

# Intermediate Tableau Workshop

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# Intermediate Tableau Workshop Handout

Jane Zhao

[janezhao@rice.edu](mailto:janezhao@rice.edu)

This handout was developed with Tableau 2019.1,

last updated on Thursday, June 27, 19.

Note: This handout assembles some materials from Tableau's free training videos <https://www.tableau.com/learn/training>, no claims on its originality for that part.

## Outline

1. Workshop objectives
2. Intermediate Tableau
  - I. Data Preparation for Excel Files
  - II. Merge data from different data sheets/datasets
  - III. Viewing two measures
  - IV. Overview of calculations
  - V. Quick table calculations
  - VI. Regular calculations
  - VII. Parameters
  - VIII. Adding Analytics objects to the view
  - IX. Adding URL action to dashboard

## Objectives

Participants will be able to

- 1) use Data Interpreter to clean data
- 2) do Join and Union, the two basic ways to merge data
- 3) create dual axis chart and scatter plot
- 4) do basic quick table calculations
- 5) make regular calculations on date, string, number, and Boolean data type
- 6) create and use parameters and calculated fields
- 7) add analytics objects to the view

## I. Data Preparation for Excel Files

Data can be organized in various ways. To take advantage of Tableau Desktop, Tableau recommends that you connect to data that has not been formatted. That is, data that has not already been organized in a crosstab, aggregated, or contains other extraneous information. If your data is like this, in most cases, you can connect directly to it from Desktop and use Data Interpreter or other cleaning options to work around the problematic structure of the data. In other cases, you might need to edit the Excel data directly before connecting to it from Desktop. For more details, go to [Tips for Working with Your Data Within Tableau](#).

When data is formatted as in crosstab format, the table is column oriented. In a column oriented table, the variables are stored as column headers. However, Tableau Desktop is optimized for row oriented data. In a row-oriented table, the variables are stored in the row values. Ideally, the Excel file should be prepared as the rules specified below.

- a. The first row of data only includes column headers.
- b. The sheet doesn't contain any comments/notes and column/row totals.
- c. Each column of data contains the same type of data throughout the column and each row of data is one data item.
- d. The sheet/table is row oriented. That means variables are stored in the row values. In contrast, in column orientated sheet/table, the variables are stored as column headers. See [Tips for Working with Data](#) for more details.

## Tableau data source interface

The screenshot displays the Tableau data source interface. On the left, there is a 'Connections' pane with 'DMC-charges-d...16-sheet-2017' selected. Below it is the 'Sheets' pane with 'DMC-charges-2014-2016' and 'DMC-Charges-2017'. The main area is the 'Canvas' showing a 'Data grid' with columns: User Profile, User Cat1, User Cat2, Time Charge, Op Type, Station Operator, Barcode, and Title/Call No. A 'Metadata grid' is also visible, showing field names, tables, and remote field names. The 'Data source tab' is highlighted at the bottom left.

Field Name	Table	Remote Field Name
Abc User Profile	DMC-Charges-2017	User Profile
Abc User Cat1	DMC-Charges-2017	User Cat1
Abc User Cat2	DMC-Charges-2017	User Cat2
Abc Time Charge	DMC-Charges-2017	Time Charge
Abc Op Type	DMC-Charges-2017	Op Type
Abc Station Operator	DMC-Charges-2017	Station Operator
Abc Barcode	DMC-Charges-2017	Barcode

Activity 1.1 Use Data Interpreter to clean data, use Pivot function to convert the data to a row oriented table, use Split function to split a field.

- 1) Open the Excel file *data\_prep - flights.xlsx* with Excel.
  - a. The *Resolved Incidents* sheet has extra information other than raw data.
  - b. The *Resolved Incidents* sheet shows the number of resolved incidents per Employee per month. The table is wider. This is a typical column orientated table, which Tableau doesn't like.
  - c. The *Ideal* sheet shows a "Date" column and each row contains the number of resolved incidents for each unique combination of date and employee. This data is

taller, with more rows, rather than wider, with more columns. This is a typical row orientated table, which is the format Tableau prefers for optimal analysis.

- In Tableau, connect to the Excel file `data_prep_-_flights.xlsx`, drag out the *Resolved Incidents* sheet to the canvas area.

The screenshot shows the Tableau interface with the 'Resolved Incidents' data source. The table view displays the following data:

Resolved Incidents	Resolved Inc.	Resolved Inc.	Resolved Inc.	Resolved Inc.	Resolved Inc.	Resolved Inc.	Resolved Inc.	Resolved Inc.	Resolved Inc.
Flights Data Summary	null	null	null	null	null	null	null	null	null
This report was gene...	null	null	null	null	null	null	null	null	null
Employee	1/1/2015	2/1/2015	3/1/2015	4/1/2015	5/1/2015	6/1/2015	7/1/2015	8/1/2015	9/1/2015
B-002	4	1	5	2	3	0	3	1	2
E-055	1	2	1	3	4	1	4	0	2
E-075	14	17	16	15	18	16	14	17	12
B-066	4	4	5	2	5	0	0	2	0
C-025	17	13	17	18	17	17	12	15	17
E-030	2	2	1	1	0	3	5	5	0
C-001	14	14	14	14	13	18	17	14	13

- We see wrong field names, null values, column headers in the original Excel file misinterpreted as values in the data.
- In the side panel, click to turn on the Data Interpreter. Instantly, the data sheet has been cleaned up. All the original column headers have been correctly identified.

The screenshot shows the same Tableau interface, but with the 'Cleaned with Data Interpreter' checkbox checked. The table view is now clean and correctly formatted:

Resolved Incidents	Resolved Incidents	Resolved Incidents	Resolved Incidents	Resolved Incidents	Resolved Incidents	Resolved Incidents	Resolved Incidents
Employee	2/1/2015	3/1/2015	4/1/2015	5/1/2015	6/1/2015	7/1/2015	
B-002	4	1	5	2	3	0	
E-055	1	2	1	3	4	1	
E-075	14	17	16	15	18	16	
B-066	4	4	5	2	5	0	
C-025	17	13	17	18	17	17	
E-030	2	2	1	1	0	3	
C-001	14	14	14	14	13	18	
E-038	4	1	0	4	0	2	
C-054	2	5	4	4	2	3	
A-081	3	2	4	5	2	2	

- 5) Click on *Review the results* link on the left pane. This will open an Excel file describing what Tableau has done to clean the data. Click on *Resolved Incident* sheet, we see which fields are being used as headers, in red, and which are considered data, in green.

Employee	1/1/15	2/1/15	3/1/15	4/1/15	5/1/15	6/1/15	7/1/15	8/1/15	9/1/15	10/1/15	11/1/15	12/1/15	Header
B-002	4	1	5	2	3	0	3	1	2	0	2	5	Data
E-055	1	2	1	3	4	1	4	0	2	1	4	0	Data
E-075	14	17	16	15	18	16	14	17	12	13	14	12	Data
B-066	4	4	5	2	5	0	0	2	0	1	0	3	Data
C-025	17	13	17	18	17	17	12	15	17	17	14	15	Data
E-030	2	2	1	1	0	3	5	5	0	2	4	1	Data
C-001	14	14	14	14	13	18	17	14	13	18	15	14	Data
E-038	4	1	0	4	0	2	5	0	2	2	2	2	Data
C-054	2	5	4	4	2	3	0	5	5	5	3	5	Data
A-081	3	2	4	5	2	2	2	4	1	4	2	0	Data
B-031	14	14	14	14	15	13	15	14	12	16	12	18	Data
D-019	2	3	0	0	4	4	1	2	5	0	5	5	Data
E-096	2	0	4	4	5	3	3	0	5	4	2	0	Data
D-026	0	2	0	2	5	3	1	0	0	2	5	4	Data
E-022	3	3	4	3	4	2	0	3	2	3	3	1	Data
C-015	1	5	3	5	2	1	3	3	1	1	5	2	Data
B-062	14	12	16	16	16	18	12	12	18	16	12	17	Data
E-029	5	1	2	4	0	3	5	4	5	3	4	5	Data
A-037	2	2	0	2	3	4	2	0	2	1	2	2	Data
E-087	14	17	13	17	18	13	13	12	13	16	13	16	Data
C-040	5	0	4	5	3	5	2	1	1	4	2	1	Data
A-077	3	5	3	5	2	3	5	3	4	5	4	4	Data
C-041	18	18	15	15	15	17	17	12	18	17	16	16	Data
D-005	4	0	5	3	2	3	5	1	0	2	3	3	Data
E-046	12	13	14	17	16	14	14	18	13	16	15	17	Data
C-053	2	5	5	0	2	1	0	4	5	1	1	3	Data

This report is generated once a month  
 For questions, contact [flights@support.com](mailto:flights@support.com)  
 Employee field consists of Location-Employee ID

- 6) Back to Tableau, we want to change the table from column orientated to row orientated.  
 7) Click on the first column header 1/1/2015 to select the first column, scroll to the right, shift-click the last column header 12/1/2015 to select all the dates column, open the menu, select Pivot.

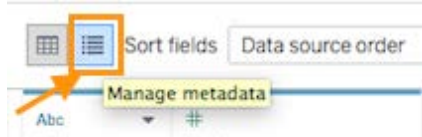
Show aliases  Show hidden fields 26 rows

#	Resolved Incidents	Resolved Incidents	Resolved Incidents
	10/1/2015	11/1/2015	12/1/2015
2	0	2	
2	1	4	
12	13	14	
0	1	0	

Context menu options: Rename, Copy Values, Hide, Create Calculated Field..., Pivot, Merge Mismatched Fields

- 8) This pivot feature essentially merges the information from the original columns and rows into two new columns – Pivot field names, and Pivot field values. We can see that *Pivot*

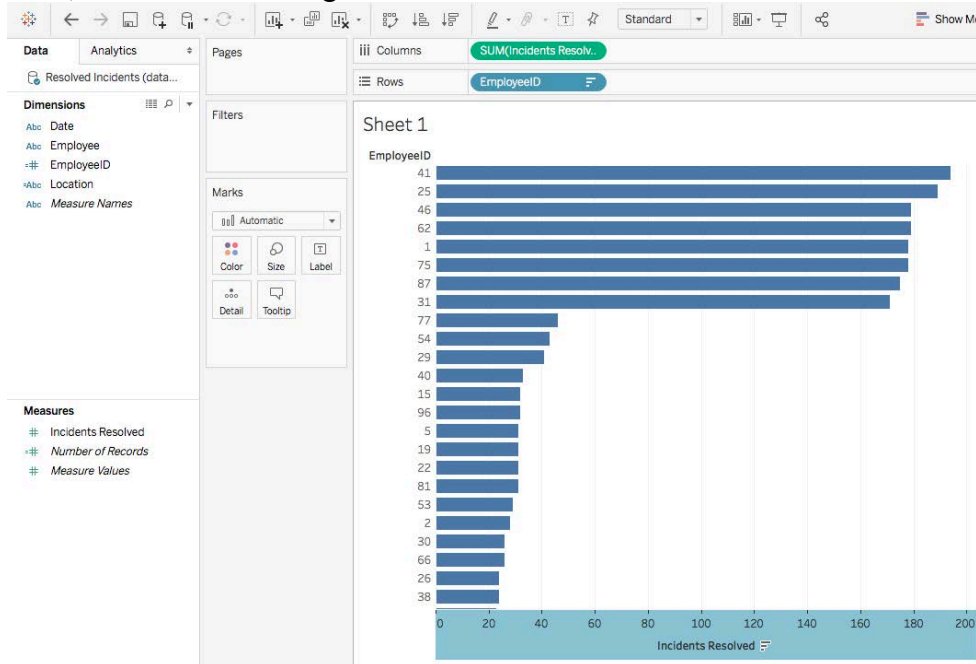
*field names* is actually our Date, double click to rename to Date, and *Pivot field values* can be renamed *Resolved Incidents*.



- 9) Click on Metadata Grid icon to view the original/remote field names.
- 10) Click on the menu on the upper right corner of *Employee* field, choose *Split*. The field *Employee* is automatically split into two fields. Double click to rename them to *Location* and *EmployeeID*.

Abc Pivot <b>Date</b>	# Pivot <b>Incidents Resolved</b>	Abc Resolved Incidents <b>Employee</b>	=Abc Calculation <b>Location</b>	=# Calculation <b>EmployeeID</b>
1/1/2015	4	B-002	B	2
1/1/2015	1	E-055	E	55
1/1/2015	14	E-075	E	75
1/1/2015	4	B-066	B	66
1/1/2015	17	C-025	C	25
1/1/2015	2	E-030	E	30
1/1/2015	14	C-001	C	1
1/1/2015	4	E-038	E	38
1/1/2015	2	C-054	C	54
1/1/2015	3	A-081	A	81
1/1/2015	14	B-031	B	31

- Click on Sheet 1, drag Incident Resolved to Columns shelf, and EmployeeID to Rows shelf, sort it in Decending order.



## II. Merge data from different data sheets/datasets

It's not practical to store all data in a single sheet/table/dataset. There are two basic ways to merge datasets. They are Join and Union.

**Join** will combine columns of two datasets. It merges different columns for matching rows, aligning them next to each other. Tableau tries to automatically decides which field to use to match up the rows. To join, the tables may come from different connections.

- Inner Joins – preserves only the rows that have the same key filed.
- Left Joins – brings in all the information for the rows from the table on the left and any information from table on the right for rows with the same key field.
- Right Joins - brings in all the information for the rows from the table on the right and any information from table on the left for rows with the same key field.
- Outer Joins – brings in all names listed in all tables, and fills in nulls wherever there isn't information for a given column for that row.

**Union** will merge rows of two or more datasets. It merges different rows for matching columns, stacking more datasets on top of each other. This is usually used when more data comes in during the project. Tableau tries to match up columns with identical names automatically. To union data, the tables must come from the same connection.

For more, go to [Join Your Data](#).

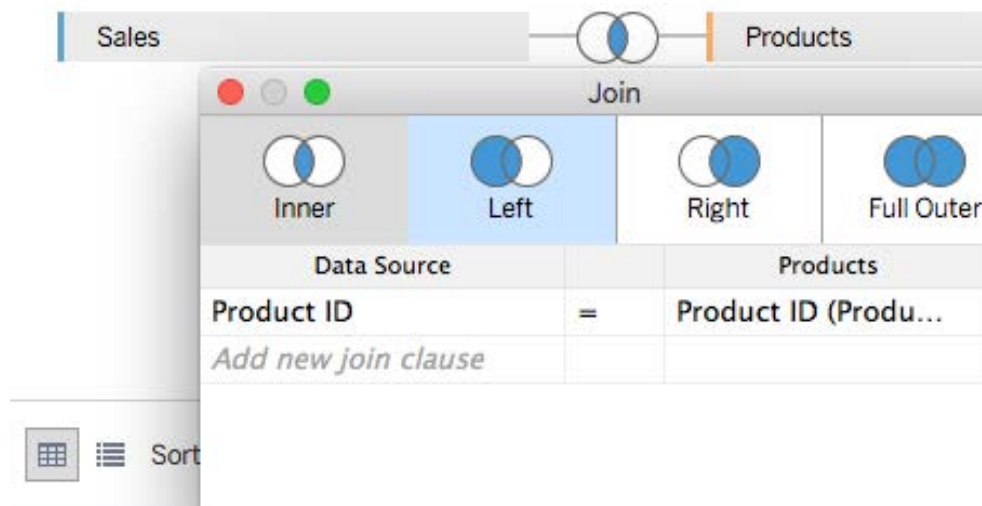
### Activity 2.1 Join Data from two different sources

- We have two different file-based data sources – one Excel, one CSV. The data is structured such that the sales data has a product ID but no other information about the product sold. The product data in the CSV file is a simple table of product ID, category,

sub-category, and the product name. If we perform a left join Product data to the Sales data on Product ID, we'll add that product information to each relevant sales transaction.

- 2) In Tableau, connect to *Sales 2016.xlsx* Excel file.
- 3) Click the Add button by the Connections area, Choose Text File, and open *Products 2016.csv* file.
- 4) The sheet has already been added to the canvas. Name the data source more descriptively *Sales and Products 2016*.
- 5) Click on the join icon, and we'll select a left join. We can see that our data has been joined at the row level on Product ID.

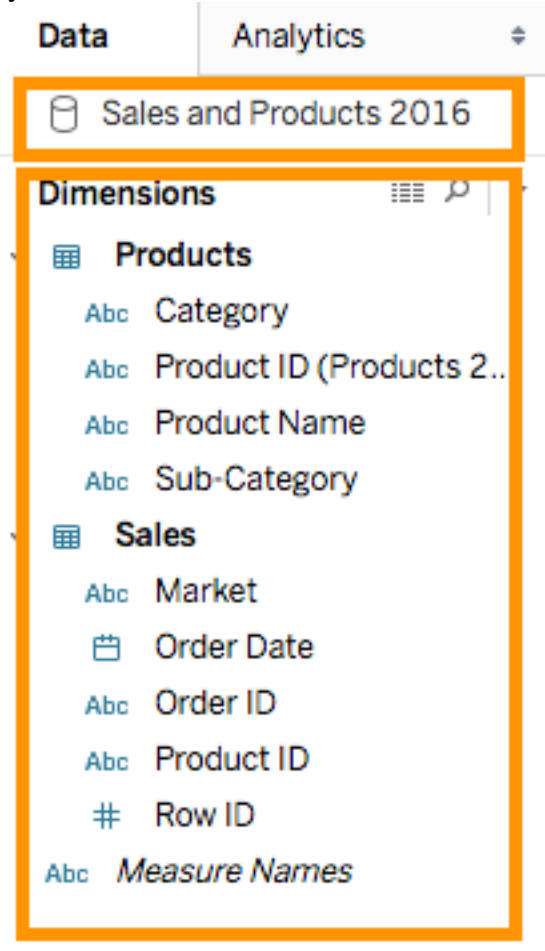
## Sales and Products 2016



- 6) In the grid, we can see the product information (in yellow) has been added to each row from the Sales data (in blue).
- 7) Test out our newly joined single data source

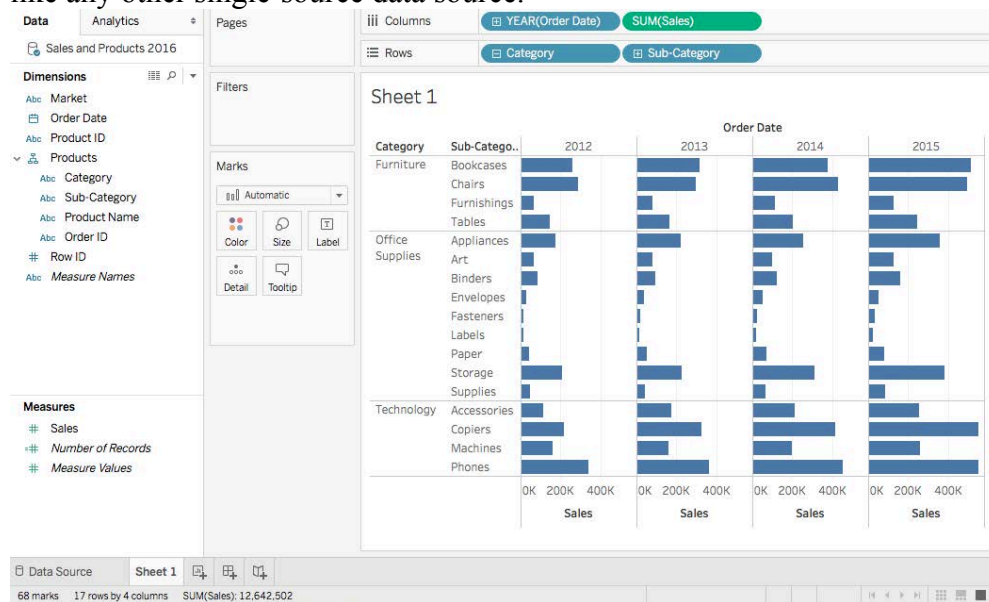


- a. We see we have a single data source in the data pane, but our fields are broken out by table.



- b. Right click inside the data pane, choose *Group by Folder* instead of Group by Data Source Table.
- c. Make a hierarchy for Products.
- Drag Sub-Category on top of Category, name it Products.
  - Drag Product Name under Sub-Category
  - Drag Product ID under Product Name.
- d. Right click over *Product ID(Products 2016)*, Hide it. Because it's just there for the join clause.
- e. Drag Category to rows, and expand it out. Drag Sales to Columns. Drag Order Date to Columns and put it in front of Sales. An integrated data source functions

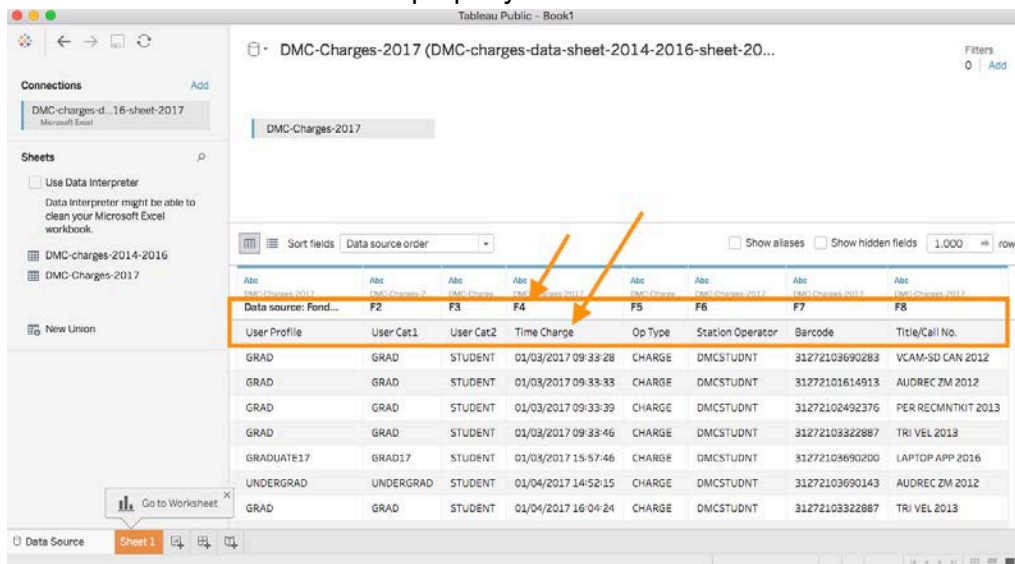
like any other single-source data source.



### Activity 2.2 Use Data Interpreter to clean data; Union two tables from the same Excel file

The sheet *DMC-charges-2017* has some notes in the beginning of the sheet. We need to remove that after loading. In addition, we need to add the rows of data in the sheet *DMC-charges-2017* to the sheet *DMC-charges-2014-2016*.

- 1) Open Tableau and connect to *DMC-charges-data-sheet-2014-2016-sheet-2017.xlsx*.
- 2) The Excel file contains 2 sheets: *DMC-charges-2014-2016*, *DMC-charges-2017*.
- 3) Drag the sheet *DMC-charges-2017* to the canvas area. Because the original Excel sheet contains some introductory text in the beginning of the sheet, the field names and the first row of data are not loaded properly.



- 4) You could do some data cleanup after the data is loaded. Check **Use Data Interpreter** on the left pane.

- 5) You will get a clean view like below. The notes have been removed and the column headers have been correctly interpreted as field names.

User Profile	User Cat1	User Cat2	Time Charge	Op Type	Station Operator	Barcode	Title/Call No.
GRAD	GRAD	STUDENT	01/03/2017 09:33:28	CHARGE	DMCSTUDNT	31,272,103,690,283	VCAM-SD CAN 2012
GRAD	GRAD	STUDENT	01/03/2017 09:33:33	CHARGE	DMCSTUDNT	31,272,101,614,913	AUDREC ZM 2012
GRAD	GRAD	STUDENT	01/03/2017 09:33:39	CHARGE	DMCSTUDNT	31,272,102,492,376	PER RECMNTKIT 2013
GRAD	GRAD	STUDENT	01/03/2017 09:33:46	CHARGE	DMCSTUDNT	31,272,103,322,887	TRI VEL 2013
GRADUATE17	GRAD17	STUDENT	01/03/2017 15:57:46	CHARGE	DMCSTUDNT	31,272,103,690,200	LAPTOP APP 2016
UNDERGRAD	UNDERGRAD	STUDENT	01/04/2017 14:52:15	CHARGE	DMCSTUDNT	31,272,103,690,143	AUDREC ZM 2012
GRAD	GRAD	STUDENT	01/04/2017 16:04:24	CHARGE	DMCSTUDNT	31,272,103,322,887	TRI VEL 2013
UNDERGRAD	UNDERGRAD	STUDENT	01/05/2017 09:53:52	CHARGE	DMCSTUDNT	31,272,101,615,944	DSL R CAN 2012
UNDERGRAD	UNDERGRAD	STUDENT	01/05/2017 09:55:57	CHARGE	DMCSTUDNT	31,272,101,615,944	DSL R CAN 2012
STAFF	STAFF	STAFF	01/05/2017 15:42:24	CHARGE	DMCSTUDNT	31,272,101,615,530	PROJ FPS 2011

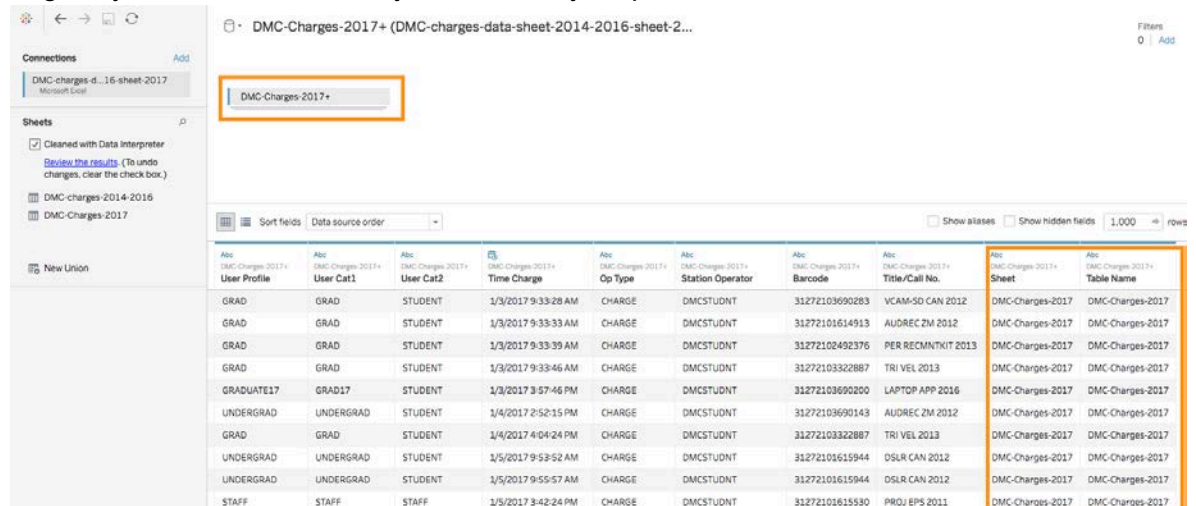
- 6) Tableau loads the entire data as is. It uses Data Interpreter to clean up the data after loading.
- 7) Change the field to the correct data type.
- Change **Time Charge** from *String Abc* to *Date & Time*
  - Change **Barcode** from *Number #* to *String Abc*.

- 8) Union data
- Drag the sheet *DMC-charges-2014-2016* to canvas and drop it over to the sheet *DMC-charges-2017*. You will see **Drag table to union** orange text box popped up briefly. Drop the sheet *DMC-charges-2014-2016* over the orange box. If you didn't drop the sheet over this orange text box, you will create a **join** instead of a **union**.

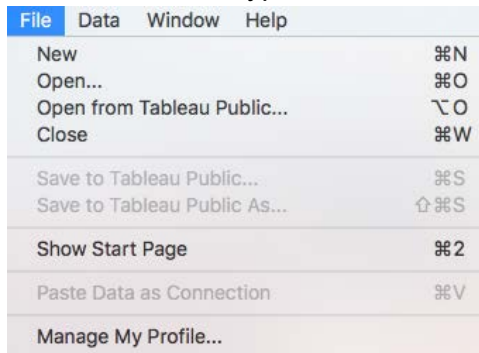
User Profile	User Cat1	User Cat2	Time Charge	Op Type	Station Operator
GRAD	GRAD	STUDENT	01/03/2017 09:33:28	CHARGE	DMCSTUDNT
GRAD	GRAD	STUDENT	01/03/2017 09:33:33	CHARGE	DMCSTUDNT
GRAD	GRAD	STUDENT	01/03/2017 09:33:39	CHARGE	DMCSTUDNT
GRAD	GRAD	STUDENT	01/03/2017 09:33:46	CHARGE	DMCSTUDNT
GRADUATE17	GRAD17	STUDENT	01/03/2017 15:57:46	CHARGE	DMCSTUDNT
UNDERGRAD	UNDERGRAD	STUDENT	01/04/2017 14:52:15	CHARGE	DMCSTUDNT
GRAD	GRAD	STUDENT	01/04/2017 16:04:24	CHARGE	DMCSTUDNT
UNDERGRAD	UNDERGRAD	STUDENT	01/05/2017 09:53:52	CHARGE	DMCSTUDNT
UNDERGRAD	UNDERGRAD	STUDENT	01/05/2017 09:55:57	CHARGE	DMCSTUDNT
STAFF	STAFF	STAFF	01/05/2017 15:42:24	CHARGE	DMCSTUDNT

- If you get the two sheets union properly, it should look like below. Tableau has added two new columns *Sheet* and *Table Name* to show where the rows

originally came from. This may become very helpful later.



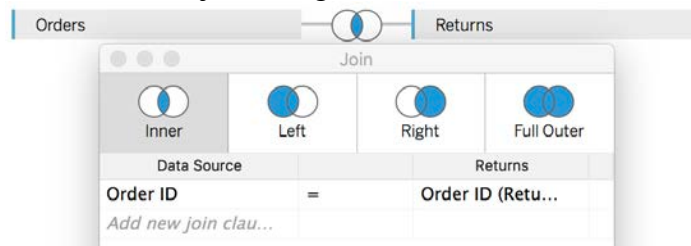
- 9) Note: Since you haven't created any worksheets, dashboards yet, Tableau Public's save functions are greyed out. That means you can't save your work to anywhere at the moment. So if you clean the canvas area, and drag and drop the sheet again, remember to check the data type. Make sure all the fields have the right data types.



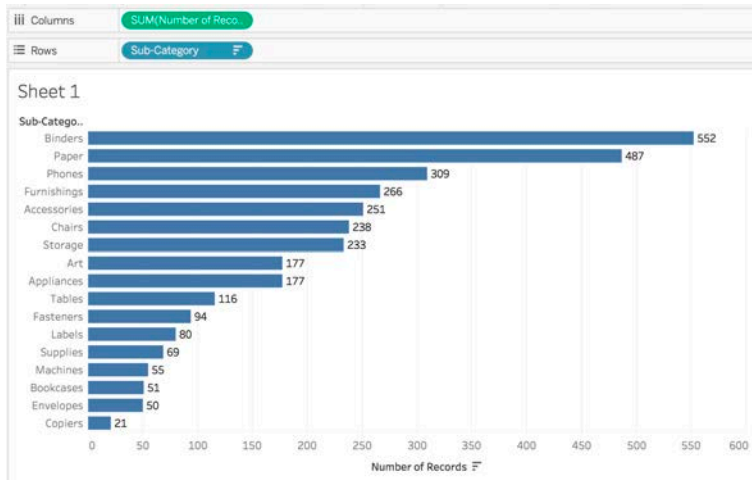
- 10) Test out our newly unioned single data source by creating a view to see how equipment has been checked out over the years 2014 through 2017.

**DIY Activity: Use Sample\_Superstore.xls, join Orders table and Returns table, create a view to show the number of returned orders in each Sub-Category.**

- Connect to Sample\_Superstore.xls
- Create an Inner join using order ID



- Create a view that uses joined table to show the number of returned orders in each Sub-Category.

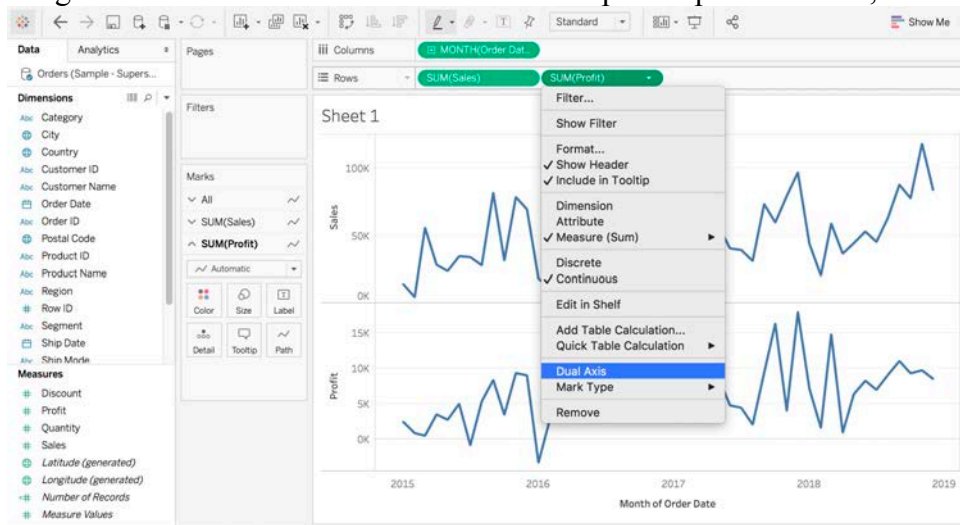


### III. Working with two measures

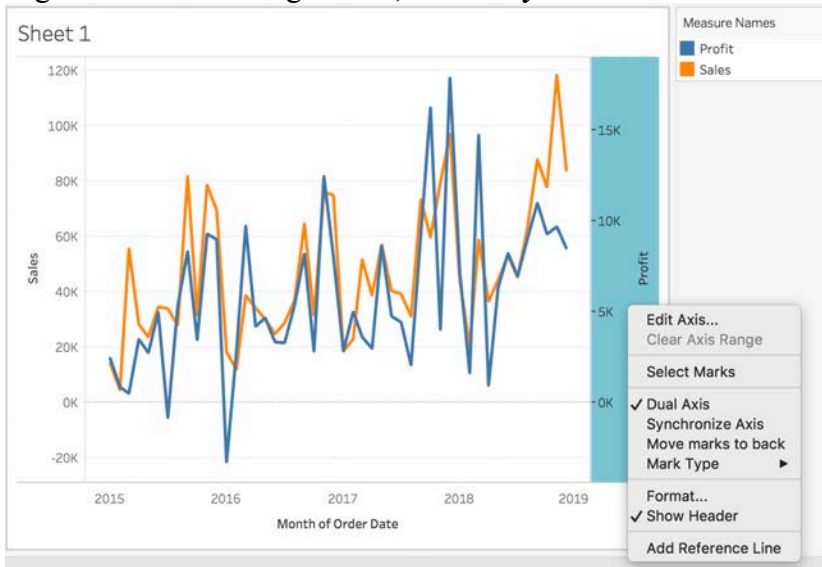
It is important to any analysis to compare measures with each other. Tableau has dual axis chart and combo chart to compare and contrast two measures. A **dual axis chart** uses two separate measures and a single dimension, comparing two measures in one view. A dual axis chart with multiple mark types is also called a **combo chart**.

#### Activity 3.1 Build a Dual Axis chart

- 1) Connect to **Sample-Superstore** excel file.
- 2) Drag Orders table to canvas.
- 3) Drag **Sales** measure to **Rows**, drag **Order Date** dimension to **Columns**. And select continuous month for Order Date.
- 4) Drag Profit measure to Rows. From the Profit pill drop down menu, choose Dual Axis.



- Right click over the right Axis, choose **Synchronize Axis** and de-select **Show Header**.



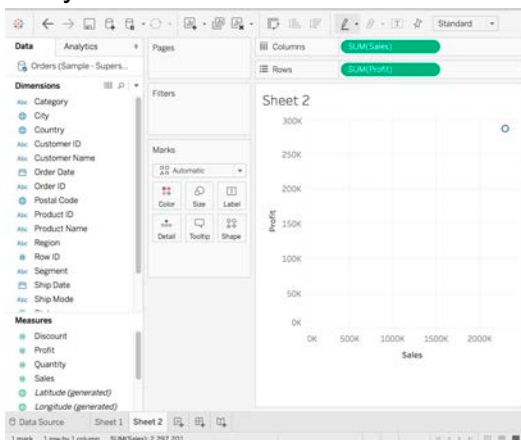
- From the Marks card, you can change mark type, color, and size.

### Building scatter plots

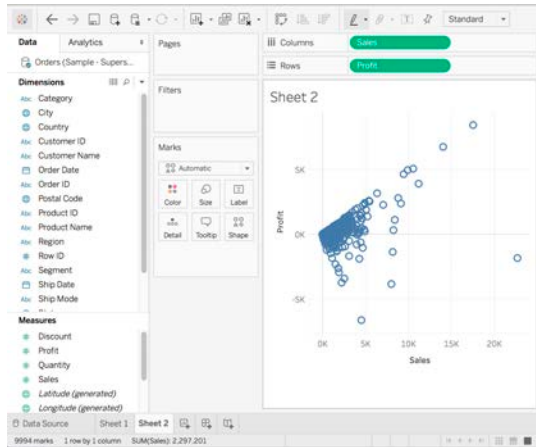
Scatter plot is a useful chart to visualize relationships between numerical values and to analyze the correlation between the two measures. It uses position as visual cue. Marks often represented as hollow circles are used to compare multiple measures based on where they are located in relation to other marks. One advantage of using scatter plot is that you can plot a lot of data at once and be able to spot trend, clusters, and outliers.

### Activity 3.2 Build a Scatterplot

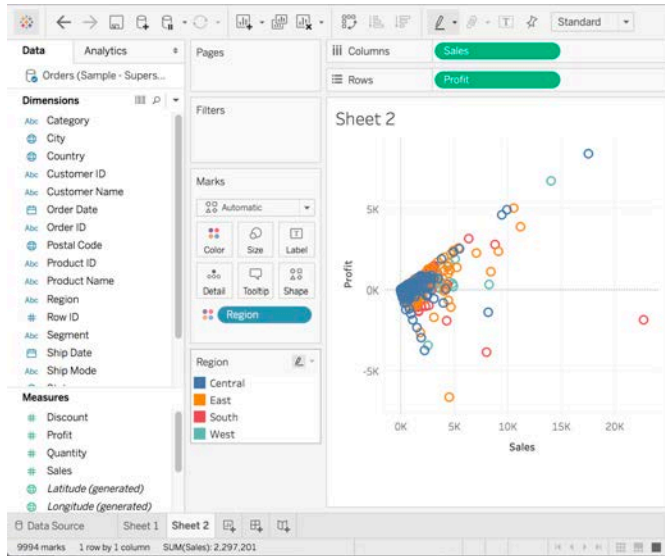
- Connect to **Sample-Superstore** excel file.
- Drag **Sales** measure to **Columns**, drag **Profit** measure to **Rows**.  
Tableau aggregates the measures as sums and creates a horizontal axis and a vertical axis.
- Now the Scatterplot has one mark, showing the sum of sales and profit values across every row in the data source.



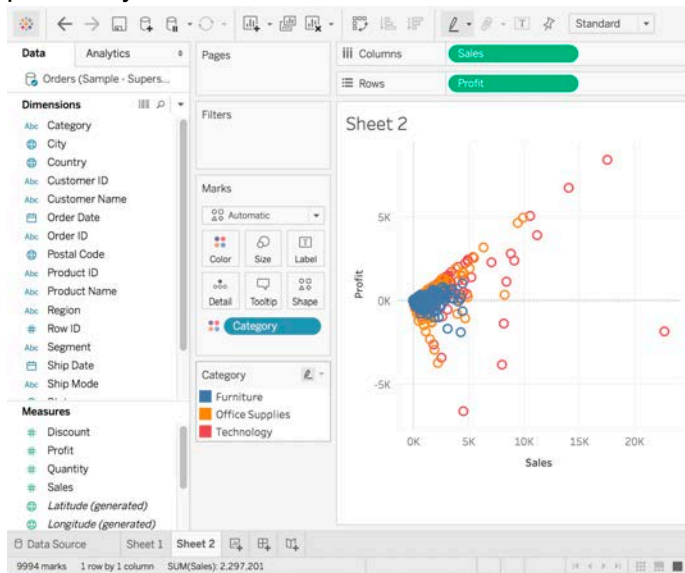
- 4) Analysis -> Aggregate Measure, and de-select to disaggregate the data. Now, the Scatterplot has 9994 marks – one for each row in the original data source.



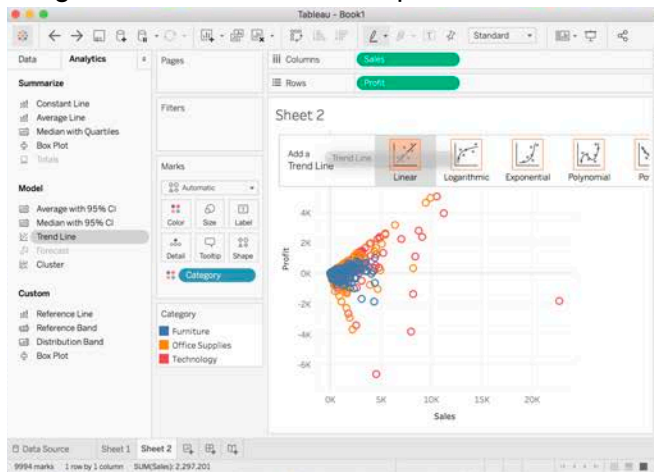
- 5) We can easily spot the outliers. But it is hard to tell any insights. Drag Region to Color. Not much discernable.



- 6) Remove Region from Color. Drag Category to Color. It looks like Furniture sales doesn't profit very much.

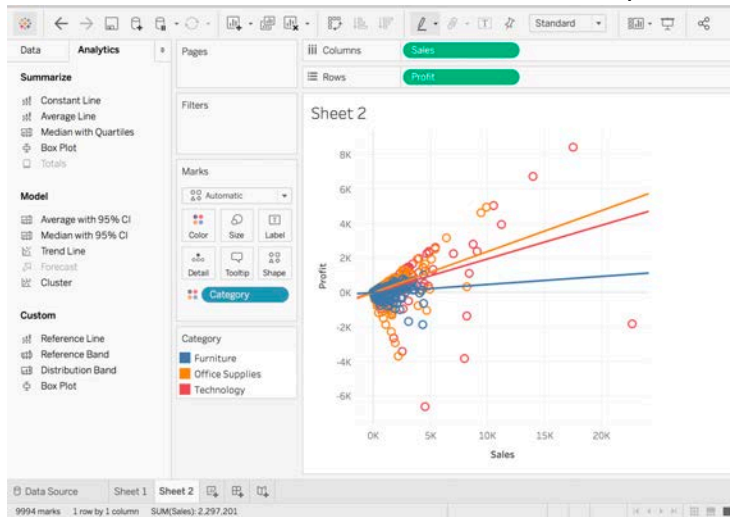


- 7) Trend lines are used to predict the continuation of a certain trend. Click on Analytics tab next to Data tab.  
8) Drag Trend Line label and drop it on to Linear model.





9) The blue trend line for Furniture does show low profitability for furniture sales.



## IV. Overview of Calculations

Similarly to formulas in Excel, calculations within Tableau allow you to manipulate your data in any number of ways. Calculated fields are created by defining a formula using Tableau's built-in functions or basic operations. Note that there's a little equal sign in front of the calculated field – this indicates it's a calculated field, not natively from the data source.

### Calculated Fields

If your underlying data doesn't include all of the fields you need to answer your questions, you can create new fields in Tableau using calculations and then save them as part of your data source. These fields are called calculated fields.

There are two types of calculations within Tableau, regular calculations vs table calculations.

**A regular calculation**, such as Sales minus Profit, is passed as part of the query that Tableau asks of a data source and the computation is handled by the data source itself with only the result set being returned to Tableau.

**A table calculation** is a secondary calculation that performed on top of the returned result set. This computation is done within Tableau. An example is as Running Total of Sales. A table calculation is indicated by this delta symbol on the pill.

Table Calculations can either be written like any other calculation, using the Table Calc functions in the calculation editor or **there is a set of pre-defined, commonly used computations called Quick Table Calculations**. These include options like Running Total, Percent of Total, and Year over Year Growth.

## V. Quick Table Calculations

In a given view, the underlying data table (hence “table calculations”) contains the information that makes up the marks. If you’re working with a crosstab, this data is exactly what you see. For any other view, the underlying data is represented differently, but the values are the same as the crosstab. Adding or removing fields changes the view, which in turn alters the Table Calculation.

Quick table calculations are table calculations that you can apply quickly to your visualization in Tableau. The following common calculations are available as quick table calculations in Tableau for you to use:

- Running total
- Difference
- Percent difference
- Percent of total
- Rank
- Percentile
- Moving average
- YTD total
- Compound growth rate
- Year of year growth
- YTD growth

Table Calculations are performed on the returned results of a view. Table calculations are computed locally in Tableau, rather than being handled in the database. **The calculations are based only on the information in the view.**

### Activity 5.1 Calculate Percent of Total for each user group per year.

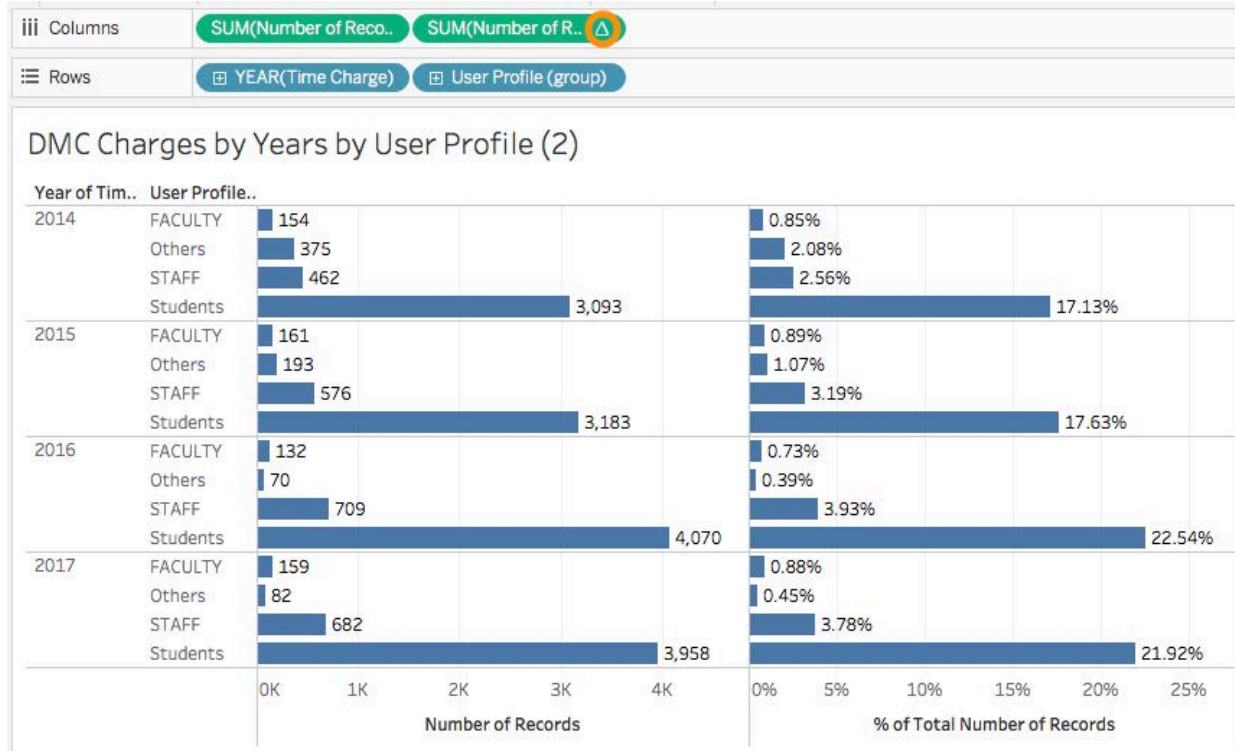
- 1) Connect to DMC-charges-data-sheet-2014-2017 Excel file.
- 2) Build the view
  - a. Place Number of Records on the Columns shelf.
  - b. Drag Time Charge and User Profile to the Rows shelf.

c. Drag Number of Records to the Columns again.

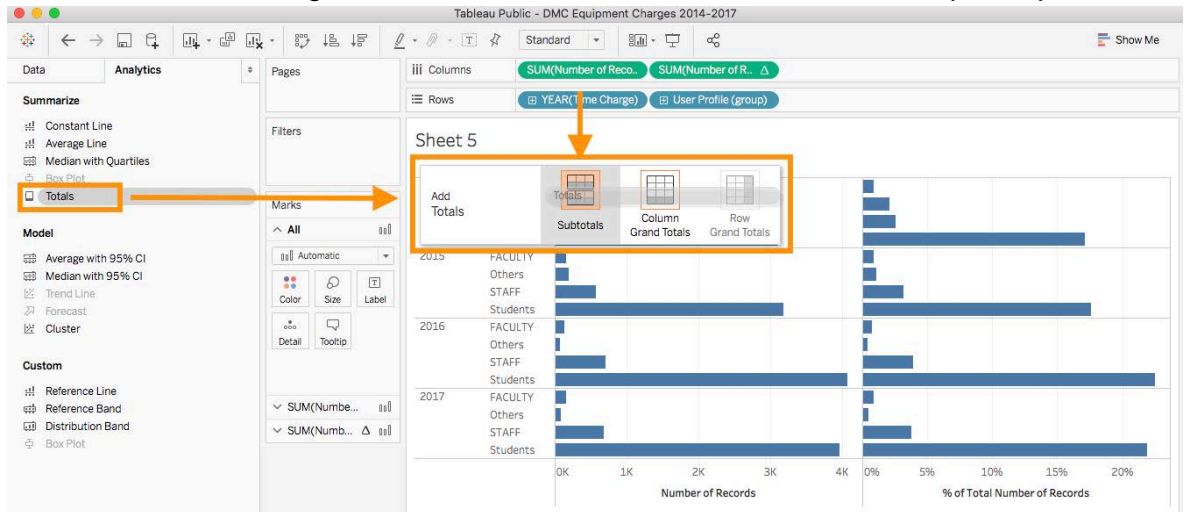


3) Create a Quick Table Calculation

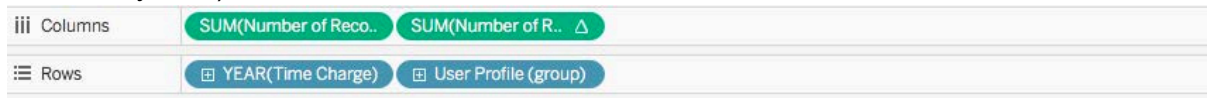
- Right click on the second SUM(Number of Records) field.
- On the drop down menu, choose Quick Table Calculation -> Percent of Total
- Notice the delta symbol on the pill? That indicates it is a table calculation. Do your math and check the results. Do these numbers seem correct?



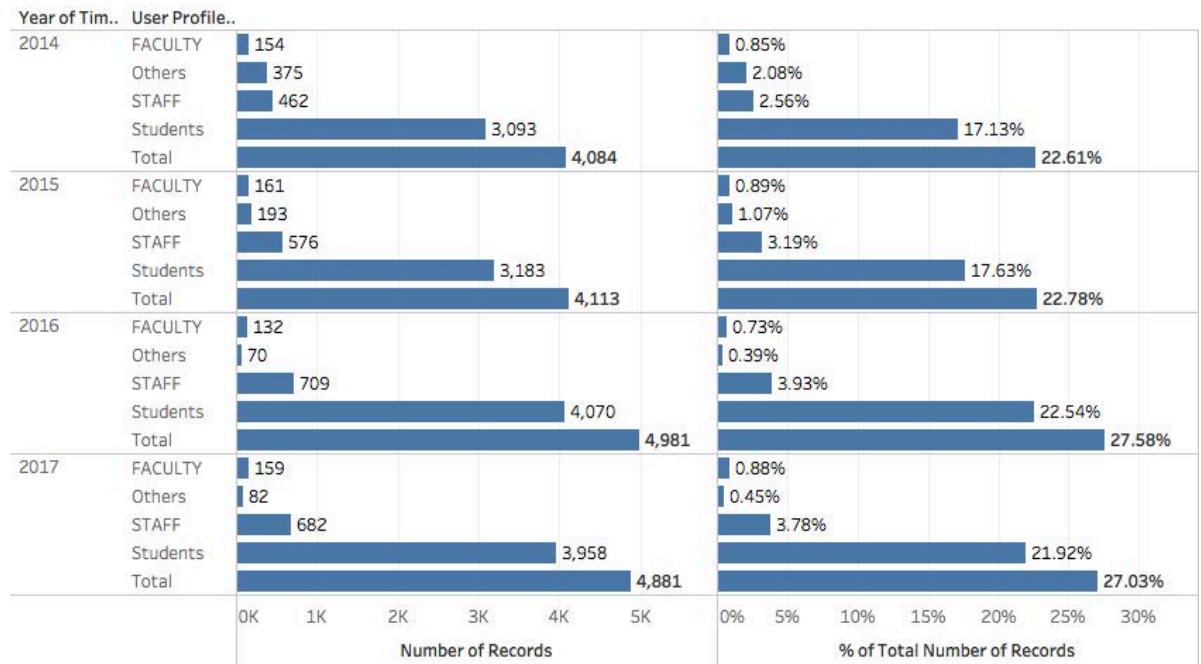
- 4) We see a percentage across year 2014-2017.
- 5) Add Subtotals for each year
  - a. In the data pane, click on the Analytics tab.
  - b. Click on Totals and drag it into the view, select Subtotals when a menu opens up.



- c. The totals for each year are added to the view. But the percentage is still the % of Total Number of Records along Table (Down) (i.e. the total number of records for all the years.)

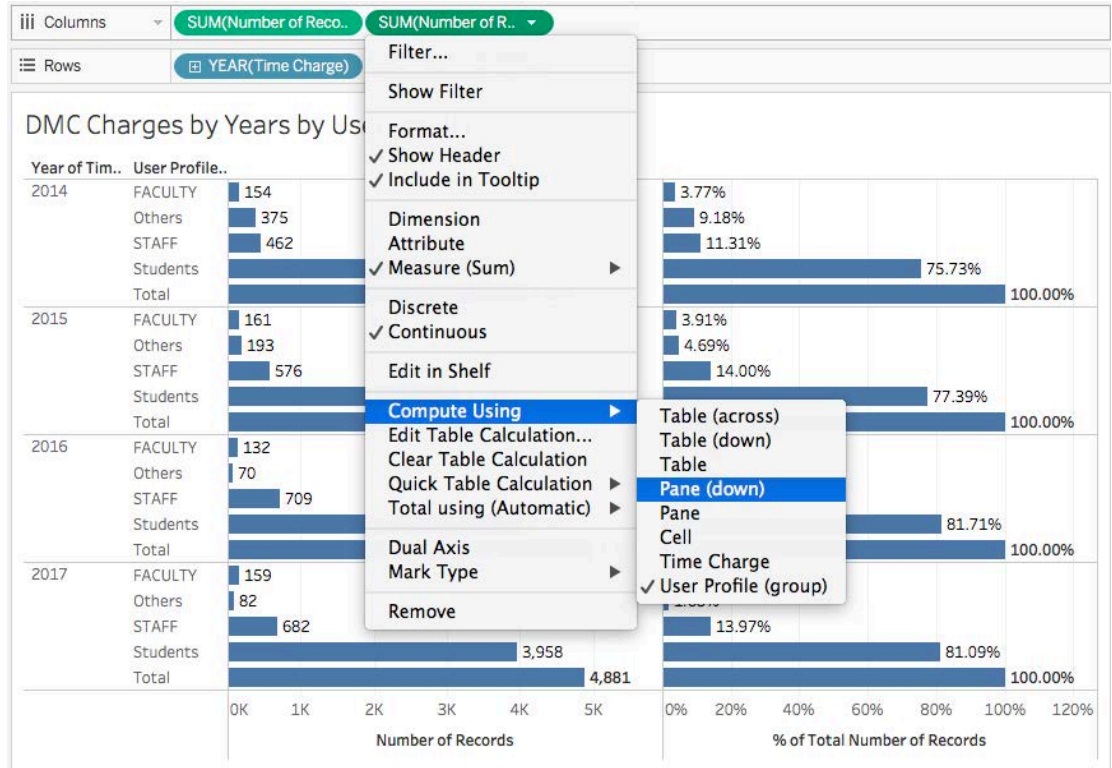


DMC Charges by Years by User Profile (2)

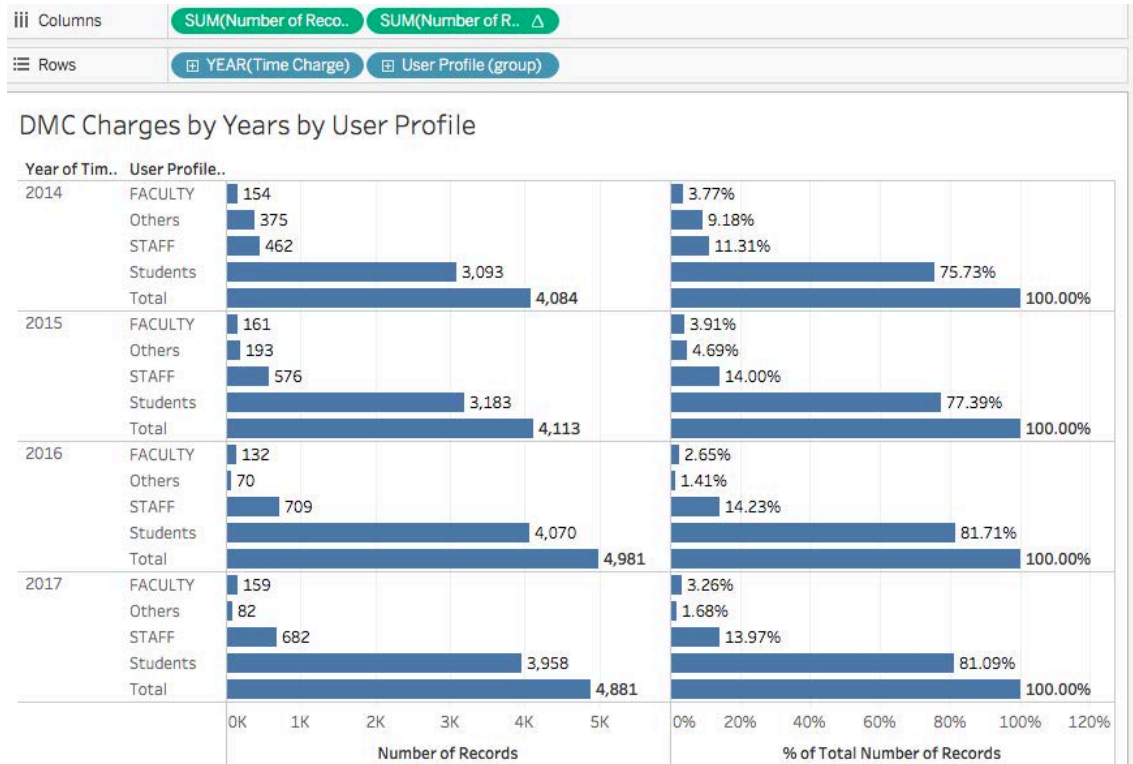


- 6) Change how the table calculation is computing
  - a. Right click on the second field in the Columns shelf

b. From the drop down menu, choose Compute Using -> Pane (down).



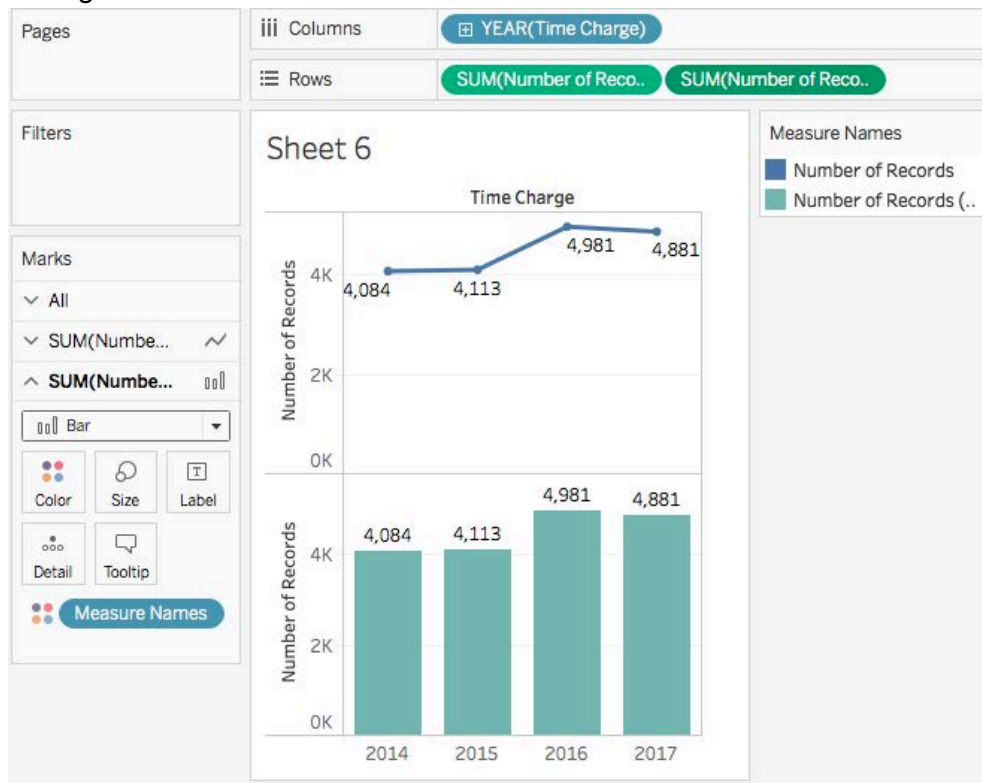
c. The percentage changes to % of Total Number of Records along User Profile(group) per year as shown below.



- d. Tableau has defaulted to have the calculation run along Table (Across), meaning we see Percent of Total across all four years. If we want to see Percent of Total for each group per year, we need to change the scope from Table to Pane, computing the Percent of Total for each Pane, or Year.

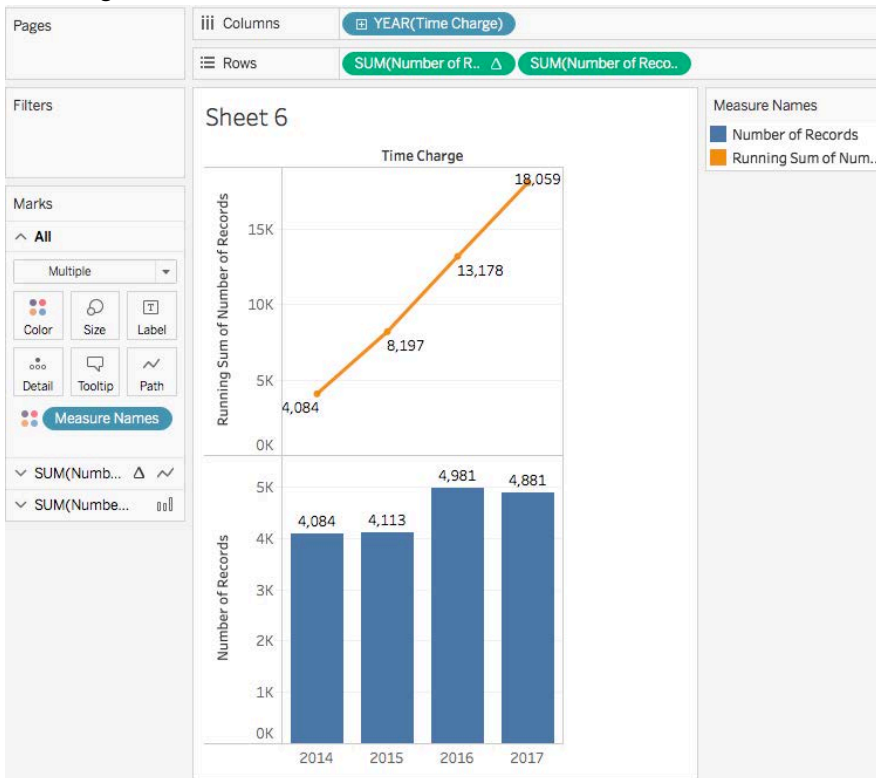
**DIY Activity: Show the DMC equipment charges by year and a running total over years. Create a dual axis chart.**

- 1) Connect to DMC-charges-data-sheet-2014-2017 Excel file.
- 2) Build the view.
  - a. Drag Number of Records to the Rows shelf, the Time Charge to the Columns shelf, Drag Number of Records to the Rows shelf again.
  - b. Change the second Number of Records on the Rows shelf to a bar chart.



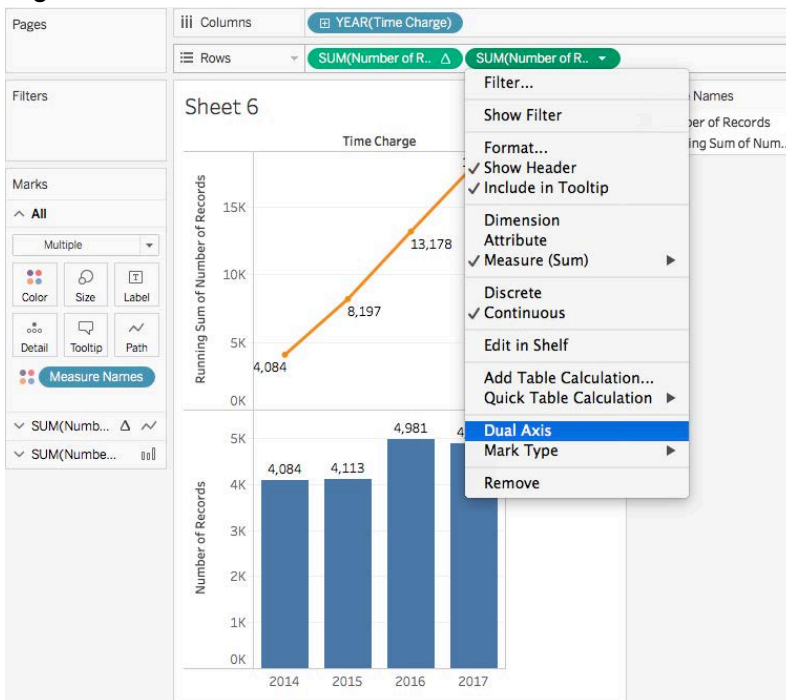
- 3) Create a running total table calculation.  
Right click on the first field on the Rows shelf, choose Quick Table Calculation ->

## Running Total.

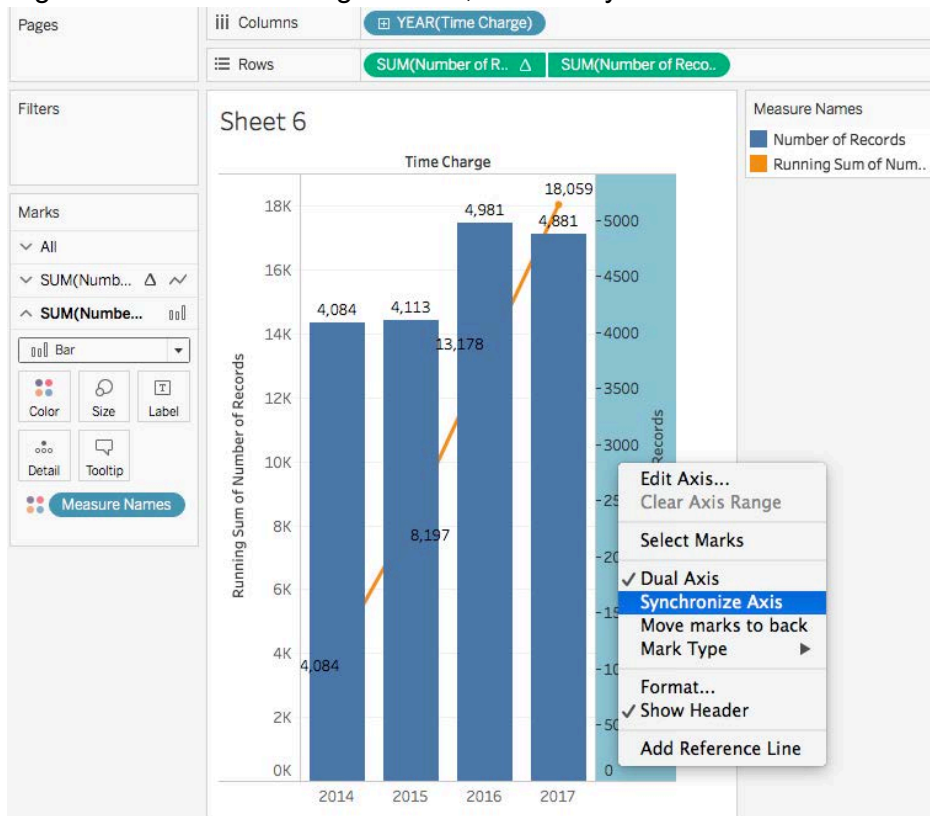


### 4) Create a Dual Axis view.

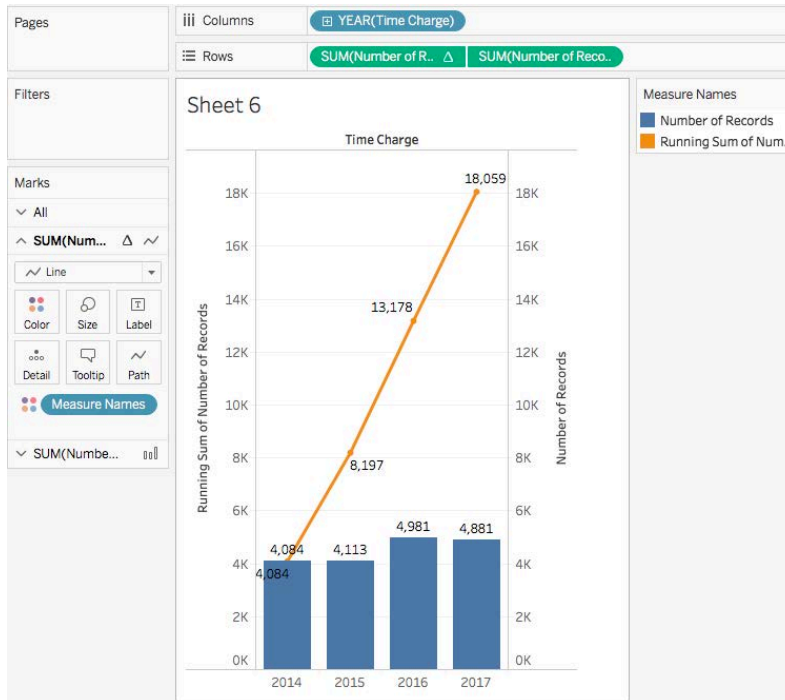
Right click on the second field on the Rows shelf, choose Dual Axis.



a. Right click on the left or right Y axis, choose Synchronize Axis.



b. Turn on the Mark Label. Here is the final view.





## VI. Regular Calculations

There are four basic components to calculations in Tableau:

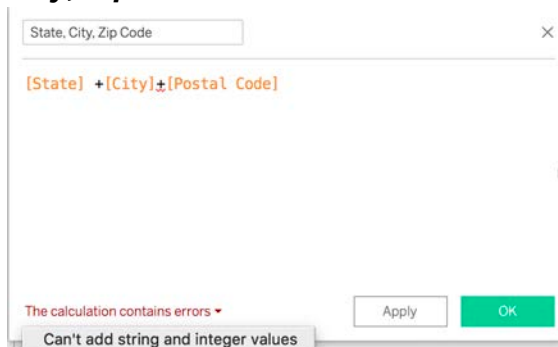
- **Functions** - Statements used to transform the values or members in a field, such as IF, THEN, ELSEIF, ELSE, and END.
- **Fields** - Dimensions or measures (columns) from your data source.
- **Operators** - Symbols that denote an operation, such as > and <=.
- **Literal expressions** - Constant values that are represented “as is”, such as "Profitable" and "Unprofitable".

The right hand side of the calculation editor provides information about the functions. It can be collapsed to save space, or expanded. Functions are colored blue in Tableau calculations, with the exception of logical functions, which are colored black. Field names are colored orange in the formula.

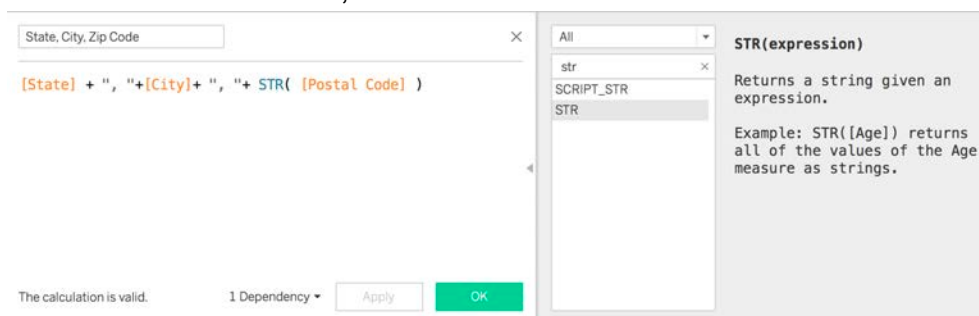
Functions in Tableau fall into one of several main categories: Number, String, Date, Logical, Type, etc. See [Functions in Tableau](#) for more.

**Activity 6.1 Working with String Calculations. Use (+) operator to combine two string fields, use “ ” if a space is needed (“abc” + “ ” + “efg”).**

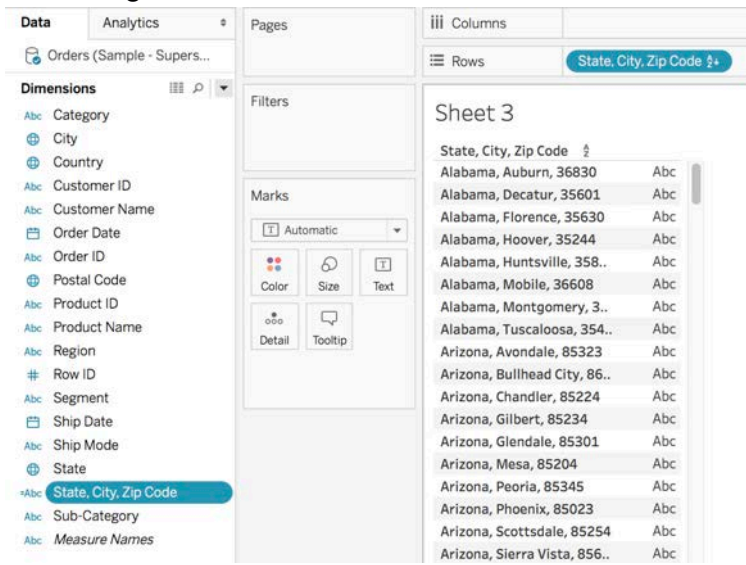
- 1) Connect to Sample\_Superstore Excel file. Drag Orders to canvas.
- 2) We wanted to create a calculated field of State + City + Postal Code
- 3) Right-click in the data pane and select create Calculated Field. Name it **State, City, Zip Code**.



- 4) Since Postal Code is integer, we have to convert it to string. Now the calculation is valid. Let's also add “,” in between the fields.

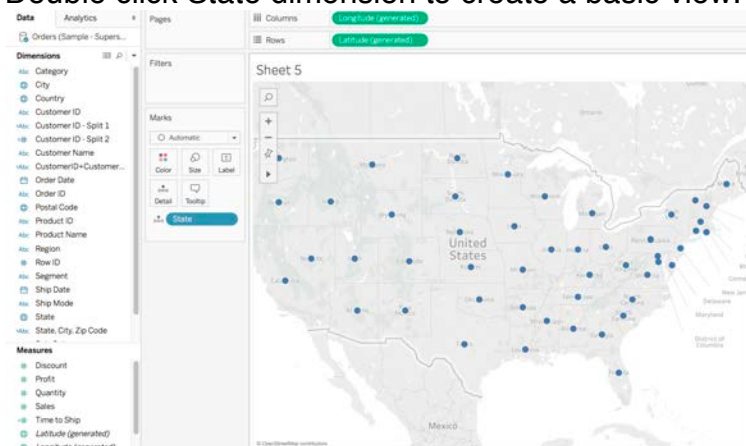


5) Now drag the calculated field to Rows. This is what it looks like.

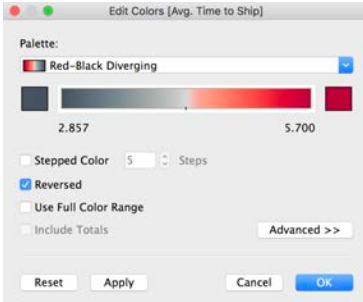


**Activity 6.2 Working with Date calculations – DATEDIFF(date\_part, start\_date, end\_date), Returns the difference between start\_date and end\_date expressed in units of date part. Use it to find out how long something took.**

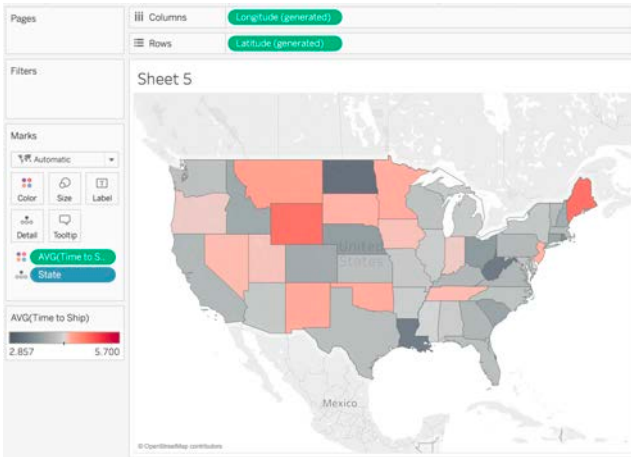
- 1) Connect to Sample\_Superstore Excel file. Drag Orders table to Canvas.
- 2) We want to know the average time it takes for an order to ship for each state.
- 3) Right click in the data pane and select Create Calculated Field. Name it “Time to Ship”.
- 4) In the Calculation editor, type in DATEDIFF('day',[Order Date],[Ship Date]), click OK.
- 5) Double click State dimension to create a basic view.



- 6) Let's color our countries by using Time to Ship by dragging Time to Ship to the Color mark. Right click over SUM(Time to Ship), change the aggregation to Average.
- 7) Click on the Color mark, change the color to a red-black diverging palette and we'll reverse it because more time is bad.



- 8) Now we can quickly see the states of the longest shipping times and we can focus on those areas.



**DIY Activity: Create a view that shows the top 10 customer names by sum of sales. Make sure the customer name include text that says "Customer #", followed by the number part of the filed Customer ID and Customer Name. e.g. "Customer #10015 - Aaron Bergman".**

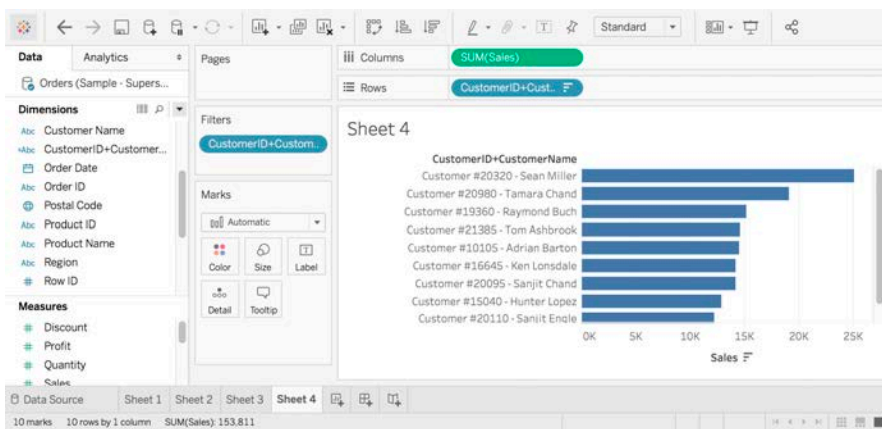
- 1) Connect to Sample\_Superstore Excel file.
- 2) Use SPLIT(string, delimiter, token number) to get the number part of CustomerID. For instance, SPLIT('Jane Johnson', ',', 2) = 'Johnson'.
- 3) Combine string text, a calculated numerical field, and a string field.
- 4) Use STR() to convert a numerical field to a string.



## 5) Apply a filter



## 6) Here is the final look



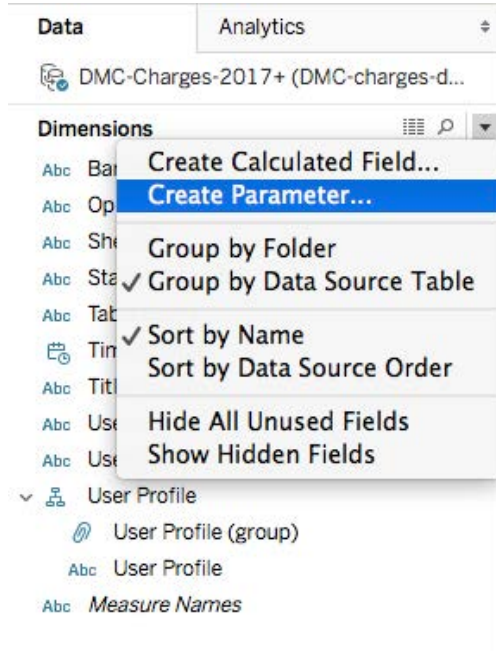
## VII. Parameters

Parameters are dynamic values that can replace constant values in calculations, filters, and reference lines. Parameters allow you to give your users control over the visualization.

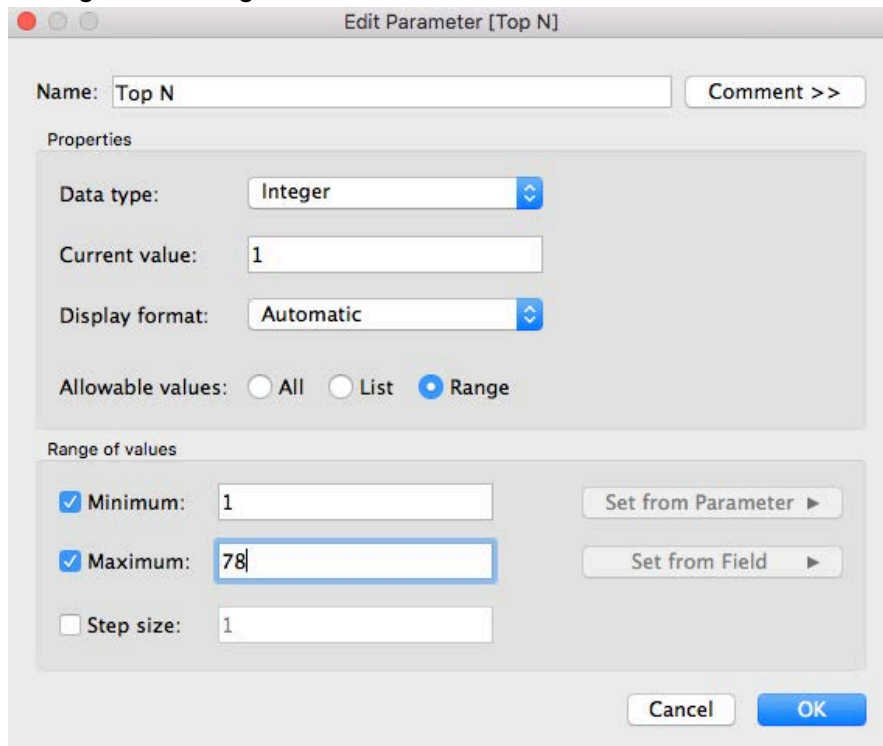
### Activity 7.1 Create a parameter to show Top N most checked out items.

- 1) Connect to **DMC-charges-data-sheet-2014-2017** Excel file.
- 2) Create a parameter named **Top N**.

- a. Click on the drop down menu on Data pane. Choose create Parameter...



- b. Change the settings as below.

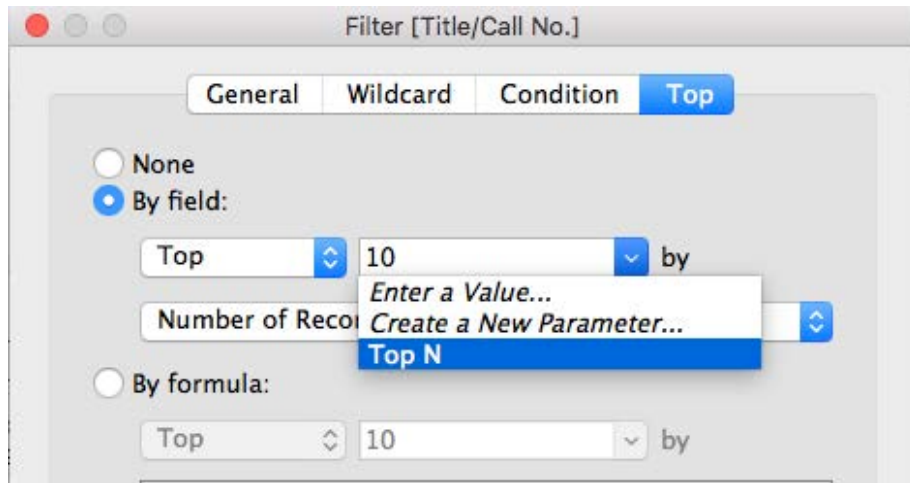


- c. Right click on the *Top N* parameter, choose *Show Parameter Control*.

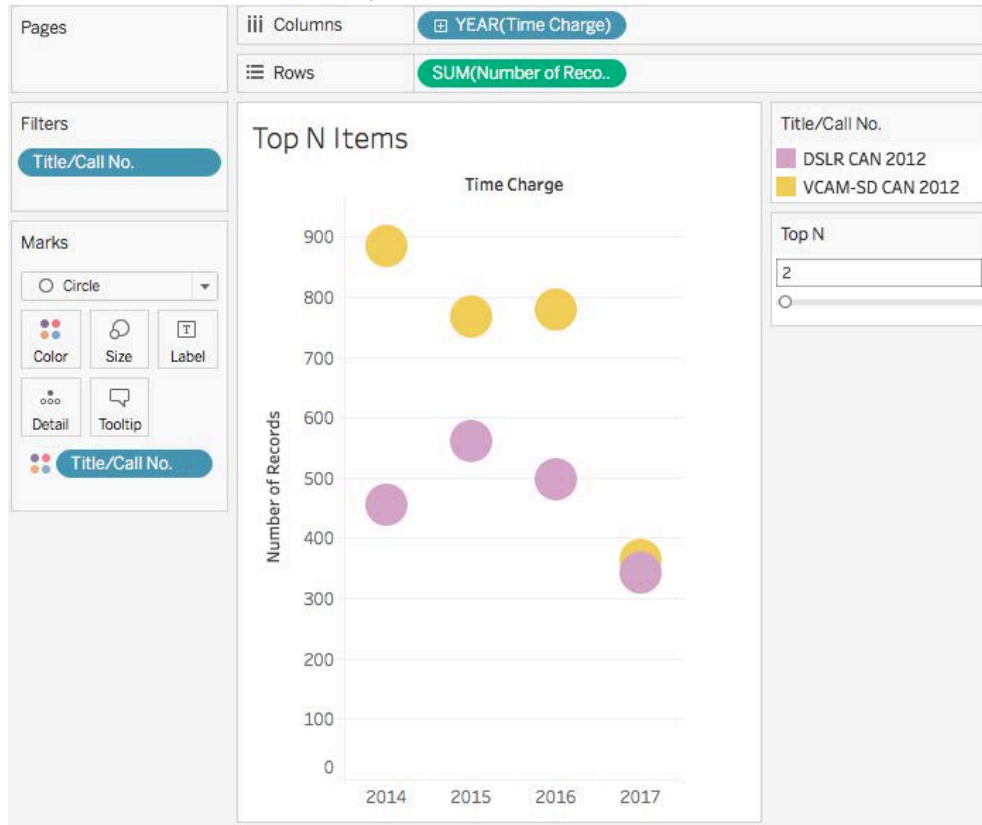
3) Create a new worksheet and build a view.

- a. Drag Number of Records to Columns shelf, Time Charge to Rows shelf, Title/Call No. to Color mark, change the chart type to a circle chart.

- b. Drag Title/Call No. to Filters shelf. Choose Top -> By field -> Top -> Top N. click OK.



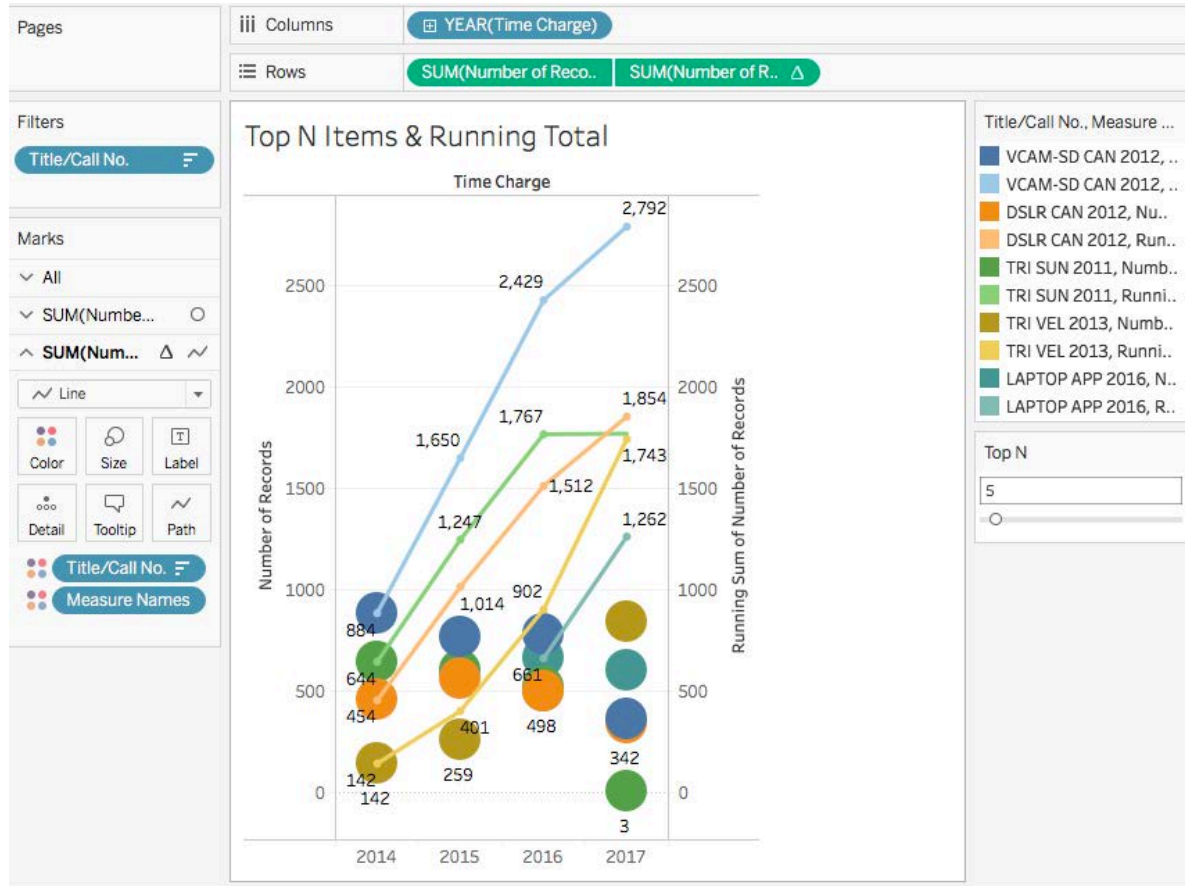
- c. The view will look something like below.



**DIY Activity: Show Top N most checked out items and a running total on the same view.**

- 1) Duplicate the worksheet created in the previous activity.
- 2) Drag Number of Records to the Rows shelf again.
- 3) Create a running total table calculation.  
Right click on the first field on the Rows shelf, choose Quick Table Calculation -> Running Total.

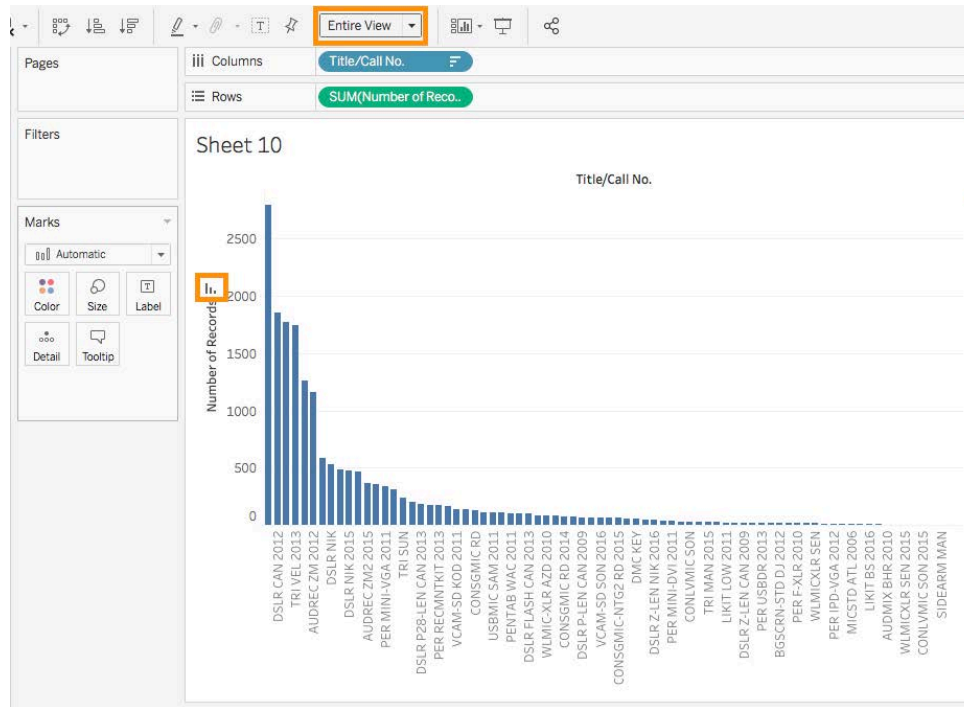
- 4) Create a Dual Axis view.  
Right click on the second field on the Rows shelf, choose Dual Axis.
- 5) Right click on the left or right Y axis, choose Synchronize Axis.
- 6) The final view look like below.



**DIY Activity: Create a view to show the number of charges for each device, sort the view in descending order. Use a parameter and a calculated field to split the view into two color groups. One group is more than the reference number, while the other group is less than the reference number.**

- 1) Build the view
  - a. Drag Number of Records to Rows, Title/Call No. to Columns
  - b. Sort by descending order

c. Click on Entire View to see the whole view.



2) Create a parameter

- a. From the data pane, click on the drop-down menu, choose Create Parameter...
- b. Name it Pick a Number and set it as below.

The image shows the 'Edit Parameter [# of checkouts]' dialog box. The 'Name' field contains 'Pick a Number'. The 'Data type' is set to 'Integer'. The 'Current value' is '10'. The 'Display format' is 'Automatic'. Under 'Allowable values', the 'Range' radio button is selected. In the 'Range of values' section, the 'Minimum' is set to 1 and the 'Maximum' is set to 2,000. The 'Step size' is set to 1. There are 'Set from Parameter' and 'Set from Field' buttons next to the range fields. 'Cancel' and 'OK' buttons are at the bottom.

c. Right click over the parameter *Pick a Number*, choose *Show Parameter Control*

3) Create a Calculated Field

- a. From the data pane, click on the drop-down menu, choose Create Calculated Field...

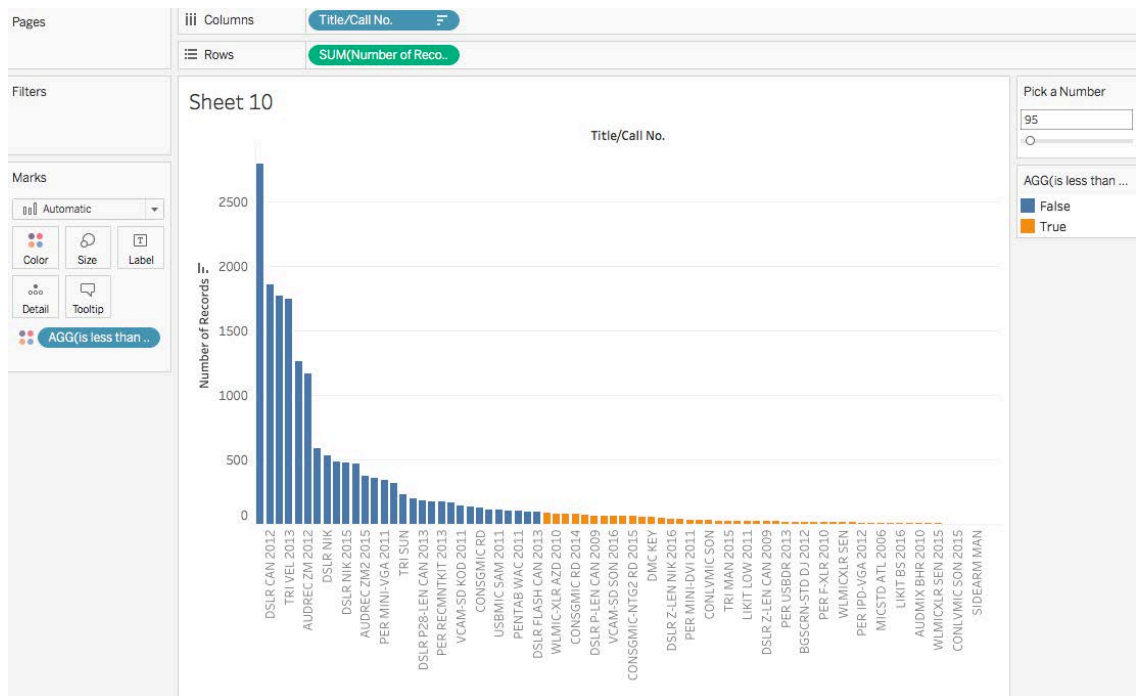


- b. Name it *is less than Pick a Number* and set it as below. This is a logical calculation that returns true if the condition meets, false otherwise.



4) Split the view

- a. Drag *is less than Pick a Number* from **Measures** to **Color** mark.
- b. Slide the *Pick a Number* slider to test it out.



## VIII. Adding Analytics objects to the view

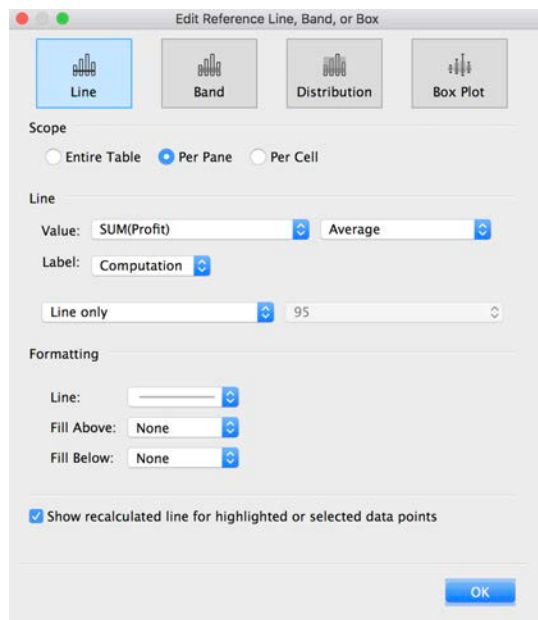
In Tableau Desktop, options for adding Analytics objects to the view are available in the **Analytics** pane or menu, or in context in the view.

To add an item from the **Analytics** pane, drag it into the view. When you drag an item from the **Analytics** pane, Tableau shows the possible destinations for that item. The range of choices varies depending on the type of item and the current view.

Reference lines do exactly what it sounds like they'd do – they add a point of reference to a view.

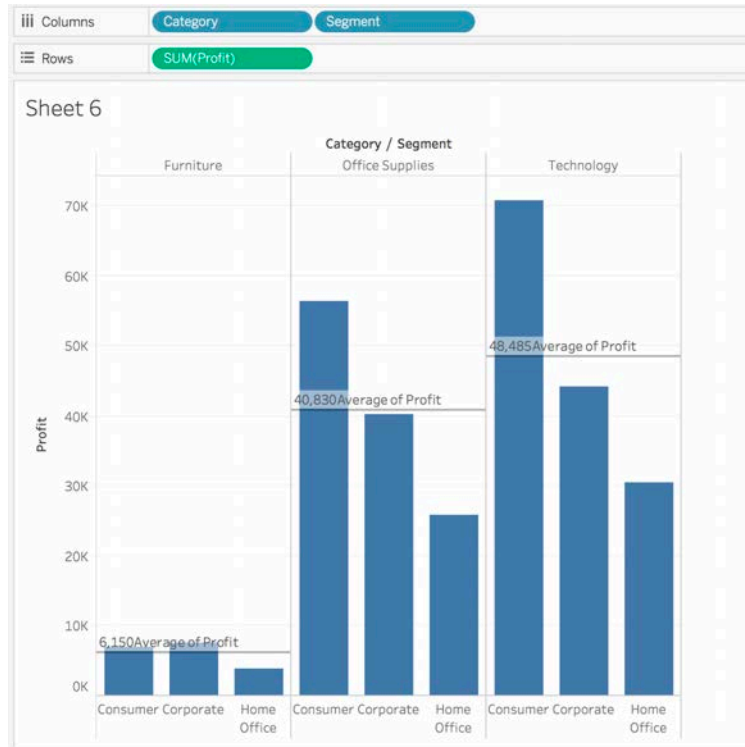
### Activity 8.1 Reference line options

- 1) Connect to Sample\_Superstore Excel file.
- 2) Create a basic view by adding Profit to Rows, Category and Segment to Columns.
- 3) Click Analytics pane, choose Custom-> Reference Line, drop to scope Table, click OK. We will see a reference line has been added across the bar chart.
- 4) Right click over the line, choose Remove.
- 5) Let's redo it and use Pane this time.



- 6) Scope. Scope is set to per pane, but can also be across the entire table or per cell. If we click Entire Table, we can see that the average line switched from three different lines, per Category, to a single average across the entire table.
- 7) Line. We'll make this a Average Profit line.
  - a. Value lets us select which measure we want the line to be in reference to. Here, we only have Profit in the view.
  - b. The default aggregation for the line is average, but we can change that.
  - c. Next is Label. Here we can set what shows as the label on the line.
    - i. None is fairly self-explanatory.

- ii. Value displays whatever the value aggregation of the measure is, so the actual numerical average of profit.
- iii. Computation displays what the aggregation of the measure represents, so here it would be the words "Average".
- iv. Custom gives us the option to type in whatever we want, and the arrow to the side offers fields that can be inserted. We'll use <Value>: <Computation> of <Field Name>.

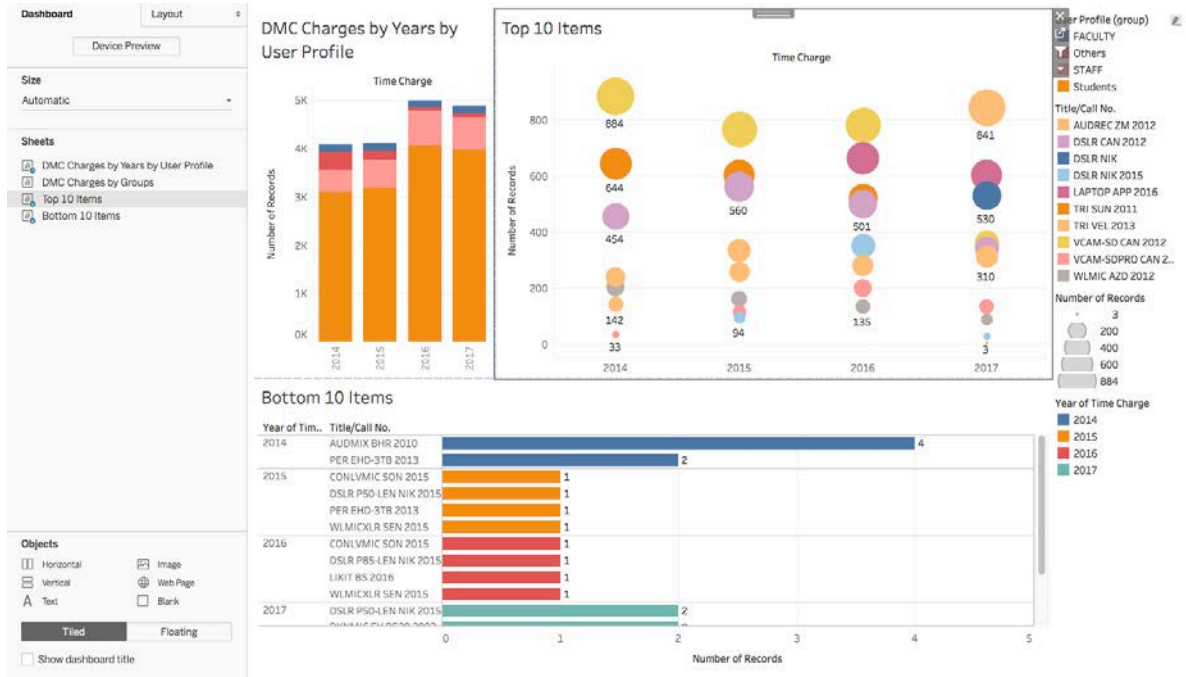


## IX. URL actions on Dashboard

Activity 9.1 Create a link to the DMC equipment listing page.

- 1) Connect to DMC-charges-data-sheet-2014-2017 Excel file.

2) Create a Dashboard shown as below.



- 3) Go to Dashboard -> Actions...
- 4) Click on Add Action -> URL...
- 5) Change the settings to as it is shown below.

**Edit URL Action**

Name:

Source Sheets:

Dashboard 1

Run action on:

- Bottom 10 Items
- DMC Charges by Years by User Profile
- Top 10 Items

Actions:

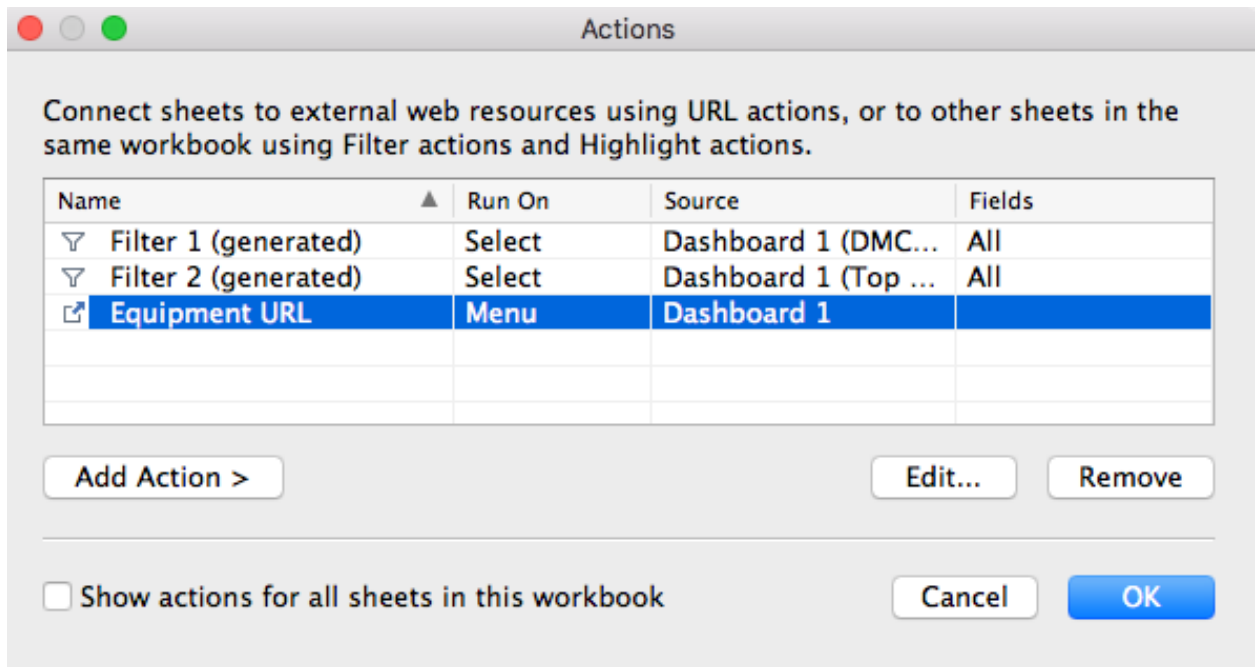
URL:

Test Link:  <http://library.rice.edu/equipment-checkout>

URL Options:

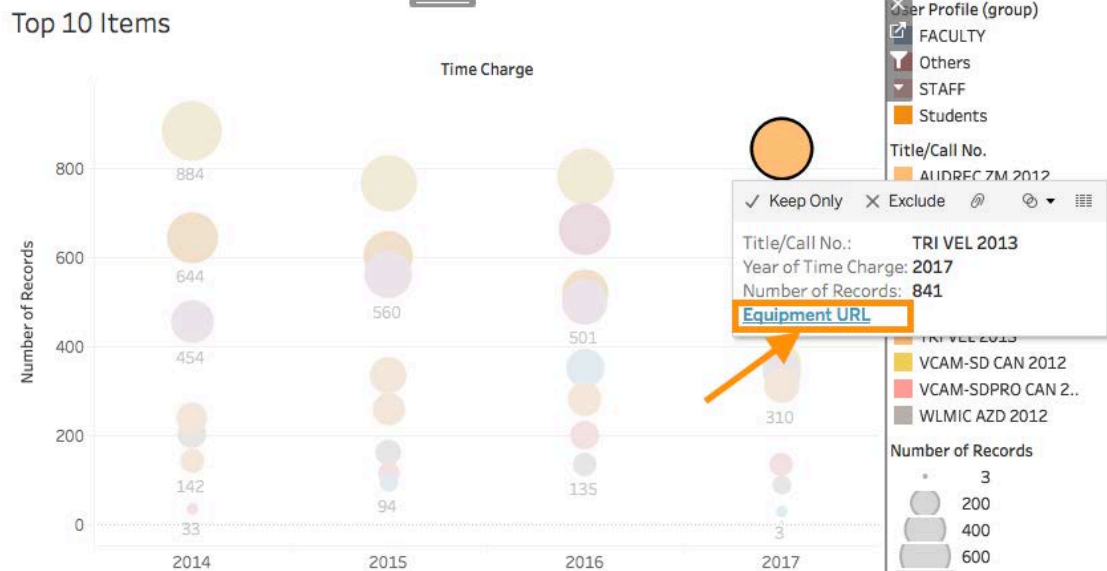
- URL Encode Data Values
- Allow Multiple Values
- Item Delimiter:
- Delimiter Escape:

6) Click OK.



7) Test out the URL action

- a. Select a mark on the Top 10 Items sheet or Bottom 10 Items sheet.
- b. Click on Equipment URL at the bottom of the tooltip.
- c. The equipment listing page will open up in a new browser window.



## Resources

- 1) Tableau online help  
<https://www.tableau.com/support/help>
- 2) Tableau free training videos  
<https://www.tableau.com/learn/training>