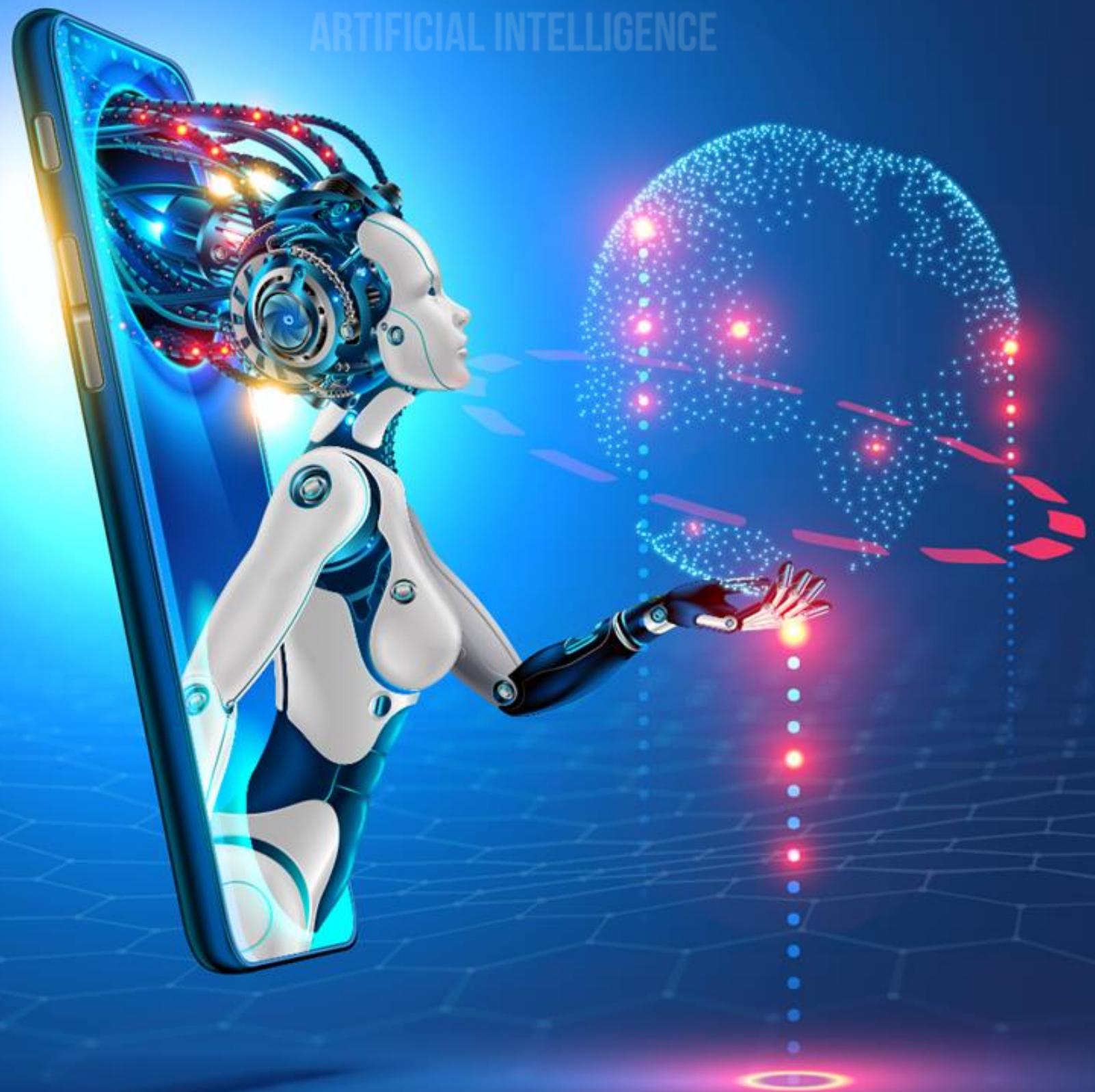
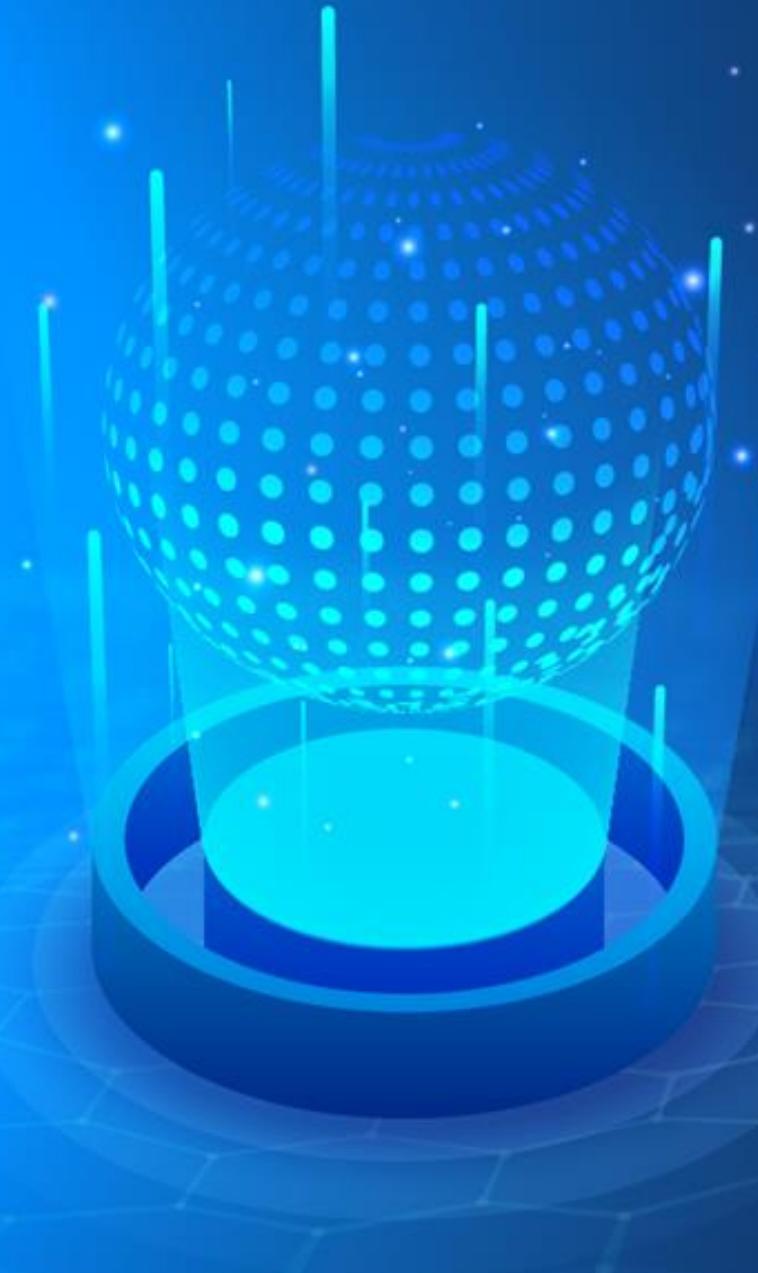


**DATA AND  
ARTIFICIAL INTELLIGENCE**



## Tableau Training

# DATA AND ARTIFICIAL INTELLIGENCE



## Calculations in Tableau

# Learning Objectives

By the end of this lesson, you will be able to:

- Distinguish and create different types of calculations in Tableau
- Analyze data using pareto and waterfall chart
- List the types of built-in and helper functions
- Create a KPI table to analyze the performance of the organization



# A Day in the Life of a Data Analyst



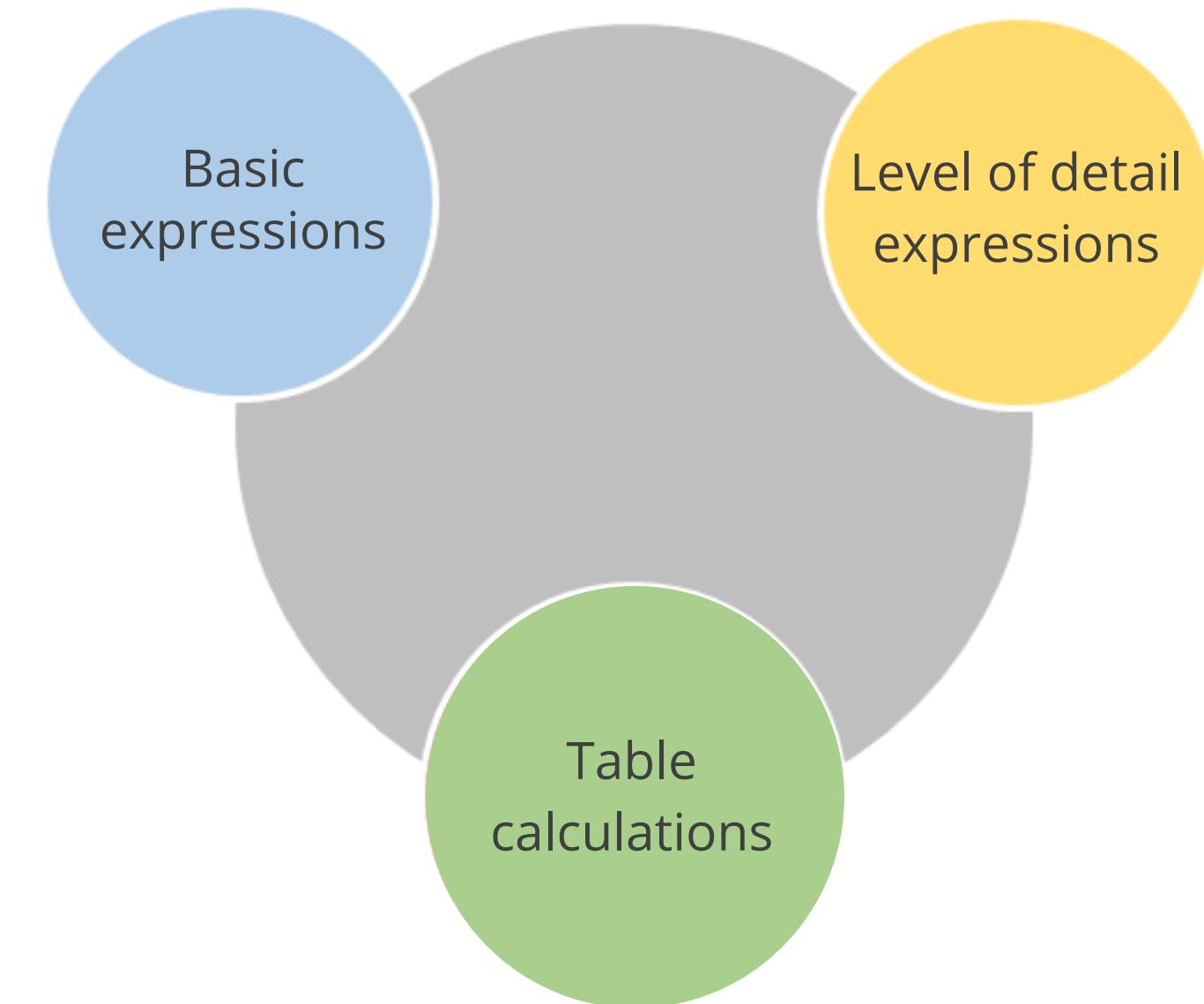
As a Data Analyst in your organization, you are asked to find out the field in a data set and how it gets the value.

To achieve these tasks, you need to check for all other variables required to create the field in your data and create the calculated fields.

## Types of Calculations

# Types of Calculations

The types of calculations performed in Tableau are:



# Basic Expressions

These calculated fields, based on the output, can either be a dimension or a measure.

Aggregated level calculations use all fields to create the aggregated field.

1

2

3

4

Basic Expressions are simple calculated fields created using the Create Calculated Field option.

The calculated field can be created either at a row-level or aggregated level.

# Level of Details

Choices can be made between aggregation and granularity.

Include increases aggregation, exclude increases granularity, and fixed increases independence.

1

2

3

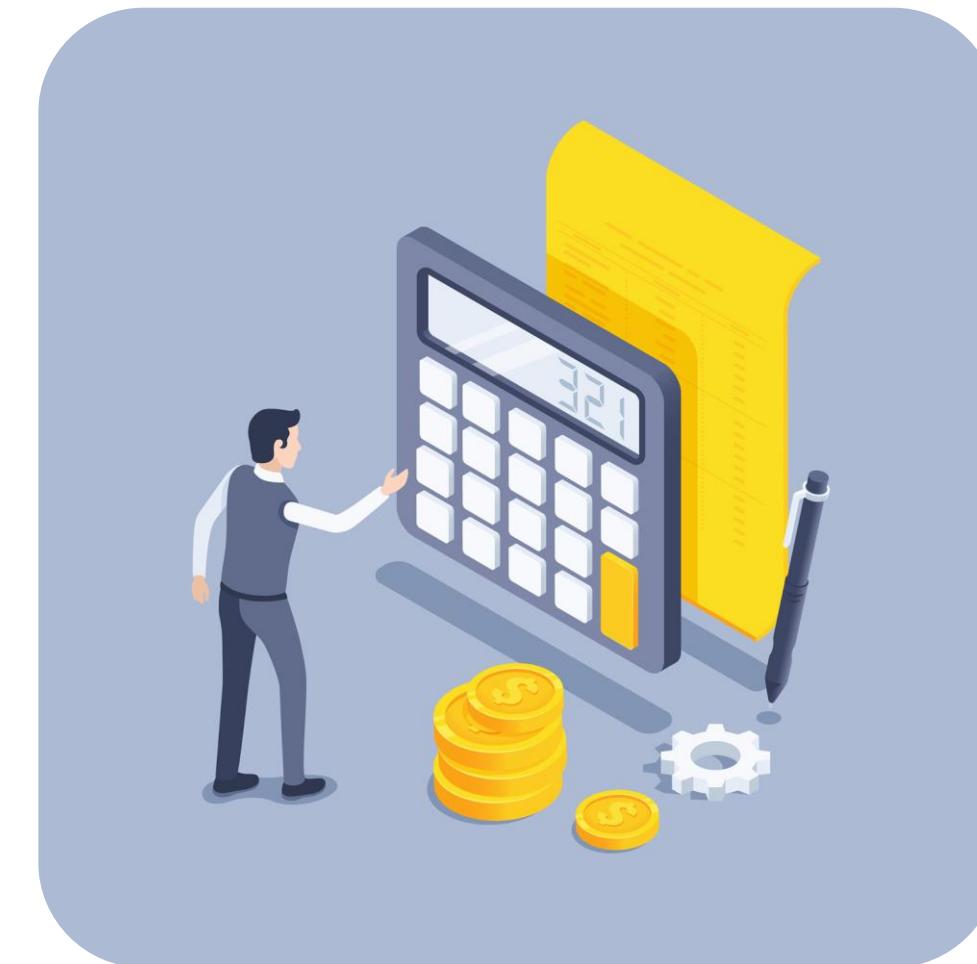
4

They are powerful functions that alter the level of detail.

The three different LOD expressions are INCLUDE(), EXCLUDE(), and FIXED().

# Table Calculations

Table calculations allow transforming values at the detail level of visualization only.



They are executed based on a tabular format with fields in rows and columns

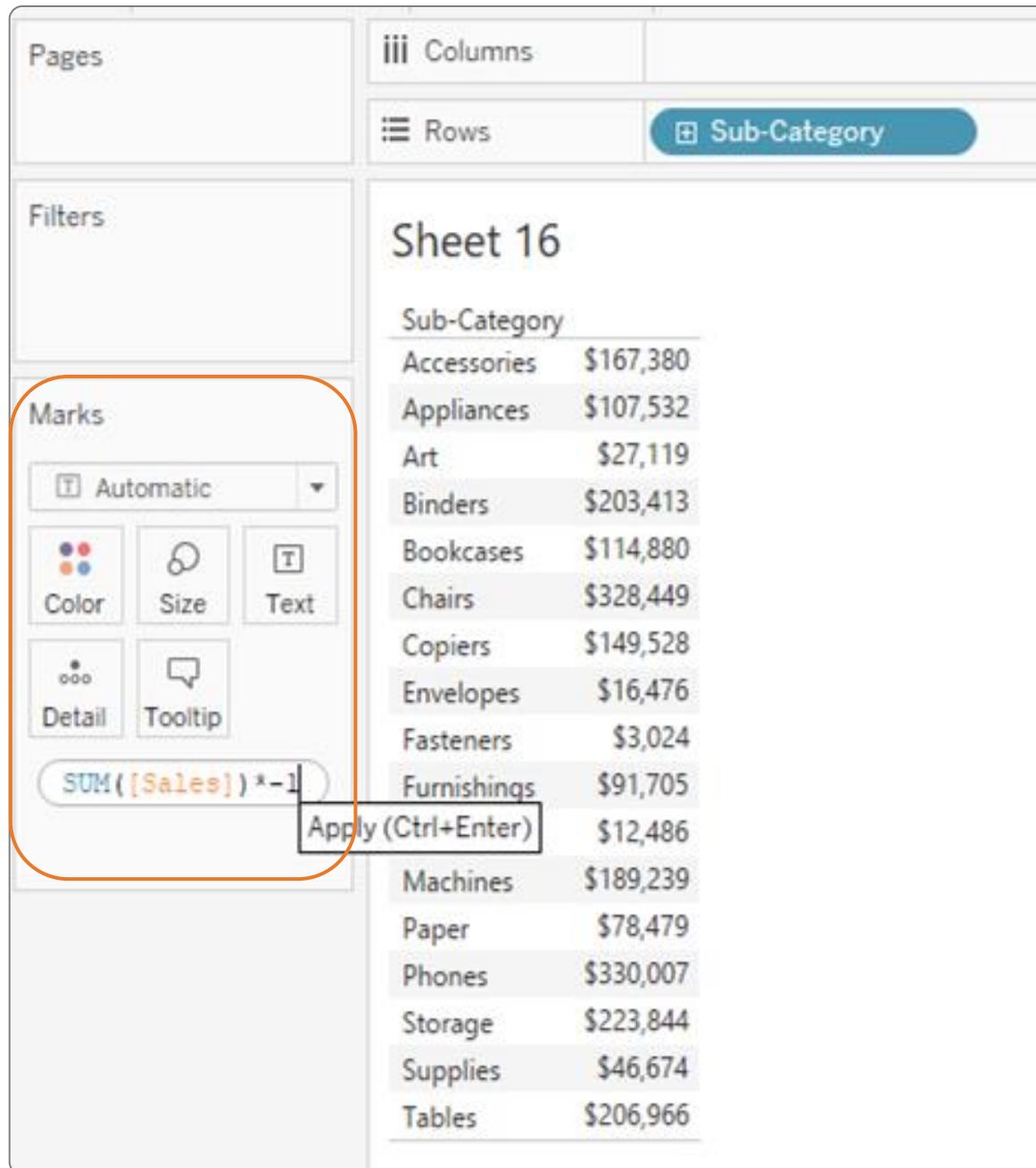
## Ad-Hoc Calculations

# Ad-Hoc Calculations

Ad-hoc calculations are temporary calculations that are carried out only for current visualizations.



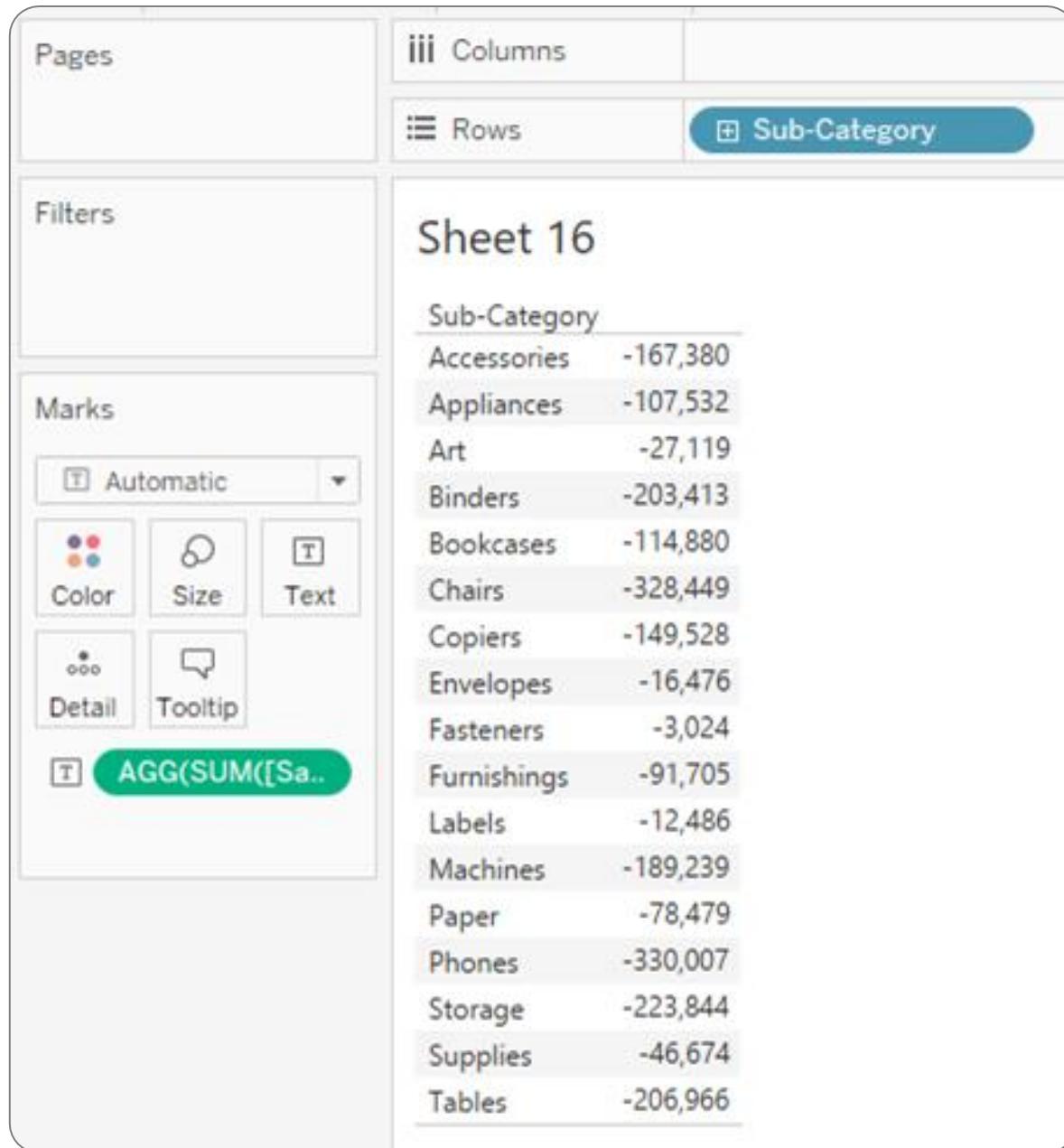
# Ad-Hoc Calculations: Steps



Steps:

- Right-click on the measure added to **Text** and click **Edit** in **Shelf** or double click on the measure in **Text**
- Add any calculations to it and click **Enter**

# Ad-Hoc Calculations



Once the calculation is updated, the values in the visualization are updated accordingly.

# Assisted Practice: Calculated Fields



Duration: 20 minutes

## Problem statement:

A retail company is planning to launch a new sales strategy. As you are a regional manager, you are asked to create a sales goal based on historical performances. The company wants to increase sales by 20% in all states where they have achieved a certain level of penetration—a minimum of 100 customers. For the remaining states where they have fewer than a hundred customers each, you must calculate the sales that would result if they had 100 customers in that state. Now, create a visualization in Tableau using a bullet chart. The chart should show the states, the number of customers, and the actual vs. sales goal.

ASSISTED PRACTICE

# Assisted Practice Guidelines



## Steps to follow:

- Step 1: Create a set to show states with 100 or more customers
- Step 2: Create a calculated field to show the average sales per customer
- Step 3: Create a calculated field to show sales goals
- Step 4: Create a calculated field to show emerging and developing states
- Step 5: Create a view using the bullet chart

ASSISTED PRACTICE

## Table Calculations

# Table Calculations

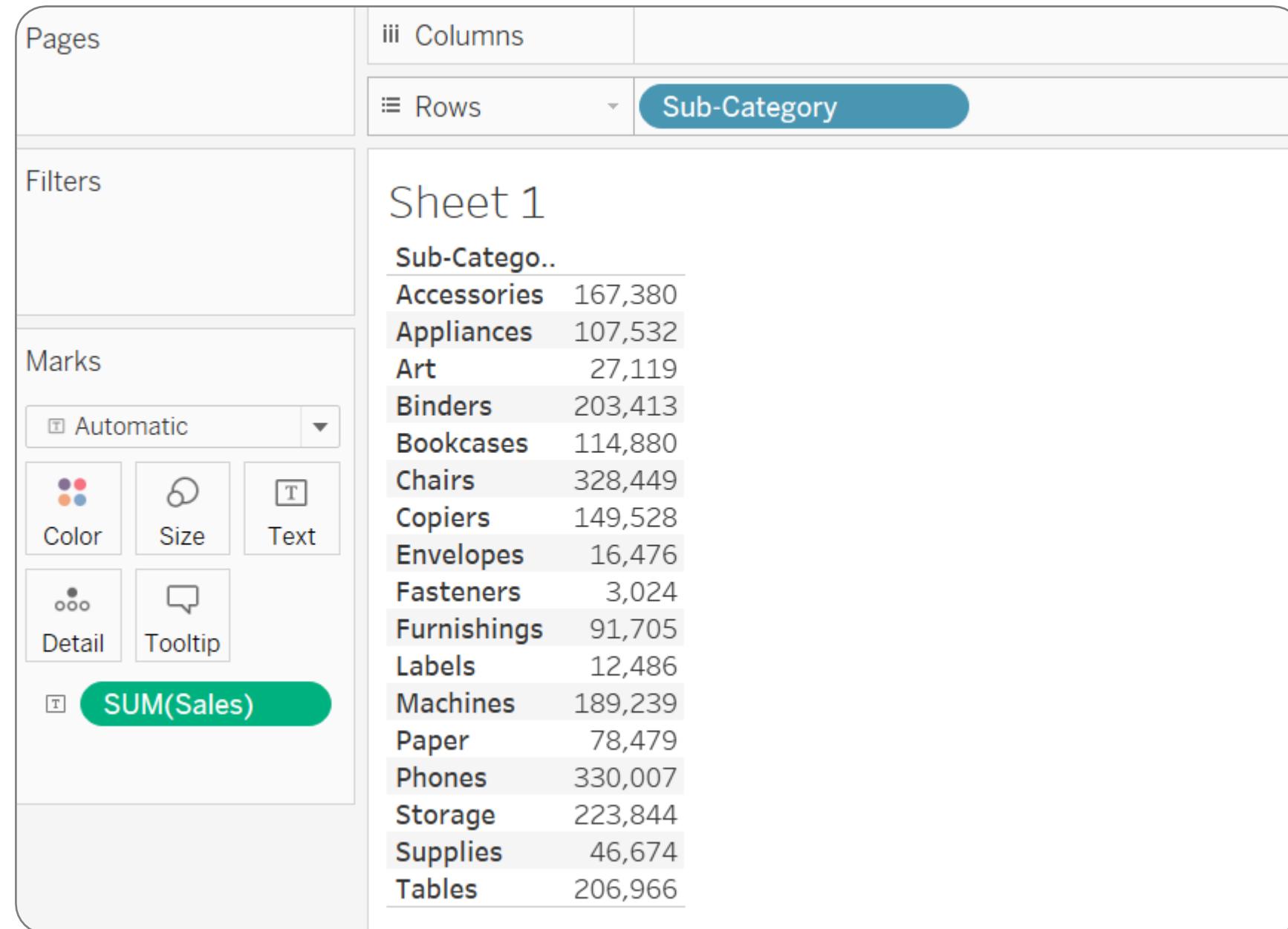
Table calculations refer to the calculations done on the visible data in a worksheet.



There are inbuilt table calculations integrated into the tableau application, such as percentage of total and rank.

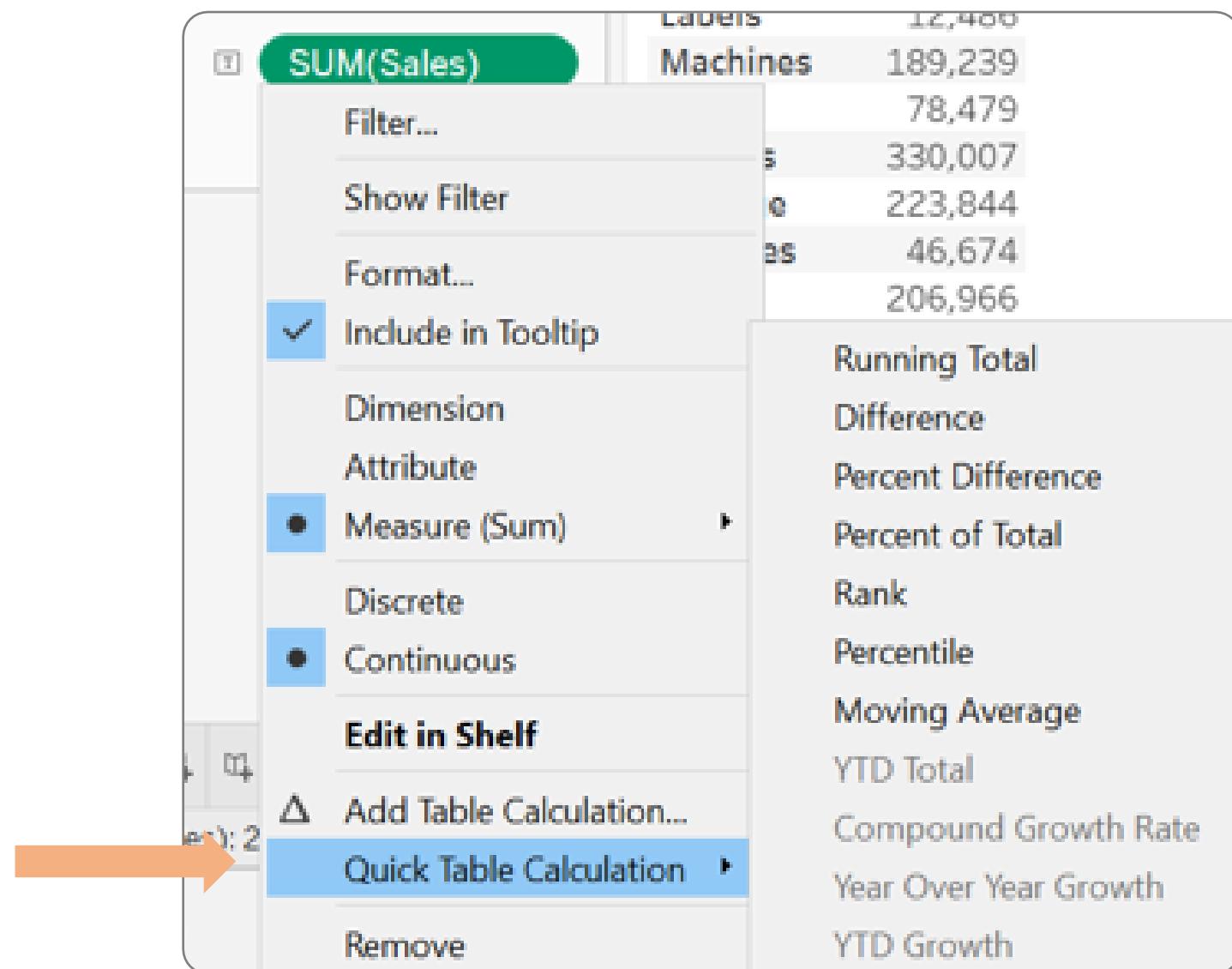
# Table Calculations

Step 01: Drag **Sub-Category** to **Rows** and **Sales** to **Text**



# Table Calculations

Step 02: Click on **SUM(Sales)** drop-down and select **Quick Table Calculation**



# Table Calculations

The inbuilt calculations are given below:

**Running Total**

**Difference**

**Percent Difference**

**Percent of Total**

**Rank**

**Percentile**

**Moving Average**

**YTD Total**

**Compound Growth Rate**

**Year Over Year Growth**

**YTD Growth**

# Assisted Practice: Calculated Fields and Tableau Calculations



Duration: 20 minutes

## Problem statement:

Comparing quarterly earnings is an important way to measure a company's financial performance during a specific year. This gives analysts, investors, and other participants an idea of how much a company's sales are increasing over time. For this, the data analyst of a consumer product company needs to analyze the difference between the average orders and the current orders for this year and all previous years every quarter. This will give the investors an idea of how well the company is doing.

ASSISTED PRACTICE

# Assisted Practice Guidelines



## Steps to follow:

Step 1: Use the Sample-Superstore excel sheet as the data source

Step 2: Create a calculated field to calculate this year's average difference using the formula:

$$\text{SUM} ([\text{Quantity}]) - \text{WINDOW\_AVG} (\text{SUM} ([\text{Quantity}]), \text{First} (), \text{Last} ())$$

Step 3: Create another calculated field to calculate the average difference over all years using the formula:  $\text{ZN} (\text{SUM} ([\text{Quantity}])) - \text{Window\_AVG} (\text{SUM} ([\text{Quantity}]))$

Step 4: Use the Order Date dimension and perform drilling to break the data into quarters

Step 5: Use the newly created calculated fields and order quantity to complete the view

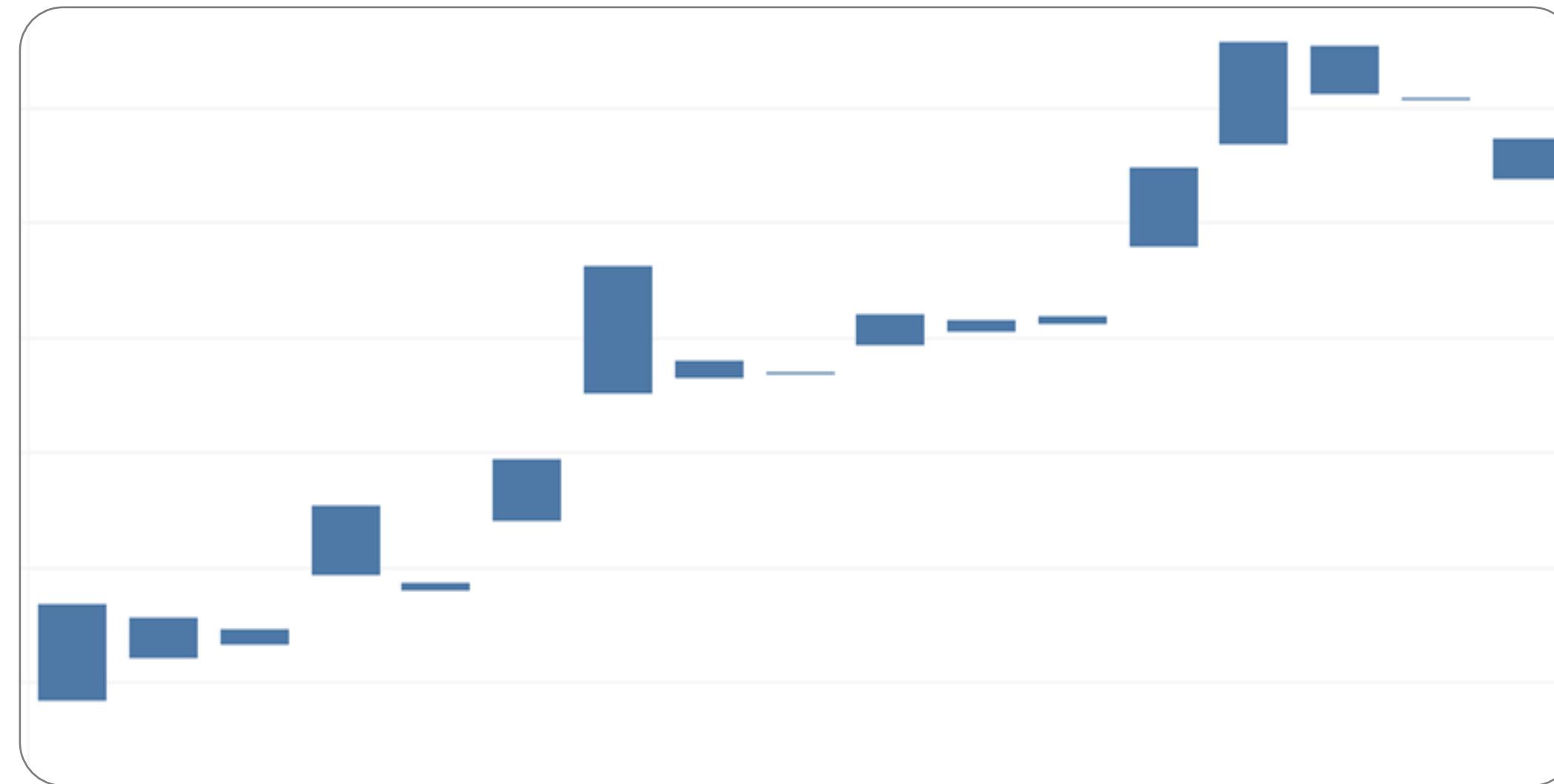
Step 6: Use the Category dimension to differentiate the data using colors

ASSISTED PRACTICE

## Waterfall Chart

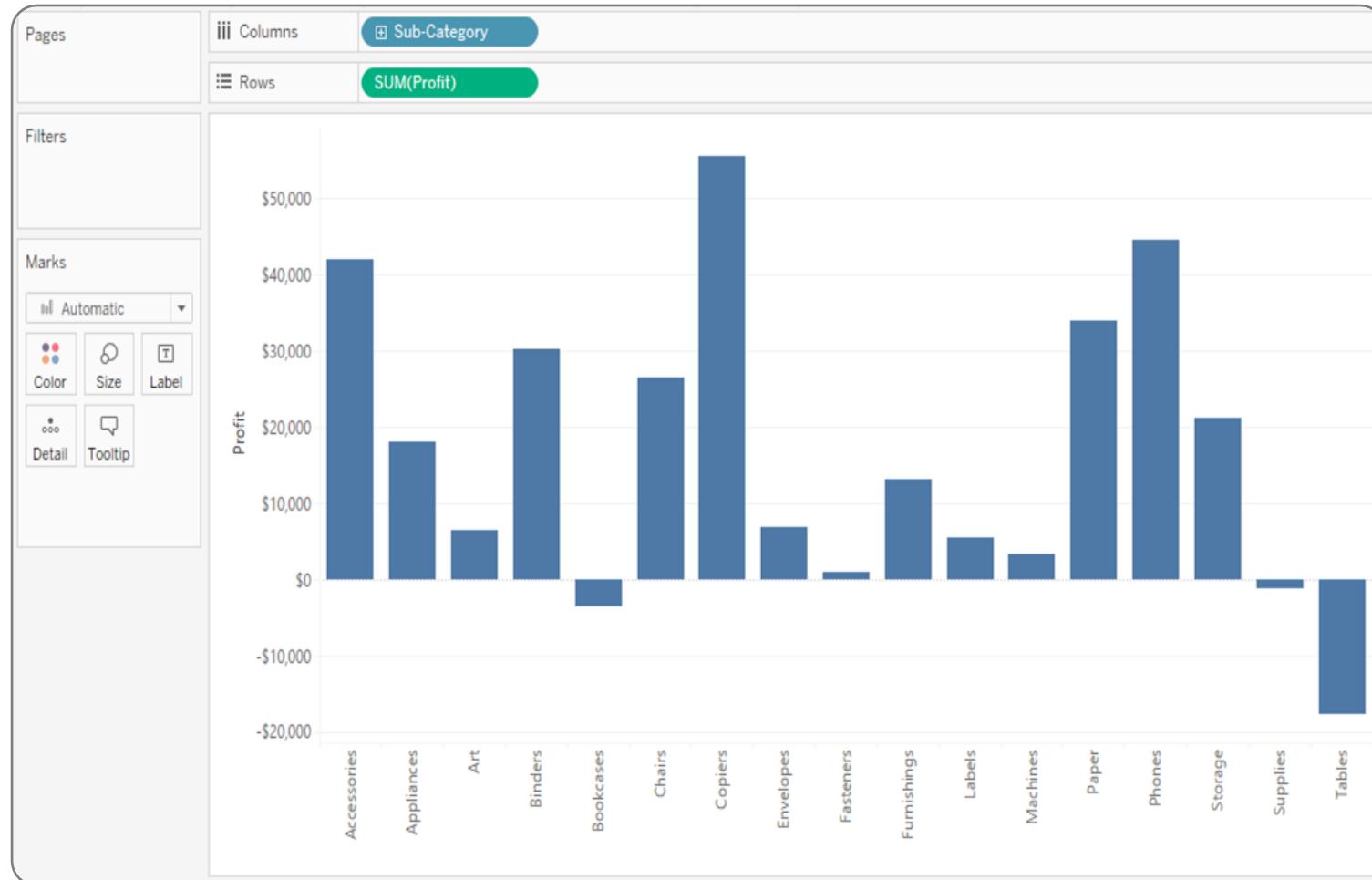
# Waterfall Chart

Waterfall chart showcases how positive and negative values affect the original value.



# Waterfall Chart

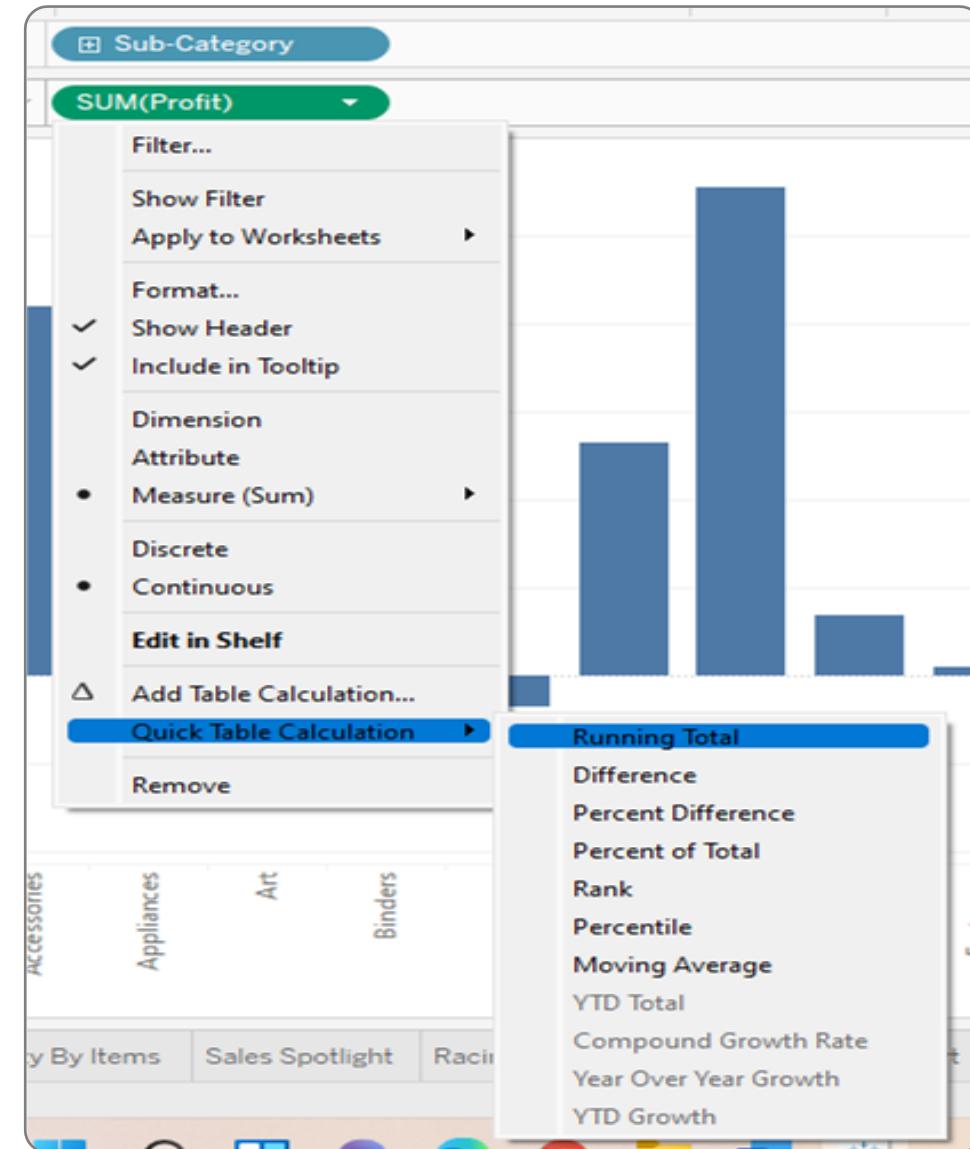
To create a waterfall chart:



## Step 1

- Use Sample-Superstore dataset
- Create a bar chart with category and profit

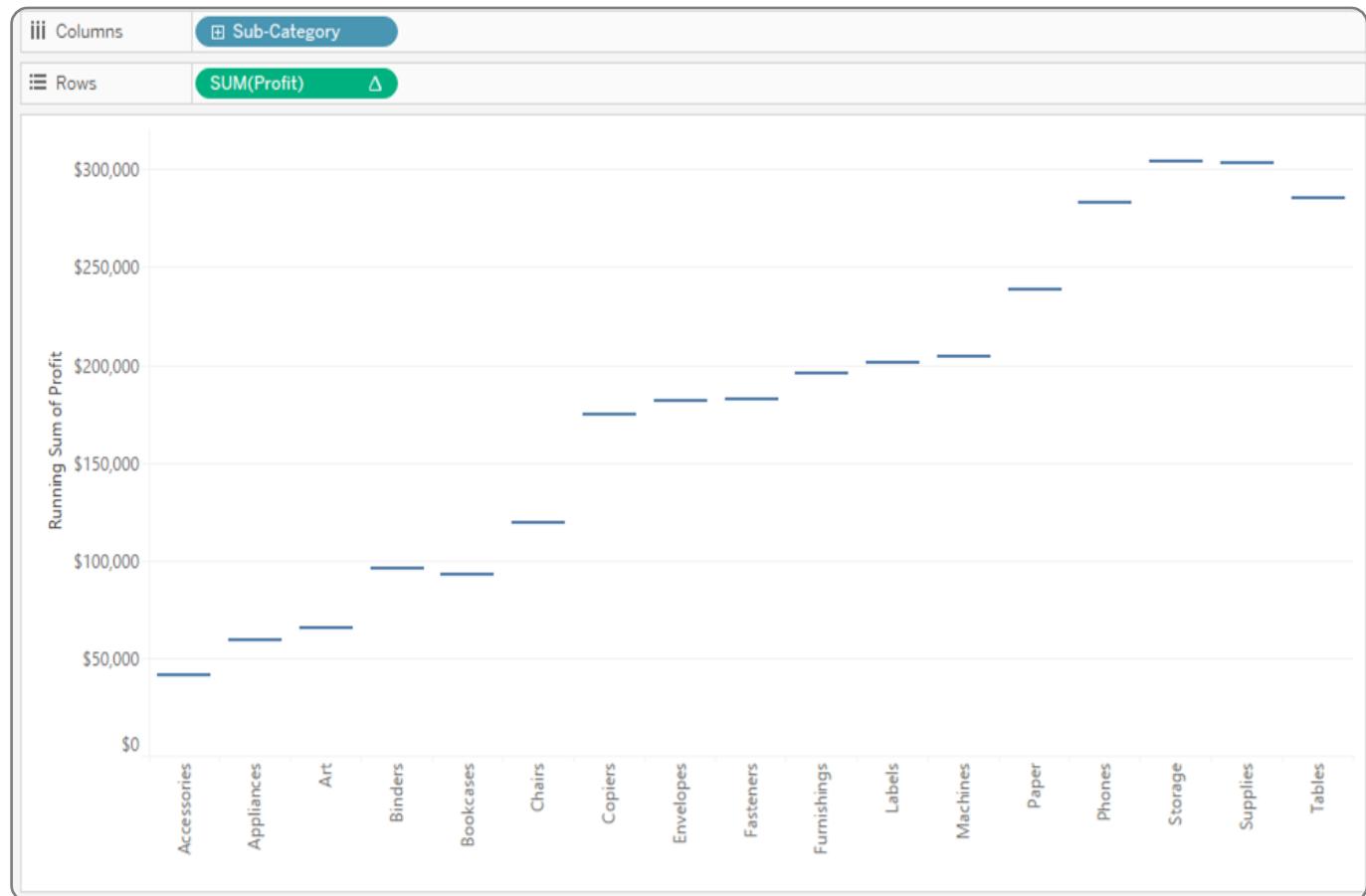
# Waterfall Chart



Step 2

Right-click on profit measure in Rows, and select Running Total under Quick Table Calculations

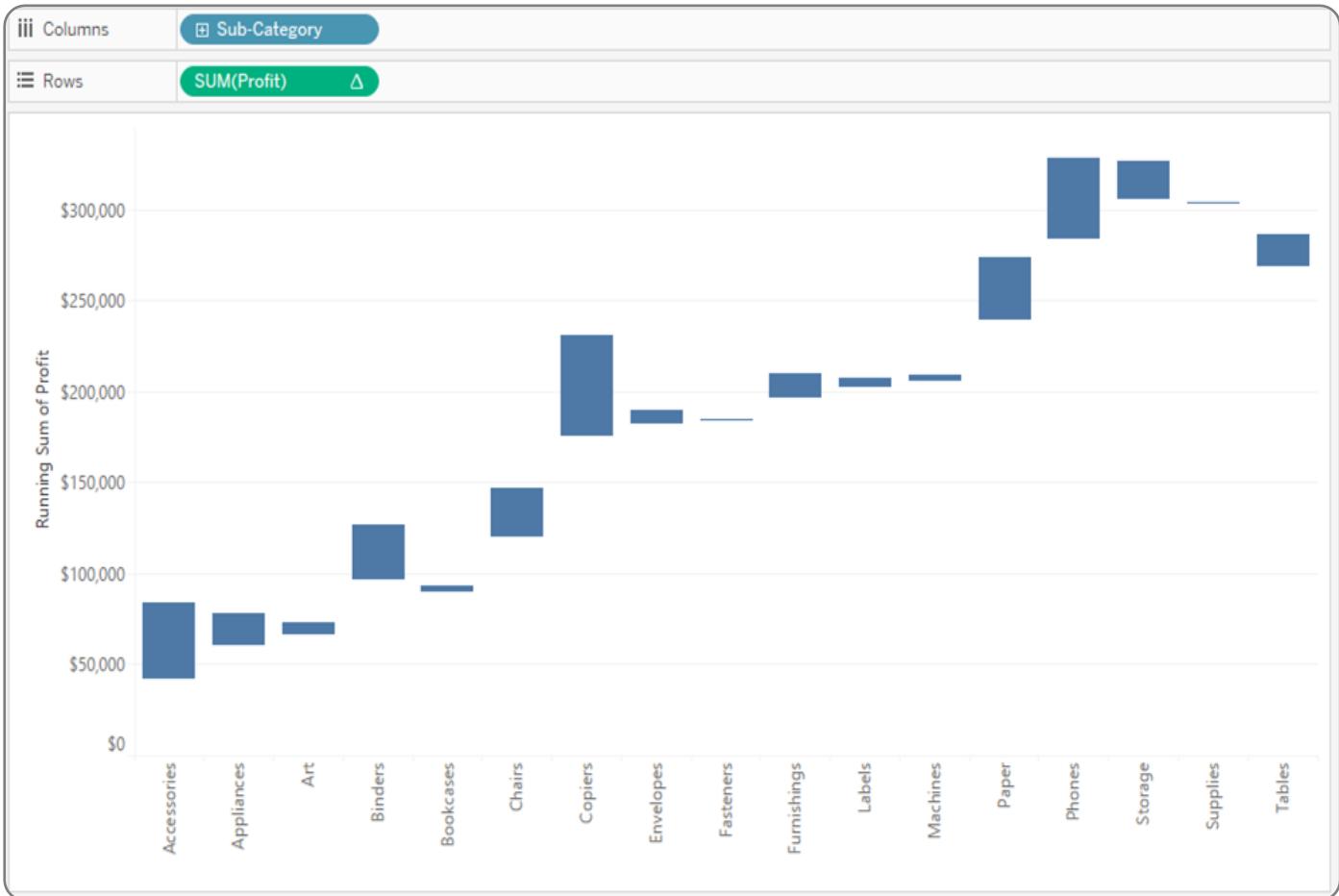
# Waterfall Chart



## Step 3

- Change Type of Mark to Gantt Bar
- Gantt bar will show a line at the end of each value

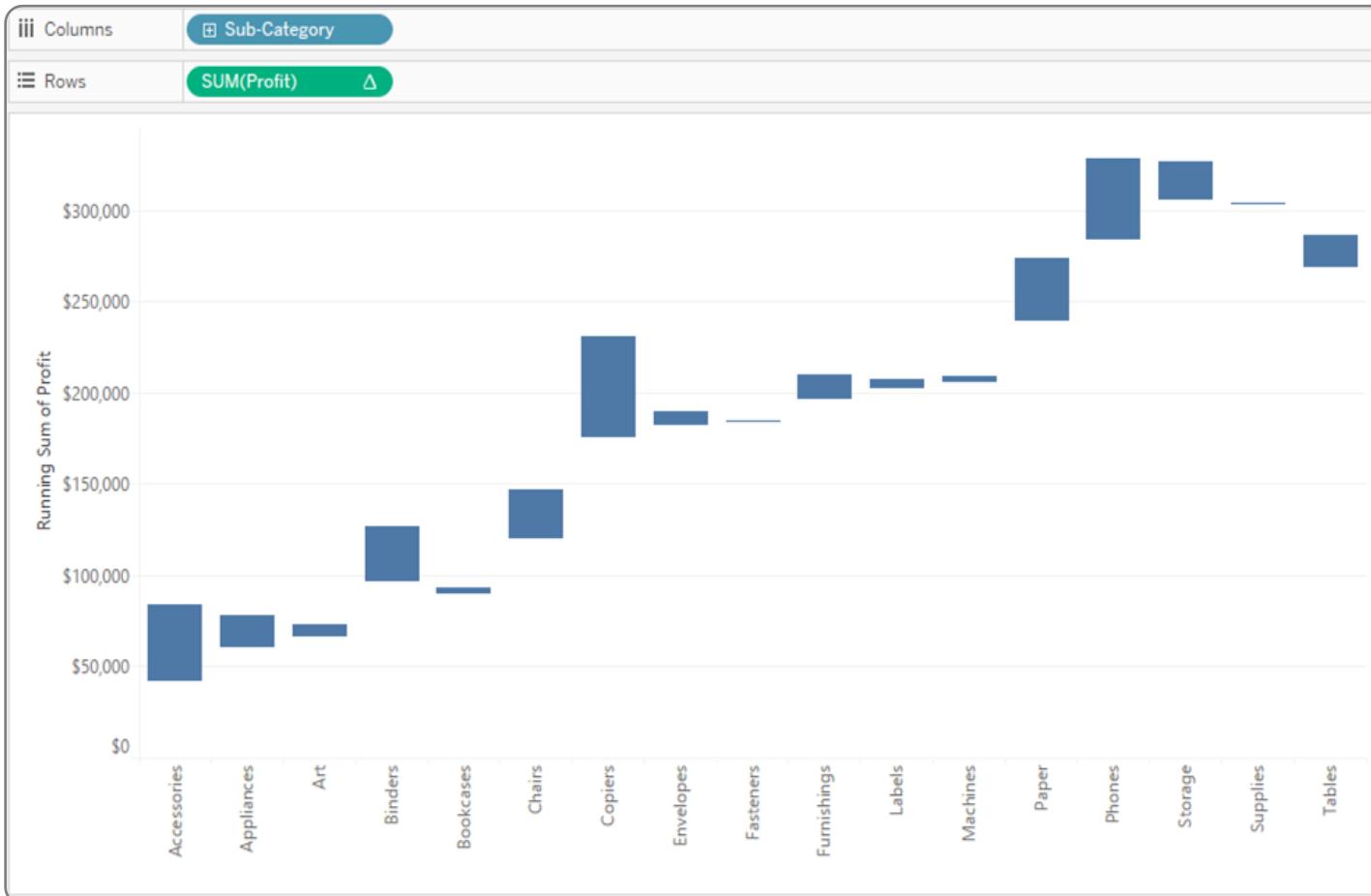
# Waterfall Chart



## Step 4

- Use the size card to add a bar to the Gantt chart
- Add Profit measure to Size and the bars will move in the upward direction

# Waterfall Chart



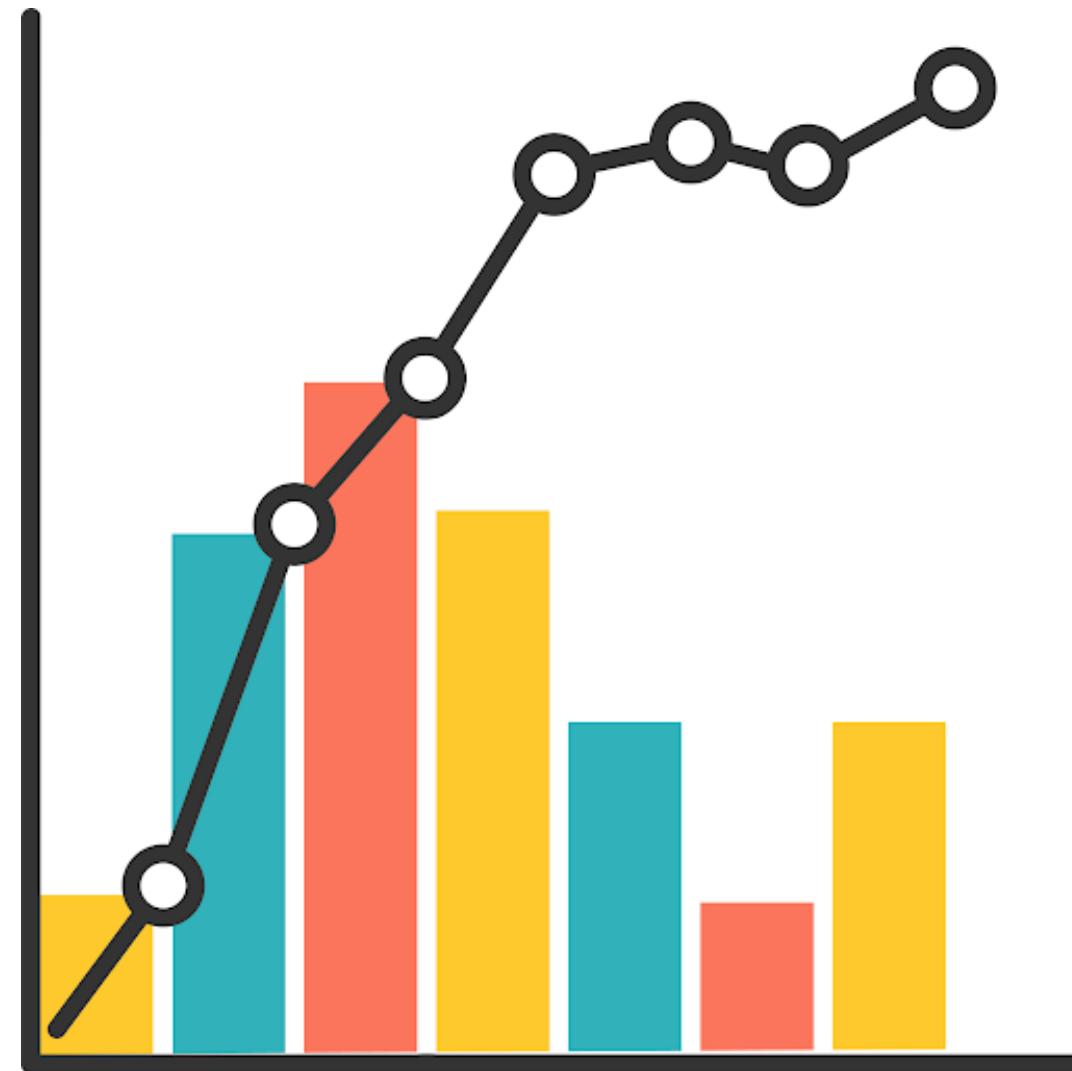
## Step 5

- To change the direction of the Gantt Bar, add an ad-hoc calculation in the Profit Measure in Size
  - Double-click on Profit in Size and multiply by -1
  - This will create the waterfall chart
  - Add colors to format the chart accordingly

## Pareto Analysis

# Pareto Analysis

Pareto analysis is a statistical technique used to identify the minimal factors that have the maximum impact.

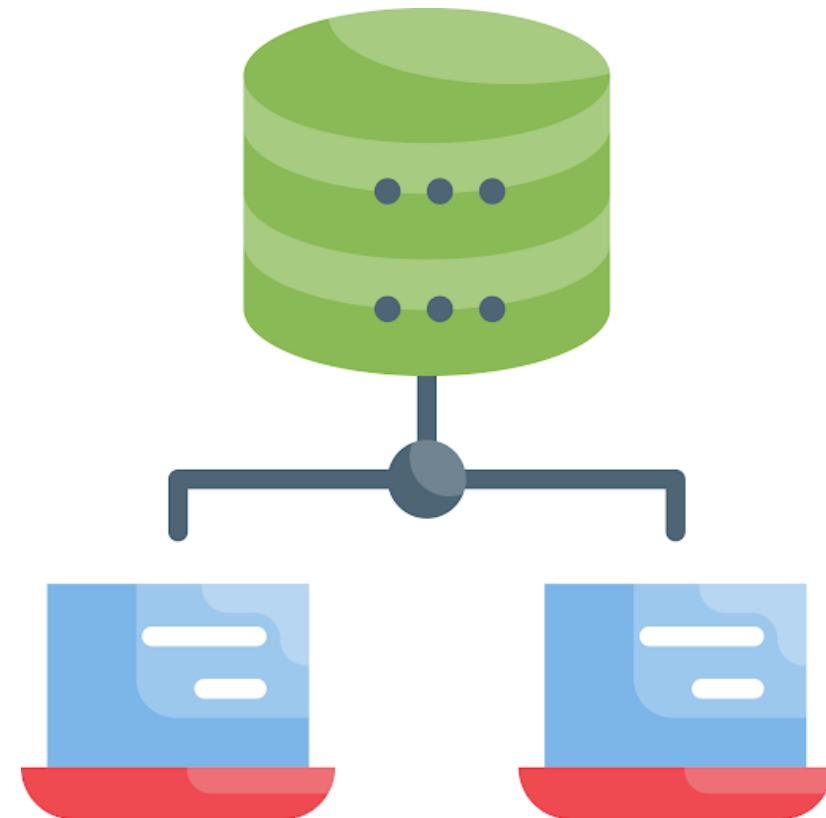


# Pareto Analysis

The steps to create a pareto analysis are as follows:

01

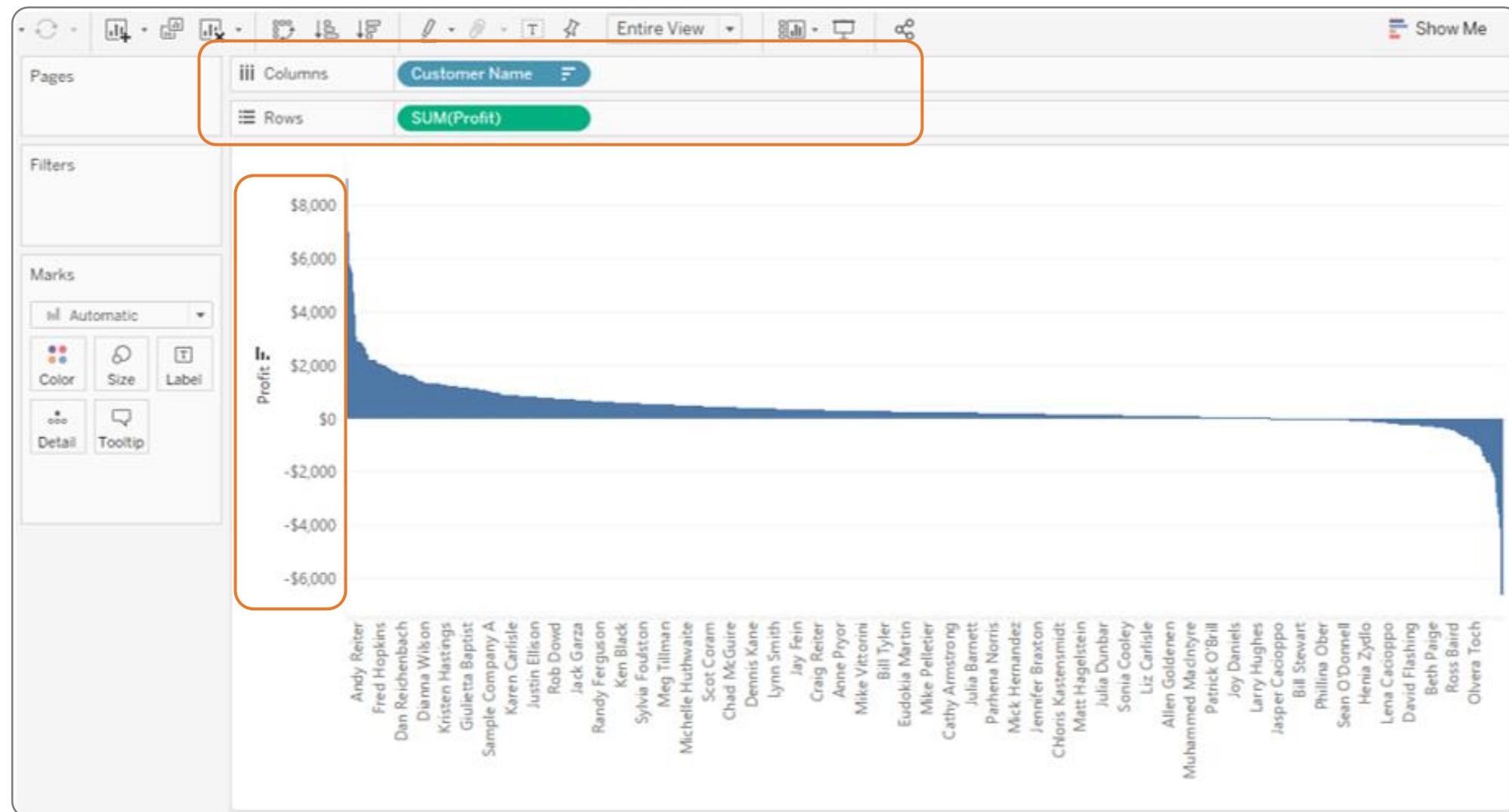
Use sample superstore dataset



# Pareto Analysis

02

Create a bar chart with customer name in column and profit in measure



03

Sort the profit in descending order

# Pareto Analysis

Table Calculation  
% of Total Running Sum of Profit

**Primary Calculation Type**

Running Total

Sum

**Compute Using**

Table (across)  
Cell  
**Specific Dimensions**

Customer Name

Restarting every

Sort order Specific Dimensions

Add secondary calculation

Show calculation assistance

**Secondary Calculation Type**

Percent of Total

Compute total across all pages

**Compute Using**

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

Customer Name

At the level

Sort order Specific Dimensions

04

Right-click on profit to add a quick table calculation

05

Select running total in table calculation window

# Pareto Analysis

06

Select the computation by specific dimension and select customer name

Table Calculation  
% of Total Running Sum of Profit

**Primary Calculation Type**

Running Total

Sum

**Secondary Calculation Type**

Percent of Total

Compute total across all pages

**Compute Using**

Table (across)

Cell

**Specific Dimensions**

Customer Name

Restarting every

Sort order Specific Dimensions

**Compute Using**

Table (across)

Table (down)

Table

Cell

**Specific Dimensions**

Customer Name

At the level

Sort order Specific Dimensions

Add secondary calculation

Show calculation assistance

# Pareto Analysis

07

Click add secondary calculation and select percent of total

Table Calculation  
% of Total Running Sum of Profit

**Primary Calculation Type**  
Running Total  
Sum

**Compute Using**  
Table (across)  
Cell  
**Specific Dimensions**  
 Customer Name

Restarting every

Sort order      Specific Dimensions

**Secondary Calculation Type**  
**Percent of Total**  
 Compute total across all pages

**Compute Using**  
Table (across)  
Table (down)  
Table  
Cell  
**Specific Dimensions**  
 Customer Name

At the level

Sort order      Specific Dimensions

Add secondary calculation  
 Show calculation assistance

# Pareto Analysis

08

Select the computation by specific dimension and select customer name

Table Calculation  
% of Total Running Sum of Profit

**Primary Calculation Type**  
Running Total  
Sum

**Secondary Calculation Type**  
Percent of Total  
 Compute total across all pages

**Compute Using**

|   |
|---|
| Table (across)                                    |
| Cell  |
| <b>Specific Dimensions</b>                        |
| <input checked="" type="checkbox"/> Customer Name |

Restarting every

Sort order Specific Dimensions

**Compute Using**

|   |
|---|
| Table (across)                                    |
| Table (down)                                      |
| Table   |
| Cell  |
| <b>Specific Dimensions</b>                        |
| <input checked="" type="checkbox"/> Customer Name |

At the level

Sort order Specific Dimensions

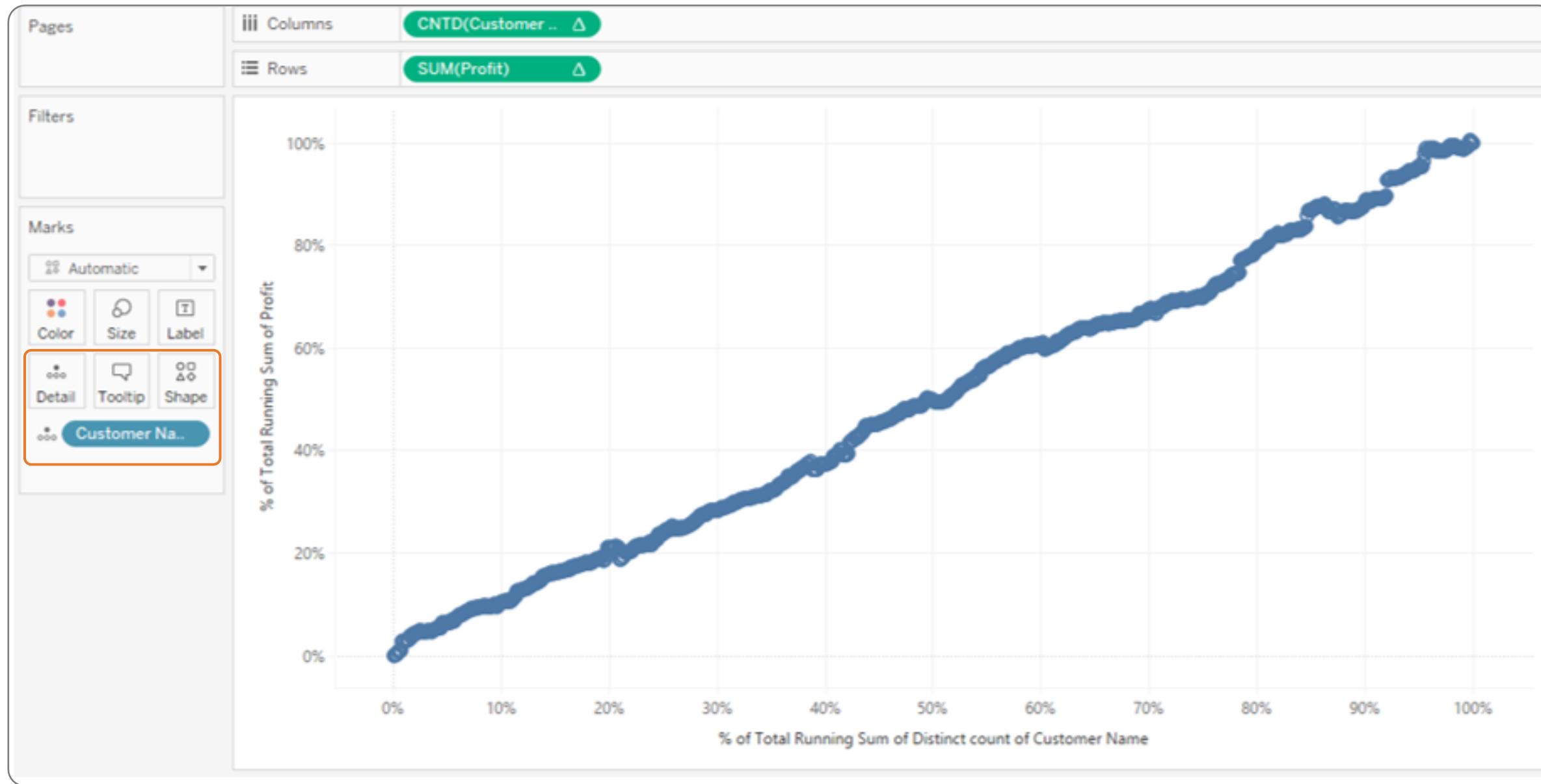
Add secondary calculation  
 Show calculation assistance



# Pareto Analysis

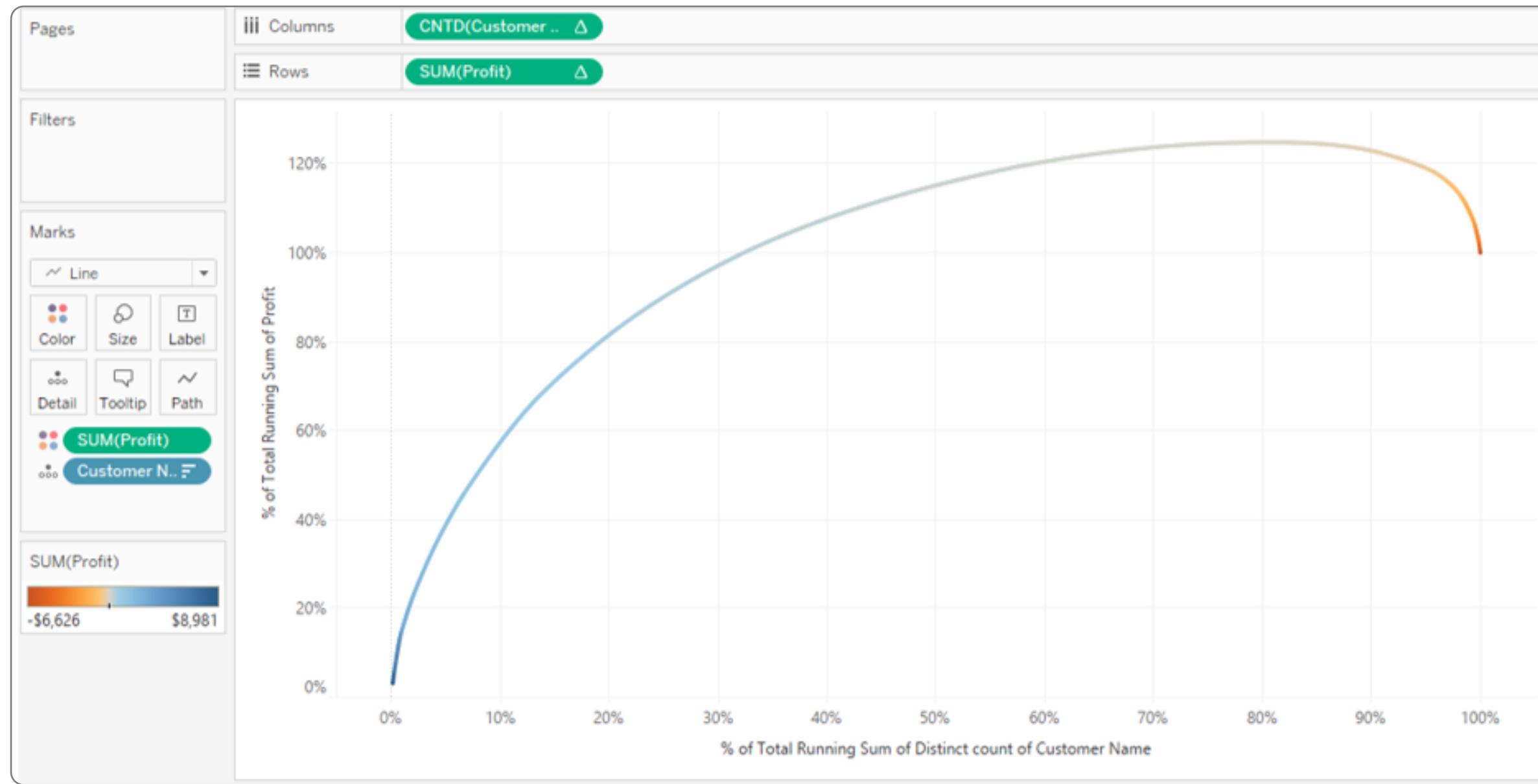
09

Right-click on customer name in detail and sort it in descending order by profit



# Pareto Analysis

The chart below shows that 20% of the customers generate 80% of the profit.



## Built-in Functions

# Built-in Functions

Tableau has several built-in functions, such as:

01

Number

04

Type conversion

02

String

05

Logical

03

Date

06

Aggregate

# Built-in Functions

Tableau has several built-in functions, such as:

07

User

08

Table calculation

09

Spatial analysis

# Built-in Functions

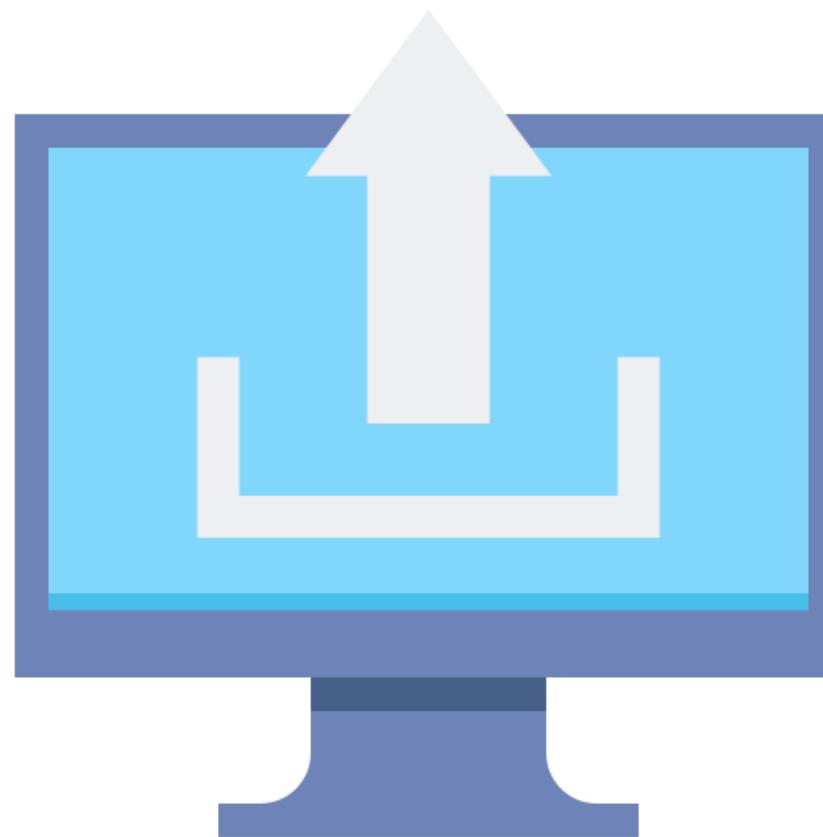
They are required to build calculated fields.

Calculated fields:

Measure

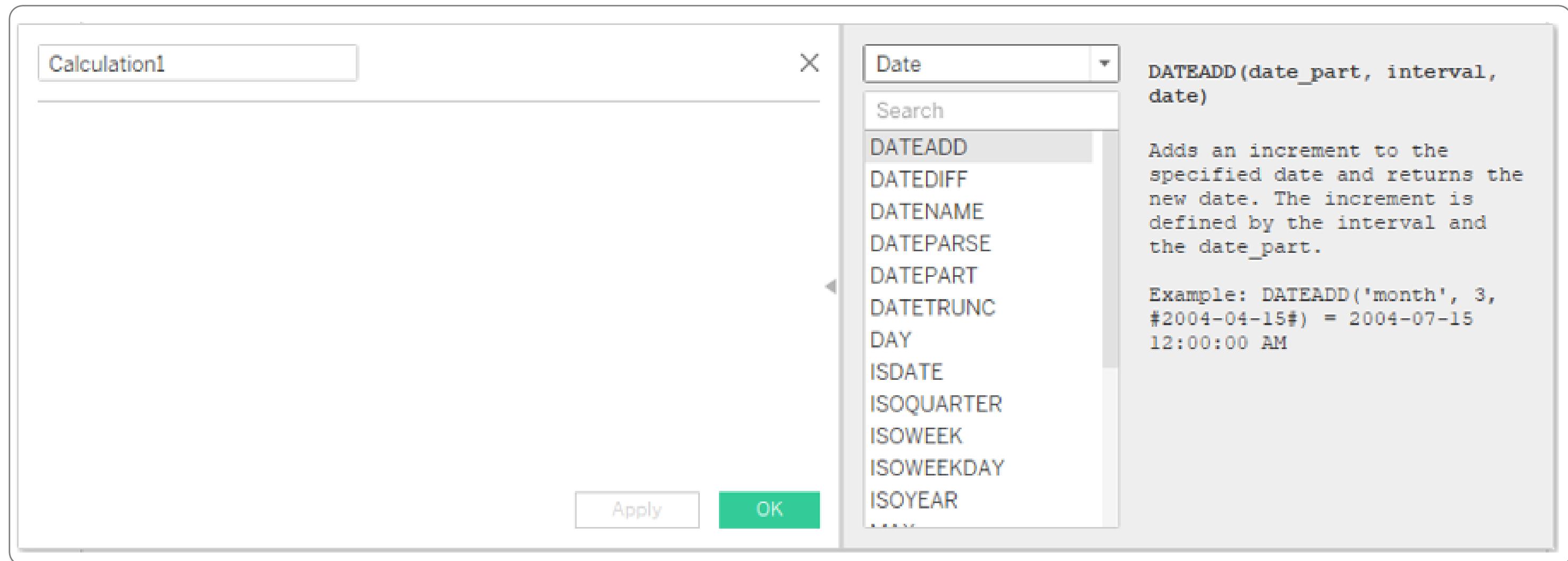
Dimension

Output



# Built-in Functions

The calculated fields dialog box will show each function.



Syntax, description, and sample calculation

## Introduction to Level of Detail

## Level of Detail

Level of detail (LOD) allows computing values at the data source and visualization level.



It can be added to measures or dimensions.

## Level of Detail

There are three types of LOD calculations in Tableau:



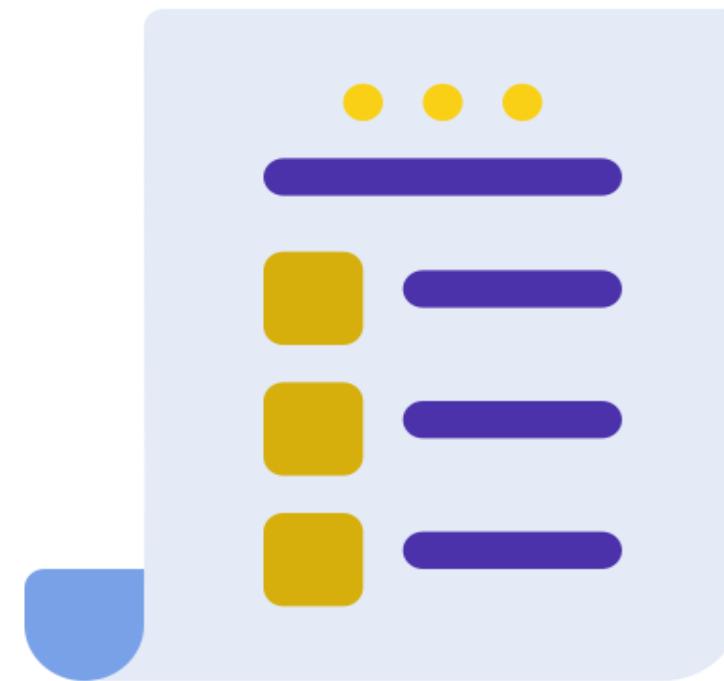
Fixed LOD

Include LOD

Exclude LOD

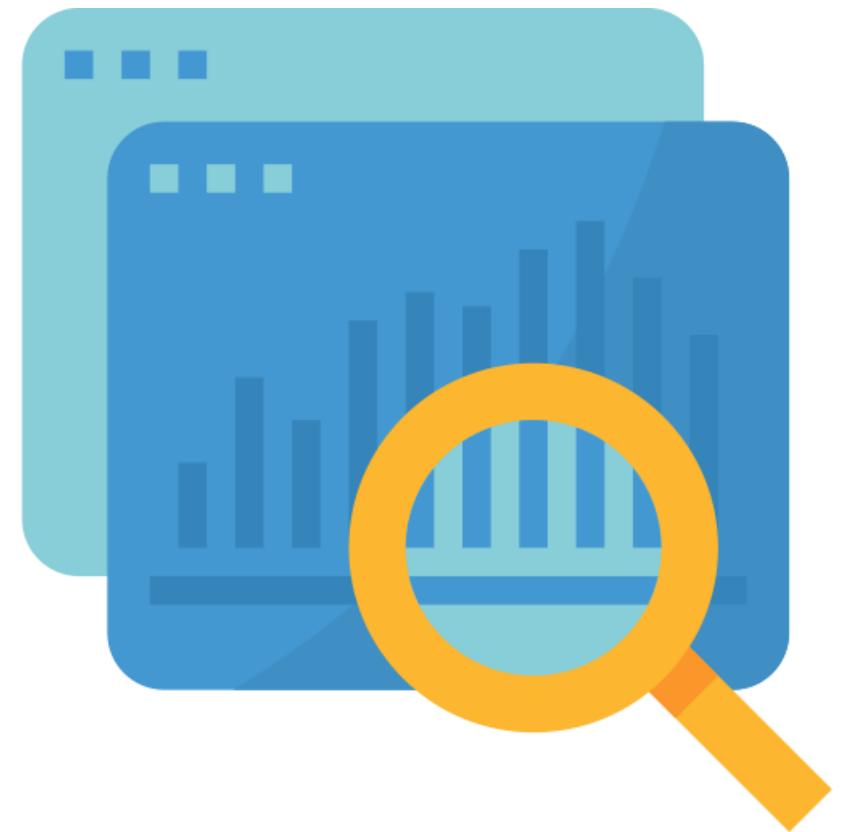
## Fixed LOD

It computes values using the specified dimensions but does not refer to the dimensions in the view.



## Include LOD

It computes values based on specified dimensions in addition to the dimensions in the view.



## Exclude LOD

It prevents the calculation from using one or more dimensions in the view.



## Fixed Level of Detail

## Fixed LOD

**Fixed()** is the most powerful of the LOD expressions.



It precedes **Exclude()** and **Include()** in the order of execution.

## Fixed LOD

It fixes visualization at a certain level of detail.



It provides various benefits for data visualization.

## Fixed LOD

Let us consider a scenario to identify the first order date for each of the products.



Identify the launch date of a specific product.

# Fixed LOD

Step 01: Use a sample superstore dataset

The screenshot shows a Microsoft Excel spreadsheet titled 'Product Name'. The table has 31 columns and approximately 300 rows of data. The columns are labeled A through P. Column A contains Row ID, Column B contains Order ID, Column C contains Order Date, Column D contains Ship Date, Column E contains Ship Mode, Column F contains Customer ID, Column G contains Customer Name, Column H contains Segment, Column I contains Country, Column J contains City, Column K contains State, Column L contains Postal Code, Column M contains Region, Column N contains Product ID, Column O contains Category, Column P contains Sub-Category, and Column Q contains Product Name. The data includes various products like Furniture, Office Supplies, and Technology items from different regions like North America, South America, and Europe. The bottom of the screen shows navigation buttons for 'Orders', 'People', and 'Returns'.

| Row ID | Order ID        | Order Date | Ship Date  | Ship Mode    | Customer ID | Customer Name | Segment   | Country       | City            | State          | Postal Code | Region  | Product ID | Category    | Sub-Category                               | Product Name   |
|--------|-----------------|------------|------------|--------------|-------------|---------------|-----------|---------------|-----------------|----------------|-------------|---------|------------|-------------|--|--|
| 1      | CA-2019-152158  | 08-11-2019 | 11-11-2019 | Second Class | CO-12523    | Claire Guti   | Consumer  | United States | Henderson       | Kentucky       | 421420      | South   | FUR-BD-1   | Furniture   | Business Bush Standard Collection Bookcase |  |
| 2      | CA-2019-152158  | 08-11-2019 | 11-11-2019 | Second Class | CO-12523    | Claire Guti   | Consumer  | United States | Henderson       | Kentucky       | 421420      | South   | FUR-CH-1   | Furniture   | Chair                                      | Hon Deluxe Fabric Upholstered Stackable Adhesive Address Labeler |
| 3      | CA-2019-152158  | 12-06-2019 | 16-06-2019 | Second Class | CO-13045    | Darin Vito    | Corporate | United States | Lisa            | Augusta        | 330336      | West    | OFF-CA-1   | Office Sup. | Binders                                    | Baldwin CP4500 Series Slim Filing                                |
| 4      | US-2018-188986  | 11-13-2018 | 18-18-2018 | Standard     | SD-29335    | Deron         | Consumer  | United States | Fort Lauderdale | Florida        | 333111      | South   | FUR-TA-1   | Furniture   | Tables                                     | Brentford CP4500 Series Slim Rectangu                            |
| 5      | US-2018-188986  | 11-13-2018 | 18-18-2018 | Standard     | SD-29335    | Dawn          | Consumer  | United States | Fort Lauderdale | Florida        | 333111      | South   | OFF-ST-1   | Office Sup. | Storage                                    | Elbow Fold 'N Roll Can System                                    |
| 6      | CA-2017-115812  | 09-06-2017 | 14-06-2017 | Standard     | BH-11710    | Dossine H     | Consumer  | United States | Los Angeles     | California     | 90032       | West    | FUR-FU-1   | Furniture   | Furniture                                  | Eaton Expressions Woodland Plastic                               |
| 7      | CA-2017-115812  | 09-06-2017 | 14-06-2017 | Standard     | BH-11710    | Dossine H     | Consumer  | United States | Los Angeles     | California     | 90032       | West    | OFF-AP-1   | Office Sup. | Art  | Newell 312   |
| 8      | CA-2017-115812  | 09-06-2017 | 14-06-2017 | Standard     | BH-11710    | Dossine H     | Consumer  | United States | Los Angeles     | California     | 90032       | West    | TDC-PH-1   | Technolo    | Phones                                     | Mitel 5323 IP Phone  |
| 9      | CA-2017-115812  | 09-06-2017 | 14-06-2017 | Standard     | BH-11710    | Dossine H     | Consumer  | United States | Los Angeles     | California     | 90032       | West    | OFF-B-13   | Office Sup. | Binders                                    | Coil Angle View Binders with Locking                             |
| 10     | CA-2017-115812  | 09-06-2017 | 14-06-2017 | Standard     | BH-11710    | Dossine H     | Consumer  | United States | Los Angeles     | California     | 90032       | West    | OFF-AP-1   | Office Sup. | Appliance                                  | Belkin F5C235VTEL-E Desktop Surge                                |
| 11     | CA-2017-115812  | 09-06-2017 | 14-06-2017 | Standard     | BH-11710    | Dossine H     | Consumer  | United States | Los Angeles     | California     | 90032       | West    | FUR-TA-1   | Furniture   | Tables                                     | Curved Rectangular Conference Ta                                 |
| 12     | CA-2017-115812  | 09-06-2017 | 14-06-2017 | Standard     | BH-11710    | Dossine H     | Consumer  | United States | Los Angeles     | California     | 90032       | West    | TDC-PH-1   | Technolo    | Phones                                     | Konftel 253 Conference phone - Overbo                            |
| 13     | CA-2019-114412  | 15-04-2019 | 20-04-2019 | Standard     | AA-10480    | Andrew Al     | Consumer  | United States | Concord         | North Carolina | 280217      | South   | OFF-PA-1   | Office Sup. | Paper                                      | Xerox 1367   |
| 14     | CA-2019-161368  | 06-12-2019 | 10-12-2019 | Same Day     | SD-18273    | Erica Med     | Consumer  | United States | Seattle         | Washington     | 98103       | West    | OFF-B-13   | Office Sup. | Binders                                    | Fellowes PB260 Plastic Comb Binding                              |
| 15     | US-2018-176893  | 22-11-2018 | 26-11-2018 | Standard     | HP-14075    | Harold Pe     | Home Off  | United States | Fort Worth      | Texas          | 76106       | Central | OFF-AP-1   | Office Sup. | Appliance                                  | Holmes Replacement Filter for HEPA                               |
| 16     | US-2018-176893  | 22-11-2018 | 26-11-2018 | Standard     | HP-14075    | Harold Pe     | Home Off  | United States | Fort Worth      | Texas          | 76106       | Central | OFF-B-13   | Office Sup. | Binders                                    | Stap-DuraTech Recycled Plastic Pro                               |
| 17     | CA-2017-106893  | 11-11-2017 | 19-11-2017 | Standard     | Pe-19075    | Pete Kip      | Consumer  | United States | Madison         | Wisconsin      | 537111      | Central | OFF-ST-1   | Office Sup. | Storage                                    | Star-D-Stor Shaving Vertical S-Start 7                           |
| 18     | CA-2017-1167164 | 13-05-2017 | 15-05-2017 | Second Class | CA-13273    | Alejandro     | Consumer  | United States | West Jordan     | Utah           | 840584      | West    | OFF-ST-1   | Office Sup. | Storage                                    | Fellowes Super Stay Drawer                                       |
| 19     | CA-2017-140338  | 27-08-2017 | 01-09-2017 | Second Class | CO-21825    | Zacharias     | Consumer  | United States | San Francisco   | California     | 941020      | West    | OFF-AP-1   | Office Sup. | Art  | Newell 311   |
| 20     | CA-2017-140338  | 27-08-2017 | 01-09-2017 | Second Class | CO-21825    | Zacharias     | Consumer  | United States | San Francisco   | California     | 941020      | West    | TDC-PH-1   | Technolo    | Phones                                     | Cisco SPA501G IP Phone   |
| 21     | CA-2017-140338  | 27-08-2017 | 01-09-2017 | Second Class | CO-21825    | Zacharias     | Consumer  | United States | San Francisco   | California     | 941020      | West    | OFF-B-13   | Office Sup. | Binders                                    | Wilson Jones Hanging View Binder, W                              |
| 22     | CA-2018-127328  | 08-12-2018 | 13-12-2018 | Standard     | KB-16565    | Ken Block     | Corporate | United States | Fremont         | Nebraska       | 680225      | Central | OFF-AP-1   | Office Sup. | Art  | Newell 318   |
| 23     | CA-2019-157338  | 09-12-2019 | 13-12-2019 | Standard     | KB-16565    | Ken Block     | Corporate | United States | Fremont         | Nebraska       | 680225      | Central | OFF-AP-1   | Office Sup. | Appliance                                  | Alco Six-Outlet Power Strip, # Cord                              |
| 24     | US-2018-158820  | 16-07-2018 | 18-07-2018 | Second Class | CP-23065    | Sandra PI     | Consumer  | United States | Philadelphia    | Pennsylvania   | 191140      | East    | FUR-CH-1   | Furniture   | Chair                                      | Global Deluxe Stacking Chair, Gray                               |
| 25     | CA-2018-106328  | 26-08-2018 | 30-08-2018 | Standard     | FB-13820    | Finley Blue   | Consumer  | United States | Ogallala        | Utah           | 840587      | West    | FUR-TA-1   | Furniture   | Tables                                     | Gossamer CP4500 Series Slim Rectangu                             |
| 26     | CA-2019-121755  | 18-01-2019 | 20-01-2019 | Second Class | CE-H-13045  | Eric Hollie   | Consumer  | United States | Los Angeles     | California     | 900485      | West    | OFF-B-13   | Office Sup. | Binders                                    | Wilson Jones Active Use Binders                                  |
| 27     | CA-2019-121755  | 18-01-2019 | 20-01-2019 | Second Class | CE-H-13045  | Eric Hollie   | Consumer  | United States | Los Angeles     | California     | 900485      | West    | TDC-AC-1   | Technolo    | Accessories                                | Imation SGD Mini TravelDrive USB 2.0                             |
| 28     | US-2018-150630  | 17-08-2018 | 21-08-2018 | Standard     | TB-21520    | Tracy Blue    | Consumer  | United States | Philadelphia    | Pennsylvania   | 191140      | East    | FUR-BD-1   | Furniture   | Business                                   | Pearlville Paper Royal Lined Book                                |
| 29     | US-2018-150630  | 17-08-2018 | 21-08-2018 | Standard     | TB-21520    | Tracy Blue    | Consumer  | United States | Philadelphia    | Pennsylvania   | 191140      | East    | OFF-B-13   | Office Sup. | Binders                                    | Avery Recycled File View Covers                                  |
| 30     | US-2018-150630  | 17-08-2018 | 21-08-2018 | Standard     | TB-21520    | Tracy Blue    | Consumer  | United States | Philadelphia    | Pennsylvania   | 191140      | East    | FUR-FU-1   | Furniture   | Furniture                                  | Howard Miller 13-3/4" Diameter Brushed                           |
| 31     | US-2018-150630  | 17-08-2018 | 21-08-2018 | Standard     | TB-21520    | Tracy Blue    | Consumer  | United States | Philadelphia    | Pennsylvania   | 191140      | East    | OFF-EN-1   | Office Sup. | Envelope Poly String Tie Envelopes         |  |

# Fixed LOD

Step 02: Drag **Category**, **Sub-Category**, **Product Name**, and discrete **Order Date** to Rows

The screenshot shows the Tableau Data Explorer interface. On the left, there are sections for 'Pages', 'Filters', and 'Marks'. The 'Marks' section has 'Automatic' selected and includes buttons for 'Color', 'Size', 'Text', 'Detail', and 'Tooltip'. In the center, there is a 'Columns' section with tabs for 'Rows', 'Category', 'Sub-Category', 'Product Name', and 'Order Date'. The 'Rows' tab is highlighted with a red box. Below these tabs is a table with the following data:

| Category  | Sub-Catego.. | Product Name               | Order Date |     |
|-----------|--------------|----------------------------|------------|-----|
| Furniture | Bookcases    | Atlantic Metals Mobile     | 19-03-2016 | Abc |
|           |              | 2-Shelf Bookcases, Custo.. | 17-11-2017 | Abc |
|           |              | Atlantic Metals Mobile     | 11-11-2014 | Abc |
|           |              | 3-Shelf Bookcases, Custom  | 20-07-2015 | Abc |
|           |              | Colors                     | 31-08-2015 | Abc |
|           |              |                            | 12-10-2015 | Abc |
|           |              |                            | 27-12-2015 | Abc |
|           |              |                            | 08-01-2016 | Abc |
|           |              |                            | 21-10-2016 | Abc |
|           |              |                            | 15-09-2017 | Abc |
|           |              | Atlantic Metals Mobile     | 31-12-2014 | Abc |
|           |              | 4-Shelf Bookcases, Custom  | 12-10-2015 | Abc |
|           |              | Colors                     | 24-12-2015 | Abc |
|           |              |                            | 25-12-2015 | Abc |
|           |              |                            | 25-09-2016 | Abc |
|           |              |                            | 17-07-2017 | Abc |
|           |              | Atlantic Metals Mobile     | 01-03-2015 | Abc |
|           |              | 5-Shelf Bookcases, Custom  | 13-11-2015 | Abc |
|           |              | Colors                     | 04-07-2016 | Abc |
|           |              |                            | 06-09-2016 | Abc |
|           |              |                            | 06-02-2017 | Abc |
|           |              |                            | 27-03-2017 | Abc |
|           |              |                            | 30-05-2017 | Abc |
|           |              |                            | 22-09-2017 | Abc |

## Fixed LOD

Step 03: Open calculated fields to fix the **Product Name** as the level of detail

First Order Date

{ FIXED [Product Name] : MIN([Order Date]) }

The calculation is valid.

Apply OK

## Fixed LOD

Step 04: Calculate the minimum **Order Date** for each **Product Name**

First Order Date

{ FIXED [Product Name] : MIN([Order Date]) }

The calculation is valid.

Apply OK

# Fixed LOD

Step 05: Use the field in the text to showcase the **First Order Date** of the product

The screenshot shows a Tableau dashboard with a data view and a marks card.

**Data View:** A table with columns: Category, Sub-Catego., Product Name, and Order Date. The data is grouped by Category (Furniture) and Sub-Category (Bookcases). The table lists various products and their first order dates.

| Category               | Sub-Catego..                     | Product Name                     | Order Date |
|------------------------|----------------------------------|----------------------------------|------------|
| Furniture              | Bookcases                        | Atlantic Metals Mobile           | 19-03-2016 |
|                        |                                  | 2-Shelf Bookcases, Custo..       | 17-11-2017 |
|                        |                                  | Atlantic Metals Mobile           | 11-11-2014 |
|                        |                                  | 3-Shelf Bookcases, Custom Colors | 20-07-2015 |
|                        |                                  |                                  | 31-08-2015 |
|                        |                                  |                                  | 12-10-2015 |
|                        |                                  |                                  | 27-12-2015 |
|                        |                                  |                                  | 08-01-2016 |
|                        |                                  |                                  | 21-10-2016 |
|                        |                                  |                                  | 15-09-2017 |
| Atlantic Metals Mobile | 4-Shelf Bookcases, Custom Colors | 31-12-2014                       |            |
|                        |                                  | 12-10-2015                       |            |
|                        |                                  | 24-12-2015                       |            |
|                        |                                  | 25-12-2015                       |            |
|                        |                                  | 25-09-2016                       |            |
|                        |                                  | 17-07-2017                       |            |
|                        | 5-Shelf Bookcases, Custom Colors | 01-03-2015                       |            |
|                        |                                  | 13-11-2015                       |            |
| 04-07-2016             |                                  |                                  |            |
| 06-09-2016             |                                  |                                  |            |
| 06-02-2017             |                                  |                                  |            |
| 27-03-2017             |                                  |                                  |            |
| 30-05-2017             |                                  |                                  |            |
| 22-09-2017             |                                  |                                  |            |
| 01-03-2015             |                                  |                                  |            |

**Marks Card:** A card titled "Marks" with a dropdown set to "Automatic". It contains three buttons: "Color", "Size", and "Text". Below these is a "Detail" button, followed by a "Tooltip" button, and finally a green "First Order Date" button, which is highlighted with an orange rectangle.

## Include Level of Detail

## Include LOD

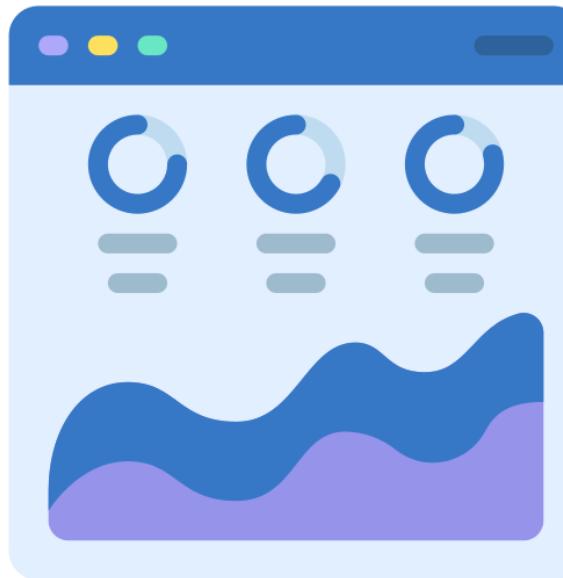
**Include()** is the least used LOD expression.



It brings granularity to the aggregated visualization.

## Include LOD

Let us consider an example:



Add subcategory level information to category level visualization.

# Include LOD

## Step 01: Use a sample superstore dataset

The screenshot shows a Microsoft Excel spreadsheet titled 'Product Name' with a table containing data from the Superstore dataset. The table has 31 columns and approximately 300 rows of data. The columns are labeled A through P, and the data includes Order ID, Order Date, Ship Date, Ship Mode, Customer Segment, Country/Region, State, Postal Code, Region, Product ID, Category, Sub-Category, and Product Name. The 'Product Name' column is highlighted in blue. The bottom of the screen shows navigation buttons for 'Orders', 'People', and 'Returns'.

| A        | B              | C          | D          | E                | F              | G             | H           | I       | J          | K                     | L  | M   | N | O | P | Product Name |
|----------|----------------|------------|------------|------------------|----------------|---------------|-------------|---------|------------|-----------------------|--|---|---|---|---|--------------|
| Order ID | Order Date     | Ship Date  | Ship Mode  | Customer Segment | Country/Region | State         | Postal Code | Region  | Product ID | Category              | Sub-Category                                     | Product Name  |   |   |   |              |
| 1        | CA-2019-152158 | 08-11-2019 | 11-11-2019 | Second Class     | Consumer       | United States | 42420       | South   | FUR-BD-1   | Furniture             | Business Bush Standard Collection Bookcase       |   |   |   |   |              |
| 2        | CA-2019-152158 | 08-11-2019 | 11-11-2019 | Second Class     | Consumer       | United States | 42420       | South   | FUR-CH-1   | Furniture             | Chairs   | Non-Deluxe Fabric Upholstered Stackable Office Chair      |   |   |   |              |
| 3        | CA-2019-152158 | 08-11-2019 | 11-11-2019 | Second Class     | Corporate      | United States | 90836       | West    | OFF-CA-1   | Office Sup. Labels    | Self-Adhesive Address Labels                     | Self-Adhesive Address Labels for Typewriters              |   |   |   |              |
| 4        | US-2018-188986 | 11-13-2018 | 18-18-2018 | Standard         | Business       | United States | 33011       | South   | FUR-TA-1   | Furniture             | Tables   | Brentford CP4500 Series Slim Rectangular Conference Table |   |   |   |              |
| 5        | US-2018-188986 | 11-13-2018 | 18-18-2018 | Standard         | Business       | United States | 33011       | South   | OFF-ST-1   | Office Sup. Storage   | Elbow Fold 'N Roll Can System                    |   |   |   |   |              |
| 6        | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard         | Business       | United States | 90832       | West    | FUR-FU-1   | Furniture             | Furniture Expressions Woodland Plastic           |   |   |   |   |              |
| 7        | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard         | Business       | United States | 90832       | West    | OFF-AP-1   | Office Sup. Art       | Newell 312                                       |   |   |   |   |              |
| 8        | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard         | Business       | United States | 90832       | West    | TEC-PH-1   | Technology            | Phones   | Motorola E323 IP Phone                                    |   |   |   |              |
| 9        | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard         | Business       | United States | 90832       | West    | OFF-B-13   | Office Sup. Binders   | Coil-Angle View Binders with Locking Ring        |   |   |   |   |              |
| 10       | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard         | Business       | United States | 90832       | West    | OFF-AP-1   | Office Sup. Appliance | Belkin F5C235VTEL-E Desktop Surge                |   |   |   |   |              |
| 11       | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard         | Business       | United States | 90832       | West    | FUR-TA-1   | Furniture             | Tables   | Curved Rectangular Conference Table                       |   |   |   |              |
| 12       | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard         | Business       | United States | 90832       | West    | TEC-PH-1   | Technology            | Phones   | Motorola 253 Conference phone - Overhead                  |   |   |   |              |
| 13       | CA-2019-114412 | 15-04-2019 | 20-04-2019 | Standard         | Business       | United States | 20027       | South   | OFF-PA-1   | Office Sup. Paper     | Xerox 1067                                       |   |   |   |   |              |
| 14       | CA-2019-161368 | 06-12-2019 | 10-12-2019 | Same Day         | Consumer       | United States | 90103       | West    | OFF-B-13   | Office Sup. Binders   | Fellowes PB260 Plastic Comb Binding              |   |   |   |   |              |
| 15       | US-2018-176893 | 22-11-2018 | 26-11-2018 | Standard         | Home Office    | United States | 70106       | Central | OFF-AP-1   | Office Sup. Appliance | Holmes Replacement Filter for HEPA Air Purifiers |   |   |   |   |              |
| 16       | US-2018-176893 | 22-11-2018 | 26-11-2018 | Standard         | Home Office    | United States | 70106       | Central | OFF-B-13   | Office Sup. Binders   | Stap-2-DuraTech Recycled Plastic Binders         |   |   |   |   |              |
| 17       | CA-2017-106893 | 11-11-2017 | 19-11-2017 | Standard         | Home Office    | United States | 53011       | Central | OFF-ST-1   | Office Sup. Storage   | Star-D-Stor Shaving, Vertical S-Start 7          |   |   |   |   |              |
| 18       | CA-2017-161764 | 13-05-2017 | 15-05-2017 | Second Class     | Consumer       | United States | 94054       | West    | OFF-ST-1   | Office Sup. Storage   | Fellowes Super Stay Drawer                       |   |   |   |   |              |
| 19       | CA-2017-161764 | 13-05-2017 | 01-08-2017 | Second Class     | Consumer       | United States | 34020       | West    | OFF-AP-1   | Office Sup. Art       | Newell 311                                       |   |   |   |   |              |
| 20       | CA-2017-161764 | 13-05-2017 | 01-08-2017 | Second Class     | Consumer       | United States | 91039       | West    | TEC-PH-1   | Technology            | Phones   | Cisco SPA501G IP Phone                                    |   |   |   |              |
| 21       | CA-2017-161764 | 13-05-2017 | 01-08-2017 | Second Class     | Consumer       | United States | 34020       | West    | OFF-B-13   | Office Sup. Binders   | Wilson Jones Hanging View Binder, White          |   |   |   |   |              |
| 22       | CA-2019-127328 | 08-12-2019 | 13-12-2019 | Standard         | Business       | United States | 90825       | Central | OFF-AP-1   | Office Sup. Art       | Newell 318                                       |   |   |   |   |              |
| 23       | CA-2019-127328 | 08-12-2019 | 13-12-2019 | Standard         | Business       | United States | 90825       | Central | OFF-AP-1   | Office Sup. Appliance | Alco Six-Outlet Power Strip, 8' Cord             |   |   |   |   |              |
| 24       | US-2020-158820 | 16-07-2020 | 18-07-2020 | Second Class     | Consumer       | United States | 15140       | East    | FUR-CH-1   | Furniture             | Chairs   | Global Deluxe Stacking Chair, Gray                        |   |   |   |              |
| 25       | CA-2018-106328 | 26-09-2018 | 30-09-2018 | Standard         | Business       | United States | 84057       | West    | FUR-TA-1   | Furniture             | Tables   | Gossamer CP4500 Series Slim Rectangular                   |   |   |   |              |
| 26       | CA-2019-121755 | 18-01-2019 | 20-01-2019 | Second Class     | Consumer       | United States | 90849       | West    | OFF-B-13   | Office Sup. Binders   | Wilson Jones Active Use Binders                  |   |   |   |   |              |
| 27       | CA-2019-121755 | 18-01-2019 | 20-01-2019 | Second Class     | Consumer       | United States | 30249       | West    | TEC-AC-1   | Technology            | Accessories                                      | Imation SGD Mini TravelDrive USB 2.0                      |   |   |   |              |
| 28       | US-2018-150630 | 17-03-2018 | 21-03-2018 | Standard         | Business       | United States | 19140       | East    | FUR-BD-1   | Furniture             | Business   | Pearlridge Paper Royal Lined Book                         |   |   |   |              |
| 29       | US-2018-150630 | 17-03-2018 | 21-03-2018 | Standard         | Business       | United States | 19140       | East    | OFF-B-13   | Office Sup. Binders   | Avery Recycled File View Covers                  |   |   |   |   |              |
| 30       | US-2018-150630 | 17-03-2018 | 21-03-2018 | Standard         | Business       | United States | 19140       | East    | FUR-FU-1   | Furniture             | Furnishing                                       | Howard Miller 13-3/4" Diameter Brushed Nickel Wall Clock  |   |   |   |              |
| 31       | US-2018-150630 | 17-03-2018 | 21-03-2018 | Standard         | Business       | United States | 19140       | East    | OFF-EN-1   | Office Sup. Envelopes | Poly String Tie Envelopes                        |   |   |   |   |              |

# Include LOD

## Step 02: Drag Category to Rows

The screenshot shows the Tableau Data Explorer interface. On the left, there are three panels: 'Pages' (empty), 'Filters' (empty), and 'Marks' (set to 'Automatic'). The 'Marks' panel includes buttons for Color, Size, Text, Detail, and Tooltip. At the top right, there are tabs for 'Columns' and 'Rows'. The 'Rows' tab is highlighted with an orange border, and the 'Category' tab is highlighted with a blue background. Below the tabs, there is a data preview table:

| Category        | Abc |
|-----------------|-----|
| Furniture       | Abc |
| Office Supplies | Abc |
| Technology      | Abc |

# Include LOD

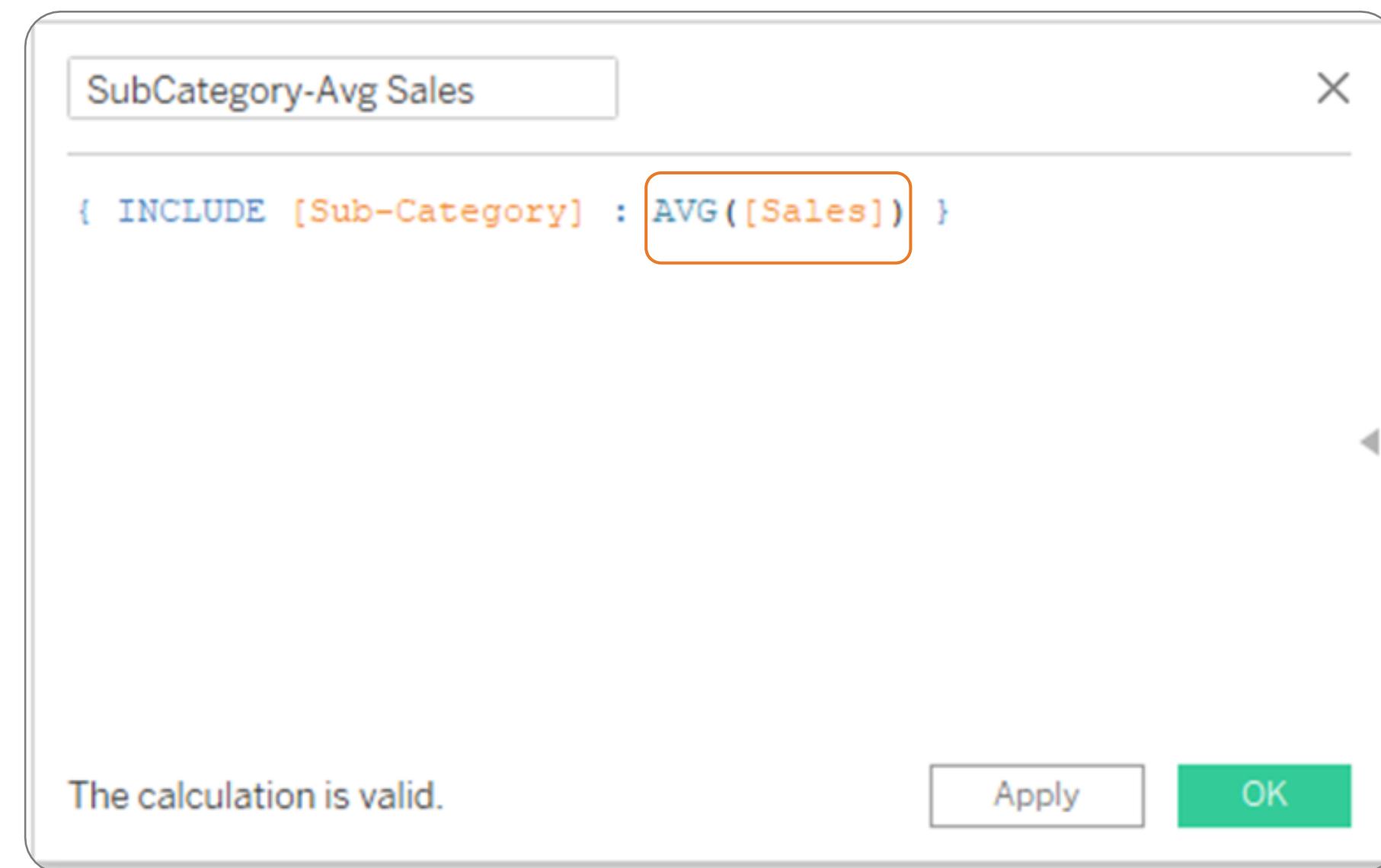
Step 03: Drag **Sales** to text and change the aggregate to average

The screenshot shows the Tableau Data Explorer interface. The top navigation bar includes 'Pages', 'Columns' (with three columns), 'Rows' (with 'Category' selected), and 'Category'. The 'Filters' section is empty. The 'Marks' shelf on the left is set to 'Automatic' and contains several options: 'Color', 'Size', 'Text', 'Detail' (selected), 'Tooltip' (disabled), and 'AVG(Sales)' (selected). A green button at the bottom of the Marks shelf also has 'AVG(Sales)' selected. The main workspace displays a table titled 'Category' with three rows: Furniture (349.8), Office Supplies (119.3), and Technology (452.7).

| Category        |       |
|-----------------|-------|
| Furniture       | 349.8 |
| Office Supplies | 119.3 |
| Technology      | 452.7 |

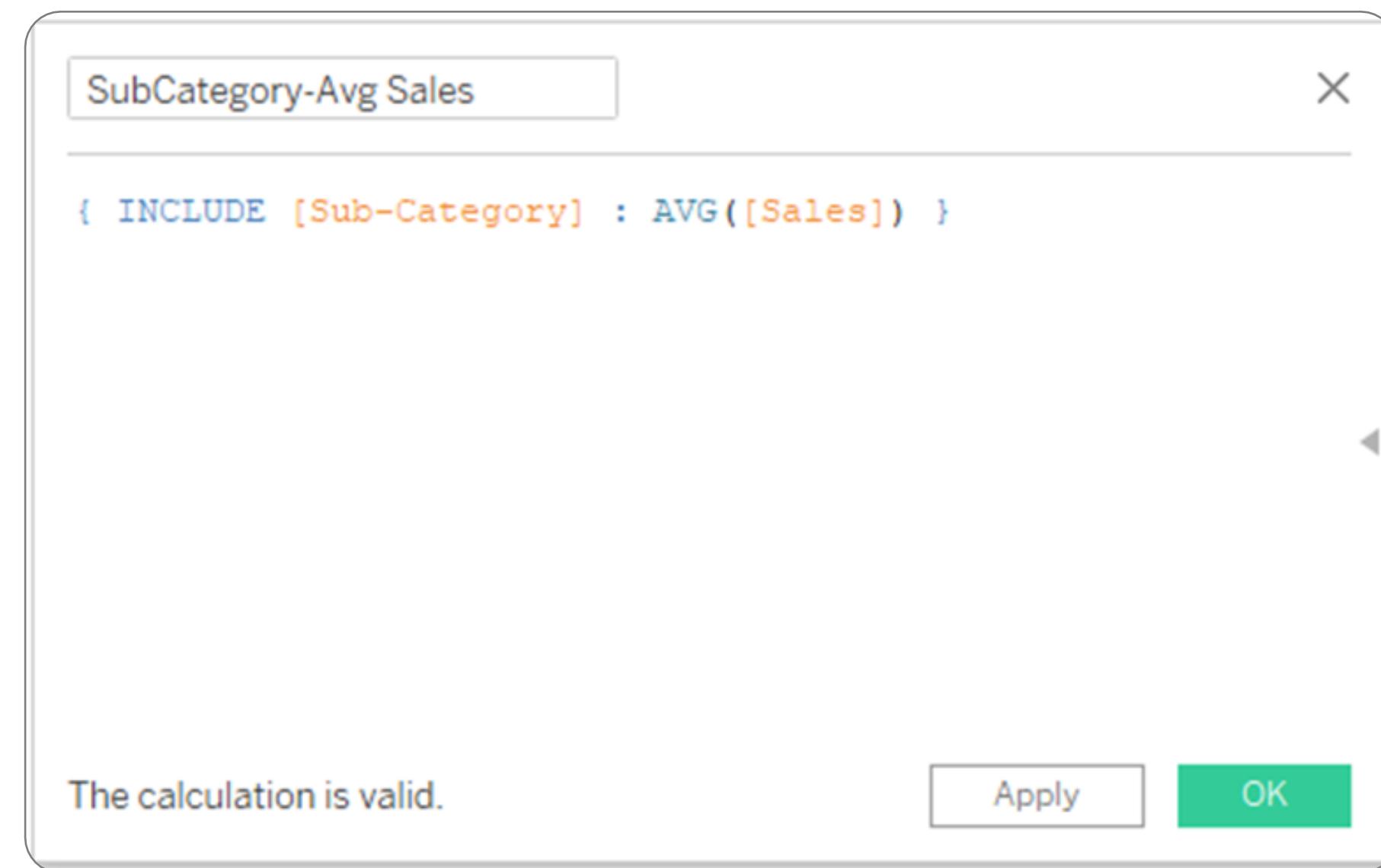
## Include LOD

Step 04: Open calculated fields to include **Sub-Category** and calculate **AVG(Sales)**



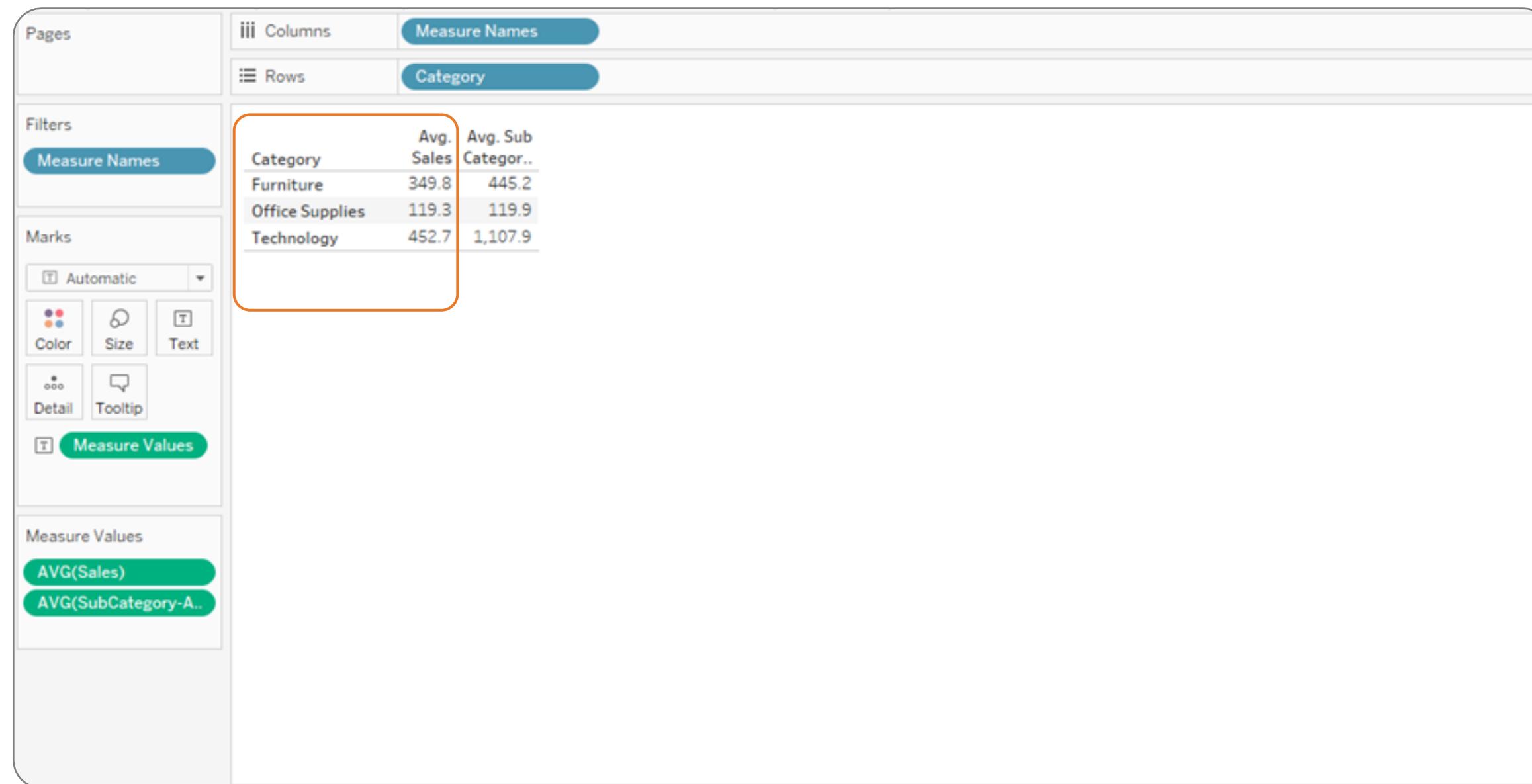
## Include LOD

Step 05: Use the given field in the table to bring in the **Sub-Category** wise average sales



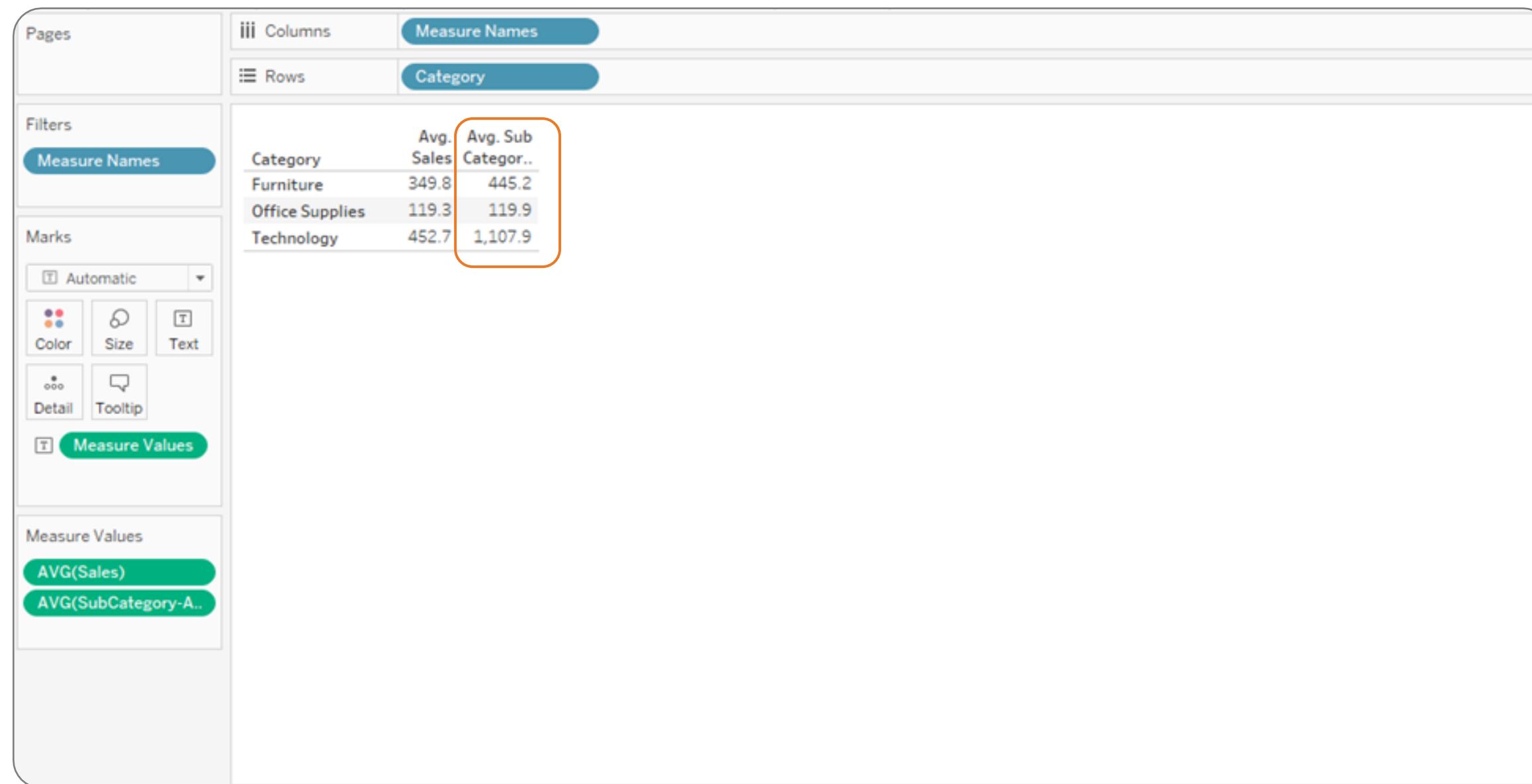
# Include LOD

The actual average sales will be the average of individual line items.



# Include LOD

**Include()** brings in the average of the **AVG(Sales)** of the sub-categories alone.



## Exclude Level of Detail

# Exclude LOD

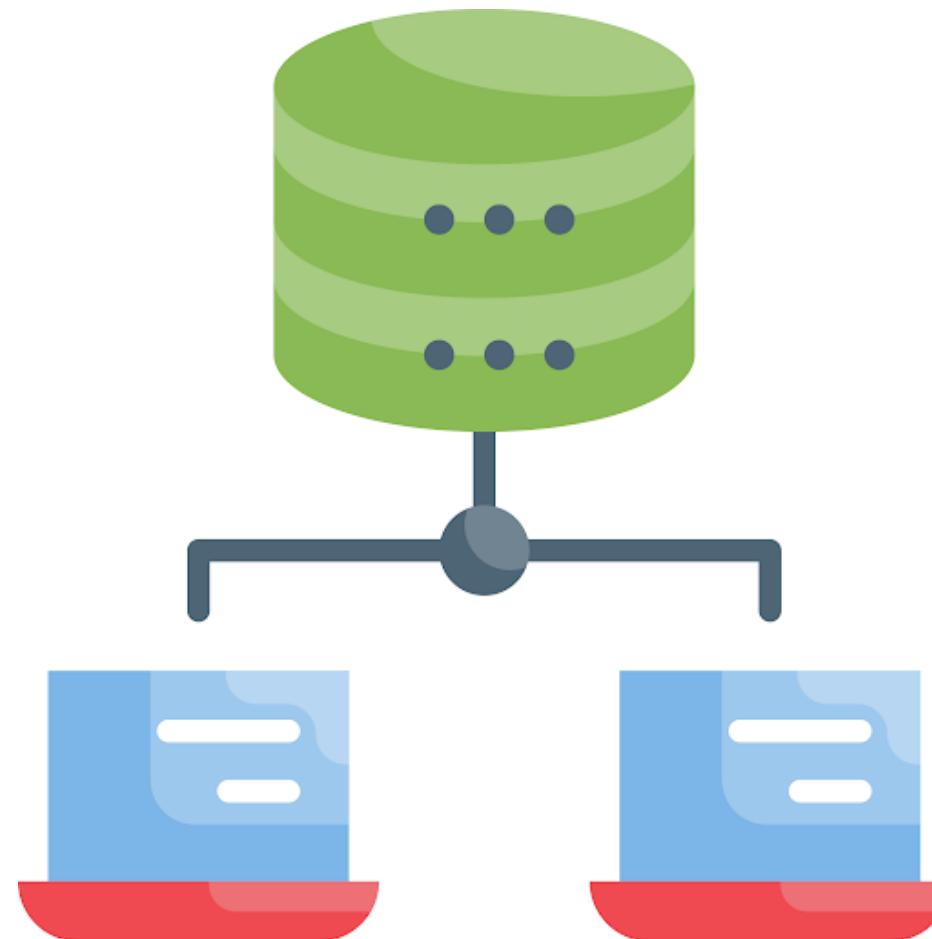
**Exclude()** is the first function of LOD expressions.



It is used to increase the aggregation of values without altering visualizations.

## Exclude LOD

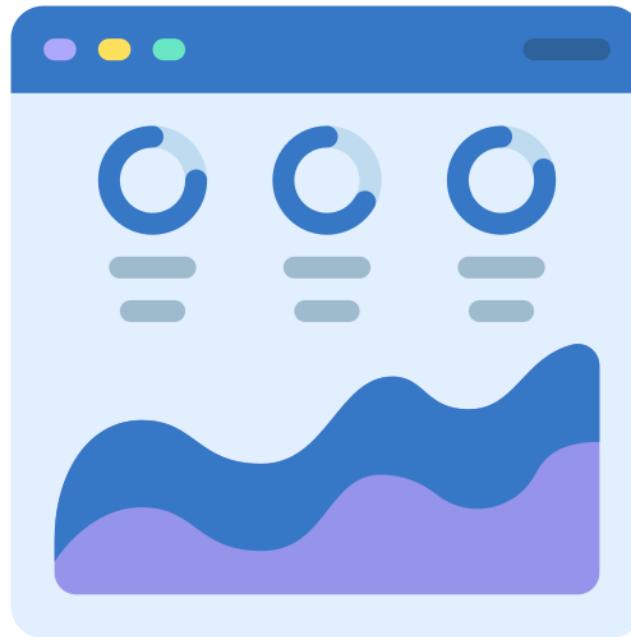
It is used when there are multiple levels in the dataset.



Comparisons can be made by bringing the topmost value from the granular level data.

## Exclude LOD

Let us consider an example:



Fetch the sales of the category when visualization is at the sub-category level.

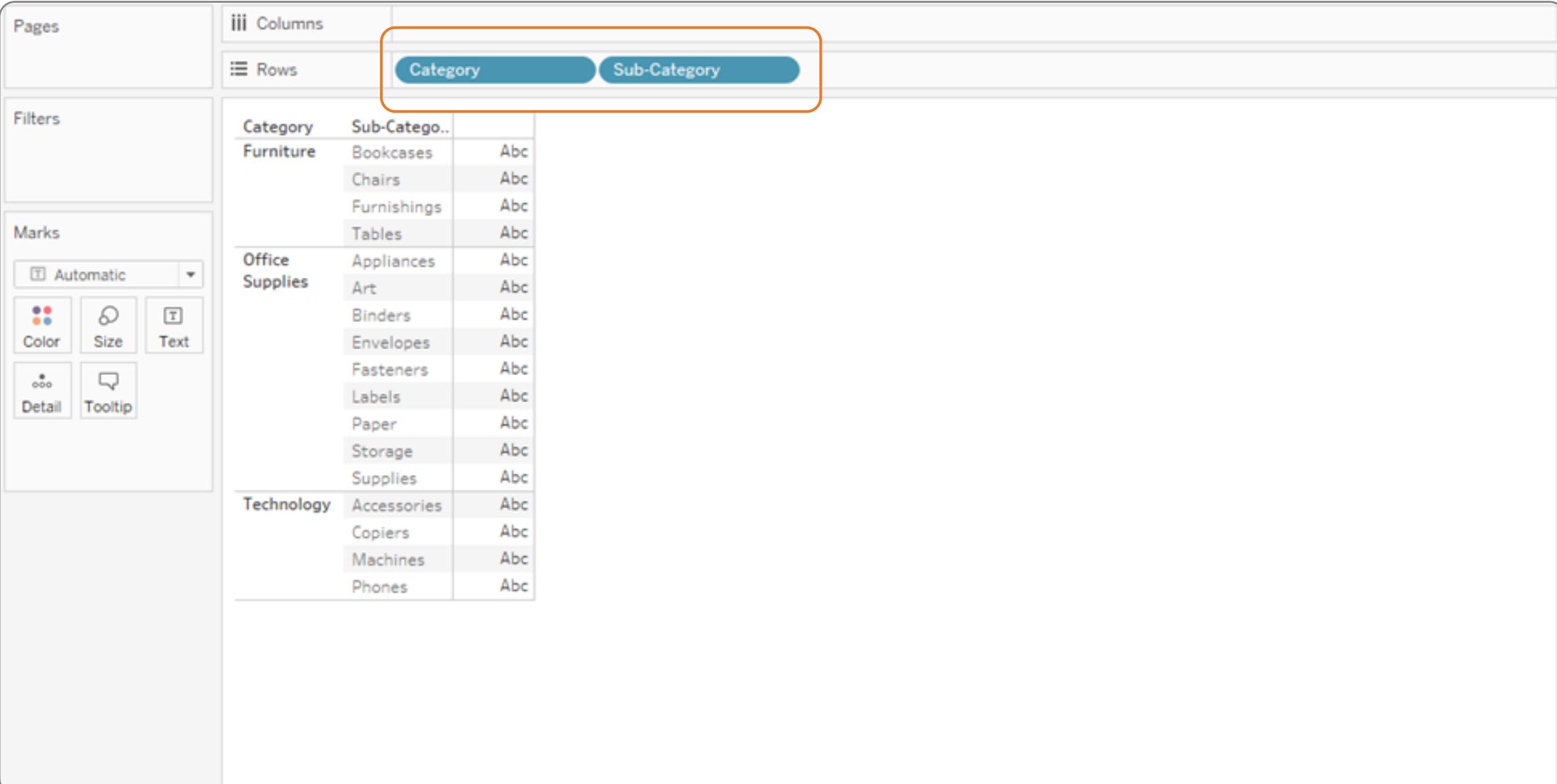
# Exclude LOD

The first step is to use a sample superstore dataset.

| Row ID | Order ID       | Order Date | Ship Date  | Ship Mode    | Customer Customer Segment | Country/Region         | State                   | Postal Code               | Region             | Product Category                    | Sub-Category  | Product Name  |
|--------|----------------|------------|------------|--------------|---------------------------|------------------------|-------------------------|---------------------------|--------------------|-------------------------------------|---|---|
| 1      | CA-2019-152158 | 08-11-2019 | 11-11-2019 | Second Class | Consumer United States    | Kentucky               | 40420                   | South                     | Furniture          | Business                            | Bush Somerton Collection Bookcase                                     |   |
| 2      | CA-2019-152158 | 08-11-2019 | 11-11-2019 | Second Class | Consumer United States    | Kentucky               | 40420                   | South                     | Furniture          | Chairs                              | Hon Deluxe Fabric Upholstered Stackable Adhesive Address Labeler Type |   |
| 3      | CA-2019-152158 | 12-06-2019 | 16-06-2019 | Second Class | Corporate United States   | Los Angeles California | 90036                   | West                      | Office Supplies    | Tables                              | Brentford CP4500 Series Slim Rectangular                              |   |
| 4      | US-2018-188986 | 11-19-2018 | 18-18-2018 | Standard     | SD-29335                  | Devin O'Donnell        | Florida                 | 33111                     | South              | Office Sup Storage                  | Elbow Fold 'N Roll Can System   |   |
| 5      | US-2018-188986 | 11-19-2018 | 18-18-2018 | Standard     | SD-29335                  | Sean O'Donnell         | Florida                 | 33111                     | South              | Office Sup Storage                  | Furniture Expressions Woodland Plastic                                |   |
| 6      | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | BH-11710                  | Brosius H              | California              | 90032                     | West               | Office Sup Art                      | Newell 312  |   |
| 7      | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | BH-11710                  | Brosius H              | California              | 90032                     | West               | Technology Phones                   | Mitel 5323 IP Phone   |   |
| 8      | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | BH-11710                  | Brosius H              | California              | 90032                     | West               | Office Sup Binders                  | CDX Angle View Binders with Locking                                   |   |
| 9      | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | BH-11710                  | Brosius H              | California              | 90032                     | West               | Office Sup Binders                  | Officemate Duet Surge   |   |
| 10     | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | BH-11710                  | Brosius H              | California              | 90032                     | West               | Office Sup Appliance                | Belkin F5C235VTEL F Duet Surge  |   |
| 11     | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | BH-11710                  | Brosius H              | California              | 90032                     | West               | Furniture                           | Curved Rectangular Conference Table                                   |   |
| 12     | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | BH-11710                  | Brosius H              | California              | 90032                     | West               | Technology Phones                   | Konftel 250 Conference phone - Overhead                               |   |
| 13     | CA-2019-114412 | 15-04-2019 | 20-04-2019 | Standard     | AA-10480                  | Andrew Al              | United States           | North Carolina            | 28027              | South                               | Office Sup Paper  | Xerox 1067  |
| 14     | CA-2019-161368 | 06-12-2019 | 10-12-2019 | Second Class | Consumer United States    | Washington             | 98103                   | West                      | Office Sup Binders | Fellowes PB260 Plastic Comb Binding |   |   |
| 15     | US-2018-176893 | 22-11-2018 | 26-11-2018 | Standard     | HP-14075                  | Harold Pei             | United States           | Fort Worth Texas          | 76106              | Central                             | Office Sup Appliances   | Holmes Replacement Filter for HEPA                                |
| 16     | US-2018-176893 | 22-11-2018 | 26-11-2018 | Standard     | HP-14075                  | Harold Pei             | United States           | Fort Worth Texas          | 76106              | Central                             | Office Sup Binders  | Stapco-DuraTech Recycled Plastic Pro                              |
| 17     | CA-2017-106893 | 11-11-2017 | 16-11-2017 | Standard     | PE-19075                  | Pete Krieg             | United States           | Madison Wisconsin         | 53711              | Central                             | Office Sup Binders  | Star-D-Stor Shaving, Vertical S-Start 7                           |
| 18     | CA-2017-161764 | 13-05-2017 | 15-05-2017 | Second Class | AG-13073                  | Alejandro              | United States           | Utah                      | 84054              | West                                | Office Sup Storage  | Fellowes Super Stay Drawer  |
| 19     | CA-2017-140338 | 27-08-2017 | 01-09-2017 | Second Class | ZD-21825                  | Zacharias              | United States           | San Francisco California  | 94105              | West                                | Office Sup Art  | Newell 311  |
| 20     | CA-2017-140338 | 27-08-2017 | 01-09-2017 | Second Class | ZD-21825                  | Zacharias              | United States           | San Francisco California  | 94105              | West                                | Technology Phones   | Cisco SPA501G IP Phone  |
| 21     | CA-2017-140338 | 27-08-2017 | 01-09-2017 | Second Class | ZD-21825                  | Zacharias              | United States           | San Francisco California  | 94105              | West                                | Office Sup Binders  | Wilson Jones Hanging View Binder, White                           |
| 22     | CA-2019-127328 | 08-12-2019 | 13-12-2019 | Standard     | KB-16565                  | Karen Black            | Corporate United States | French Lick Indiana       | 46025              | Central                             | Office Sup Art  | Newell 318  |
| 23     | CA-2019-127328 | 08-12-2019 | 13-12-2019 | Standard     | KB-16565                  | Karen Black            | Corporate United States | French Lick Indiana       | 46025              | Central                             | Office Sup Appliances   | Acco Six-Outlet Power Strip, 8' Cord Length                       |
| 24     | US-2018-158820 | 16-07-2018 | 18-07-2018 | Second Class | SP-23065                  | Sandra PI              | United States           | Philadelphia Pennsylvania | 19140              | East                                | Furniture   | Global Deluxe Stacking Chair, Gray                                |
| 25     | CA-2018-106328 | 26-08-2018 | 30-08-2018 | Standard     | EB-13820                  | Finley Blue            | Consumer United States  | Utah                      | 84057              | West                                | Furniture   | Glossier CP4500 Series Slim Rectangular                           |
| 26     | CA-2019-121755 | 18-01-2019 | 20-01-2019 | Second Class | CEH-13045                 | Eric Holler            | Consumer United States  | Los Angeles California    | 90049              | West                                | Office Sup Binders  | Wilson Jones Active Use Binders                                   |
| 27     | CA-2019-121755 | 18-01-2019 | 20-01-2019 | Second Class | CEH-13045                 | Eric Holler            | Consumer United States  | Los Angeles California    | 90049              | West                                | Technology Accessories  | TechAC-1 Technology Accessoryimation 3GB Mini TravelDrive USB 2.0 |
| 28     | US-2018-150630 | 17-08-2018 | 21-08-2018 | Standard     | TB-21520                  | Tracy Blue             | Consumer United States  | Philadelphia Pennsylvania | 19140              | East                                | Furniture   | Business Leatherette Royal Lined Book                             |
| 29     | US-2018-150630 | 17-08-2018 | 21-08-2018 | Standard     | TB-21520                  | Tracy Blue             | Consumer United States  | Philadelphia Pennsylvania | 19140              | East                                | Office Sup Binders  | Avery Recycled File View Covers Letter                            |
| 30     | US-2018-150630 | 17-08-2018 | 21-08-2018 | Standard     | TB-21520                  | Tracy Blue             | Consumer United States  | Philadelphia Pennsylvania | 19140              | East                                | Furniture   | Howard Miller 13-3/4" Diameter Brushed                            |
| 31     | US-2018-150630 | 17-08-2018 | 21-08-2018 | Standard     | TB-21520                  | Tracy Blue             | Consumer United States  | Philadelphia Pennsylvania | 19140              | East                                | Office Sup Envelopes  | IPF-EN-1 Office Sup Envelope Poly String Tie Envelopes            |

# Exclude LOD

## Step 02: Drag Category and Sub-Category to Rows

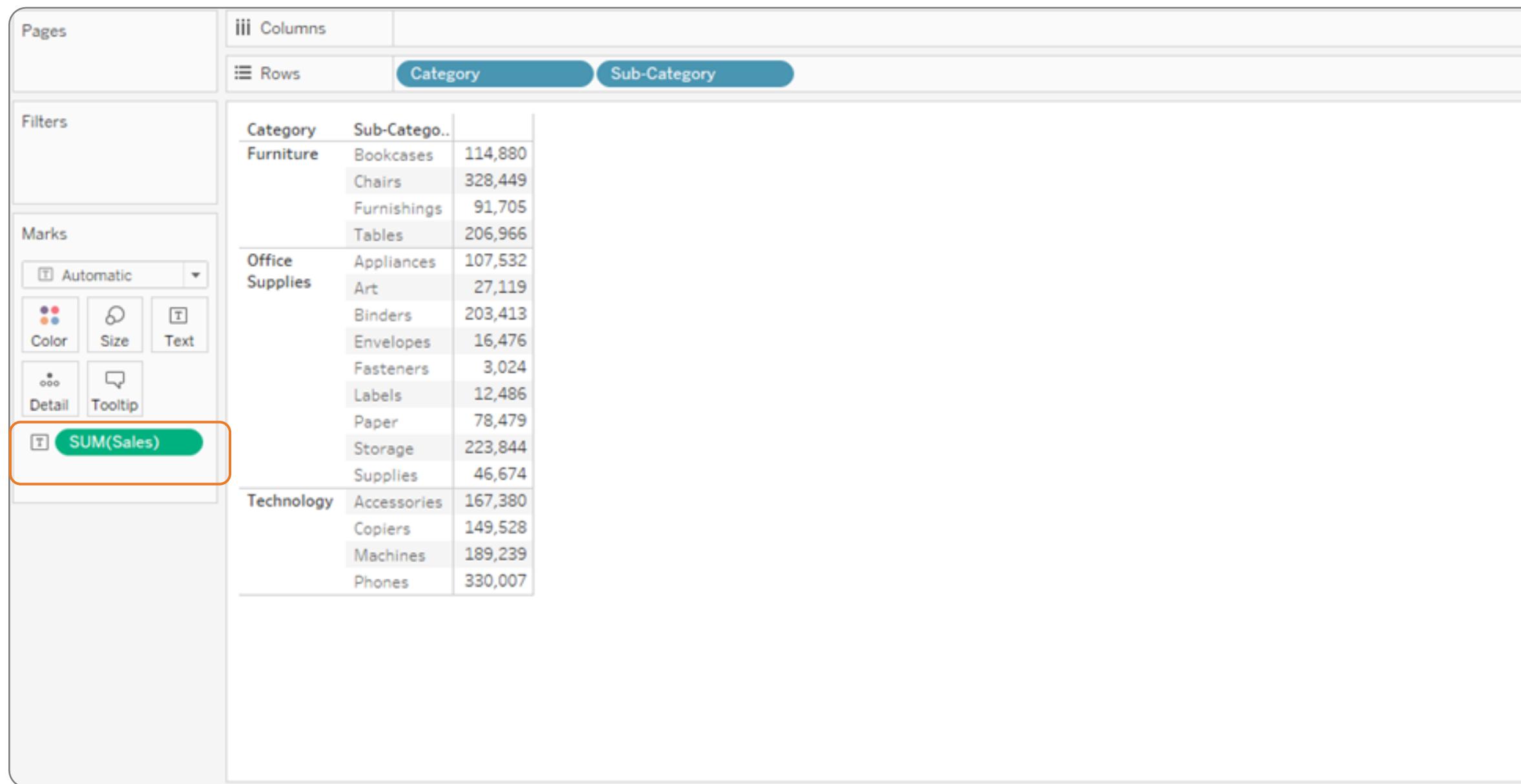


The screenshot shows the Tableau Data Source view. On the left, there are sections for 'Pages', 'Filters', and 'Marks'. The 'Marks' section includes options for Automatic, Color, Size, Text, Detail, and Tooltip. In the center, under 'Rows', there are two buttons: 'Category' and 'Sub-Category', both highlighted with an orange box. Below these buttons is a table with three columns: 'Category', 'Sub-Catego..', and 'Abc'. The data in the table is as follows:

| Category        | Sub-Catego.. | Abc |
|-----------------|--------------|-----|
| Furniture       | Bookcases    | Abc |
|                 | Chairs       | Abc |
|                 | Furnishings  | Abc |
|                 | Tables       | Abc |
| Office Supplies | Appliances   | Abc |
|                 | Art          | Abc |
|                 | Binders      | Abc |
|                 | Envelopes    | Abc |
|                 | Fasteners    | Abc |
|                 | Labels       | Abc |
|                 | Paper        | Abc |
|                 | Storage      | Abc |
|                 | Supplies     | Abc |
| Technology      | Accessories  | Abc |
|                 | Copiers      | Abc |
|                 | Machines     | Abc |
|                 | Phones       | Abc |

# Exclude LOD

Step 03: Drag **Sales** to text. It will show the total sales of each **Sub-Category**



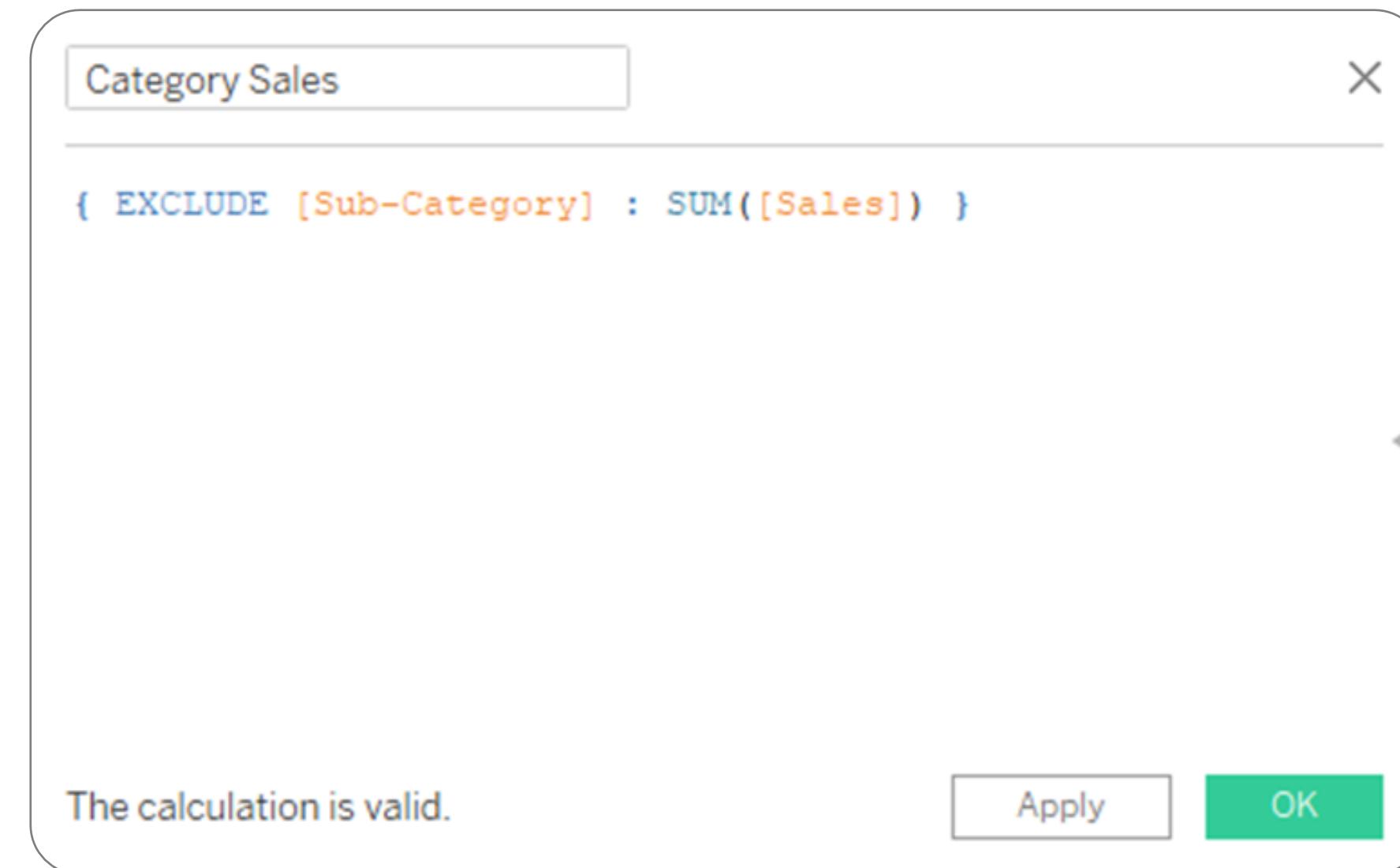
## Exclude LOD

Step 04: Create a calculated field to calculate the sales at the **Category** level



## Exclude LOD

It will exclude the fields added next to the **Exclude** keyword and perform the operation mentioned after the colon.



# Exclude LOD

Step 05: Use the field in the table to show the sales for each **Category** at the **Sub-Category** level

The screenshot shows the Tableau Data Source view. The top navigation bar includes 'Pages', 'Columns' (with 'Measure Names'), 'Rows' (with 'Category' selected), and 'Sub-Category'. The left sidebar has 'Filters' (with 'Measure Names'), 'Marks' (with 'Automatic' selected, 'Color', 'Size', 'Text', 'Detail', 'Tooltip', and 'Measure Values' buttons), and 'Measure Values' (with 'SUM(Sales)' and 'ATTR(Category Sale..)' buttons). The main area displays a table with the following data:

| Category        | Sub-Catego.. | Sales   | Sales   |
|-----------------|--------------|---------|---------|
| Furniture       | Bookcases    | 114,880 | 742,000 |
|                 | Chairs       | 328,449 | 742,000 |
|                 | Furnishings  | 91,705  | 742,000 |
|                 | Tables       | 206,966 | 742,000 |
| Office Supplies | Appliances   | 107,532 | 719,047 |
|                 | Art          | 27,119  | 719,047 |
|                 | Binders      | 203,413 | 719,047 |
|                 | Envelopes    | 16,476  | 719,047 |
|                 | Fasteners    | 3,024   | 719,047 |
|                 | Labels       | 12,486  | 719,047 |
|                 | Paper        | 78,479  | 719,047 |
|                 | Storage      | 223,844 | 719,047 |
|                 | Supplies     | 46,674  | 719,047 |
| Technology      | Accessories  | 167,380 | 836,154 |
|                 | Copiers      | 149,528 | 836,154 |
|                 | Machines     | 189,239 | 836,154 |
|                 | Phones       | 330,007 | 836,154 |

## Nested Level of Detail Expressions

# Nested LOD Expressions

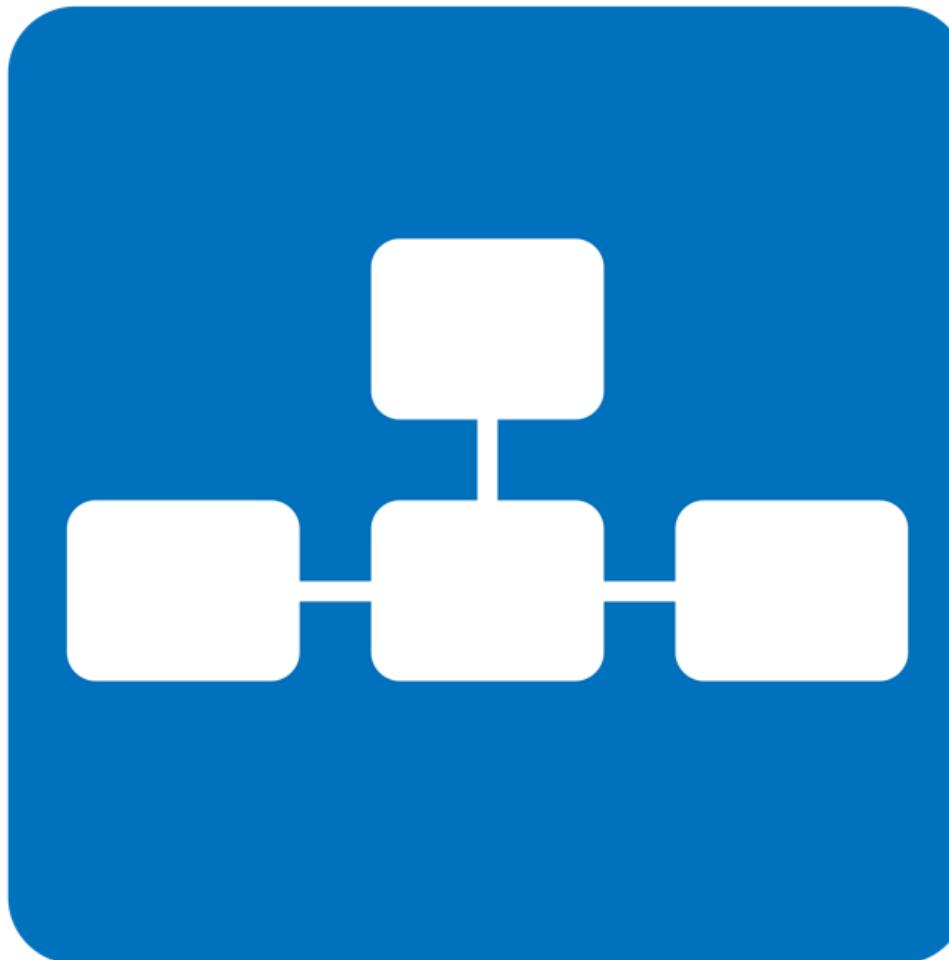
Nested LOD expressions are used in complex scenarios.



It is important to know how expressions are evaluated.

## Nested LOD Expressions

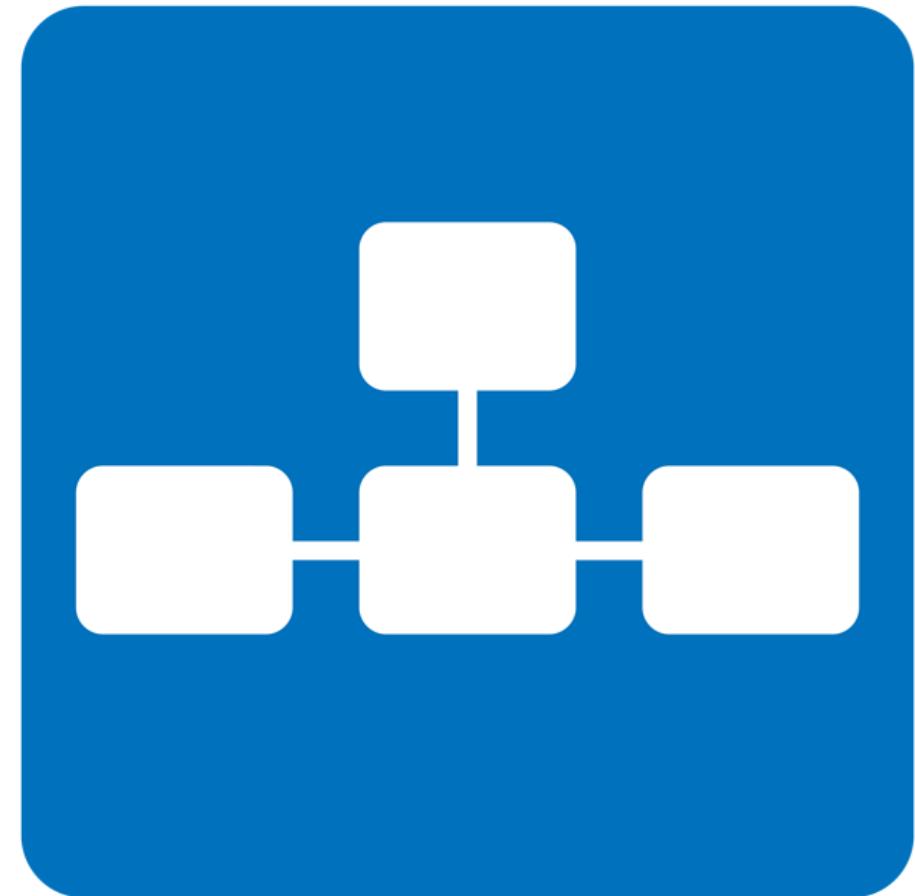
It inherits the dimensions from the outer calculation.



The inner calculation is defined by its parent.

## Nested LOD Expressions

The aggregation and replication follow the **Fixed** rule.



It matches the parent dimensions.

# Nested LOD Expressions

It has the following conditions:

01

If the inner calculation is more aggregated than the outer calculation, then the inner results are replicated in the outer calculation.

02

If the inner calculation is more granular than the outer calculation, then the results are aggregated by the outer calculation.

## **Aggregation and Replication with Level of Detail Expressions**

# Aggregation and Replication

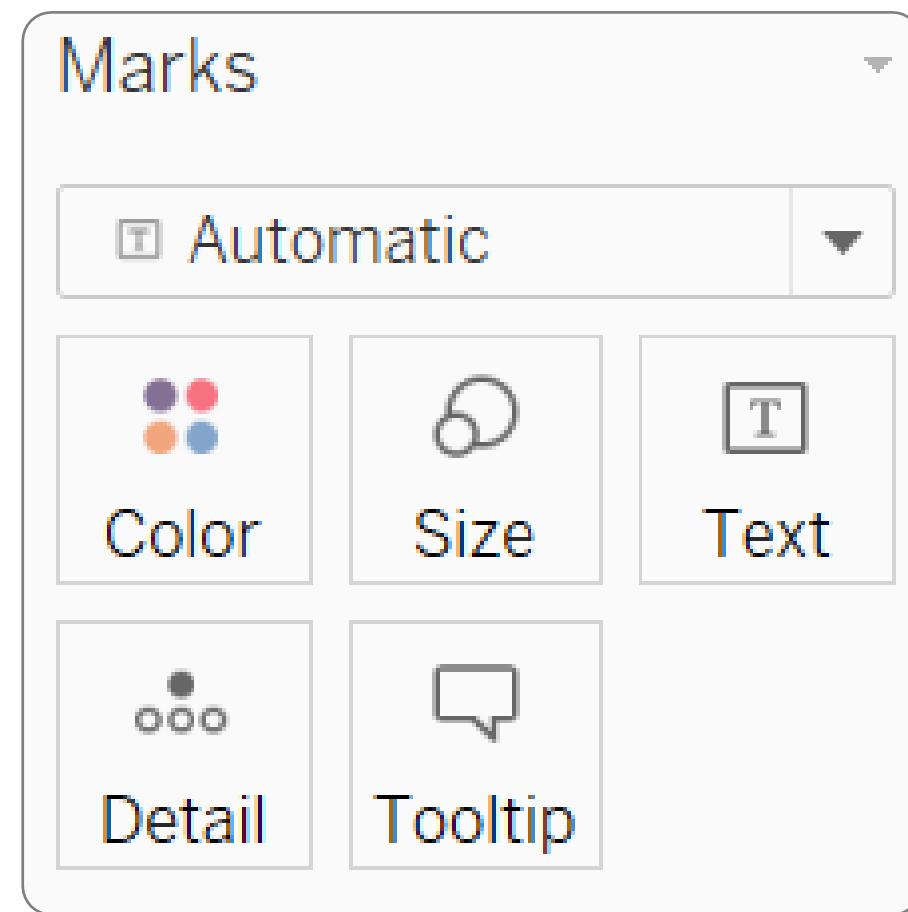
It refers to the terms in the LOD expression view.

Aggregation is useful when the expression in a view has only **Segment** as its level of detail.

Replication is useful while comparing specific values against average values within a **Category**.

## Level of Detail

The level of detail sets the number of marks that appear on the visualization.



It is necessary to reconcile the difference between level of detail and calculation.

## Level of Detail

The **Fixed** version is the easiest to read.



It computes values using specified dimensions without considering the view level of detail.

# Aggregation or Replication of Results

Fixed LOD expressions may result in the following:

Below

It is more **granular** than the LOD that establishes marks on the sheet.

Above

It is more **aggregated** than the LOD that establishes marks on the sheet.

## Fixed Aggregated Results

The LOD expression values are aggregated to create the view if the results are more granular than the view.

The LOD of the view is simply Segment.

The LOD expression gets fixed at a granular level of both Segment and Category.

## Fixed Aggregated Results

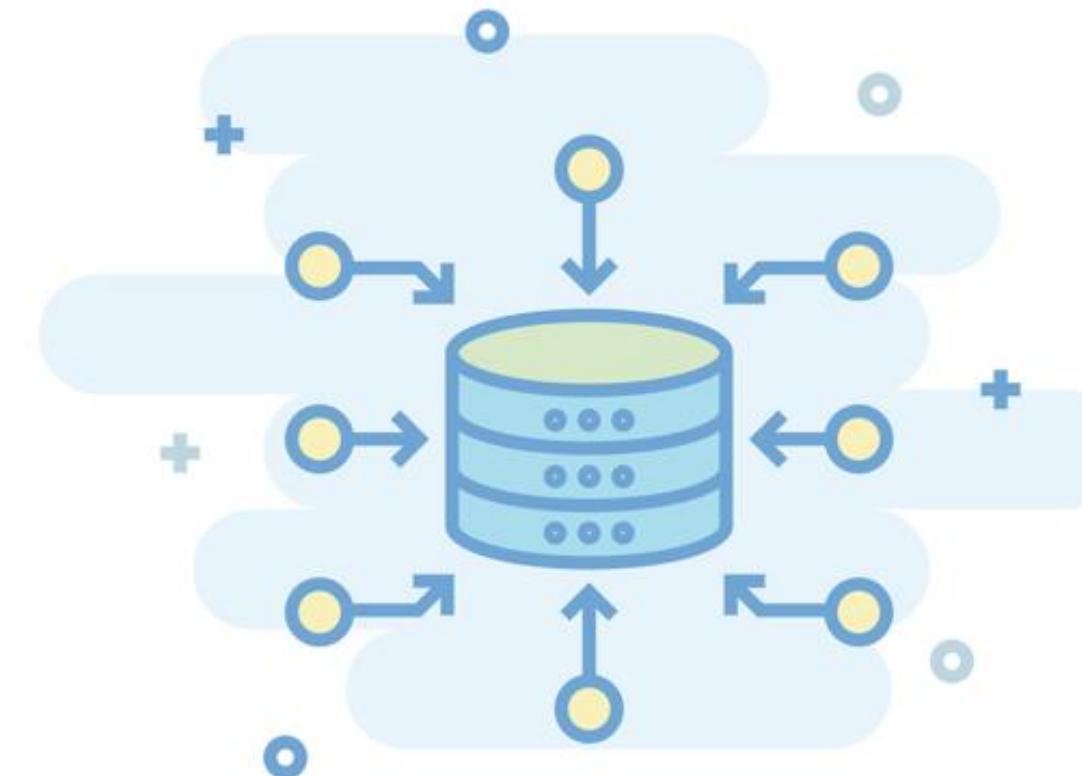
The values are aggregated into a single value per Segment.



It is displayed in the view.

## Fixed Aggregated Results

Tableau selects the LOD expression contained in an aggregation.



It will not select the expression automatically.

## Fixed Replicated Results

The LOD expression values are replicated to create the view if the dimension declaration is less granular than the view.

LOD of the view will be:

Category

Segment

It gets fixed at a less granular level of Segment.

# Fixed Replicated Results

The expression values for each segment are replicated for each **Category** within a **Segment**.

The screenshot shows a Tableau interface with a data view and a marks shelf.

**Pages:** Shows the current page configuration.

**Columns:** Shows the columns being displayed: Category, Sub-Category, Product Name, and Order Date.

**Rows:** Shows the data rows for Furniture Bookcases, categorized by Sub-Category and Product Name, with their corresponding Order Dates.

**Filters:** Shows a filter for Furniture.

**Marks:** Shows the Marks shelf with various options: Automatic, Color, Size, Text, Detail, Tooltip, and First Order Date. The "First Order Date" option is selected.

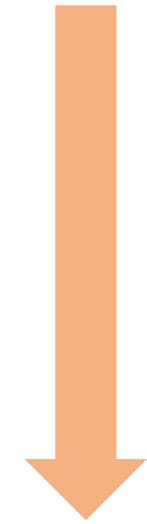
**Data View:** The main area displays the following data:

| Category  | Sub-Catego.. | Product Name                     | Order Date |
|-----------|--------------|----------------------------------|------------|
| Furniture | Bookcases    | Atlantic Metals Mobile           | 19-03-2016 |
|           |              | 2-Shelf Bookcases, Custo..       | 17-11-2017 |
|           |              | Atlantic Metals Mobile           | 11-11-2014 |
|           |              | 3-Shelf Bookcases, Custom Colors | 20-07-2015 |
|           |              |                                  | 31-08-2015 |
|           |              |                                  | 12-10-2015 |
|           |              |                                  | 27-12-2015 |
|           |              |                                  | 08-01-2016 |
|           |              |                                  | 21-10-2016 |
|           |              |                                  | 15-09-2017 |
|           |              | Atlantic Metals Mobile           | 31-12-2014 |
|           |              | 4-Shelf Bookcases, Custom Colors | 12-10-2015 |
|           |              |                                  | 24-12-2015 |
|           |              |                                  | 25-12-2015 |
|           |              |                                  | 25-09-2016 |
|           |              |                                  | 17-07-2017 |
|           |              | Atlantic Metals Mobile           | 01-03-2015 |
|           |              | 5-Shelf Bookcases, Custom Colors | 13-11-2015 |
|           |              |                                  | 04-07-2016 |
|           |              |                                  | 06-09-2016 |
|           |              |                                  | 06-02-2017 |
|           |              |                                  | 27-03-2017 |
|           |              |                                  | 30-05-2017 |
|           |              |                                  | 22-09-2017 |

## Fixed Disjoint Results

Let us consider a scenario:

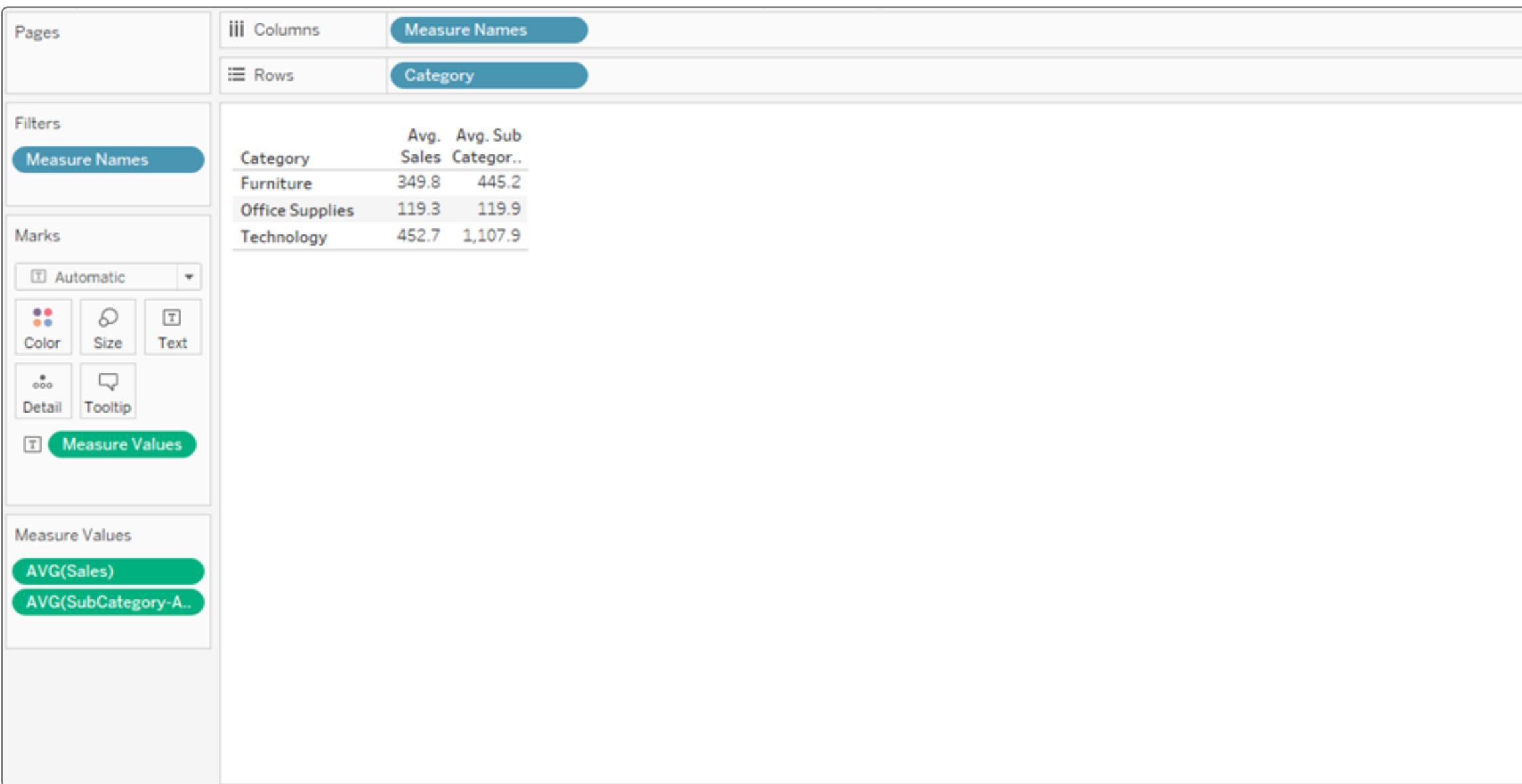
LOD expressions dimensions are entirely disjoint from other dimensions in the view.



The value of the LOD expression is replicated for each combination of LOD expression or LOD of view and then aggregated.

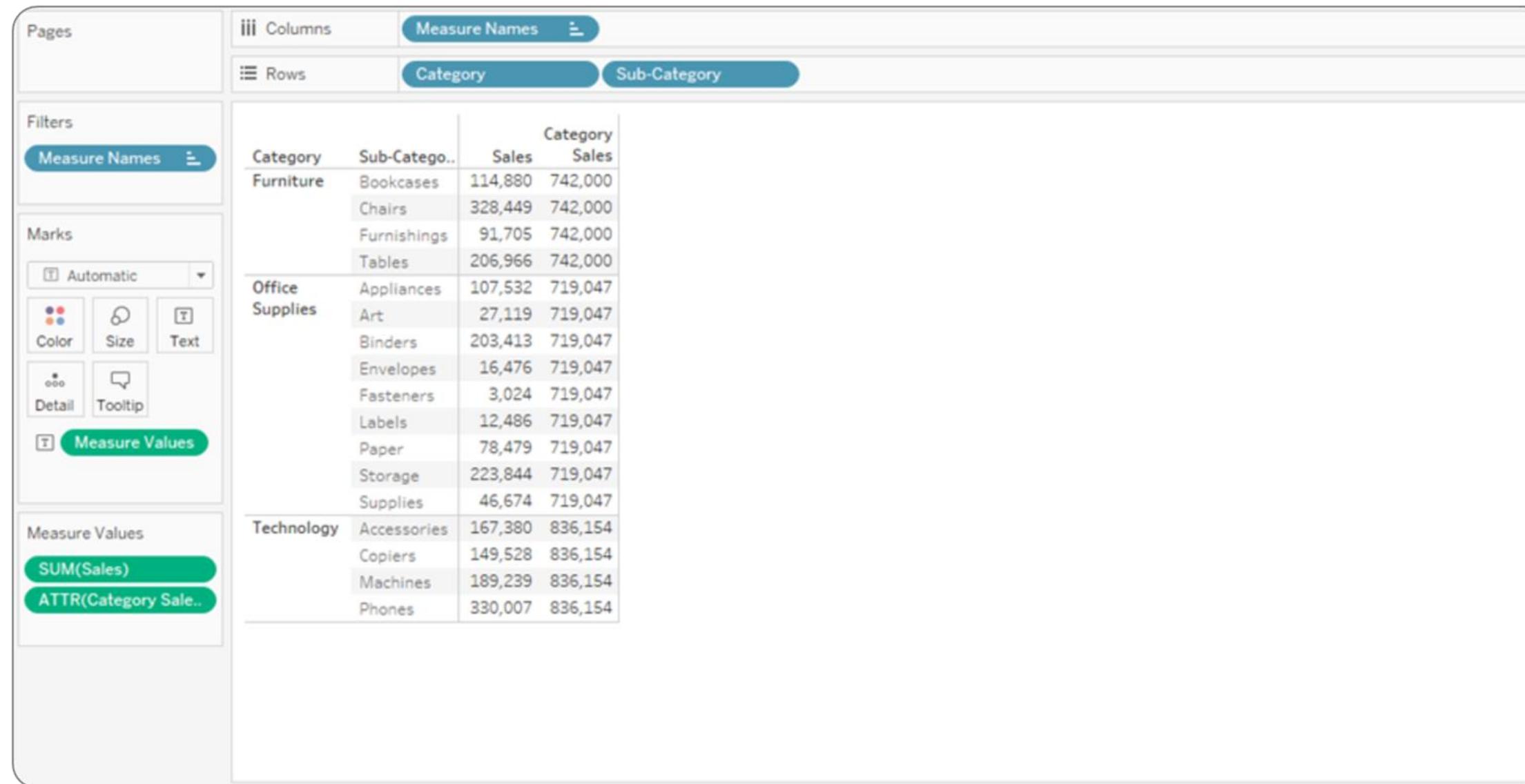
# Include

It computes values using specified dimensions in addition to other dimensions in the view.



# Exclude

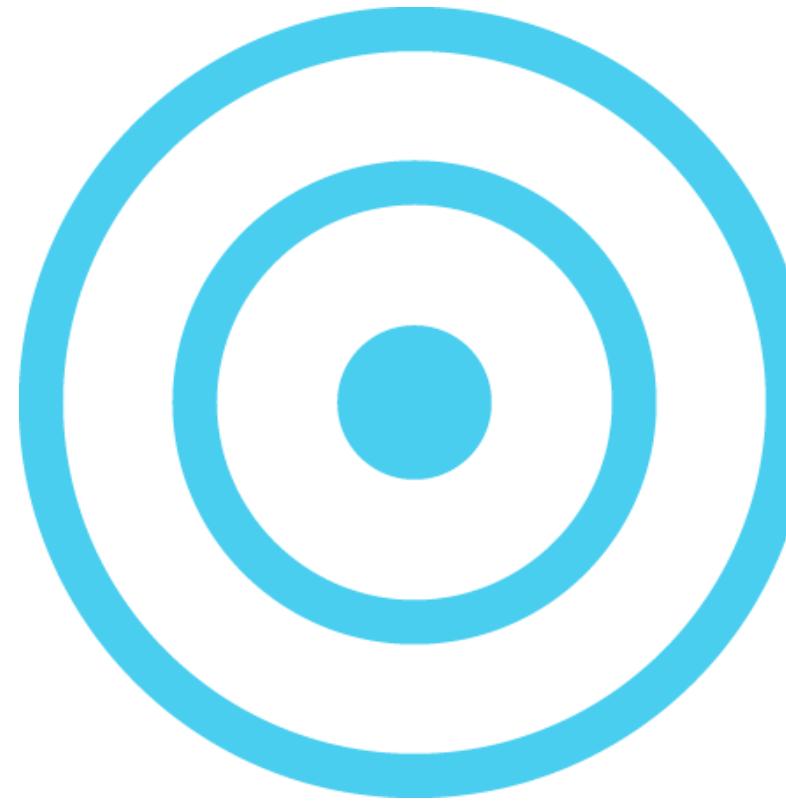
It explicitly removes dimensions from the expression by subtracting dimensions from the view level of detail.



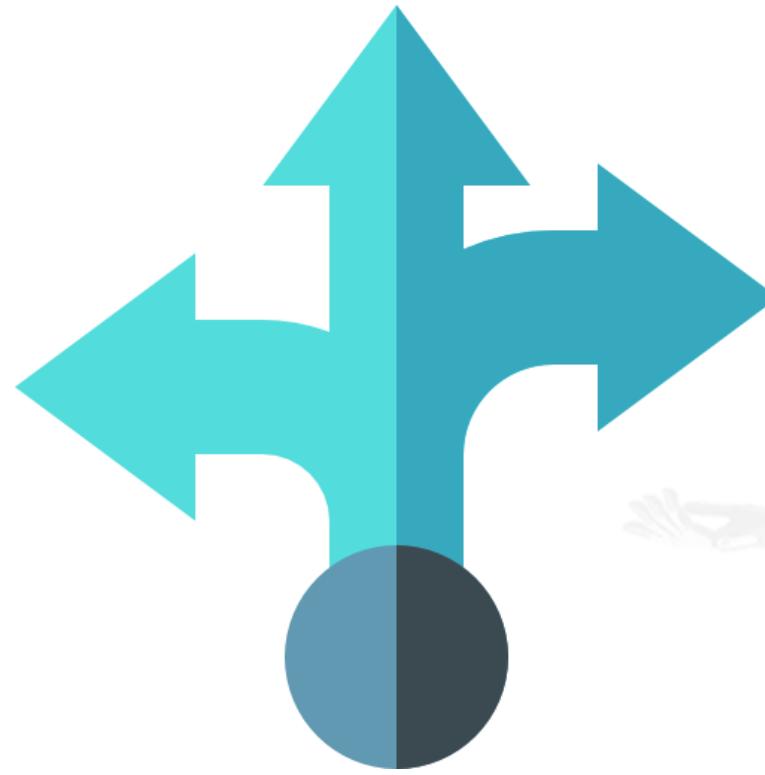
## Helper Functions

# Helper Functions

Helper functions are used to provide the relative position or size of an item.



Scope



Direction

# Helper Functions

There are four helper functions in tableau:



**INDEX()**

**FIRST()**

**LAST()**

**SIZE()**

# Index()

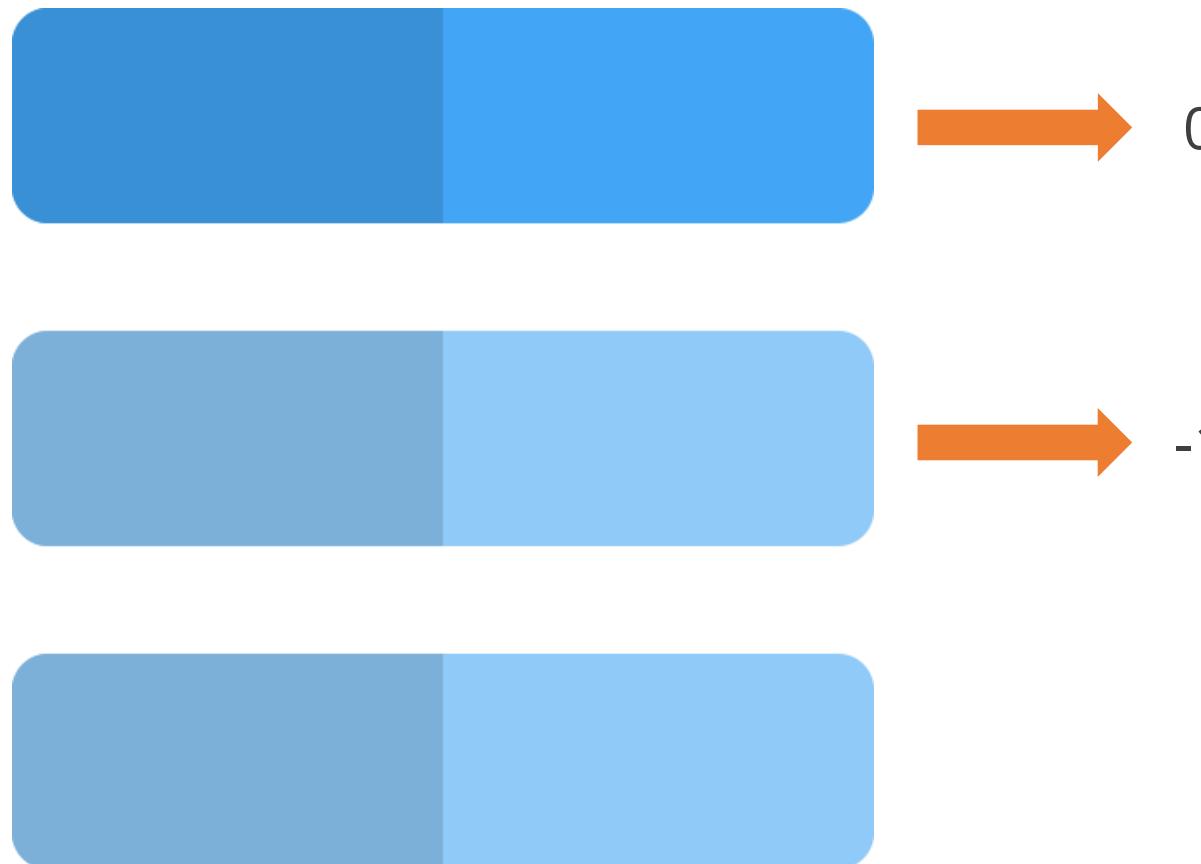
It returns the position of the current value.



Index for the first row starts at 1.

## **First()**

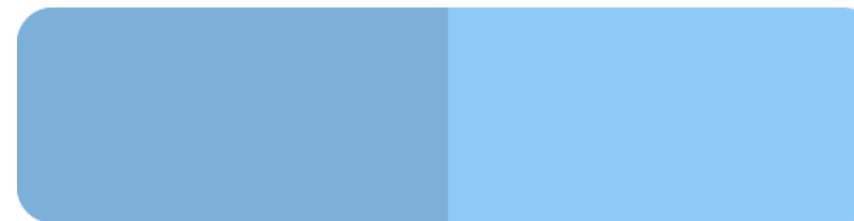
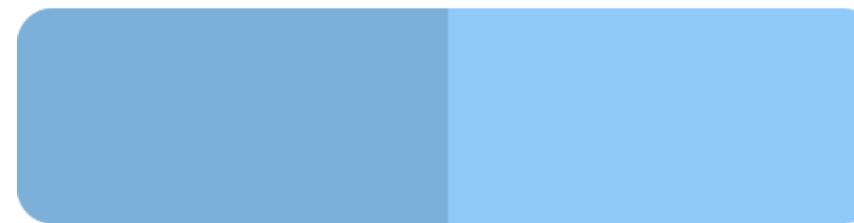
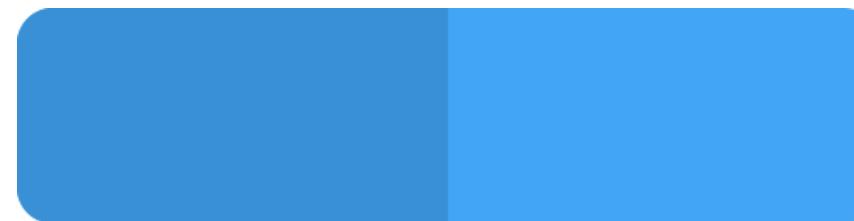
It returns the offset of the position of the current value.



- It returns `0` if the current value is in the first row.
- It returns `-1` if the current value is in the second row.

## Last()

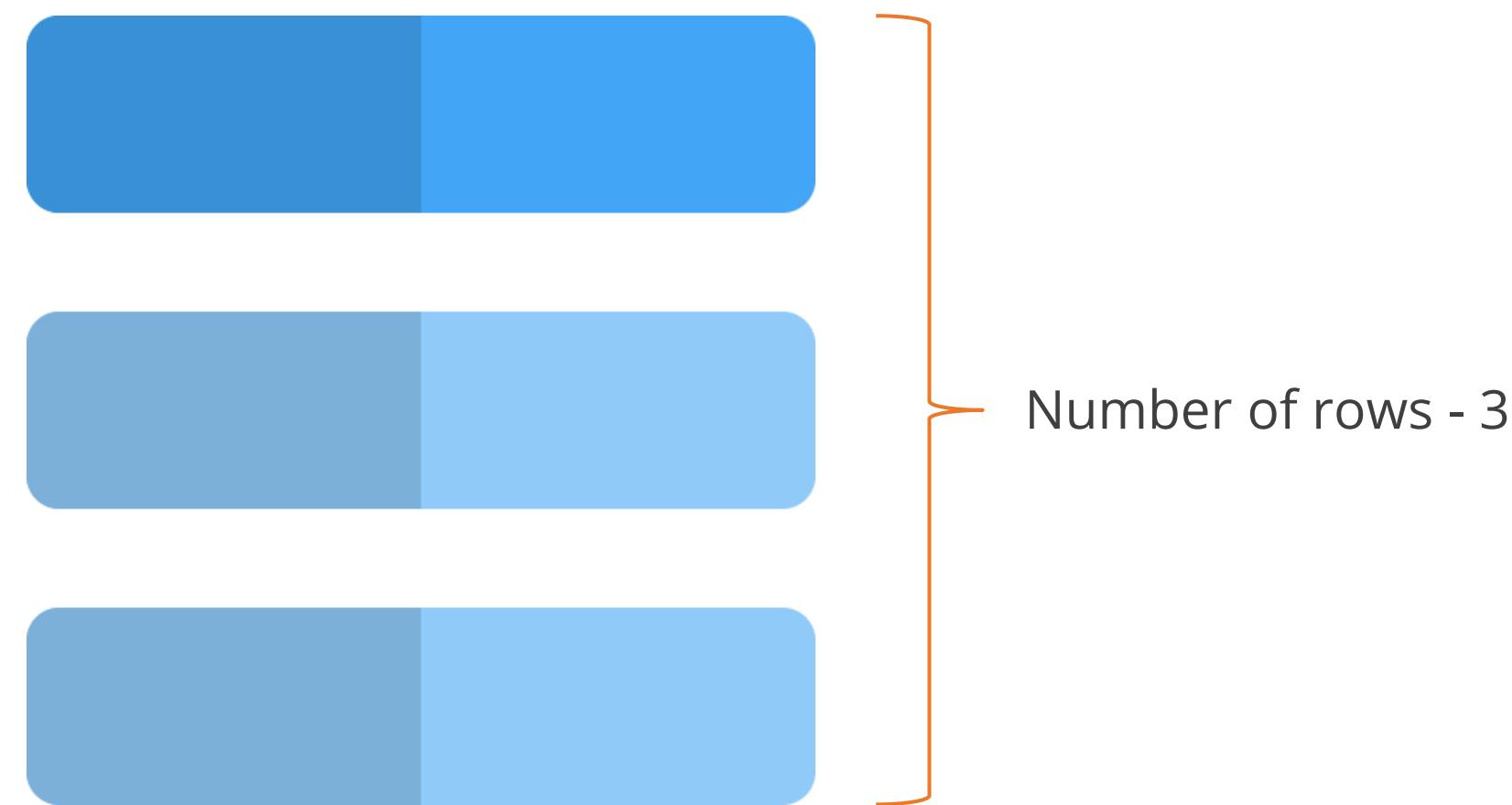
It returns the offset of the position of the current value.



It returns 0 if the current value is in the last row.

## **Size()**

It returns the number of rows in the current range.



## Key Performance Indicator Table

# Key Performance Indicator

KPI is used to measure performance.

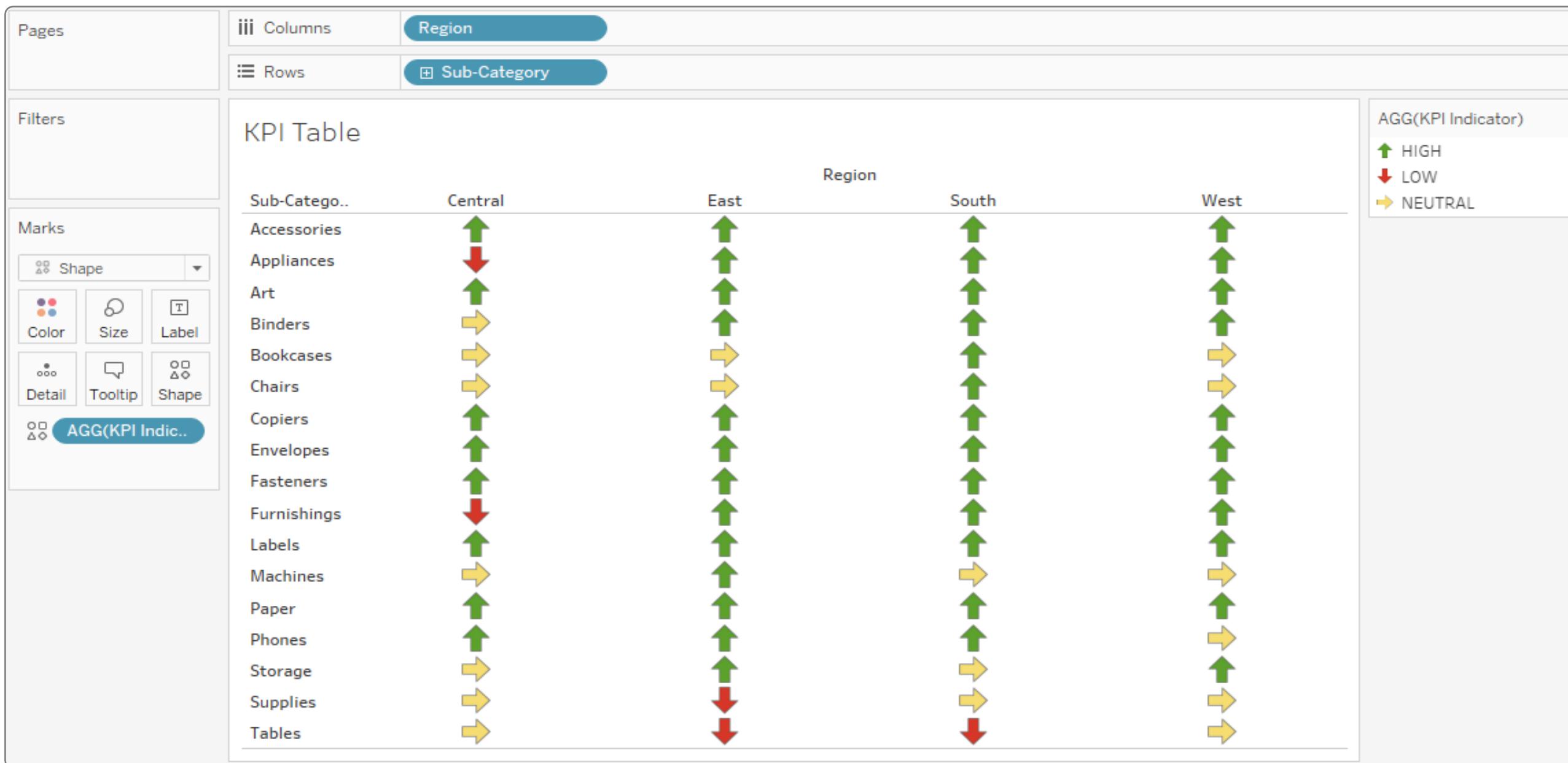


It relates to the success of any individual process or the entire organization

It is a very significant aspect of any managerial activity.

# KPI Table

KPI table contains the following information:



# KPI Table

KPI table can be created using the sample superstore dataset.

| Row ID | Order ID       | Order Date | Ship Date  | Ship Mode    | Customer Segment | Country/Region | State           | Postal Code    | Product Category   | Sub-Category   | Product Name   |
|--------|----------------|------------|------------|--------------|------------------|----------------|-----------------|----------------|--------------------|----------------|--|
| 1      | CA-2019-152158 | 08-11-2019 | 11-11-2019 | Second Class | Consumer         | United States  | Henderson       | Kentucky       | Furniture          | Business Class | Concurrent Collection Bookcase   |
| 2      | CA-2019-152158 | 08-11-2019 | 11-11-2019 | Second Class | Consumer         | United States  | Henderson       | Kentucky       | Furniture          | Office Chair   | Hon Deluxe Fabric Upholstered Stackable Executive Chair                          |
| 3      | CA-2019-152158 | 12-06-2019 | 16-06-2019 | Second Class | Corporate        | United States  | Lisa            | Augusta        | Furniture          | Tables         | Brentford CP4500 Series Slim Rectangular Conference Table                        |
| 4      | US-2018-188986 | 11-19-2018 | 18-18-2018 | Standard     | Consumer         | United States  | Fort Lauderdale | Florida        | Office Storage     | Mobile         | Elbow Fold 'N Roll Can System  |
| 5      | US-2018-188986 | 11-19-2018 | 18-18-2018 | Standard     | Consumer         | United States  | Fort Lauderdale | Florida        | Office Sup Storage | Mobile         | Furniture Expressions Woodland Plastic Bin                                       |
| 6      | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | Business         | United States  | Los Angeles     | California     | Office Art         | Mobile         | Newell 352   |
| 7      | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | Business         | United States  | Los Angeles     | California     | Office Binders     | Mobile         | NEC E323 IP Phone  |
| 8      | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | Business         | United States  | Los Angeles     | California     | Office Binders     | Mobile         | Officemate Locking Angle View Binders  |
| 9      | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | Business         | United States  | Los Angeles     | California     | Office Binders     | Mobile         | Officemate Locking Angle View Binders with Locking Ring                          |
| 10     | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | Business         | United States  | Los Angeles     | California     | Office Appliance   | Mobile         | Belkin F5C235VTEL RJ45 Surge   |
| 11     | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | Business         | United States  | Los Angeles     | California     | Office Binders     | Mobile         | Curved Rectangular Conference Table  |
| 12     | CA-2017-115812 | 09-06-2017 | 14-06-2017 | Standard     | Business         | United States  | Los Angeles     | California     | Office Phones      | Mobile         | Motorola 253 Conference phone - Overhead   |
| 13     | CA-2019-114412 | 15-04-2019 | 20-04-2019 | Standard     | Consumer         | United States  | Concord         | North Carolina | Office Paper       | Mobile         | Xerox 1567   |
| 14     | CA-2019-161368 | 06-12-2019 | 10-12-2019 | Same Day     | Consumer         | United States  | Seattle         | Washington     | Office Binders     | Mobile         | Fellowes PB260 Plastic Comb Binding  |
| 15     | US-2018-176893 | 22-11-2018 | 26-11-2018 | Standard     | Home Office      | United States  | Fort Worth      | Texas          | Office Appliance   | Mobile         | Holmes Replacement Filter for HEPA Air Purifiers                                 |
| 16     | US-2018-176893 | 22-11-2018 | 26-11-2018 | Standard     | Home Office      | United States  | Fort Worth      | Texas          | Office Binders     | Mobile         | Stapco-DuraTech Recycled Plastic Binders   |
| 17     | CA-2017-106893 | 11-11-2017 | 16-11-2017 | Standard     | Home Office      | United States  | Madison         | Wisconsin      | Office Binders     | Mobile         | Star-D-Stor Shaving, Vertical S-Start 7  |
| 18     | CA-2017-165764 | 13-05-2017 | 15-05-2017 | Second Class | Consumer         | United States  | West Jordan     | Utah           | Office Storage     | Mobile         | Fellowes Super Stay Drawer   |
| 19     | CA-2017-165764 | 13-05-2017 | 01-06-2017 | Second Class | Consumer         | United States  | San Francisco   | California     | Office Art         | Mobile         | Newell 341   |
| 20     | CA-2017-165764 | 13-05-2017 | 01-06-2017 | Second Class | Consumer         | United States  | San Francisco   | California     | Office Phones      | Mobile         | Cisco SPA501G IP Phone   |
| 21     | CA-2017-165764 | 13-05-2017 | 01-06-2017 | Second Class | Consumer         | United States  | San Francisco   | California     | Office Binders     | Mobile         | Wilson Jones Hanging View Binder, White  |
| 22     | CA-2018-127328 | 08-12-2018 | 13-12-2018 | Standard     | Business         | United States  | Frederick       | Nebraska       | Office Art         | Mobile         | Newell 318   |
| 23     | CA-2019-130338 | 09-12-2019 | 13-12-2019 | Standard     | Business         | United States  | Frederick       | Nebraska       | Office Appliance   | Mobile         | Officemate Acco Six-Outlet Power Strip, 6' Cord                                  |
| 24     | US-2020-158820 | 16-07-2020 | 18-07-2020 | Second Class | Consumer         | United States  | Philadelphia    | Pennsylvania   | Office Chair       | Mobile         | Global Deluxe Stacking Chair, Gray   |
| 25     | CA-2018-166328 | 26-09-2018 | 30-09-2018 | Standard     | Business         | United States  | Chester         | Utah           | Office Tables      | Mobile         | Gossamer CP4500 Series Slim Rectangular Conference Table                         |
| 26     | CA-2019-121755 | 18-01-2019 | 20-01-2019 | Second Class | Consumer         | United States  | Los Angeles     | California     | Office Binders     | Mobile         | Officemate Active Use Binders  |
| 27     | CA-2019-121755 | 18-01-2019 | 20-01-2019 | Second Class | Consumer         | United States  | Los Angeles     | California     | Technology         | Mobile         | Techair AC-1 Technolo Accessory Kit 8GB Mini TravelDrive USB 2.0                 |
| 28     | US-2018-150630 | 17-09-2018 | 21-09-2018 | Standard     | Business         | United States  | Philadelphia    | Pennsylvania   | Business Books     | Mobile         | Furniture Raverlage Paper Royal Lined 80g Book                                   |
| 29     | US-2018-150630 | 17-09-2018 | 21-09-2018 | Standard     | Business         | United States  | Philadelphia    | Pennsylvania   | Office Binders     | Mobile         | Avery Recycled File View Covers for Letter Size                                  |
| 30     | US-2018-150630 | 17-09-2018 | 21-09-2018 | Standard     | Business         | United States  | Philadelphia    | Pennsylvania   | Office Furniture   | Mobile         | Howard Miller 13-3/4" Diameter Brushed Nickel Envelope Poly String Tie Envelopes |
| 31     | US-2018-150630 | 17-09-2018 | 21-09-2018 | Standard     | Business         | United States  | Philadelphia    | Pennsylvania   | Office Supplies    | Mobile         | Office Envelope Poly String Tie Envelopes  |

# KPI Table

Step 01: Drag Sub-Category to Rows and Region to Columns

The screenshot shows the Tableau Data Prep interface with the following components:

- Pages:** Shows "KPI Table".
- Filters:** Shows "Marks" section with "Automatic" selected for color, size, and text.
- Columns:** Shows "Region" as the primary column.
- Rows:** Shows "Sub-Category" as the primary row.
- Data:** The "KPI Table" view displays a grid of data with "Sub-Catego.." as rows and "Region" as columns. The columns are labeled "Central", "East", "South", and "West". The data values are all "Abc".

| Sub-Catego.. | Region  |      |       |      |
|--------------|---------|------|-------|------|
|              | Central | East | South | West |
| Accessories  | Abc     | Abc  | Abc   | Abc  |
| Appliances   | Abc     | Abc  | Abc   | Abc  |
| Art          | Abc     | Abc  | Abc   | Abc  |
| Binders      | Abc     | Abc  | Abc   | Abc  |
| Bookcases    | Abc     | Abc  | Abc   | Abc  |
| Chairs       | Abc     | Abc  | Abc   | Abc  |
| Copiers      | Abc     | Abc  | Abc   | Abc  |
| Envelopes    | Abc     | Abc  | Abc   | Abc  |
| Fasteners    | Abc     | Abc  | Abc   | Abc  |
| Furnishings  | Abc     | Abc  | Abc   | Abc  |
| Labels       | Abc     | Abc  | Abc   | Abc  |
| Machines     | Abc     | Abc  | Abc   | Abc  |
| Paper        | Abc     | Abc  | Abc   | Abc  |
| Phones       | Abc     | Abc  | Abc   | Abc  |
| Storage      | Abc     | Abc  | Abc   | Abc  |
| Supplies     | Abc     | Abc  | Abc   | Abc  |
| Tables       | Abc     | Abc  | Abc   | Abc  |

# KPI Table

Step 02: create a calculated field for **Profit Ratio**

Profit Ratio

X

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

The calculation is valid.

Apply OK

# KPI Table

Step 03: Create a calculated field to calculate the **KPI Indicator**

KPI Indicator X

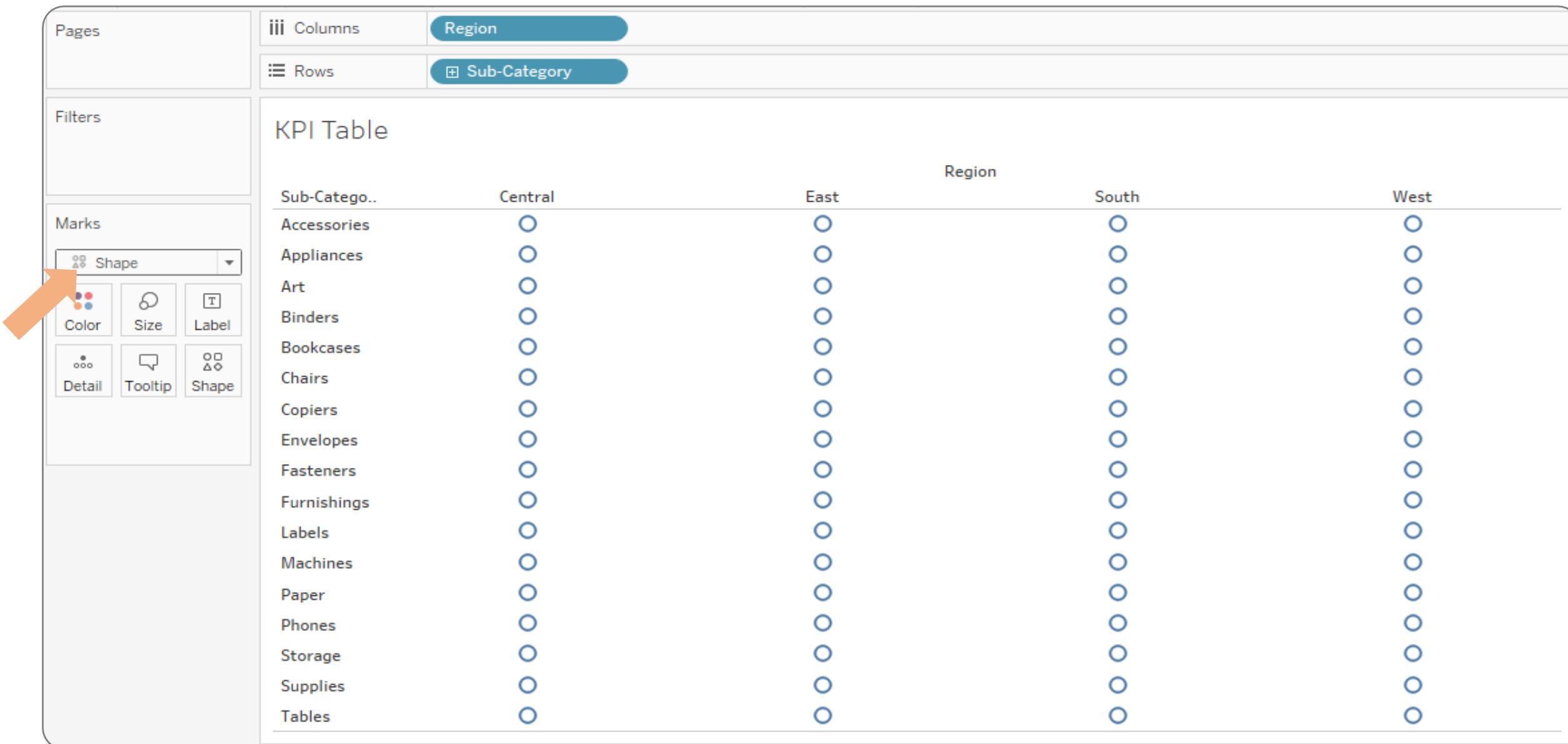
```
IF [Profit Ratio] <= -0.1 THEN "LOW"
ELSEIF [Profit Ratio] <= 0.1 THEN "NEUTRAL"
ELSEIF [Profit Ratio] > 0.1 THEN "HIGH"
END
```

The calculation is valid.

Apply OK

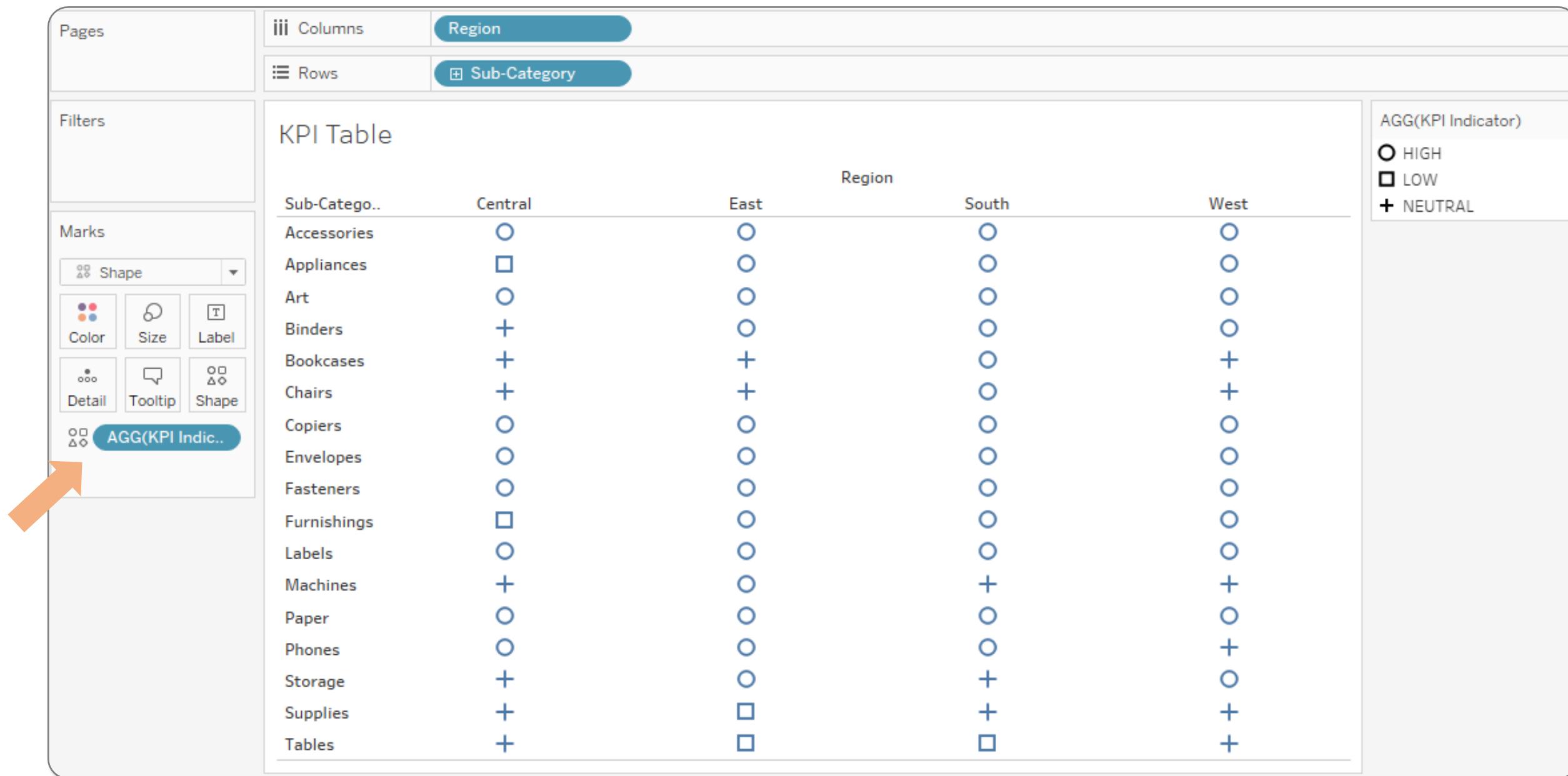
# KPI Table

Step 04: Change the Marks type to Shape



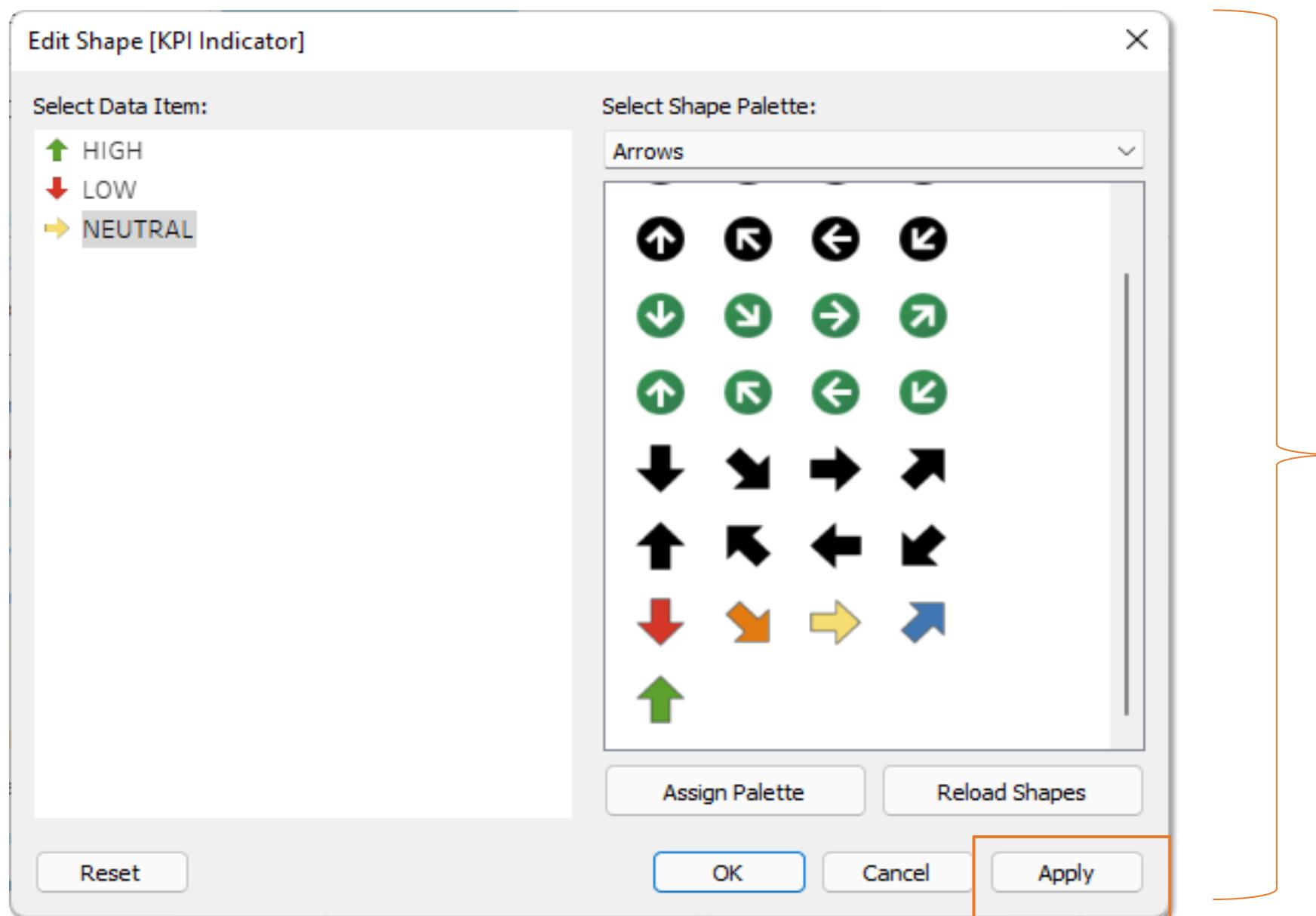
# KPI Table

Step 05: Drag the **KPI Indicator** field to shape



# KPI Table

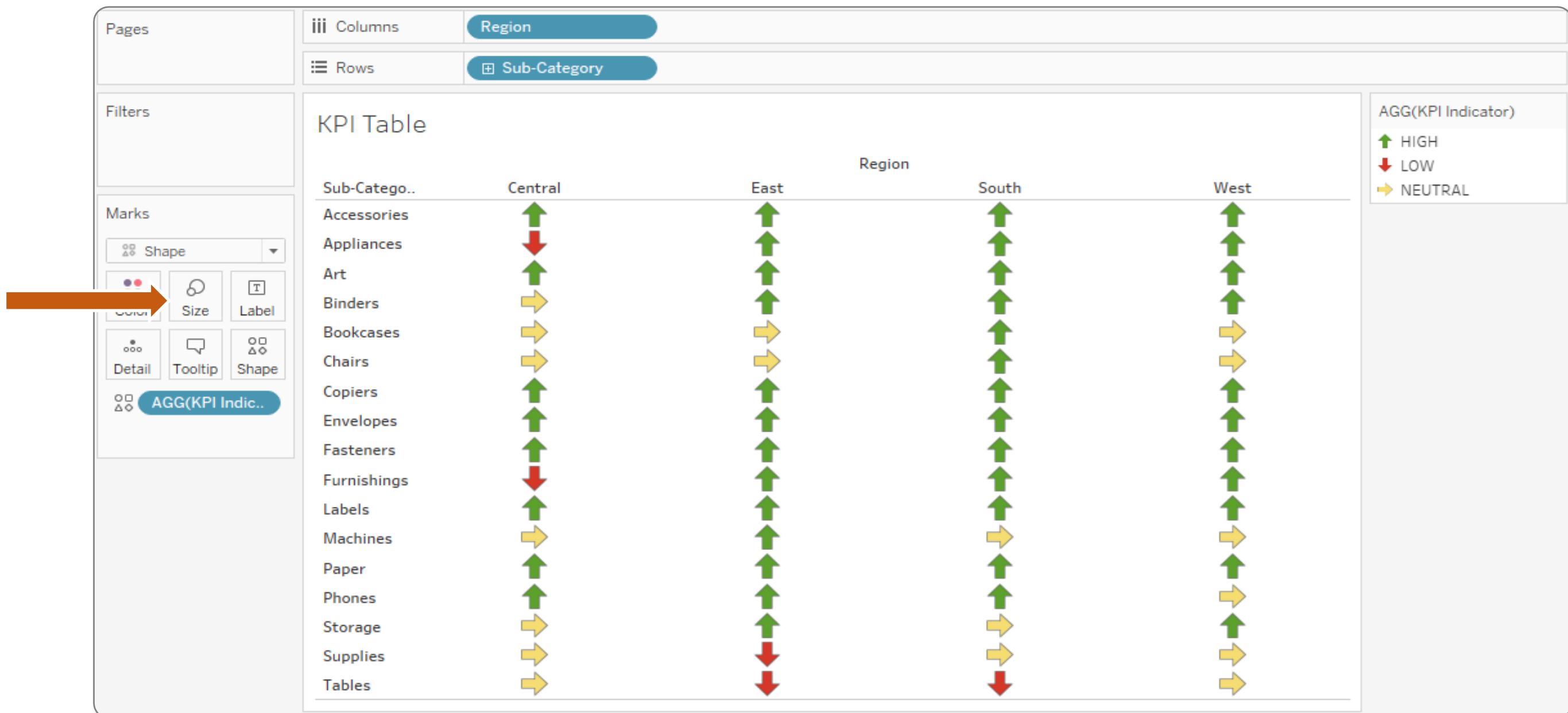
Step 06: Click on shapes card to edit shapes



- Choose the **Arrows** palette
- Select **Apply**

# KPI Table

The final step is to click on size and increase the **Size** to fit the cell.



## Key Takeaways

- The three types of calculations in Tableau include basic expression, level of detail expression, and table calculation.
- Pareto analysis and waterfall chart analyze data in Tableau.
- The built-in functions build calculated fields, whereas the helper functions provide the relative position of an item.
- KPI is used to measure performance related to the success of any individual or the entire organization.





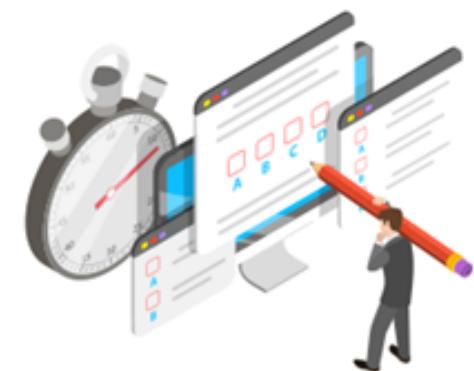
## Knowledge Check

**Knowledge  
Check**

1

**Which one of the following statements is TRUE?**

- A. Data blending supports row-level calculations of calculated fields involving two datasets.
- B. Table calculations can be created using calculated fields.
- C. Cumulative multiplication is a part of table calculations.
- D. ISBLANK is used to determine whether a value is BLANK.

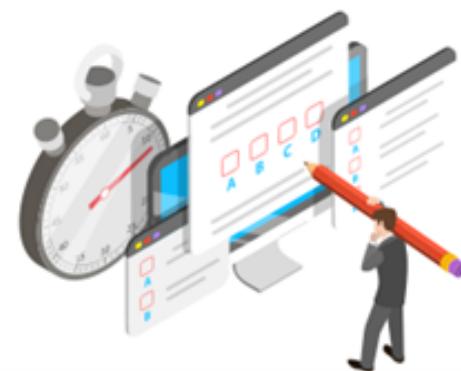


**Knowledge  
Check**

**1**

**Which one of the following statements is TRUE?**

- A. Data blending supports row-level calculations of calculated fields involving two datasets.
- B. Table calculations can be created using calculated fields.
- C. Cumulative multiplication is a part of table calculations.
- D. ISBLANK is used to determine whether a value is BLANK.



The correct answer is **B**

**Table calculations can be created using calculated fields, and a few of those are available as part of quick table calculations.**

**Knowledge  
Check**

**2**

**Which one of the following LOD expression filters gets executed first?**

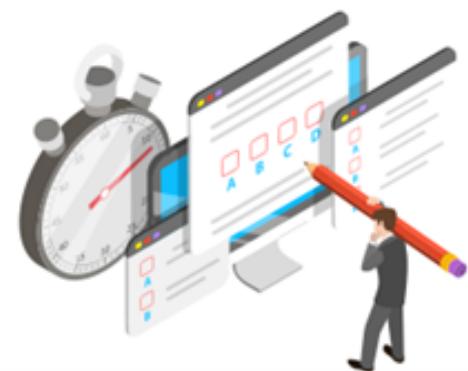
- A. Exclude
- B. Include
- C. Fixed
- D. All the above



**Knowledge  
Check  
2**

**Which one of the following LOD expression filters gets executed first?**

- A. Exclude
- B. Include
- C. Fixed
- D. All the above



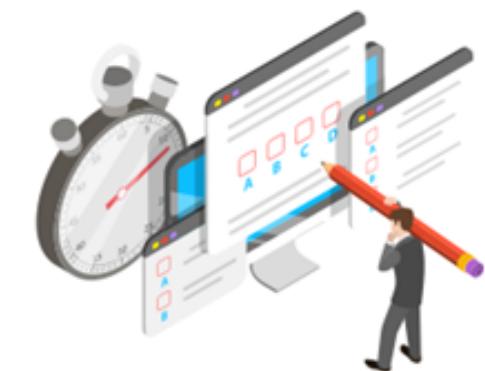
The correct answer is **B**

**Include adds granularity to visualization and reduces aggregation.**

**Knowledge  
Check  
3**

**Which one of the following is NOT a type of calculation in Tableau?**

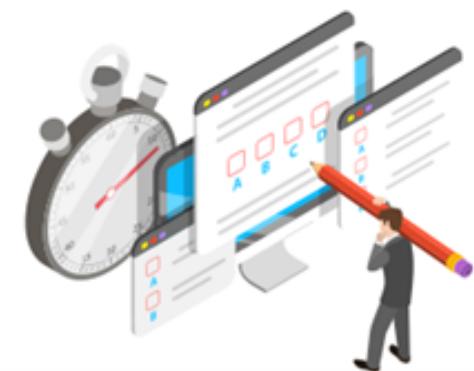
- A. Table calculations
- B. Using calculated fields
- C. Built-in calculations
- D. Ad hoc calculations



**Knowledge  
Check  
3**

**Which one of the following is NOT a type of calculation in Tableau?**

- A. Table calculations
- B. Using calculated fields
- C. Built-in calculations
- D. Ad hoc calculations



The correct answer is **C**

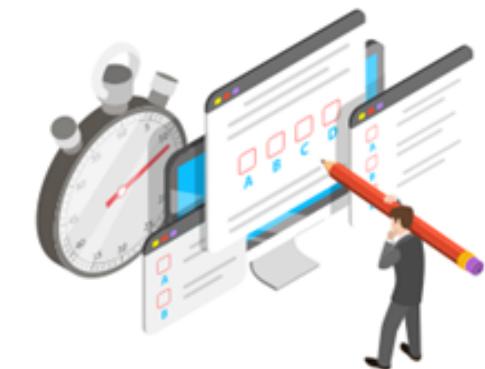
**The built-in calculation is not a type of calculation in Tableau.**

**Knowledge  
Check**

**4**

**Which one of the following is NOT an LOD expression?**

- A. Include
- B. Exclude
- C. Fixed
- D. Level

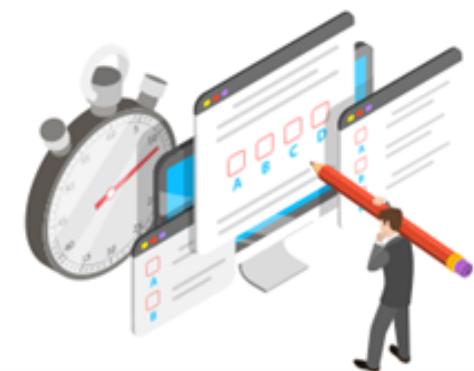


**Knowledge  
Check**

**4**

**Which one of the following is NOT an LOD expression?**

- A. Include
- B. Exclude
- C. Fixed
- D. Level



The correct answer is **D**

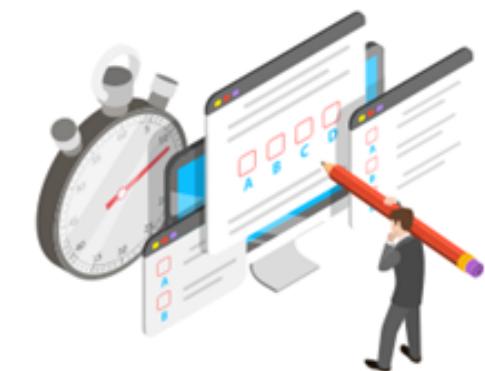
**The level is not an LOD expression in Tableau.**

**Knowledge  
Check**

**5**

**Which one of the following LOD expressions adds granularity to visualization?**

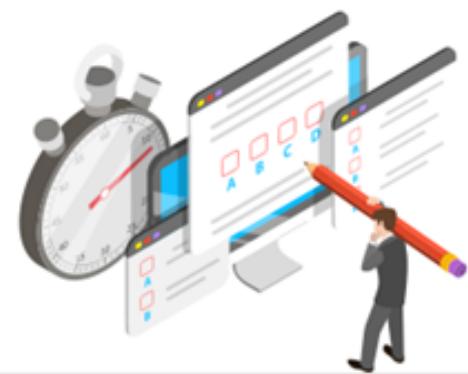
- A. Fixed
- B. Include
- C. Exclude
- D. All the above



**Knowledge  
Check**  
**5**

**Which one of the following LOD expressions adds granularity to visualization?**

- A. Fixed
- B. Include
- C. Exclude
- D. All the above



The correct answer is **A**

**Fixed expression filters will get executed first, followed by include and exclude at the same level.**