



Introduction To Calculations

Why Calculations?



Extends the possibilities for analysis and design




Provides additional flexibility in interactivity



Adds creative functionality to visualizations


What Are Calculations?



Calculation consists of code made up of functions, operations, references to other fields, parameters, constants, groups and sets



A Calculation is many times referred to as a Calculated Field in Tableau

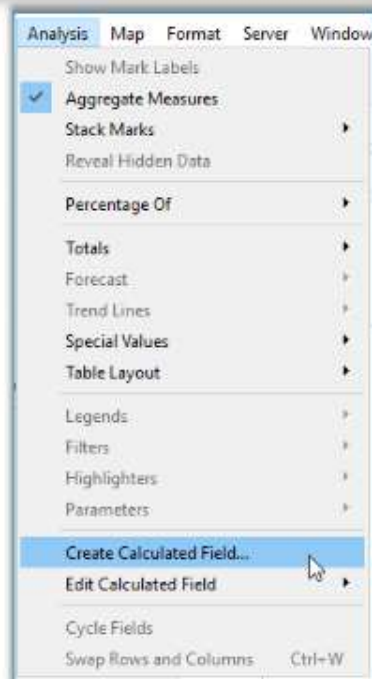


When we create a calculation, it shows up either as a new measure or dimension in the data pane

Ways To Create A Calculated Field

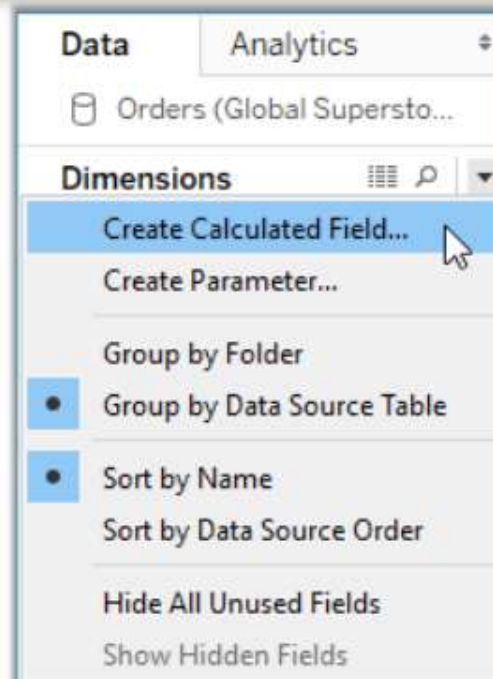
1

Select Analysis and choose Create Calculated Field from the menu



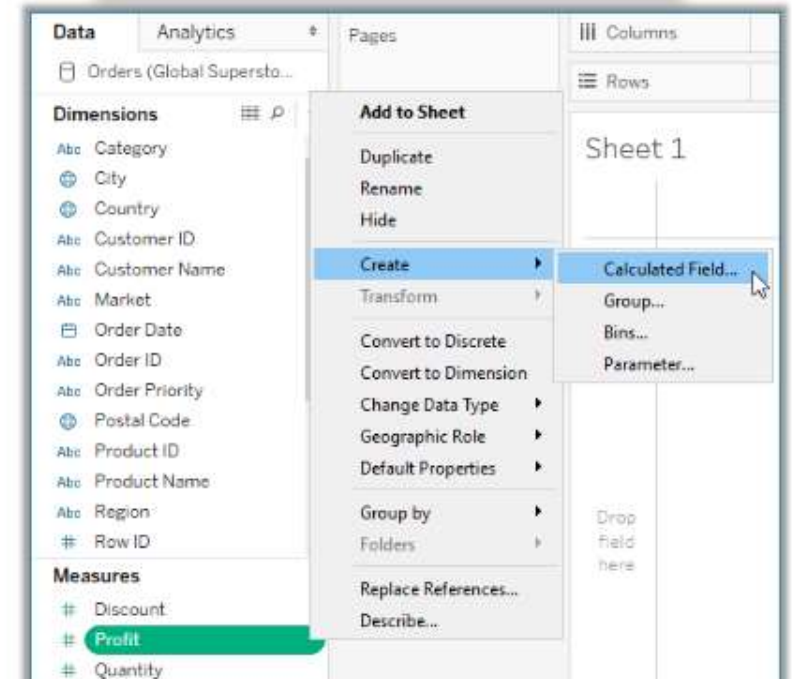
2

Use the drop - down menu next to Dimensions in the data pane



3

Use the drop - down menu on a field, set or parameter in the data pane



Ways To Create A Calculated Field

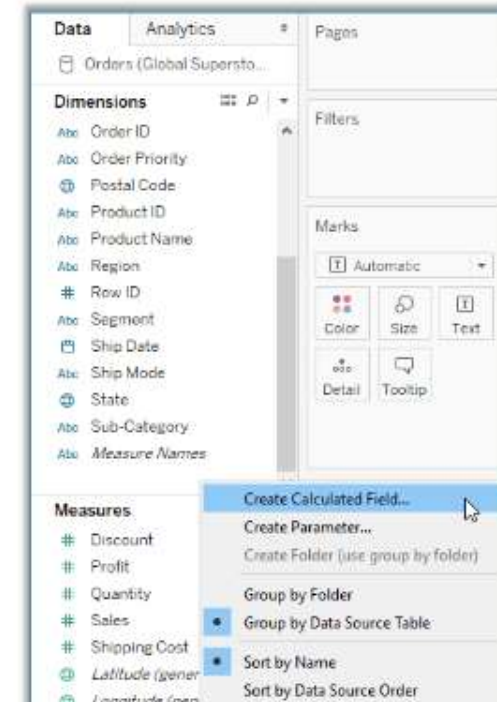
4

Double - click on an empty space on the Rows, Columns, or Measure Values shelf or an empty area on the Marks Card

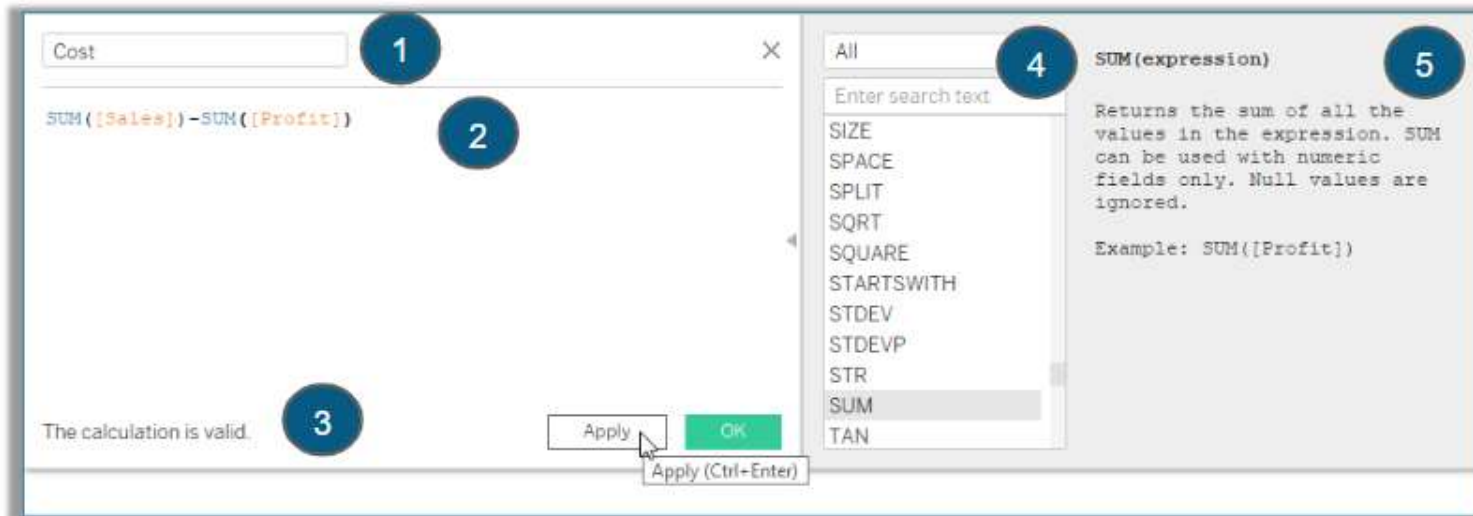


5

Right - click on an empty area in the data pane



Interface For Creating A Calculated Field



1 Calculated Field Name

2 Calculation Editor

3 Error alerts in Calculation

4 Functions List

5 Detailed description of the selected function

Creating A Calculated Field

- Drag the newly created Calculated Field **Cost** on to the View Pane

The screenshot illustrates the process of adding a calculated field to a report in a BI tool. The interface is divided into several panes: Data, Dimensions, Measures, and a View Pane. The Data pane shows the source data as 'Orders (Global Supersto...'. The Dimensions pane lists various fields like Category, City, Country, etc. The Measures pane lists various calculated fields like Profit, Sales, etc. The View Pane shows the report layout with columns for Category, Profit, and Sales. A large blue arrow points from the initial state to the final state where the calculated field 'Cost' is added to the Measures pane.

Initial State (Left):

- Dimensions:** Category, City, Country, Customer ID, Customer Name, Market, Order Date, Order ID, Order Priority, Postal Code, Product ID, Product Name, Region.
- Measures:** Cost, Discount, Profit, Quantity, Sales, Shipping Cost, Latitude (generated), Longitude (generated), Number of Records, Measure Values.
- View Pane:** Calculated Field_Interface table with columns: Category, Profit, Sales.

Final State (Right):

- Dimensions:** Order Priority, Postal Code, Product ID, Product Name, Region, Row ID, Segment, Ship Date, Ship Mode, State, Sub-Category, Measure Names.
- Measures:** Cost, Discount, Profit, Quantity, Sales, Shipping Cost, Latitude (generated), Longitude (generated), Number of Records, Measure Values.
- View Pane:** Calculated Field_Interface table with columns: Category, Cost, Profit, Sales.

A Report for displaying the cost for various categories through Calculation



Built - In Functions In Tableau

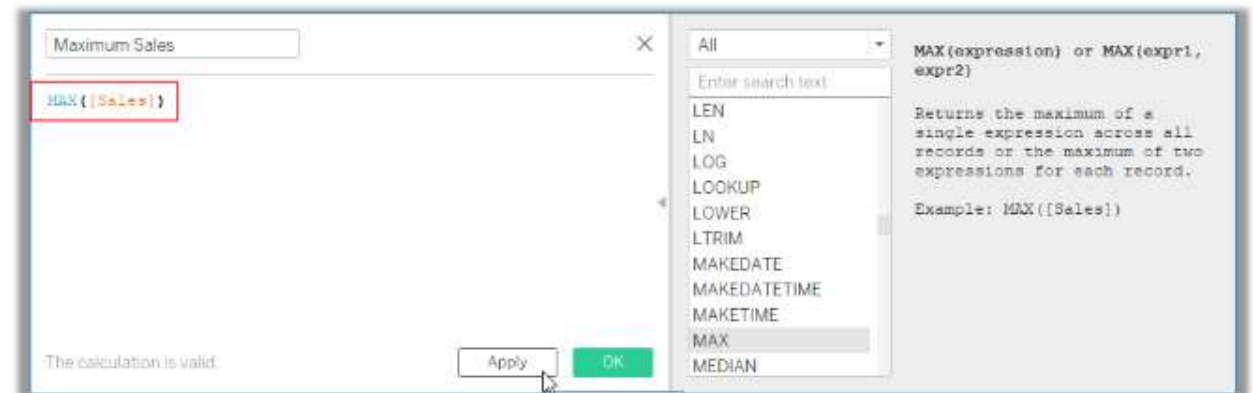
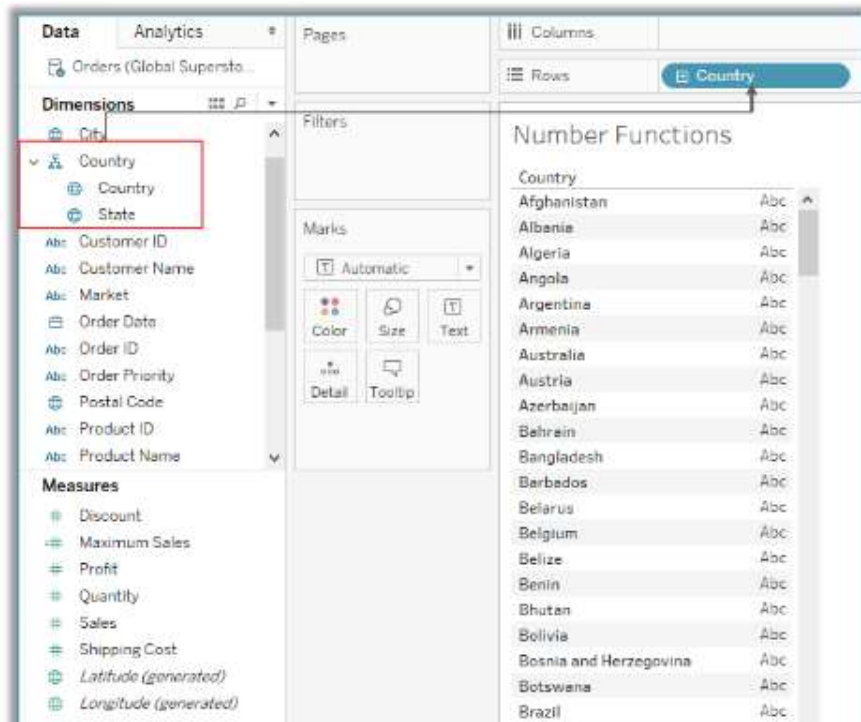
Number Functions

Number Functions are used for numeric calculations wherein only numeric values are taken as input

Function	Description	Example
CEILING(number)	Rounds the number to the nearest integer of equal or greater value	CEILING(2.145) = 3
POWER(number, power)	Raises the number to the specified power	POWER(5,3) = 125
ROUND(number, [decimals])	Rounds the number to a specified number of decimal places	ROUND(3.14152,2) = 3.14

Create A Number Calculation

- Drag **Country** field from Dimensions on to the Rows shelf
- Create a Calculated field and name it as **Maximum Sales**
- Enter the **MAX** function in the calculation editor in order to compute country wise maximum sales



Create A Number Calculation

- Drag the newly created calculated field, **Maximum Sales** that appears in the Data Pane on to the View
- When **State** is brought into the view, the maximum sales for each state are shown

The screenshot shows the Tableau interface. In the 'Data' pane on the left, under the 'Measures' section, the field 'Maximum Sales' is highlighted with a red box. The 'Columns' shelf on the right contains the 'Country' field. The 'Marks' shelf is set to 'Automatic'.

The screenshot shows the resulting view in Tableau. The 'Columns' shelf contains 'Country' and the 'Marks' shelf contains 'AGG(Maximum Sales)'. The view displays a table with two columns: 'Country' and 'Maximum Sales'.

Country	Maximum Sales
Afghanistan	4,626
Albania	1,619
Algeria	1,909
Angola	2,479
Argentina	2,301
Armenia	94
Australia	5,760
Austria	3,221
Azerbaijan	2,058
Bahrain	625
Bangladesh	3,728
Barbados	1,838
Belarus	2,758
Belgium	4,195
Belize	58
Benin	1,378
Bhutan	164
Bolivia	1,402
Bosnia and Herzegovina	740
Botswana	364
Brazil	3,408
Bulgaria	1,811

The screenshot shows the resulting view in Tableau. The 'Columns' shelf contains 'Country' and 'State', and the 'Marks' shelf contains 'AGG(Maximum Sales)'. The view displays a table with three columns: 'Country', 'State', and 'Maximum Sales'.

Country	State	Maximum Sales
Afghanistan	Hirat	732
	Kabul	4,626
	Kandahar	1,471
	Nangarhar	712
	Other	0
Albania	Durrës	554
	Elbasan	1,619
	Korçë	33
	Shkodër	219
	Vlorë	414
Algeria	Alger	1,447
	Annaba	1,112
	Batna	875
	Bechar	110
	Bejaia	581
	Constantine	408
	Djelfa	918
	Guelma	1,909
	Laghouat	436
	Medea	123
	Mostaganem	167
	Oran	1,515
	Saida	1,589

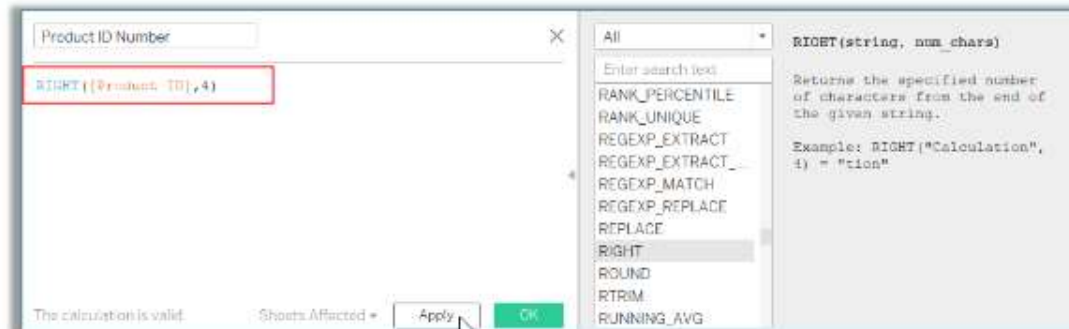
String Functions

String Functions are used to manipulate the string data

Function	Description	Example
LEN(string)	Returns the character count of the given string field	LEN("TableauPrep") = 11
LTRIM(string)	Returns the string with any leading spaces removed	LTRIM(" Tableau_2019 ") = "Tableau_2019"
REPLACE(string, substring, replacement)	Finds any occurrence of the substring in the string and replaces those characters with the replacement string	REPLACE("GreenBlueGreen", "Blue", "Red") = "GreenRedGreen"
UPPER(string)	Takes all the characters in the string and converts them to uppercase	UPPER("Tableau") = "TABLEAU"

Create A String Calculation

- Create a Calculated Field **Product ID Number** and enter the **RIGHT** function in the Calculation editor
- Drag **Product ID Number** on to the View pane, and observe the result



The screenshot shows the Tableau interface. The 'Data' pane on the left lists dimensions and measures. The 'String Functions' pane on the right shows a list of functions. The 'Product ID Number' calculated field is highlighted in the 'Dimensions' pane. The 'Columns' shelf contains 'Product ID' and 'Product ID Number'. The 'Rows' shelf is empty. The 'Marks' shelf is set to 'Automatic'. The 'Detail' and 'Tooltip' buttons are visible. The main view displays a table with the following data:

Product ID	Product ID ..	Abc
FUR-BO-3174	3174	Abc
FUR-BO-3175	3175	Abc
FUR-BO-3176	3176	Abc
FUR-BO-3177	3177	Abc
FUR-BO-3409	3409	Abc
FUR-BO-3615	3615	Abc
FUR-BO-3616	3616	Abc
FUR-BO-3617	3617	Abc
FUR-BO-3618	3618	Abc
FUR-BO-3621	3621	Abc
FUR-BO-3623	3623	Abc
FUR-BO-3624	3624	Abc
FUR-BO-3625	3625	Abc
FUR-BO-3626	3626	Abc
FUR-BO-3627	3627	Abc
FUR-BO-3628	3628	Abc
FUR-BO-3629	3629	Abc
FUR-BO-3630	3630	Abc
FUR-BO-3631	3631	Abc
FUR-BO-3632	3632	Abc
FUR-BO-3634	3634	Abc
FUR-BO-3635	3635	Abc

Date Functions

Date Functions are used for manipulating the date values in the data source

Function	Description	Example
DATEADD(date_part, increment, date)	Allows to specify a portion of a date and increment it by a given value	DATEADD('month', 3, #2019-04-15#) = 2019-07-15 12:00:00 AM
DATENAME(date_part, date, [start_of_week])	Returns date_part parameter of date as a string The start_of_week parameter is optional	DATENAME('month', #2019-04-15#) = "April"
DAY(date)	Returns the day of the specified date as an integer	DAY(#2019-04-12#) = 12
NOW()	Returns the current date and time	NOW() = 2019-04-15 1:08:21 PM

Create A Date Calculation

- Drag **Order Date** field from Dimensions on to the Rows shelf and drill down to **MONTH(Order Date)**
- Create a Calculated field, **Quarter Date** and enter the **DATETRUNC** function

Columns

Rows

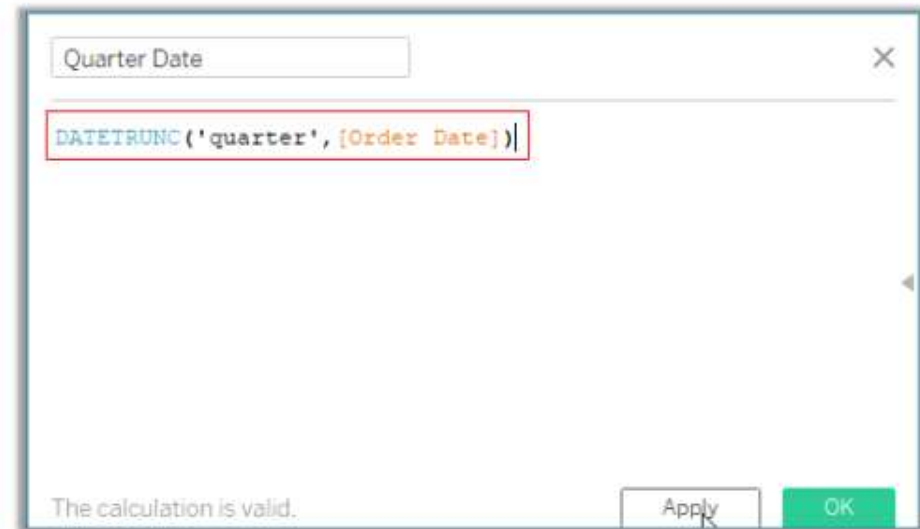
YEAR(Order Date)

QUARTER(Order Date)

MONTH(Order Date)

Sheet 1

Year of Ord.	Quarter of	Month of O.	
2012	Q1	January	Abc
		February	Abc
		March	Abc
	Q2	April	Abc
		May	Abc
		June	Abc
	Q3	July	Abc
		August	Abc
		September	Abc
	Q4	October	Abc
		November	Abc
		December	Abc
2013	Q1	January	Abc
		February	Abc
		March	Abc
	Q2	April	Abc
		May	Abc
		June	Abc
	Q3	July	Abc
		August	Abc
		September	Abc
	Q4	October	Abc
		November	Abc
		December	Abc



Quarter Date

`DATETRUNC('quarter', [Order Date])`

The calculation is valid.

Apply OK

Create A Date Calculation

- Drag **Quarter Date** field on to the Rows shelf and place it towards the right of **MONTH(Order Date)**
- Right click on **YEAR(Quarter Date)** and select **Exact Date** option from the drop - down
- Right click on **YEAR(Quarter Date)** again and select **Discrete** option from the drop - down

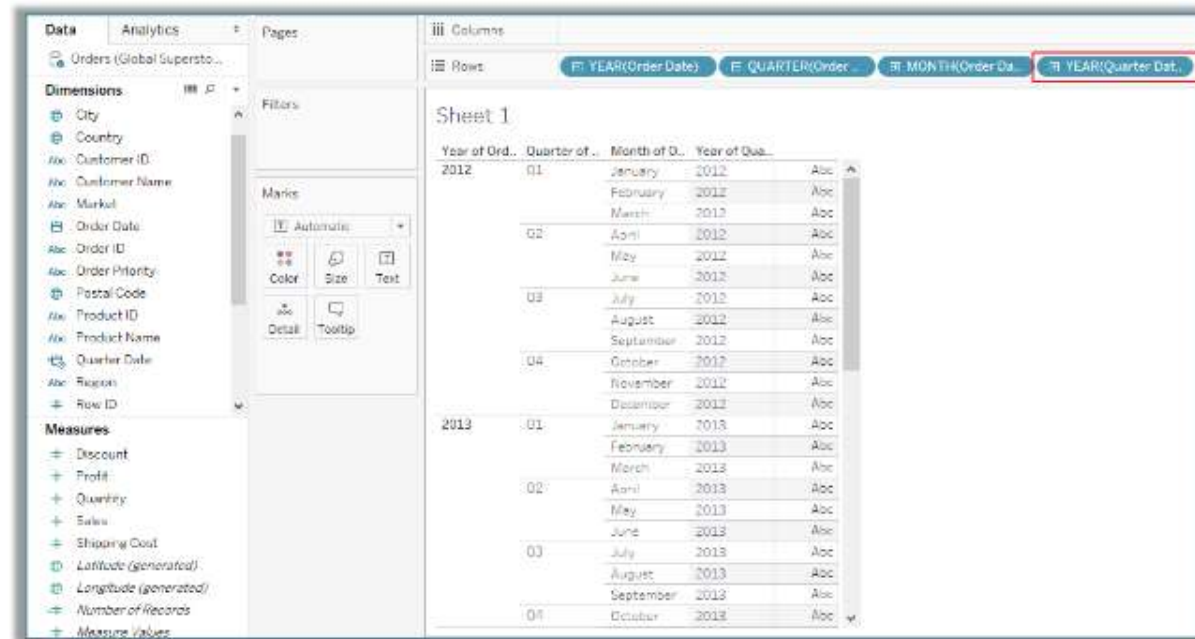
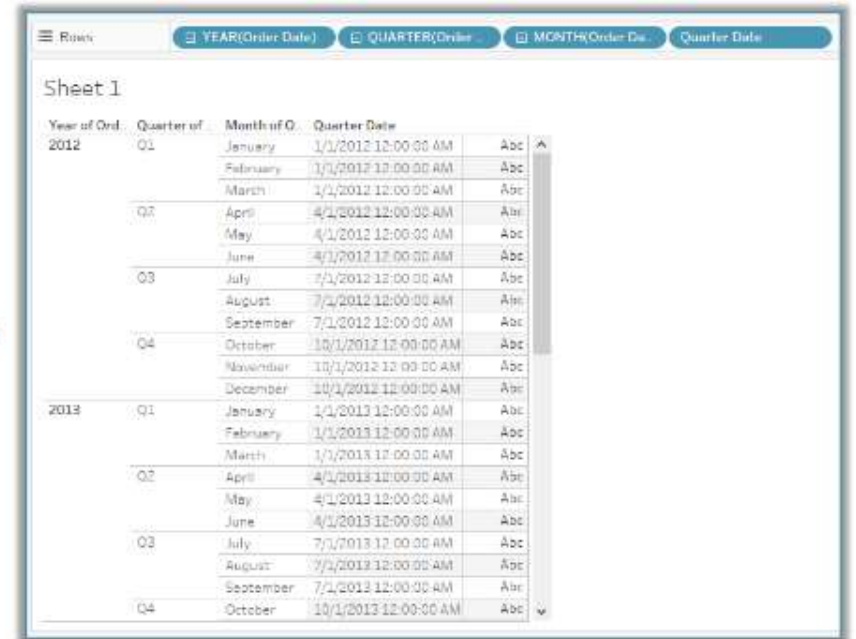


Tableau Desktop interface showing the Rows shelf with the following fields: YEAR(Order Date), QUARTER(Order Date), MONTH(Order Date), and YEAR(Quarter Date). The last field is highlighted with a red box.

Sheet 1

Year of Ord.	Quarter of ..	Month of O.	Year of Qua..	
2012	Q1	January	2012	Abc
		February	2012	Abc
		March	2012	Abc
	Q2	April	2012	Abc
		May	2012	Abc
		June	2012	Abc
	Q3	July	2012	Abc
		August	2012	Abc
		September	2012	Abc
	Q4	October	2012	Abc
		November	2012	Abc
		December	2012	Abc
2013	Q1	January	2013	Abc
		February	2013	Abc
		March	2013	Abc
	Q2	April	2013	Abc
		May	2013	Abc
		June	2013	Abc
	Q3	July	2013	Abc
		August	2013	Abc
		September	2013	Abc
	Q4	October	2013	Abc



Sheet 1

Year of Ord.	Quarter of ..	Month of O.	Quarter Date	
2012	Q1	January	1/1/2012 12:00:00 AM	Abc
		February	1/1/2012 12:00:00 AM	Abc
		March	1/1/2012 12:00:00 AM	Abc
	Q2	April	4/1/2012 12:00:00 AM	Abc
		May	4/1/2012 12:00:00 AM	Abc
		June	4/1/2012 12:00:00 AM	Abc
	Q3	July	7/1/2012 12:00:00 AM	Abc
		August	7/1/2012 12:00:00 AM	Abc
		September	7/1/2012 12:00:00 AM	Abc
	Q4	October	10/1/2012 12:00:00 AM	Abc
		November	10/1/2012 12:00:00 AM	Abc
		December	10/1/2012 12:00:00 AM	Abc
2013	Q1	January	1/1/2013 12:00:00 AM	Abc
		February	1/1/2013 12:00:00 AM	Abc
		March	1/1/2013 12:00:00 AM	Abc
	Q2	April	4/1/2013 12:00:00 AM	Abc
		May	4/1/2013 12:00:00 AM	Abc
		June	4/1/2013 12:00:00 AM	Abc
	Q3	July	7/1/2013 12:00:00 AM	Abc
		August	7/1/2013 12:00:00 AM	Abc
		September	7/1/2013 12:00:00 AM	Abc
	Q4	October	10/1/2013 12:00:00 AM	Abc

Logical Functions

Functions that evaluates a single value or a result of an expression and provides a boolean output

Function	Description	Example
IFNULL(expression1, expression2)	The IFNULL function returns the first expression if the result is not null, and returns the second expression if it is null	IFNULL([Sales], 0) = [Sales]
ISDATE(string)	The ISDATE function returns TRUE if the string argument can be converted to a date and FALSE if it cannot	ISDATE("11/05/98") = TRUE
MIN(expression) or MIN(expression1, expression2)	The MIN function returns the minimum of an expression across all the records or the minimum of two expressions for each record	MIN([Profit])

Create A Logical Calculation

- Right click on the Data pane and select the **Create Calculated Field** option
- Enter the **IF ELSE** statement in the calculation editor window

The screenshot shows the Tableau interface with a horizontal bar chart titled 'Logical Functions'. The chart displays the sum of shipping costs for various sub-categories. The 'Columns' shelf contains 'SUM(Shipping Cost)' and the 'Rows' shelf contains 'Sub-Category'. A red box highlights the 'Create Calculated Field...' option in the 'Measures' pane. A blue arrow points from this option to the 'Shipping Cost Status' dialog box.

Logical Functions Data:

Sub-Category	SUM(Shipping Cost)
Phones	184,953
Chairs	154,253
Coolers	159,601
Bookcases	155,488
Storage	120,794
Appliances	108,300
Accessories	83,592
Tables	79,863
Machines	79,150
Binders	49,773
Art	43,889
Furnishings	40,982
Paper	26,864
Supplies	24,951
Envelopes	18,582
Fasteners	10,300
Labels	8,941

Shipping Cost Status Dialog:

Shipping Cost Status

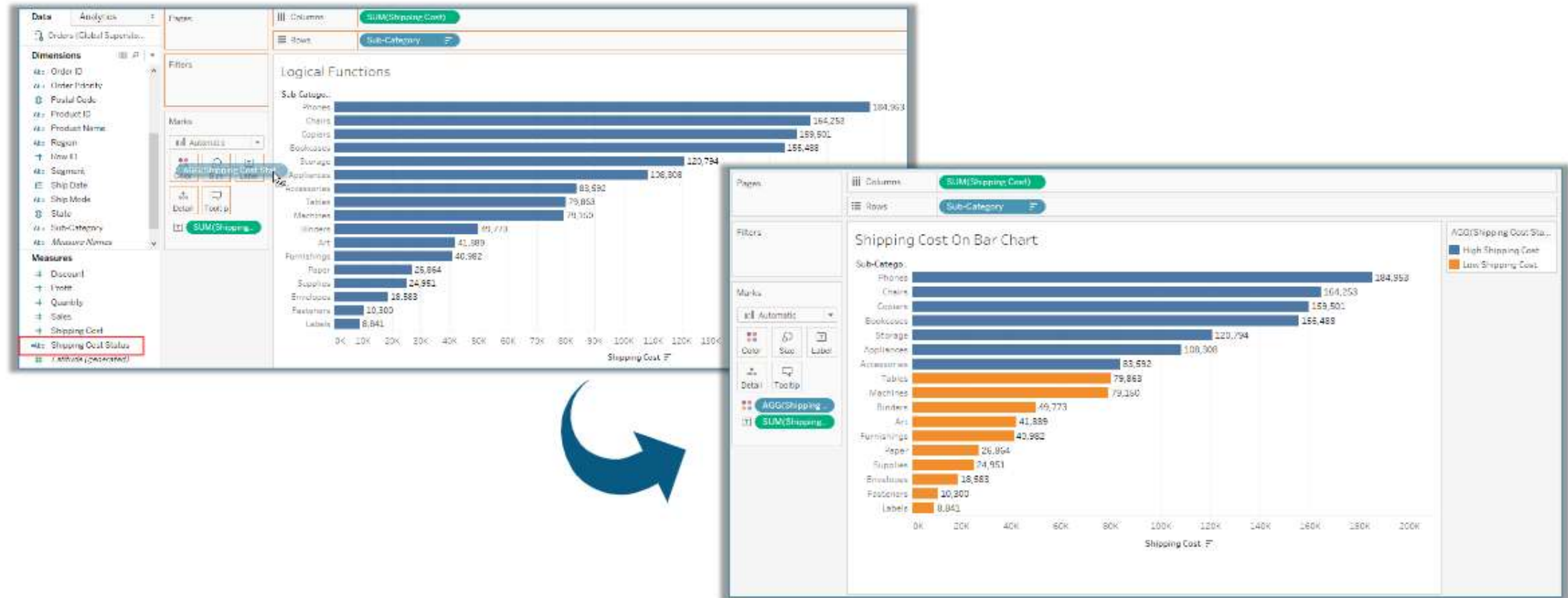
IF SUM([Shipping Cost]) > 80000 THEN
'High Shipping Cost'
ELSE
'Low Shipping Cost'
END

The calculation is valid

Apply OK

Create A Logical Calculation

- Drag the newly created Calculated Field **Shipping Cost Status** on to the Colors shelf



Subcategories displaying High and Low Shipping Cost

Aggregate Functions

Aggregate functions are used for summarizing or changing the granularity of data

Function	Description	Example
AVG(expression)	Returns the average of all the values in the expression AVG can be used with numeric fields only	AVG([Profit])
COUNT(expression)	Returns the number of items in a group	COUNT([OrderID])
MEDIAN(expression)	Returns the median of a single expression and can be only used with numeric fields	MEDIAN([Profit])
ATTR (expression)	Returns a value if all the rows have a single value. If all the rows do not match, it will return a value of " * "	ATTR([Market])

Create An Aggregate Calculation

Pages

Columns

Rows

City State

Sheet 1

City	State	
Aachen	North Rhine-Westphalia	1,117
Aalen	Baden-Württemberg	283
Aalst	East Flanders	152
Aba	Abia	-1,476
Abadan	Khuzestan	234
Abakaliki	Ebonyi	-57
Abbeville	Nord-Pas-de-Calais-Picard...	9
Abbotsford	British Columbia	55
Abeokuta	Ogun	-201
Aberdeen	Scotland	524
	South Dakota	7
Abha	'Asir	311
Abidjan	Lagunes	4,396
Abilene	Texas	-4
Abreu e Lima	Pernambuco	-81
Abu Kahir	Ash Sharqiyah	82

Filters

Marks

Automatic

Color Size Text

Detail Tooltip

SUM(Profit)

Pages

Columns

Rows

City AGG(Aggregate Ca..

Sheet 1

City	Aggregate Calculation	
Aachen	North Rhine-Westphalia	1,117
Aalen	Baden-Württemberg	283
Aalst	East Flanders	152
Aba	Abia	-1,476
Abadan	Khuzestan	234
Abakaliki	Ebonyi	-57
Abbeville	Nord-Pas-de-Calais-Picard...	9
Abbotsford	British Columbia	55
Abeokuta	Ogun	-201
Aberdeen	*	531
Abha	'Asir	311
Abidjan	Lagunes	4,396
Abilene	Texas	-4
Abreu e Lima	Pernambuco	-81
Abu Kahir	Ash Sharqiyah	82
Abula	Abula Capital Territory	-58

Filters

Marks

Automatic

Color Size Text

Detail Tooltip

SUM(Profit)

Here, a city can exist in multiple states
The Aggregate Function (ATTR([State]))
adds '*' for multiple state values



Operators

Arithmetic Operators

Operator	Description
+	Addition of numeric or date values or concatenation of strings
-	Subtraction of numeric or date values
*	Multiplication of numeric values
/	Division of numeric values
^	Raise to a power with numeric values

Logical Operators

Operator	Description	Detailed Explanation
AND	Logical AND between two boolean (true/false) values or expressions	If the Expressions or boolean values present on both the sides of the AND operator is evaluated to be TRUE, then the result is TRUE, else the result is FALSE
OR	Logical OR between two boolean(true/false) values or expressions	If any one or both the expressions or Boolean values present on both sides of the OR operator is evaluated to be TRUE, then the result is TRUE, else the result is FALSE
NOT	Logical NOT to negate a Boolean value or expression	Negates the boolean value of the expression after it
= or ==	Logical EQUALS TO tests the equality of two expressions or values	Tests whether the two expressions on both the sides of the == operator are equal or not

Syntax Conventions

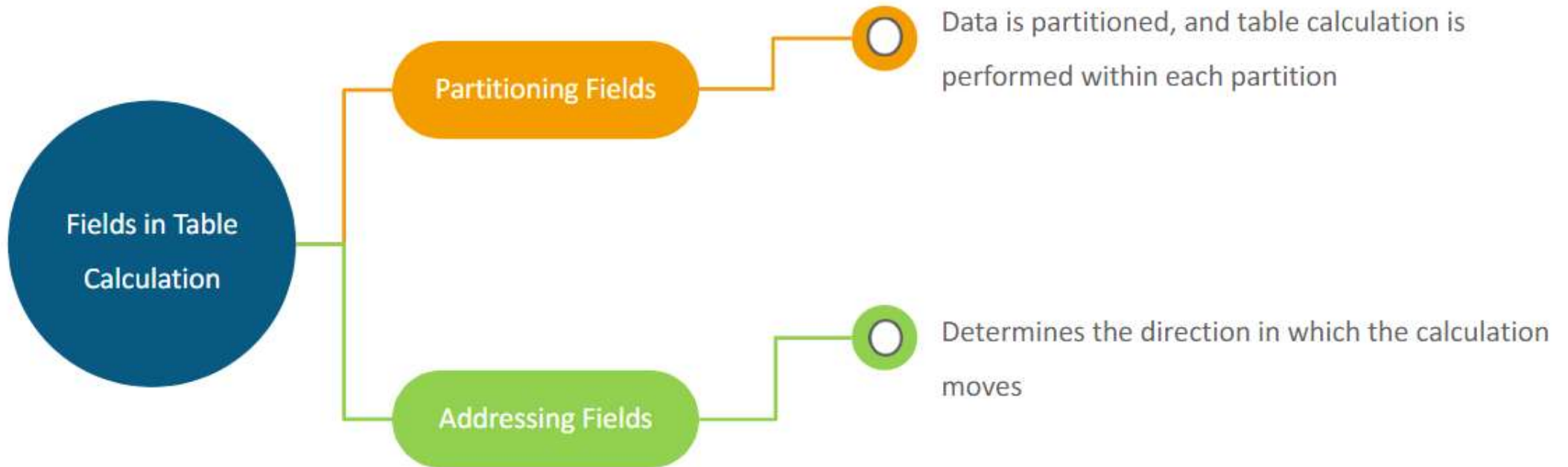
Syntax Conventions	Description
()	Parenthesis to define the order of operations or enclose the function arguments
[]	Square brackets to enclose field names
{ }	Curly braces to enclose level of detail calculations
//	Double dash to begin a comment



Introduction To Table Calculations

What Is A Table Calculation?

- Transformations that are applied to the values in a visualization
- Calculations are based on what is currently in the visualization
- Operates on the aggregated data returned from the underlying data source, just prior to the rendering of view



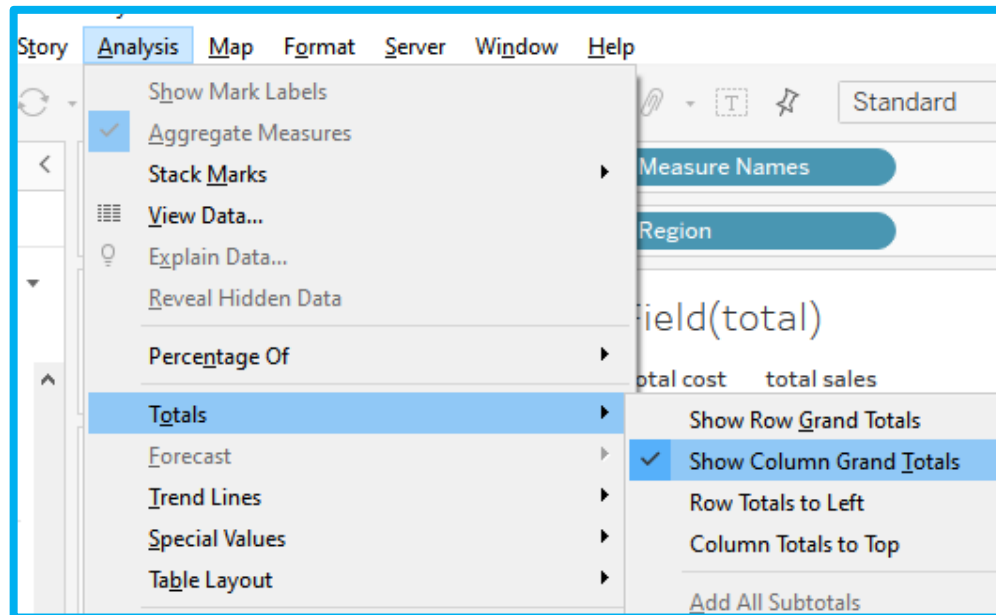
Partitioning fields

To show (total) in text table.

Steps:

Go to (Analysis) then click on (totals) ---> (show columns Grand) or (Show row Grand) depend on your data or you can select both also

Note: You can make the data as (percent of total) by right click on the measure (sales) then (Quick table calculation) ---> percent of total



Quick Table Calculation

- Pre - defined table calculation applied to any field used as a measure in the view
- Category is a partitioning field, hence a percentage of total is calculated for all the categories
- Order Date is the addressing field and hence sales are summed over time for all the categories

The image shows two screenshots of the Tableau interface. The left screenshot shows the 'Marks' card with 'SUM(Sales)' selected. A context menu is open, showing the 'Quick Table Calculation' option. The right screenshot shows the resulting table view with percentages.

Table 1: Sales Data (Left View)

Category	Order Date			
	2012	2013	2014	2015
Furniture	755,084	858,822	1,117,629	1,377,917
Office Supplies	675,715	795,175	1,010,812	1,305,790
Technology	827,652	1,023,442	1,277,305	1,616,159

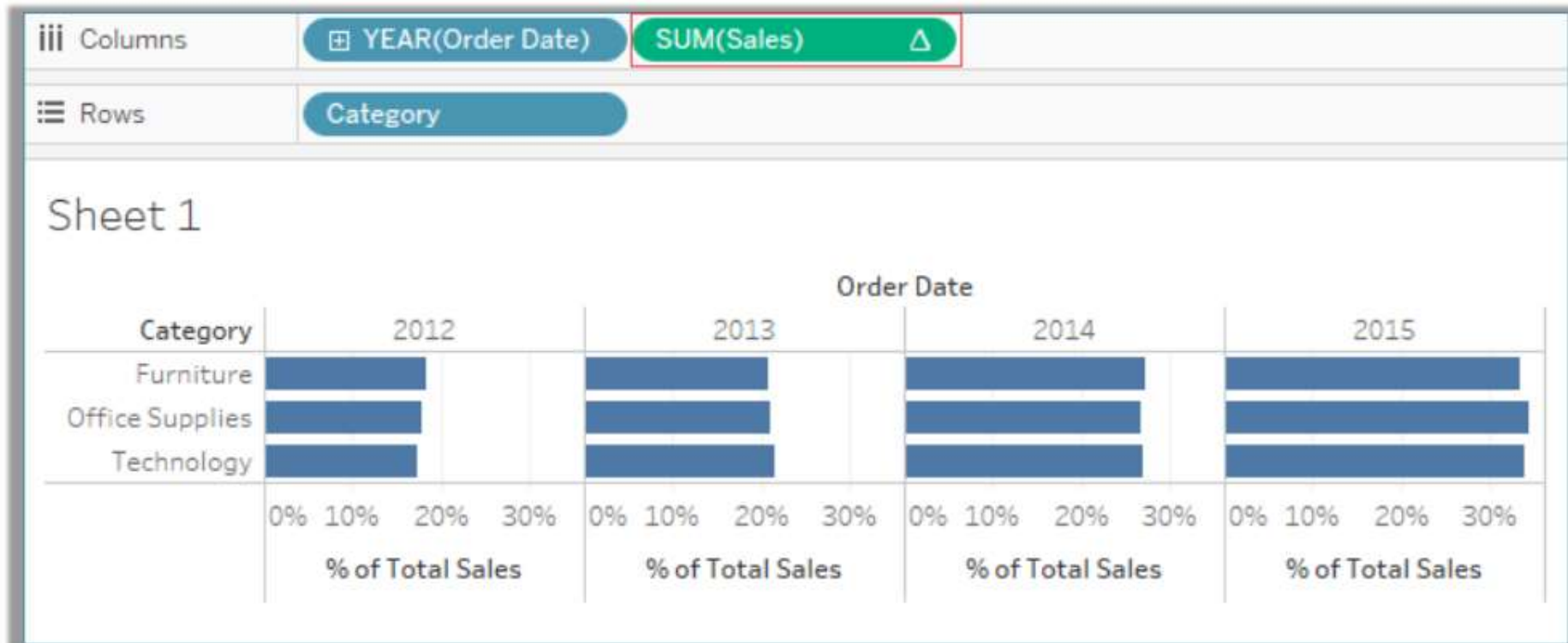
Table 2: Percentages (Right View)

Category	Order Date			
	2012	2013	2014	2015
Furniture	18.39%	20.89%	27.19%	33.52%
Office Supp..	17.84%	20.99%	26.69%	34.48%
Technology	17.44%	21.57%	26.92%	34.06%

This icon indicates that a table calculation is applied to this measure

Quick Table Calculation

- Drag the newly created quick table calculation on to the Rows shelf



Percentage of Total Sales over time for all the Categories of Product



Thank you !!