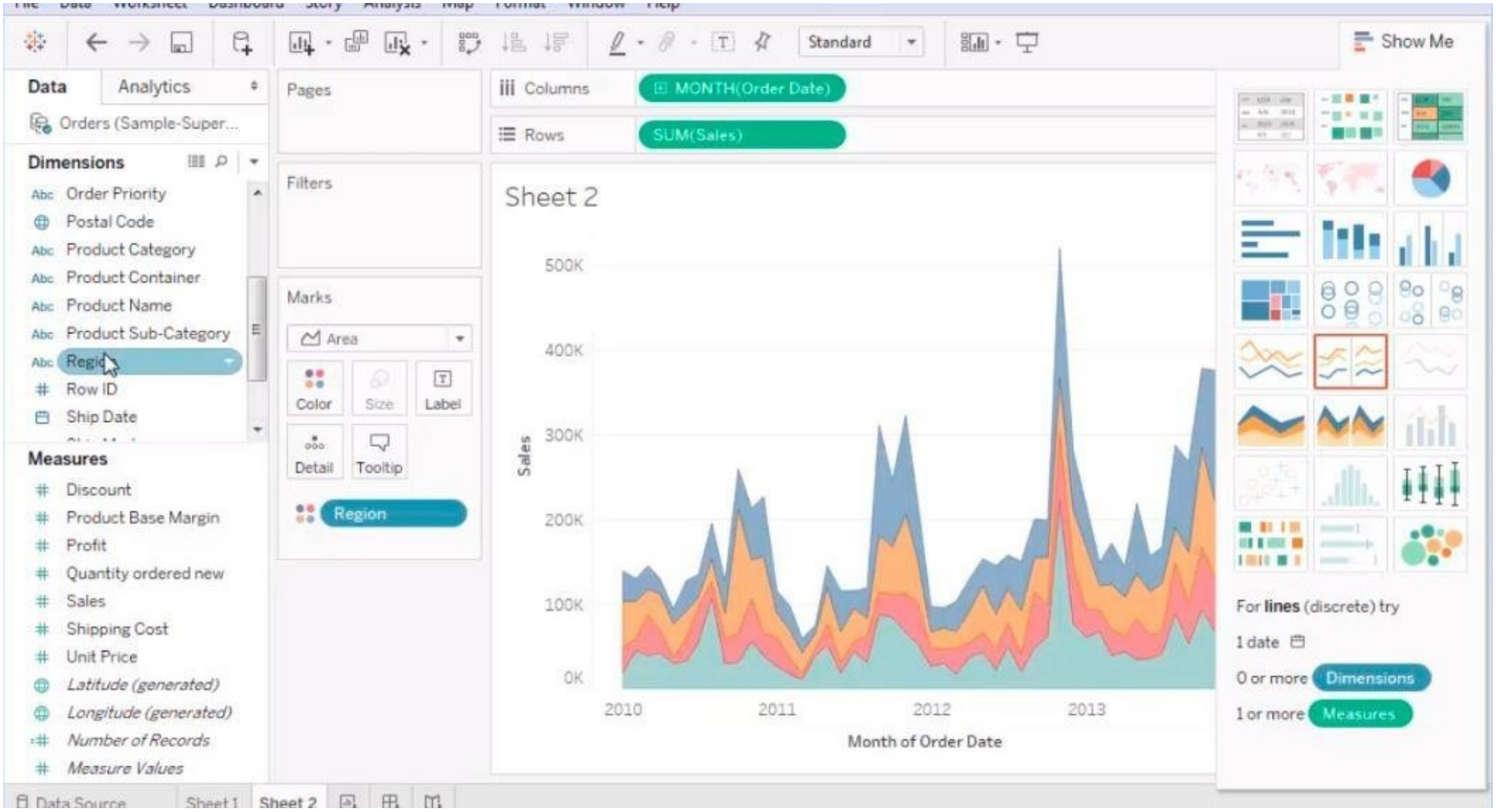
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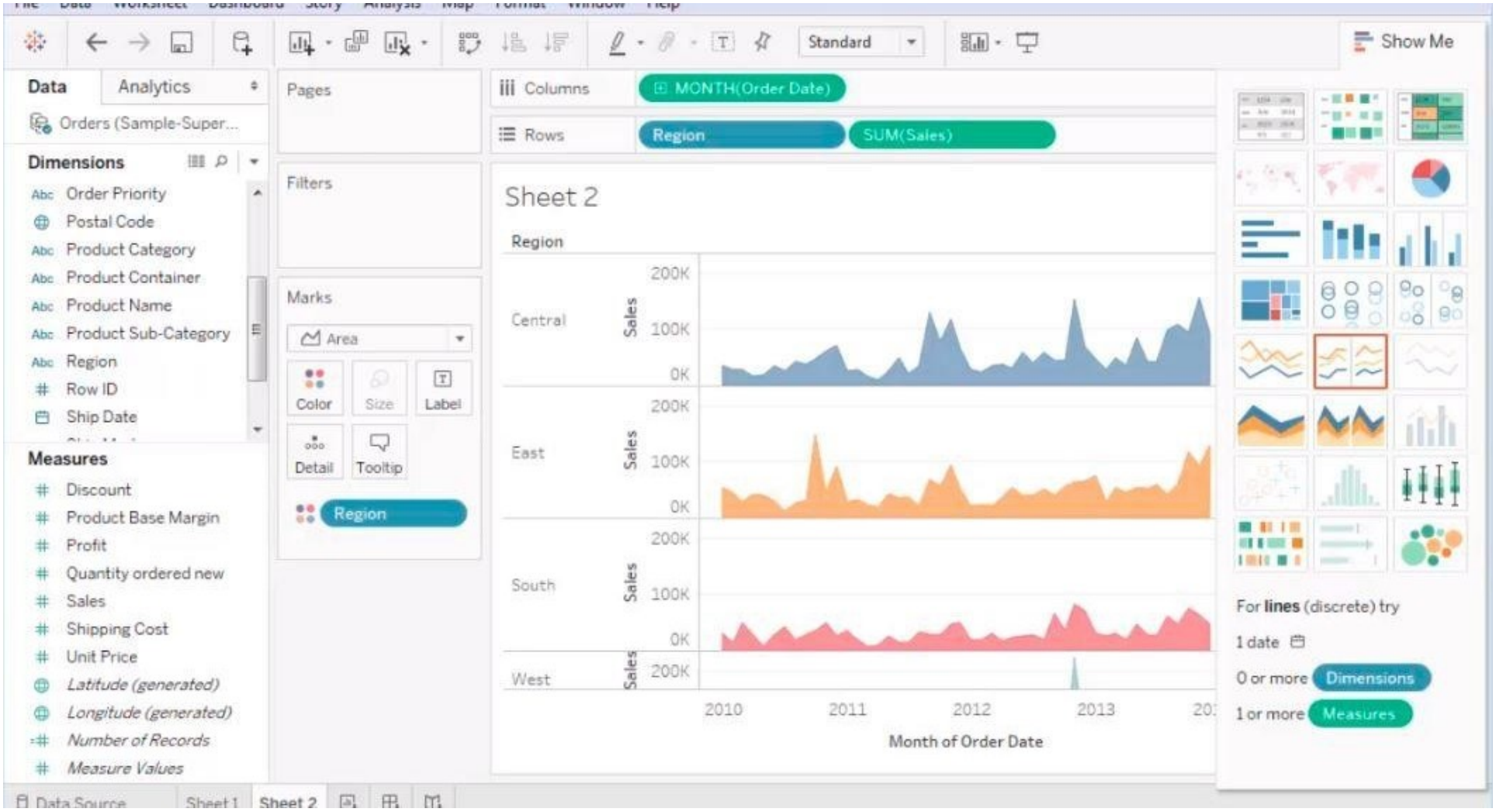
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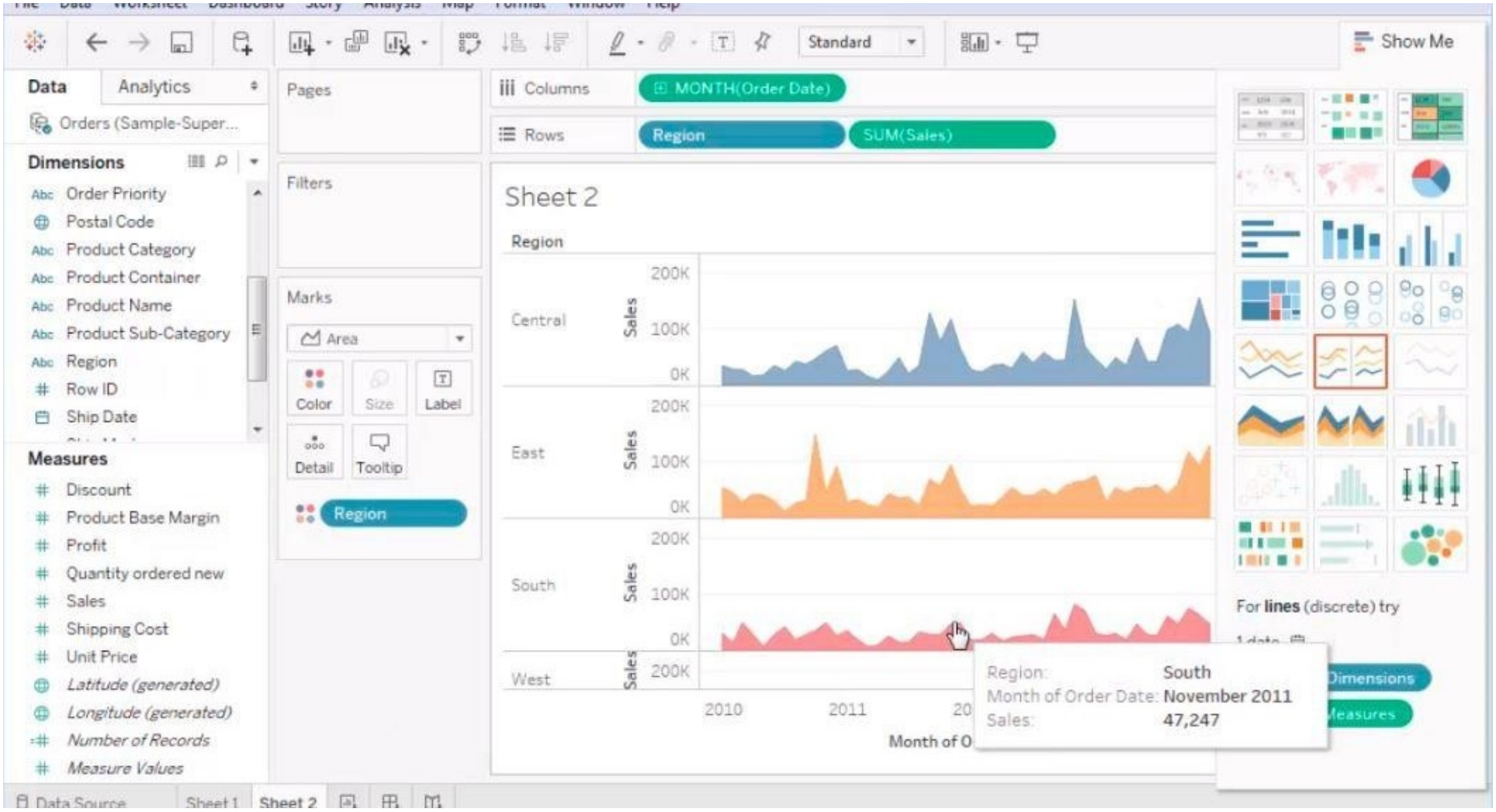
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Month of Order Date: November 2011
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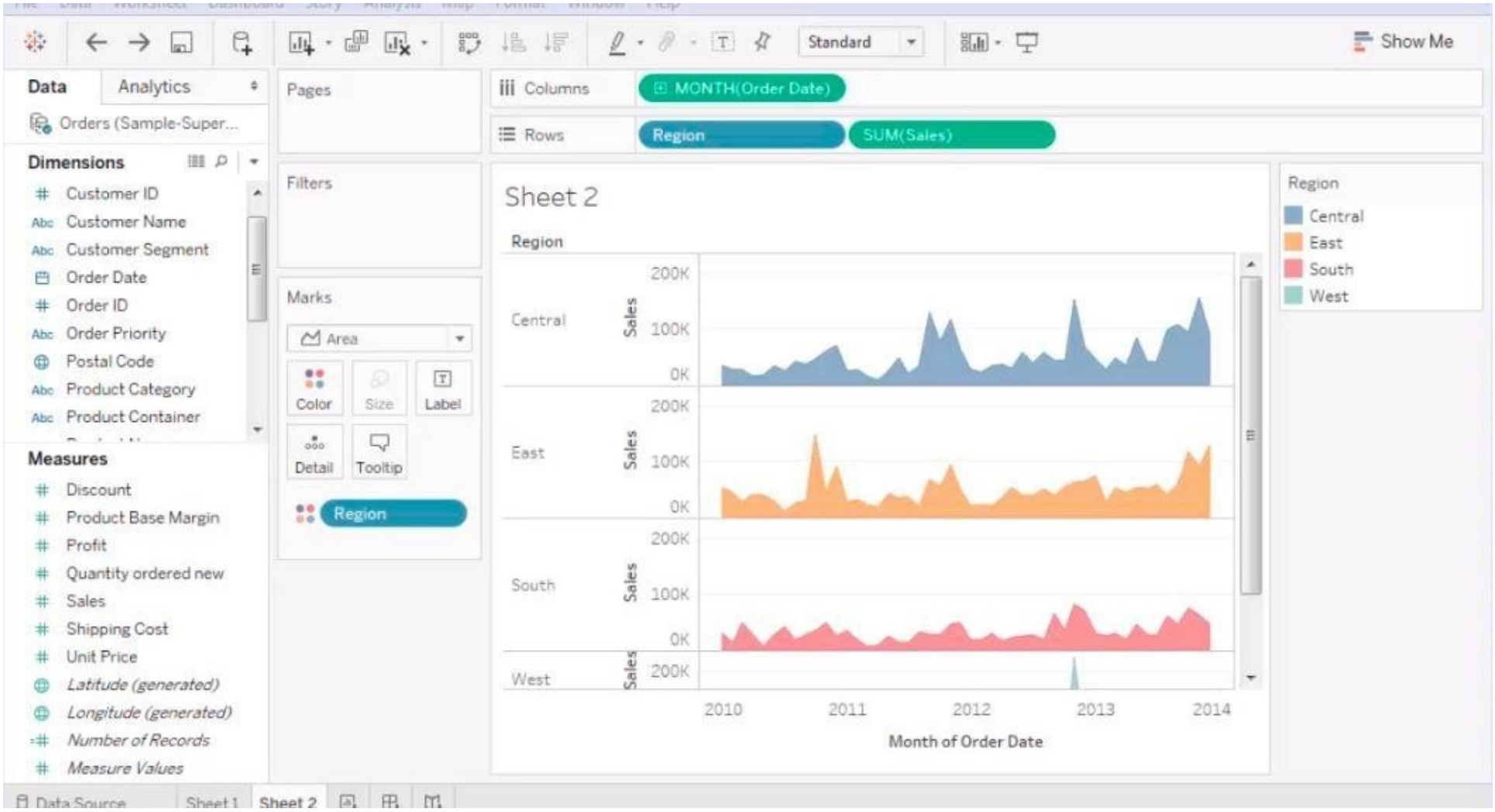
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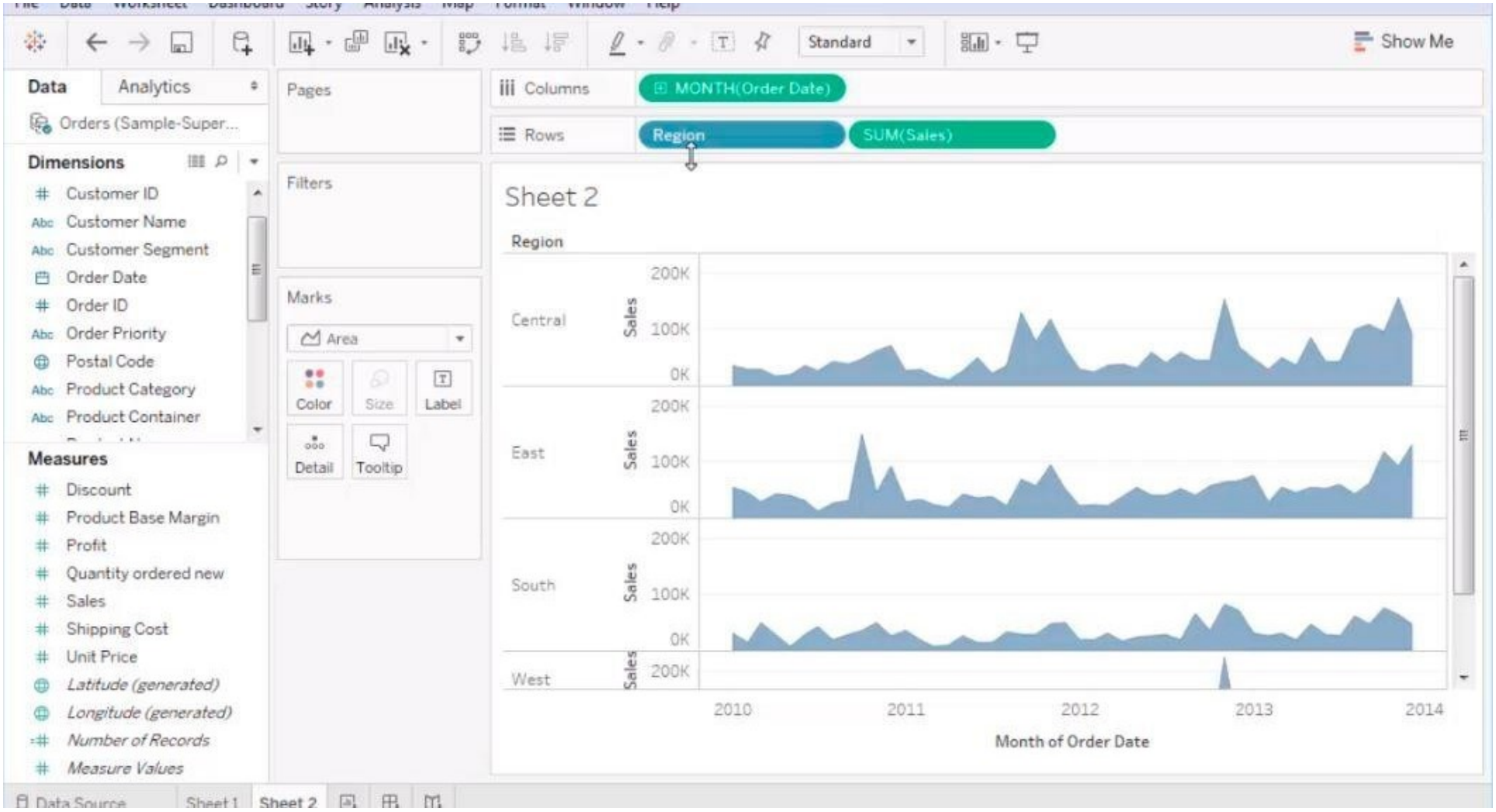
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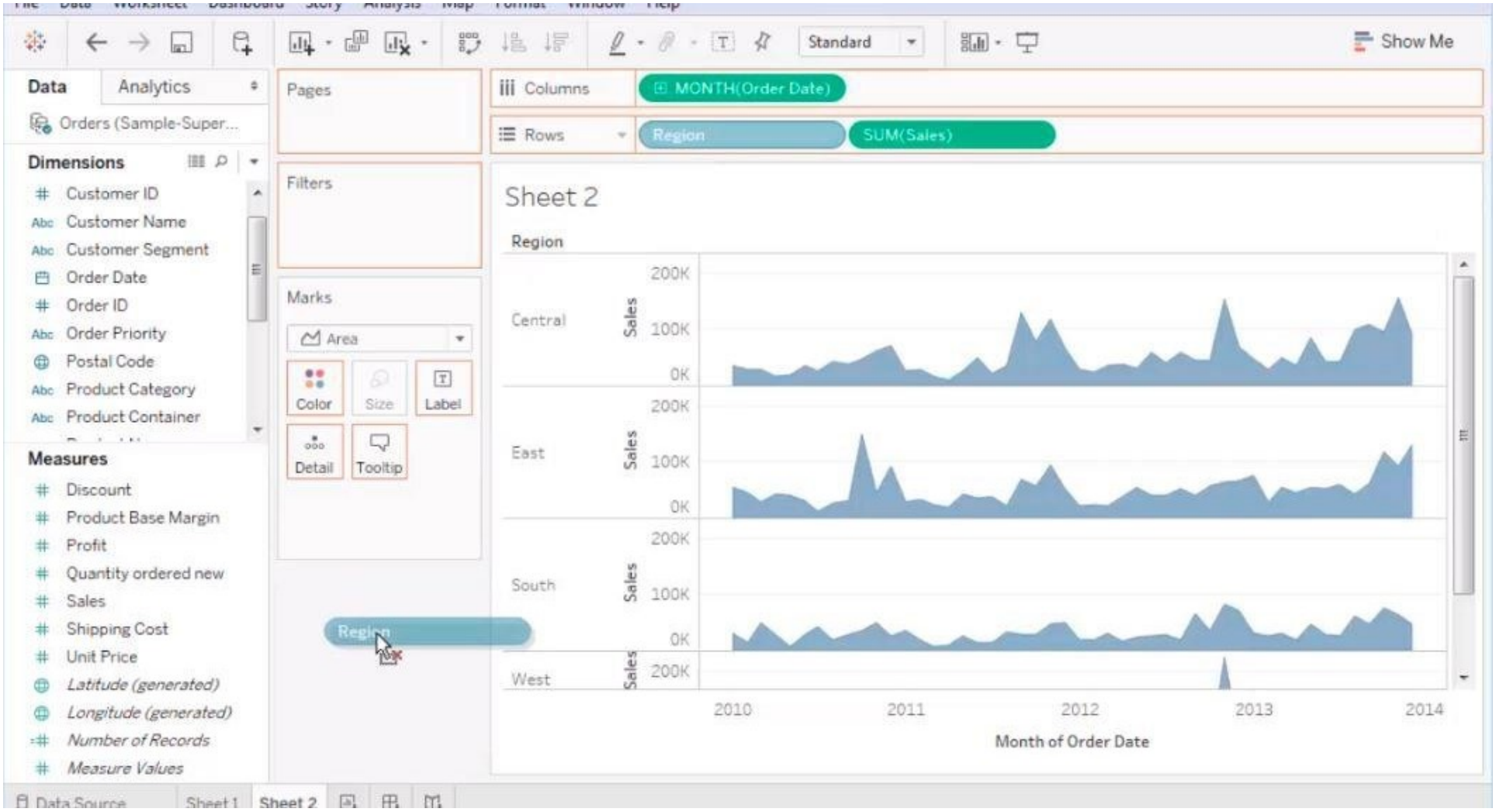
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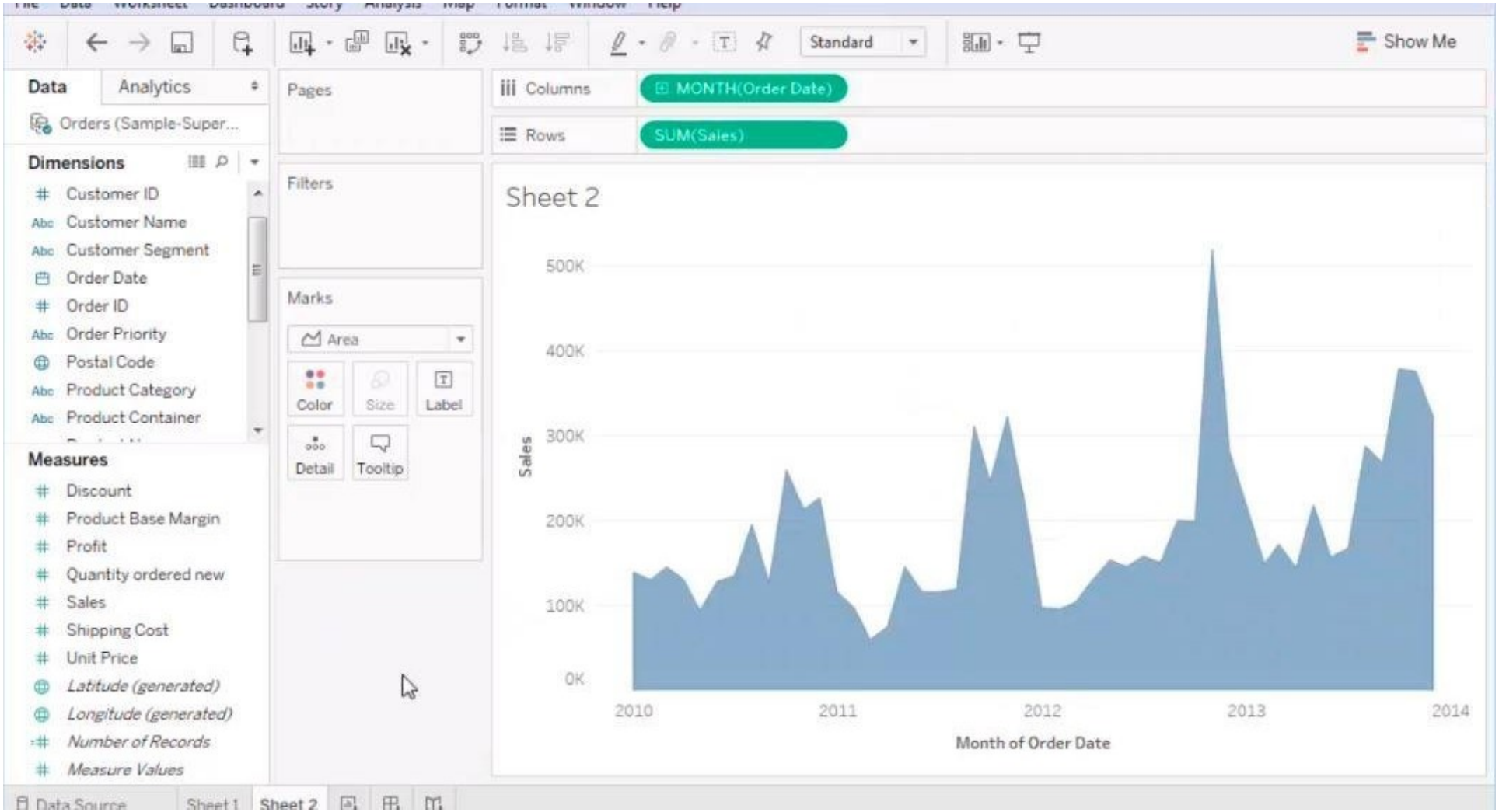
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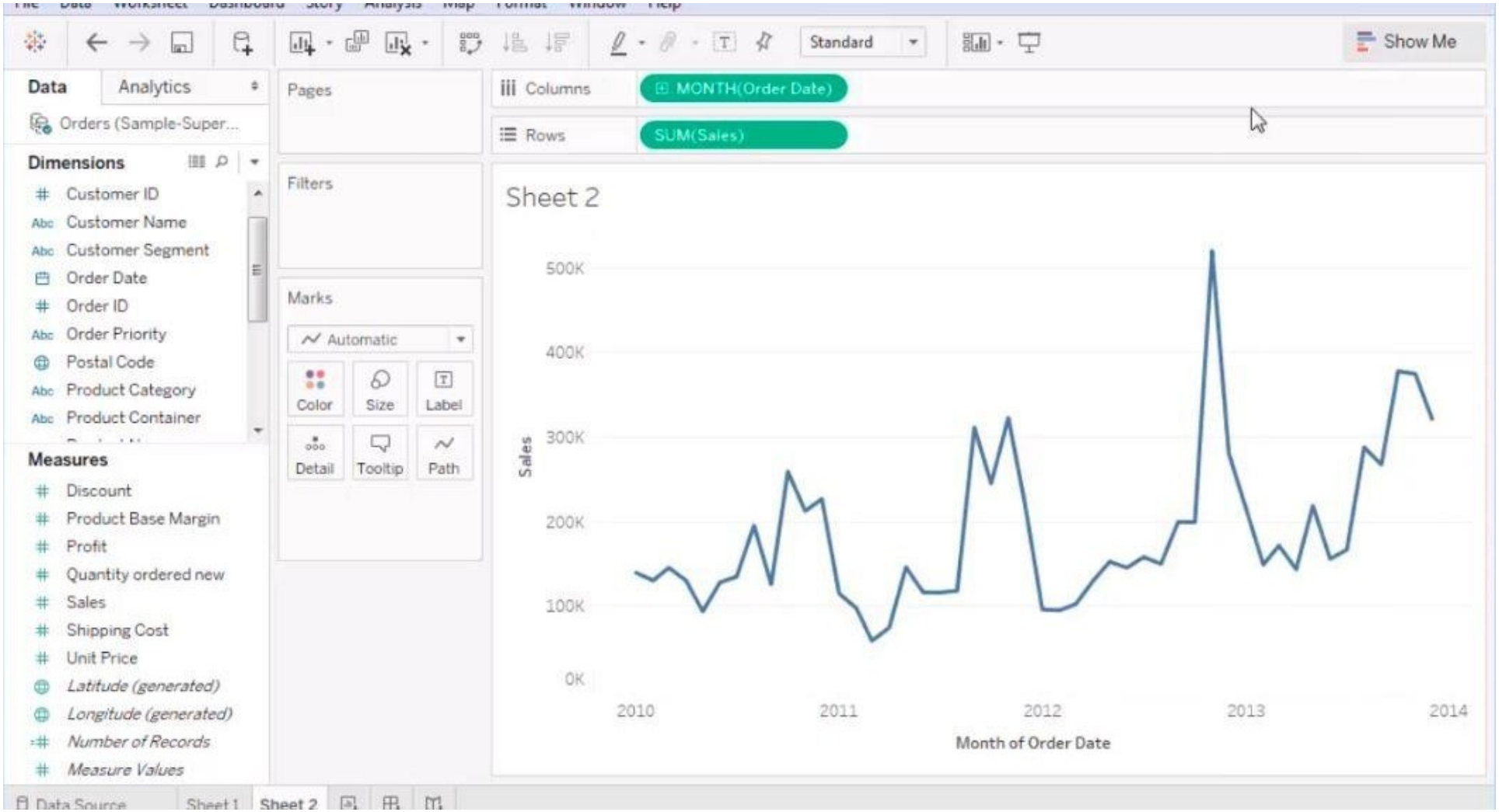
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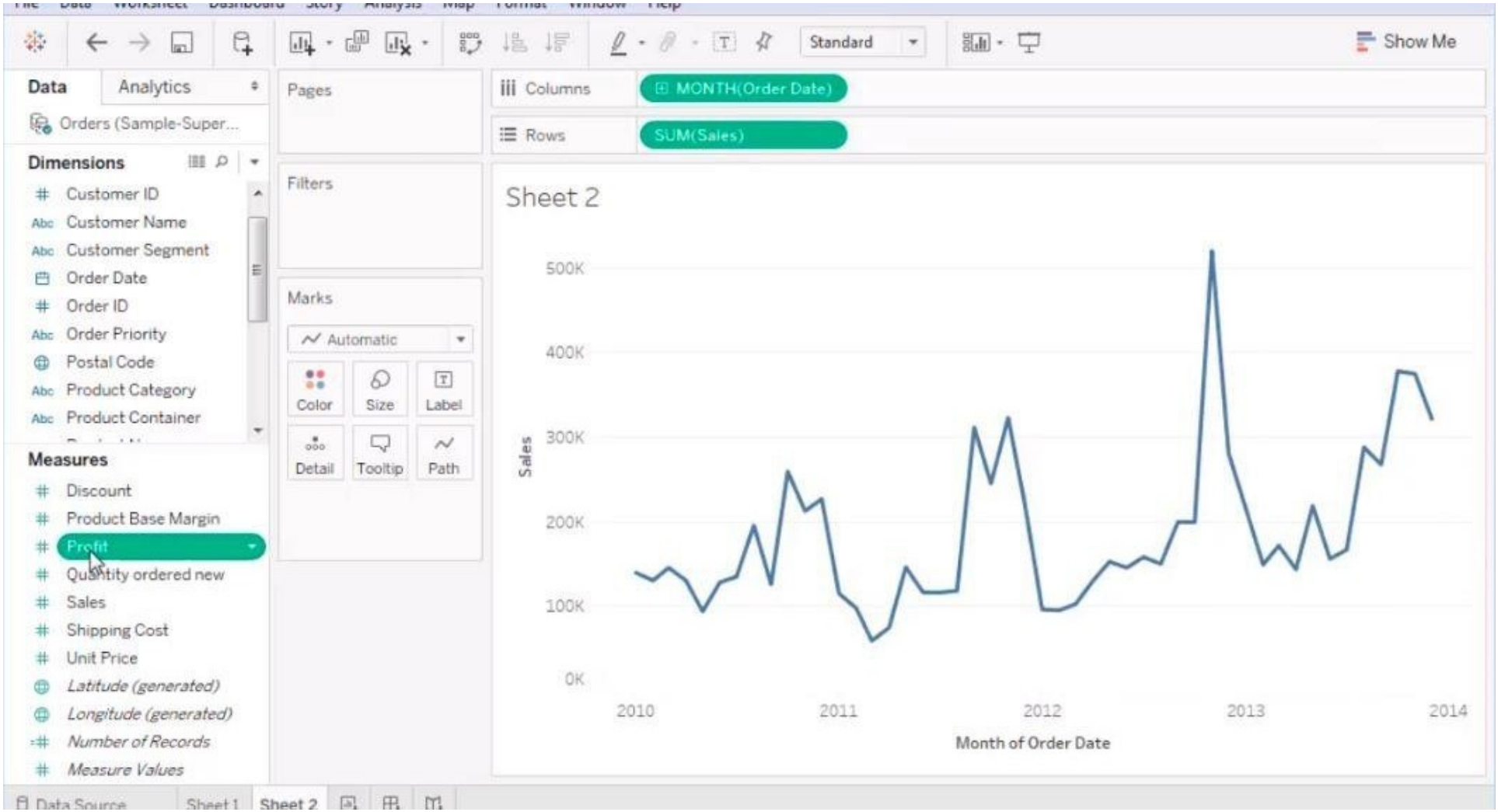
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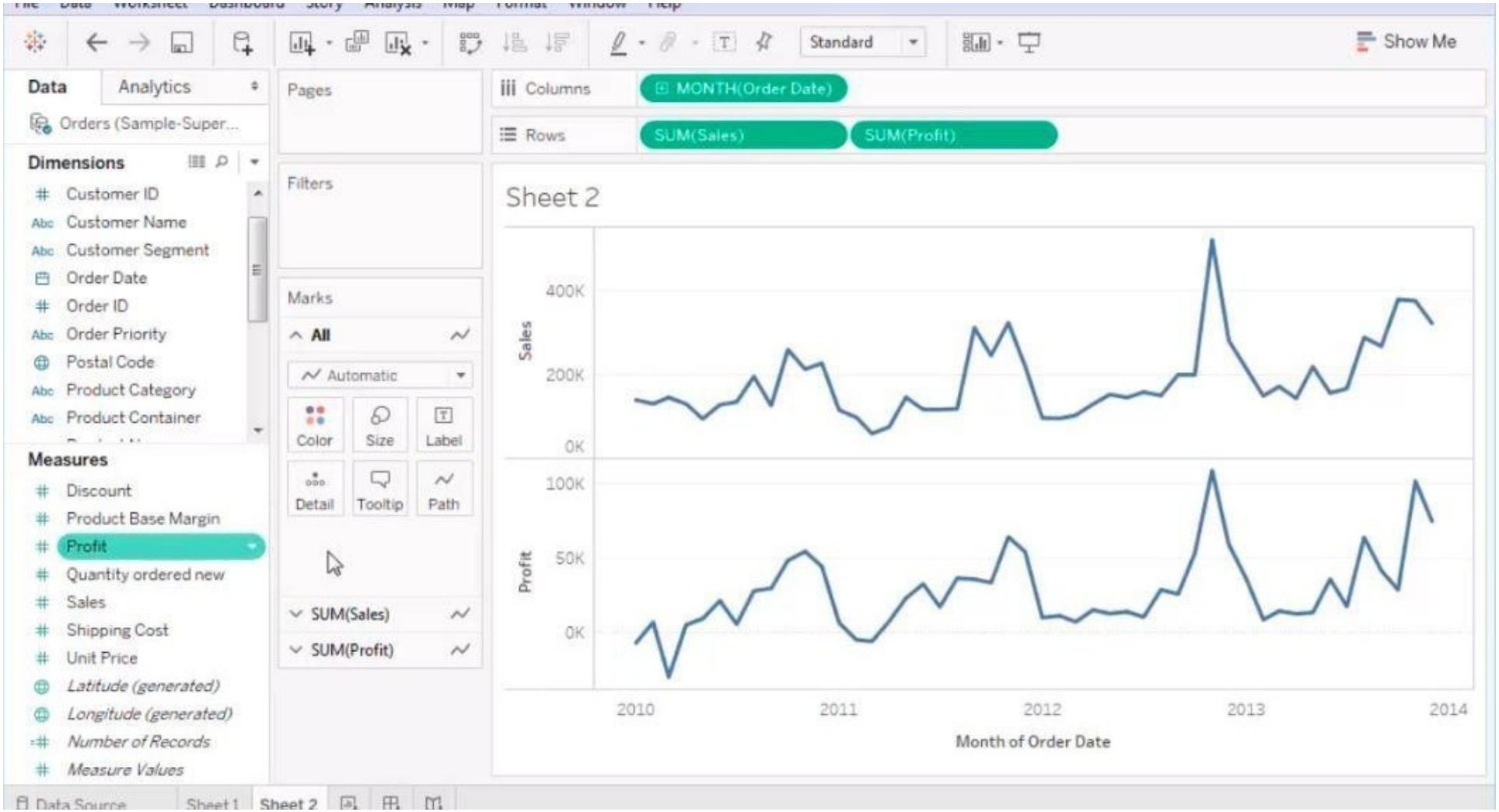
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Month of Order Date
Data Source
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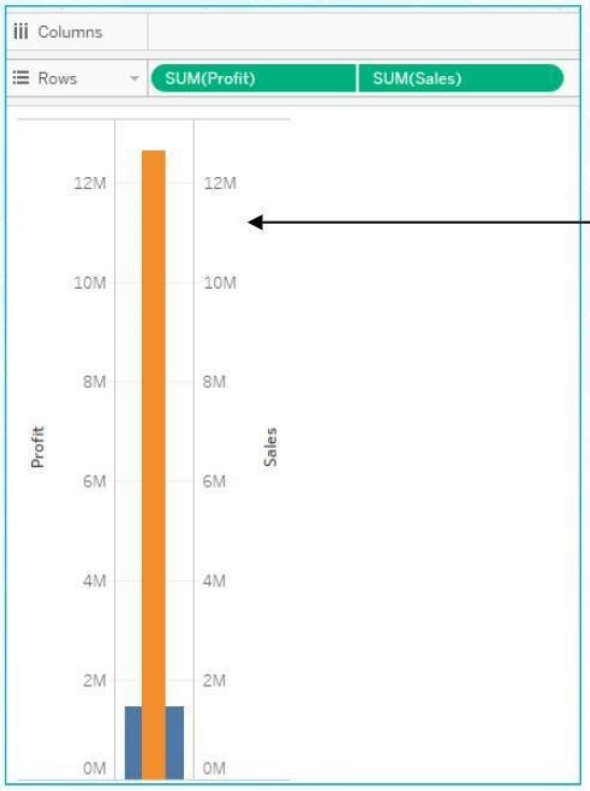
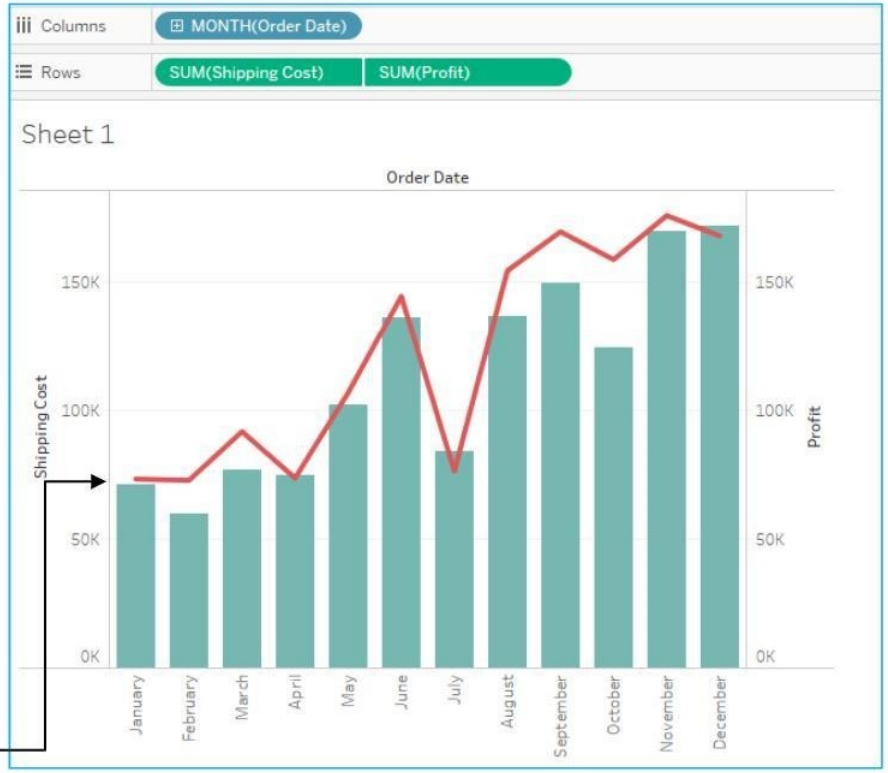
Sheet 2

Dual axis Graph

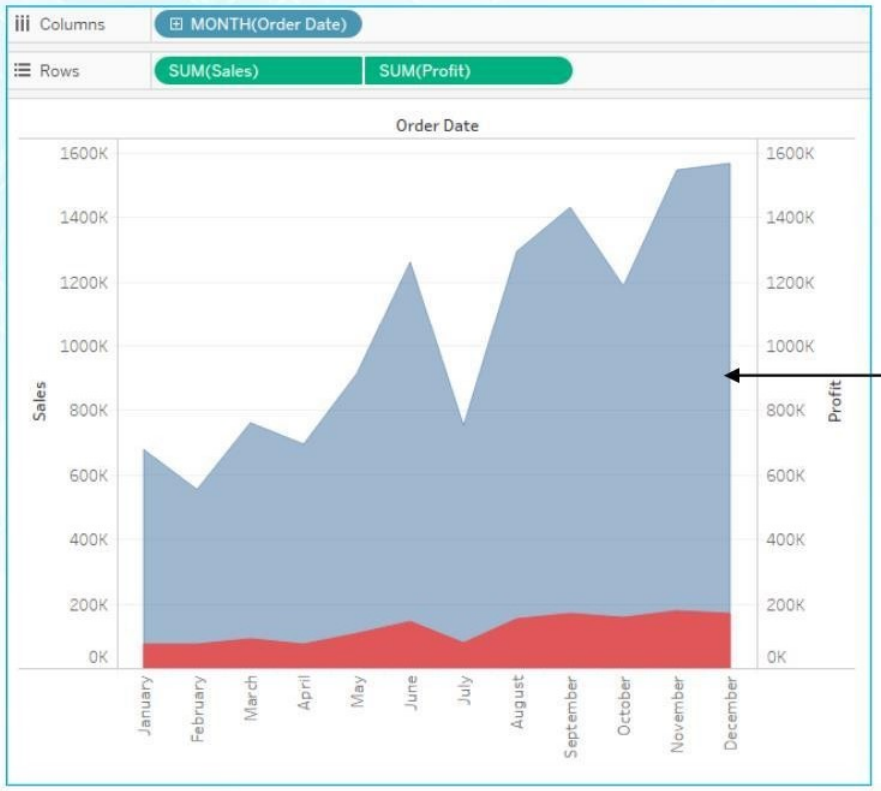


Dual Axis graph allows for more than one measure to be represented with two different axis ranges

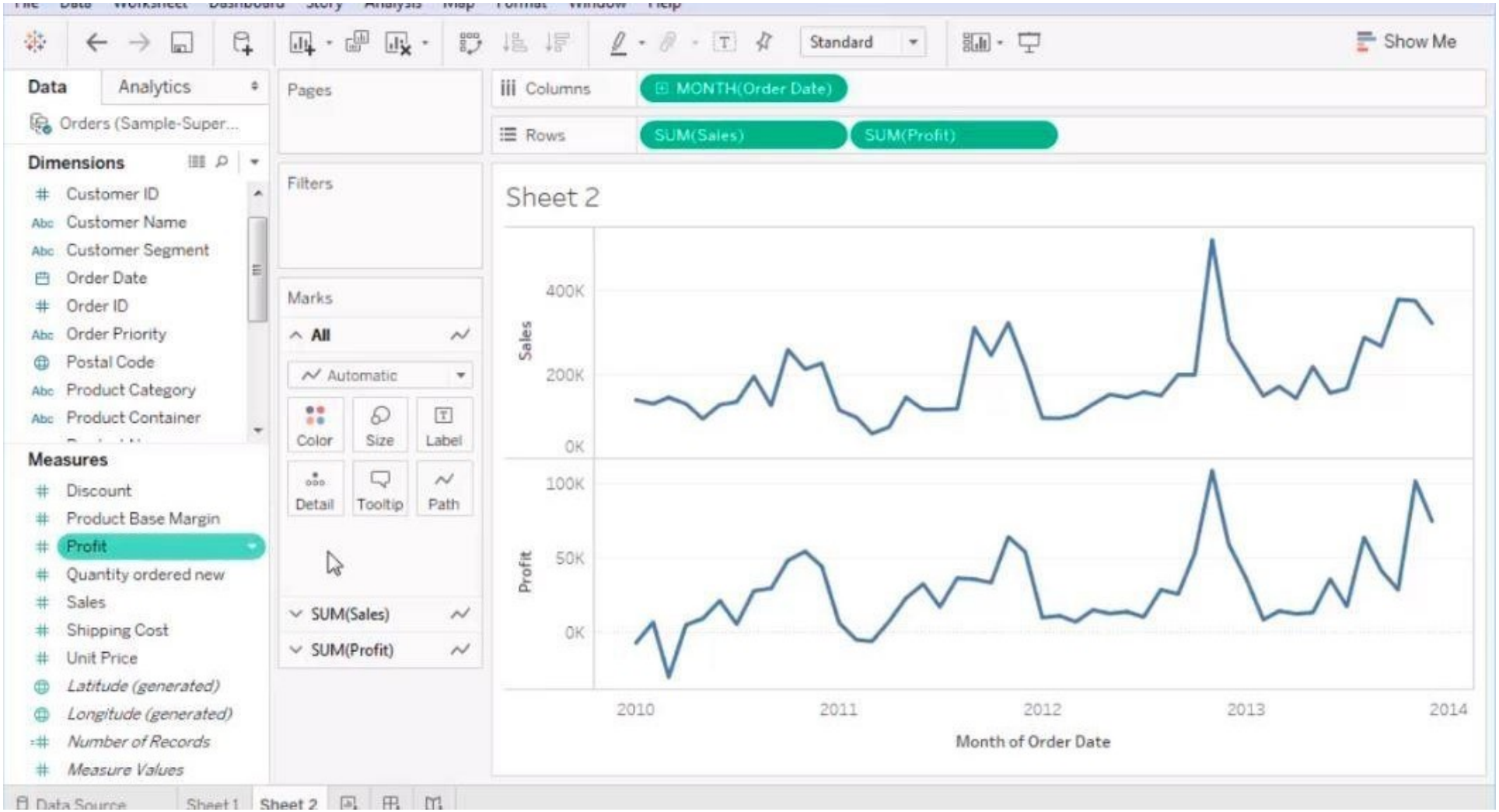
By using different mark types for both the measures a dual line can be converted into Dual Combination



Area Graph with Dual Axis



The area chart is great for showing a total trend with relative performances of individual components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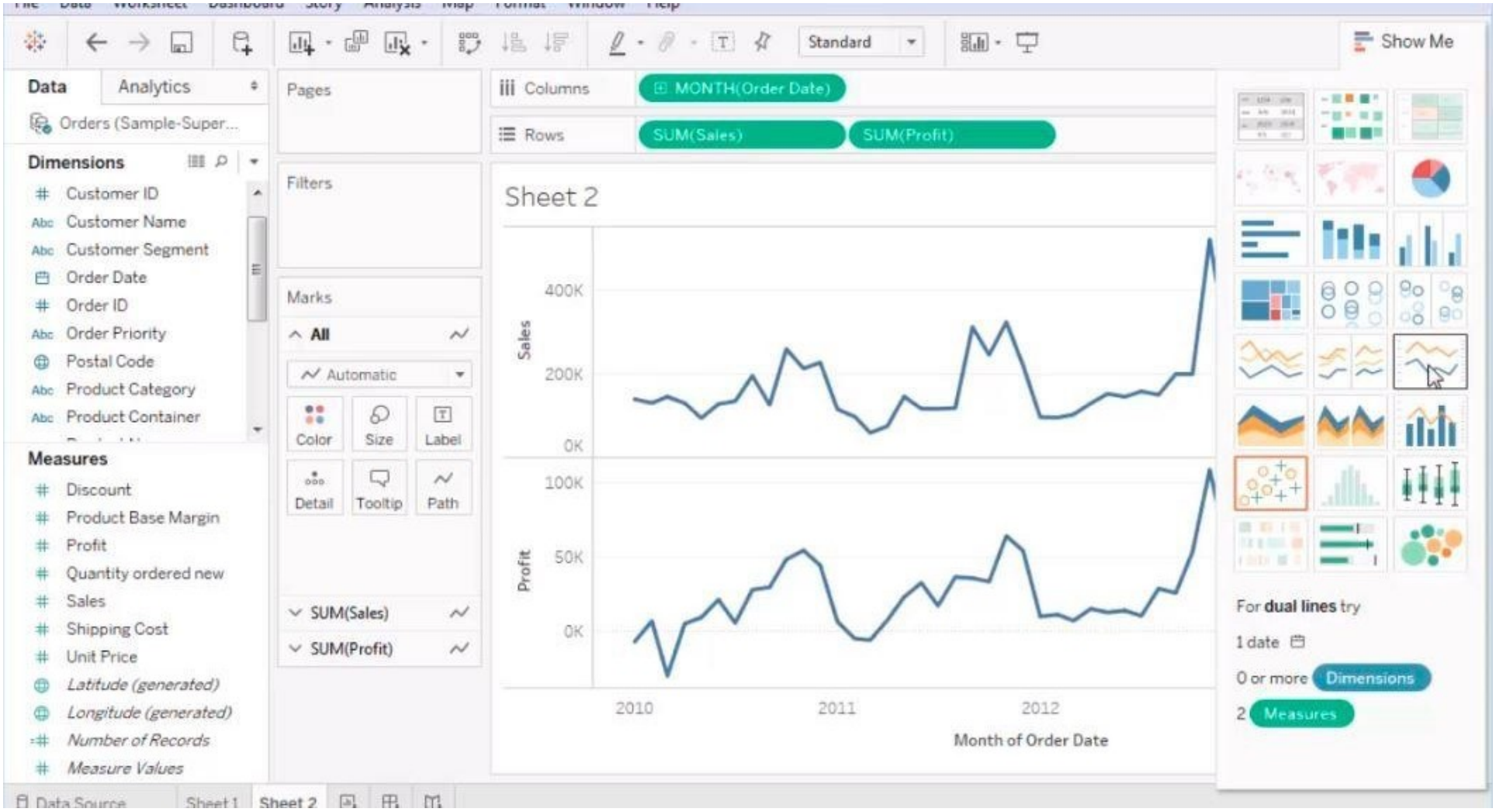
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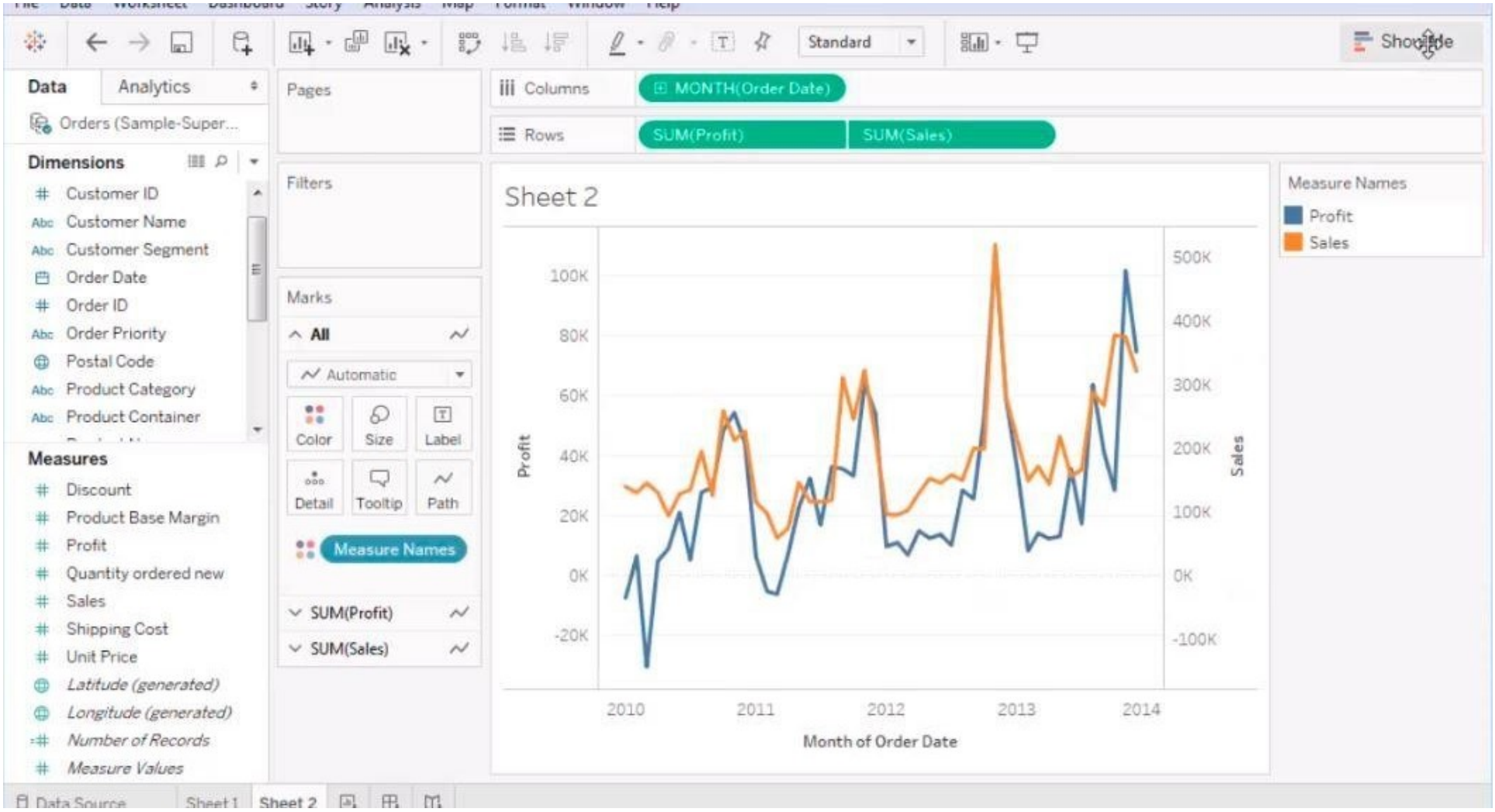
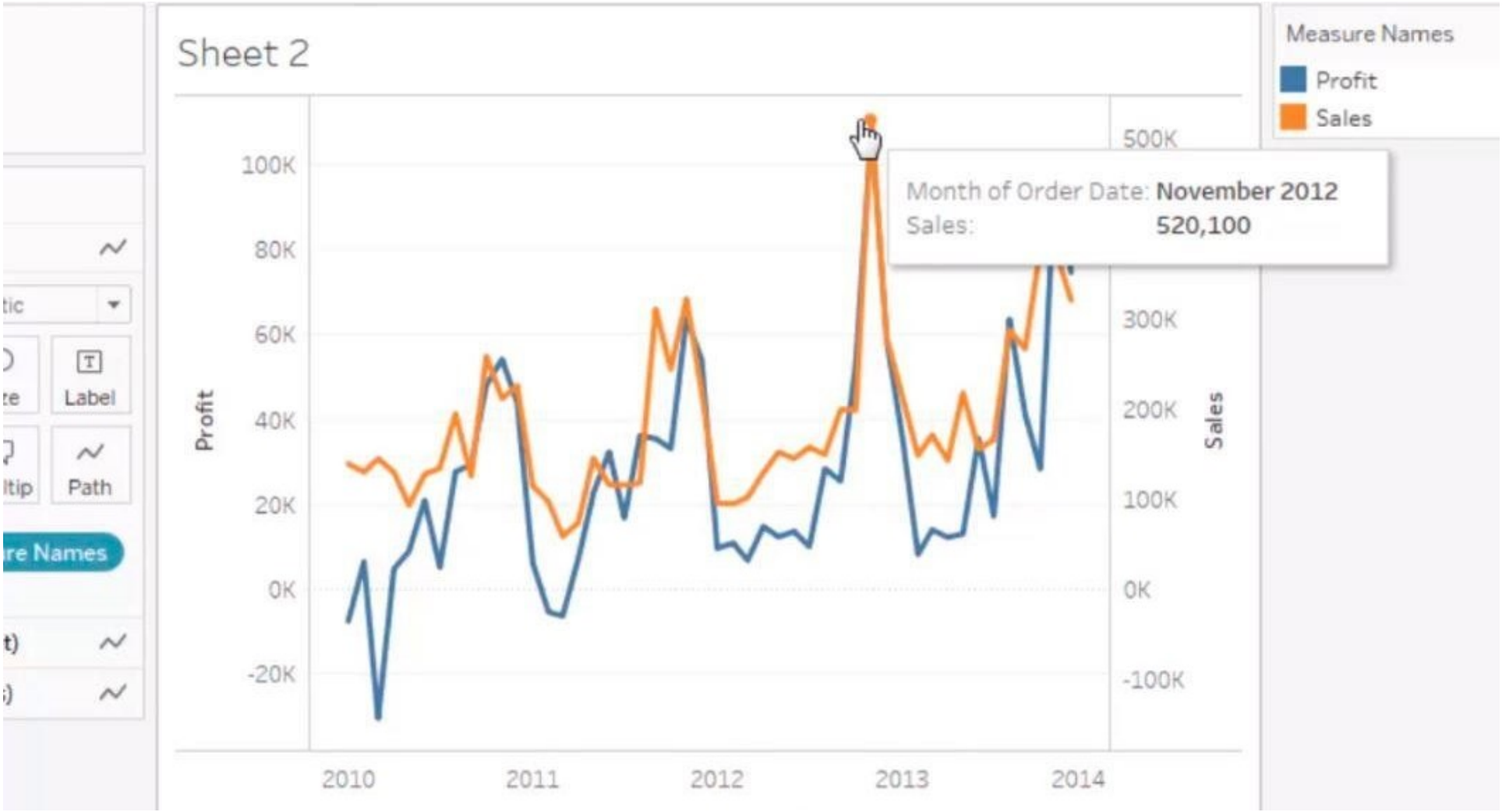
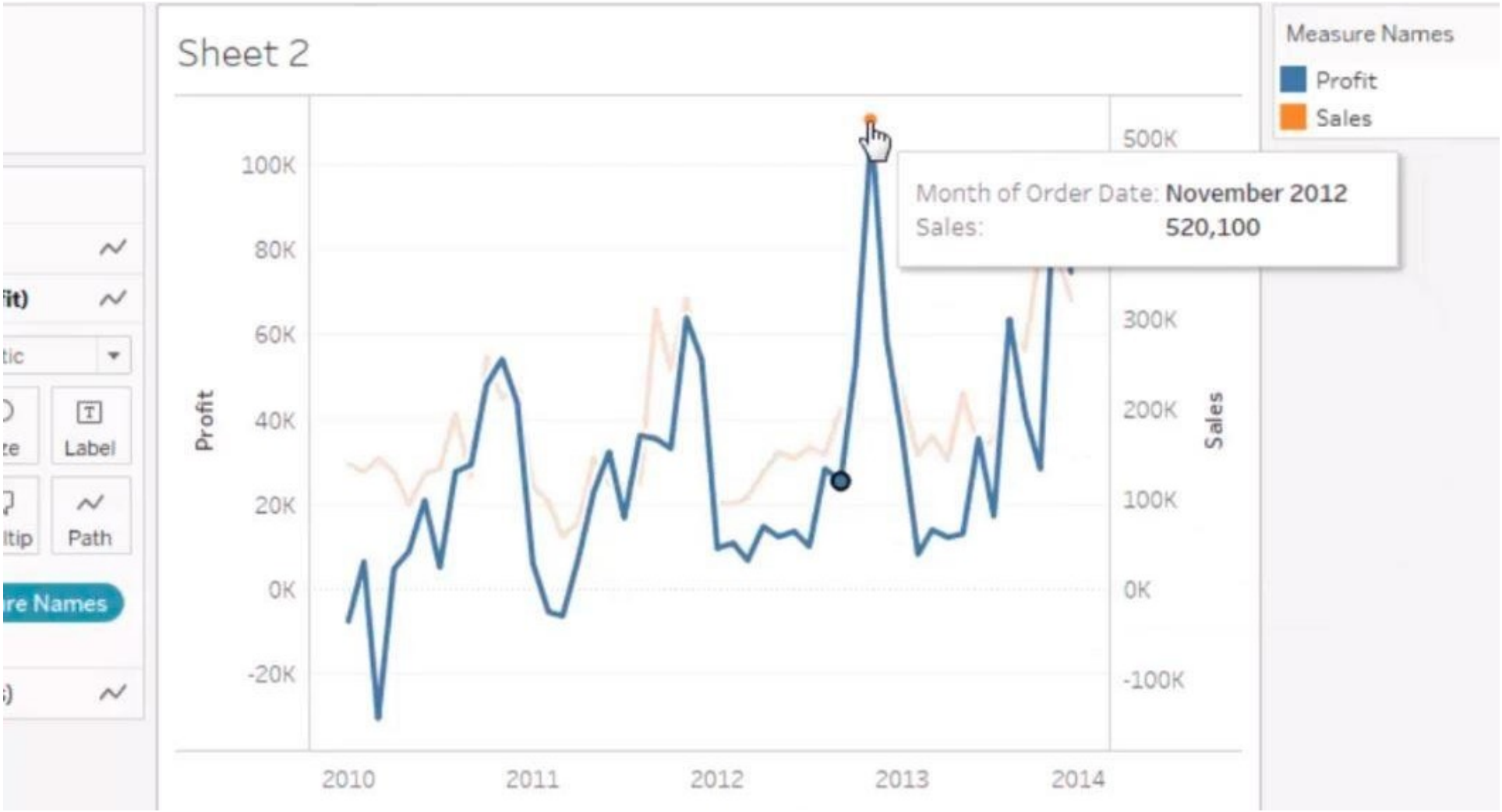
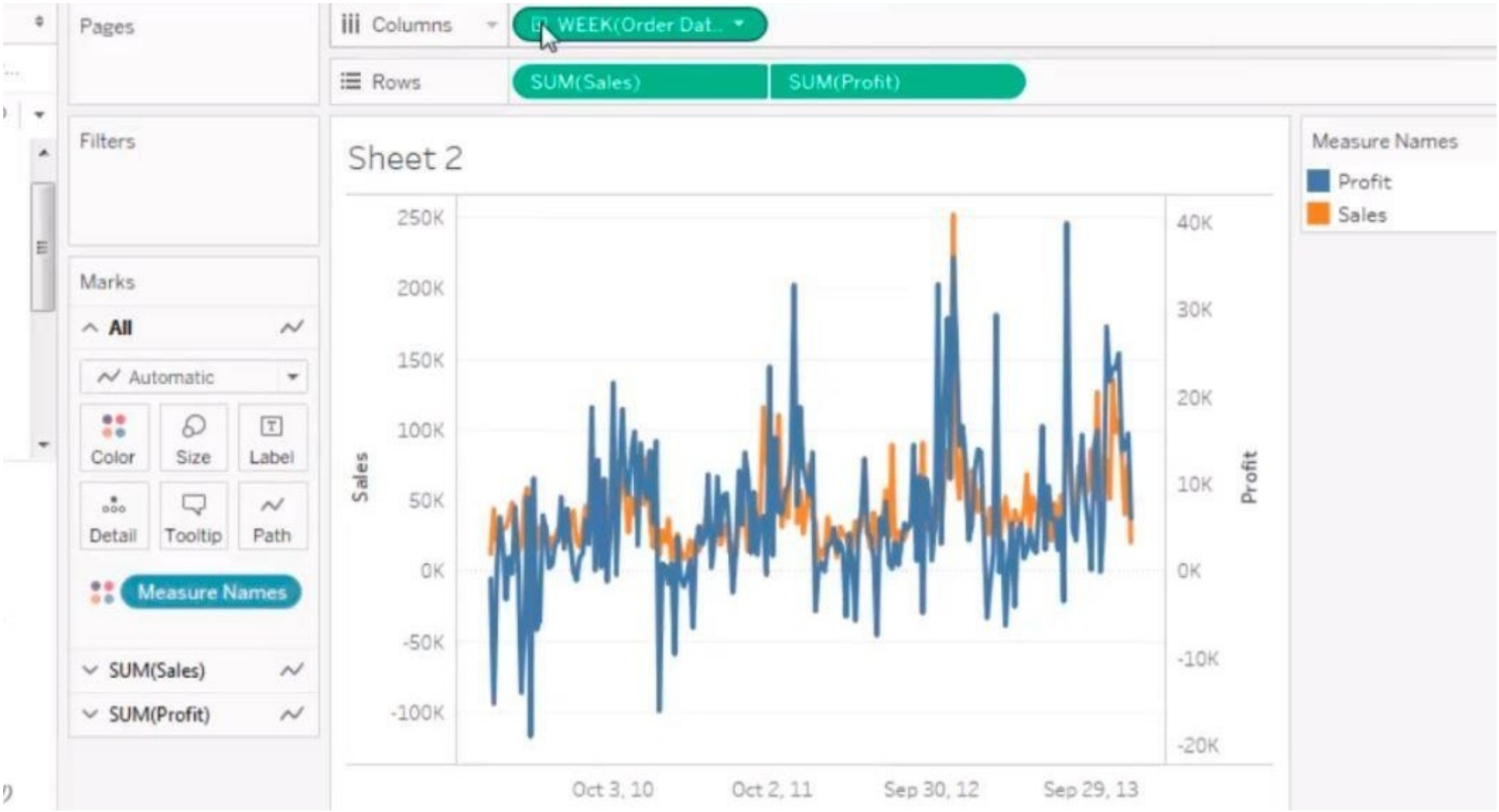
0 or more
Dimensions
2
Measures
Data Source
Sheet 1
Sheet 2

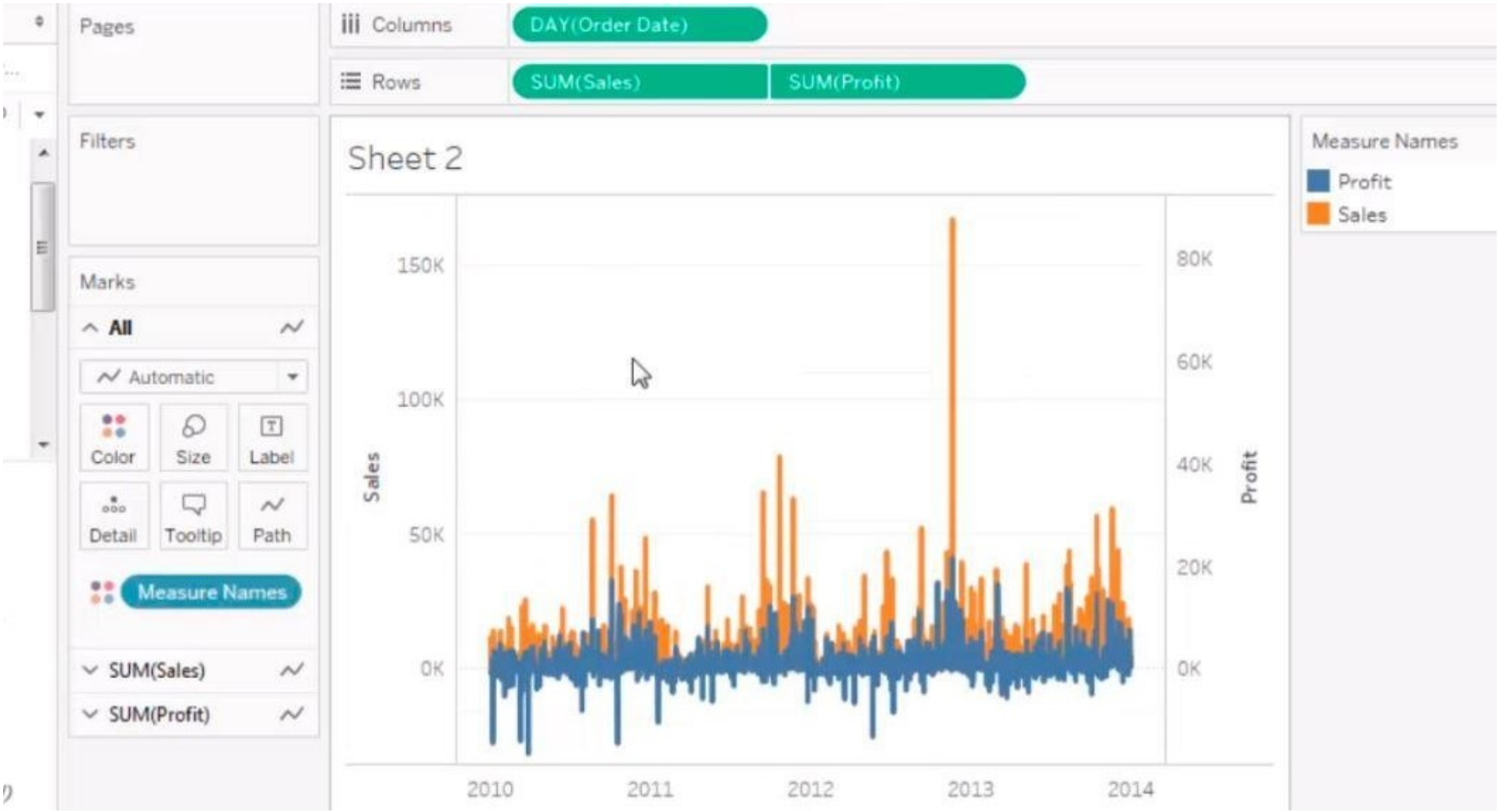

Standard
Show Me
Data
Analytics
Orders (Sample-Super...
Dimensions
Customer ID
Customer Name
Customer Segment
Order Date
Order ID
Order Priority
Postal Code
Product Category
Product Container
Measures
Discount
Product Base Margin
Profit
Quantity ordered new
Sales
Shipping Cost
Unit Price
Latitude (generated)
Longitude (generated)
Number of Records
Measure Values
Pages
Filters
Marks
All
Automatic
Color
Size
Label
Detail
Tooltip
Path
Measure Names
SUM(Profit)
SUM(Sales)
Columns
MONTH(Order Date)
Rows
SUM(Profit)
SUM(Sales)
Sheet 2
Profit
Sales
100K
80K
60K
40K
20K
0K
-20K
500K
400K
300K
200K
100K
0K
-100K
2010
2011
2012
2013
2014
Month of Order Date
Measure Names
Profit
Sales
Data Source
Sheet 1
Sheet 2

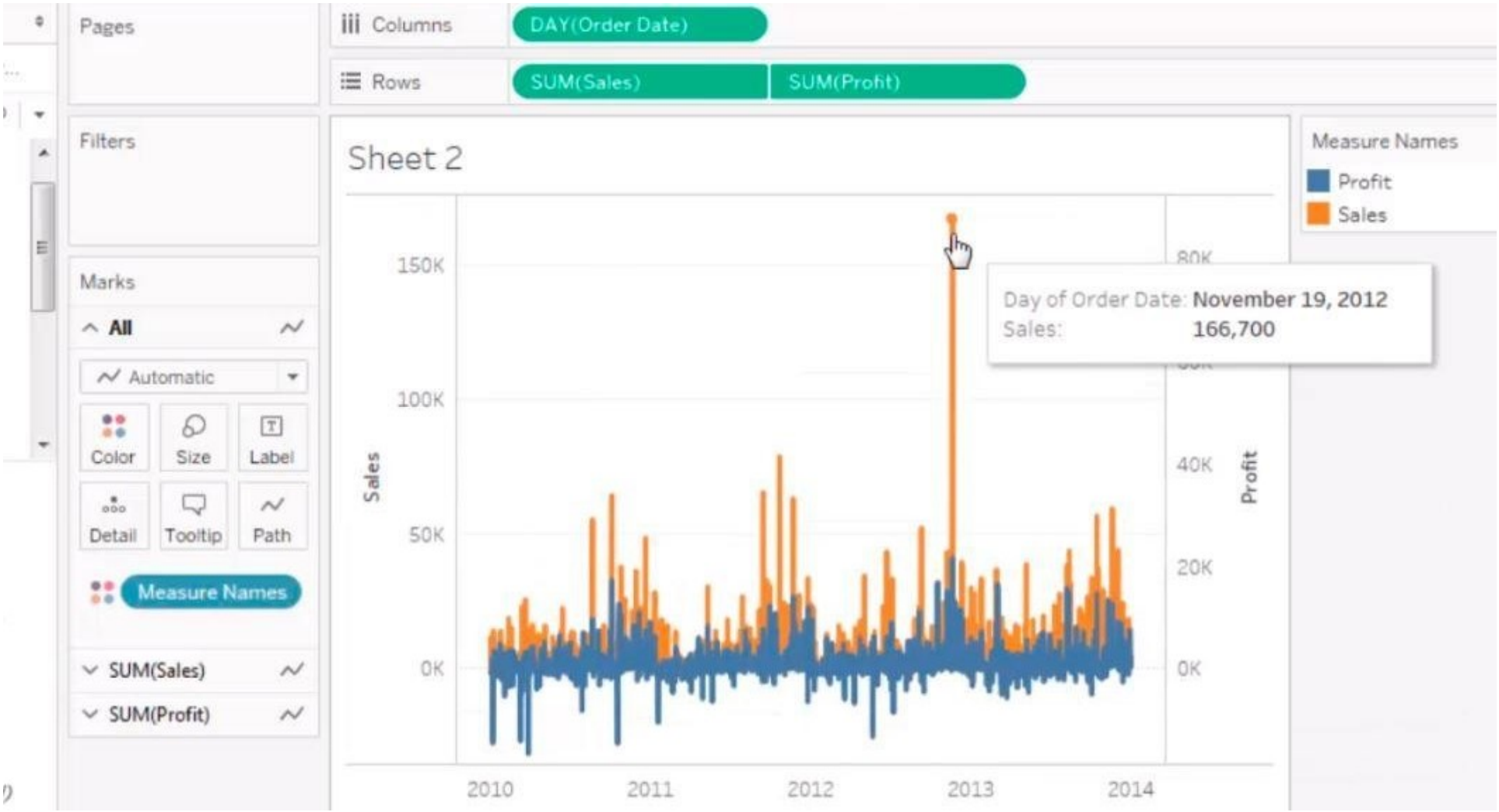

Sheet 2
Measure Names
Profit
Sales
Month of Order Date: November 2012
Sales: 520,100
100K
80K
60K
40K
20K
0K
-20K
Profit
500K
300K
200K
100K
0K
-100K
Sales
2010
2011
2012
2013
2014
Label
Path


Sheet 2
Measure Names
Profit
Sales
Month of Order Date: November 2012
Sales: 520,100
100K
80K
60K
40K
20K
0K
-20K
Profit
500K
300K
200K
100K
0K
-100K
Sales
2010
2011
2012
2013
2014
Label
Path


Pages
Columns
MONTH(Order Date)
Rows
SUM(Sales)
SUM(Profit)
Filters
Marks
All
SUM(Sales)
SUM(Profit)
Automatic
Color
Size
Label
Detail
Tooltip
Path
Measure Names
Sheet 2
500K
400K
300K
200K
100K
0K
-100K
Sales
100K
80K
60K
40K
20K
0K
-20K
Profit
2010
2011
2012
2013
2014
Measure Names
Profit
Sales


Pages
Columns
WEEK(Order Dat..
Rows
SUM(Sales)
SUM(Profit)
Filters
Marks
All
Automatic
Color
Size
Label
Detail
Tooltip
Path
Measure Names
SUM(Sales)
SUM(Profit)
Sheet 2
250K
200K
150K
100K
50K
0K
-50K
-100K
Sales
40K
30K
20K
10K
0K
-10K
-20K
Profit
Oct 3, 10
Oct 2, 11
Sep 30, 12
Sep 29, 13
Measure Names
Profit
Sales


Pages
Columns
DAY(Order Date)
Rows
SUM(Sales)
SUM(Profit)
Filters
Marks
All
Automatic
Color
Size
Label
Detail
Tooltip
Path
Measure Names
SUM(Sales)
SUM(Profit)
Sheet 2
150K
100K
50K
0K
Sales
80K
60K
40K
20K
0K
Profit
2010
2011
2012
2013
2014
Measure Names
Profit
Sales


Pages
Columns
DAY(Order Date)
Rows
SUM(Sales)
SUM(Profit)
Filters
Marks
All
Automatic
Color
Size
Label
Detail
Tooltip
Path
Measure Names
SUM(Sales)
SUM(Profit)
Sheet 2
Measure Names
Profit
Sales
Day of Order Date: November 19, 2012
Sales: 166,700
150K
100K
50K
0K
80K
40K
20K
0K
Sales
Profit
2010
2011
2012
2013
2014

Recap

Bar charts –show how a measure varies one by or more dimensions
(example profit by region)

Line and Area Charts – Show how measure varies over time
(example profit by month)

Dual Axis chart – show two different measures on the same graph.
(example –profit and sales by month)