Visual Analysis

With Tableau Server

AblazeGroup.com

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Tableau Components

Tableau is available in a variety of offerings--some computer-based, and some web-based.

- **Tableau Desktop** is available for both Windows and Mac computers and provides all available design and analytical capabilities. You must install and maintain Tableau Desktop individually on each computer it runs on.
- **Tableau Reader** is a read-only version of Tableau Desktop. It is available for both Windows and Mac computers. It only reads Tableau Packaged Workbooks (.TWBX files) with embedded data sources and cannot connect to external data sources. You must install and maintain Tableau Reader individually on each computer it runs on.
- **Tableau Server** is web-based and runs on a server within your own network, or a virtual server, such as Amazon Web Services or Microsoft Azure, that's accessible from the Internet. Tableau Server can connect to all data sources that Tableau Desktop can, as well as Tableau Data Extracts that are published and maintained on the server.
- **Tableau Online** is a web-based hosted version of Tableau Server, which is available on the Internet. Because it is hosted outside your network, it is limited in the data sources within your network it will connect to. It is also not able to integrate with internal authentication systems, such as Windows Active Directory.
- **Tableau Public** is a web-based hosted version of Tableau Server offered free of charge on the Internet. You may only publish Tableau Packaged Workbooks (.TWBX files) with embedded data sources, as Tableau Public cannot connect to external data sources. There is no security or authentication available; all workbooks are fully viewable to everyone on the Internet.

Tableau Server vs. Tableau Desktop

Initially, Tableau Desktop was designed specifically for *designing* real-time visual analytics. And, Tableau Server was designed specifically to serve *already-designed* visual analytics to web browsers. If you wanted to analyze data in real time, you simply had to have Tableau Desktop. As versions have advanced this distinction has blurred.

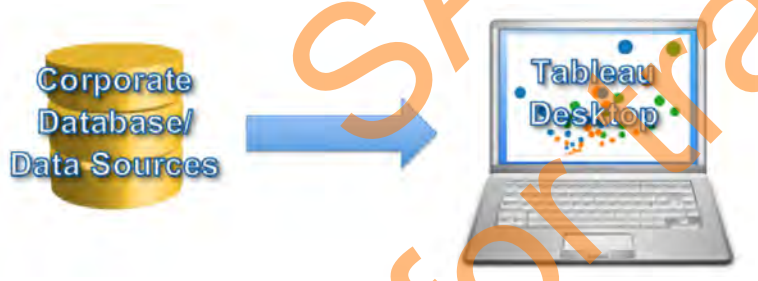
- Tableau Desktop creates all types of charts with every possible Tableau feature.
- Tableau Desktop is required to publish data sources to Tableau Server.

- Tableau Server web design creates most of the same types of charts as Tableau Desktop. There are some limitations to Tableau Desktop features.
- Tableau Server web design can modify most types of existing charts, but cannot modify dashboards or stories.
- With Tableau Server web design, some Tableau features (parameters, customized quick filters, and so forth) can be retained if already in a worksheet, but cannot be added to new worksheets.
- Tableau Server web design can create new worksheets, but cannot create dashboards or stories (these Tableau components will be defined later in this course).

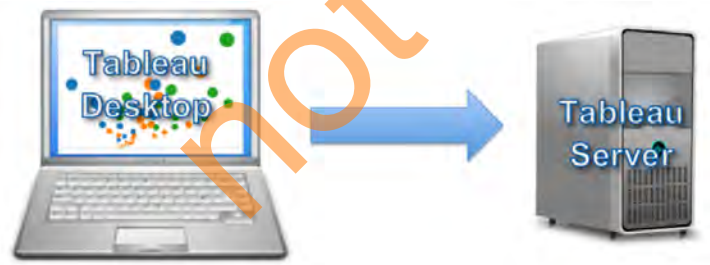
Note: Tableau Desktop is still required to perform every possible design and data source function.

Tableau Server Usage Flows

There are two general usage flows that organizations follow when designing and sharing workbooks using Tableau Server. The more traditional usage connects end users to Tableau Server at the end of the process:



1. Tableau Desktop connects to standard database/data source. Data is visualized (if an organization does *not have* Tableau Server, this is the only option available).



2. Finished visualization is published to Tableau Server.

3. Web client or tablet connects to Tableau Server to view and interact with already-designed visualization.

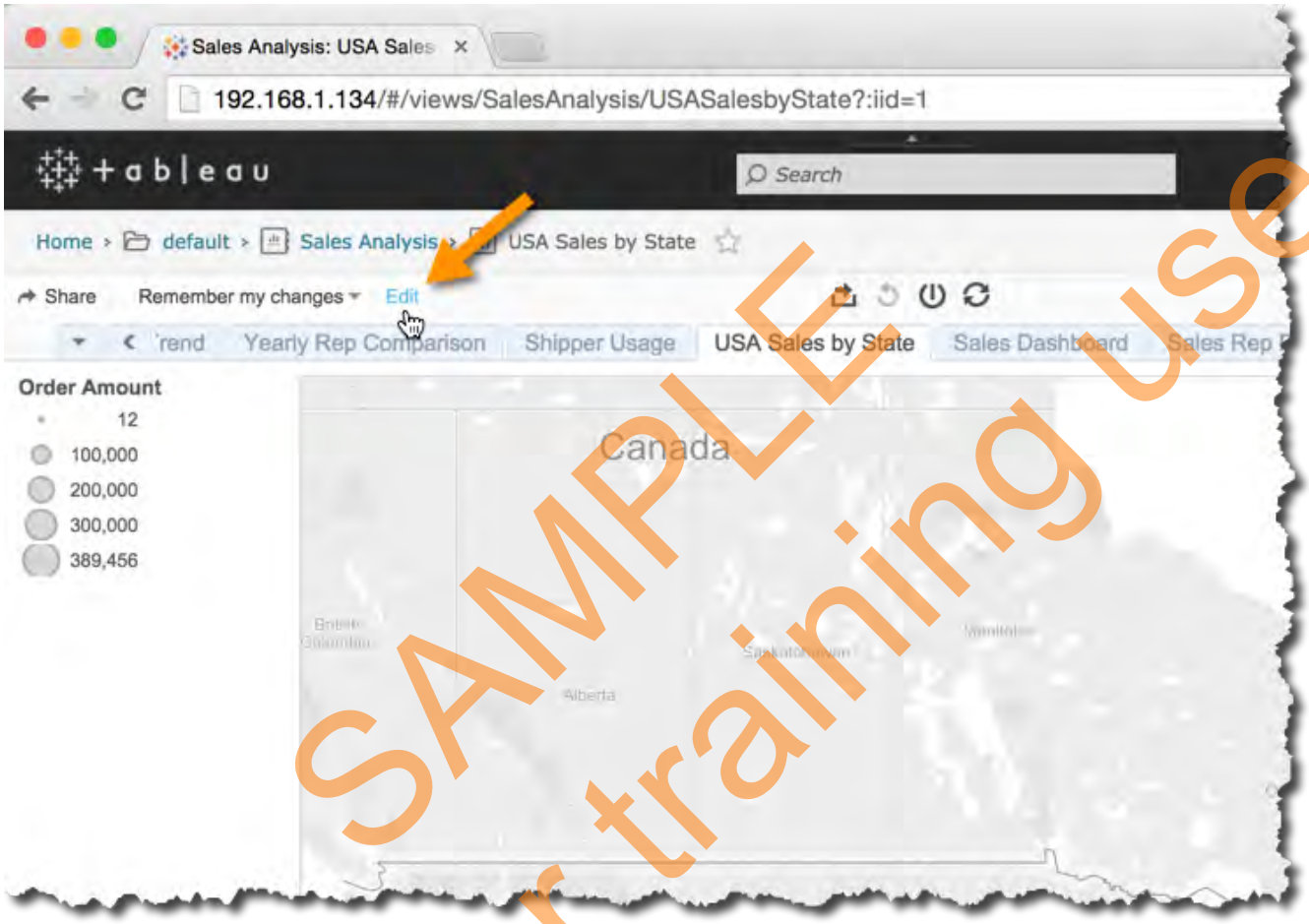
However, as more capabilities have been added to subsequent versions of Tableau Server, it provides more and more capabilities for direct data visualization from a web browser or tablet. A newer alternative workflow places Tableau Server at the center of the visualization process:

1. A connection to a standard database/data source is placed directly on Tableau Server (as a real-time live connection, or a stored "data extract").

2. Tableau Desktop, *or* a web browser/tablet client, connect to Tableau Server as the data source. Visualizations are designed, saved, and shared all via Tableau Server.

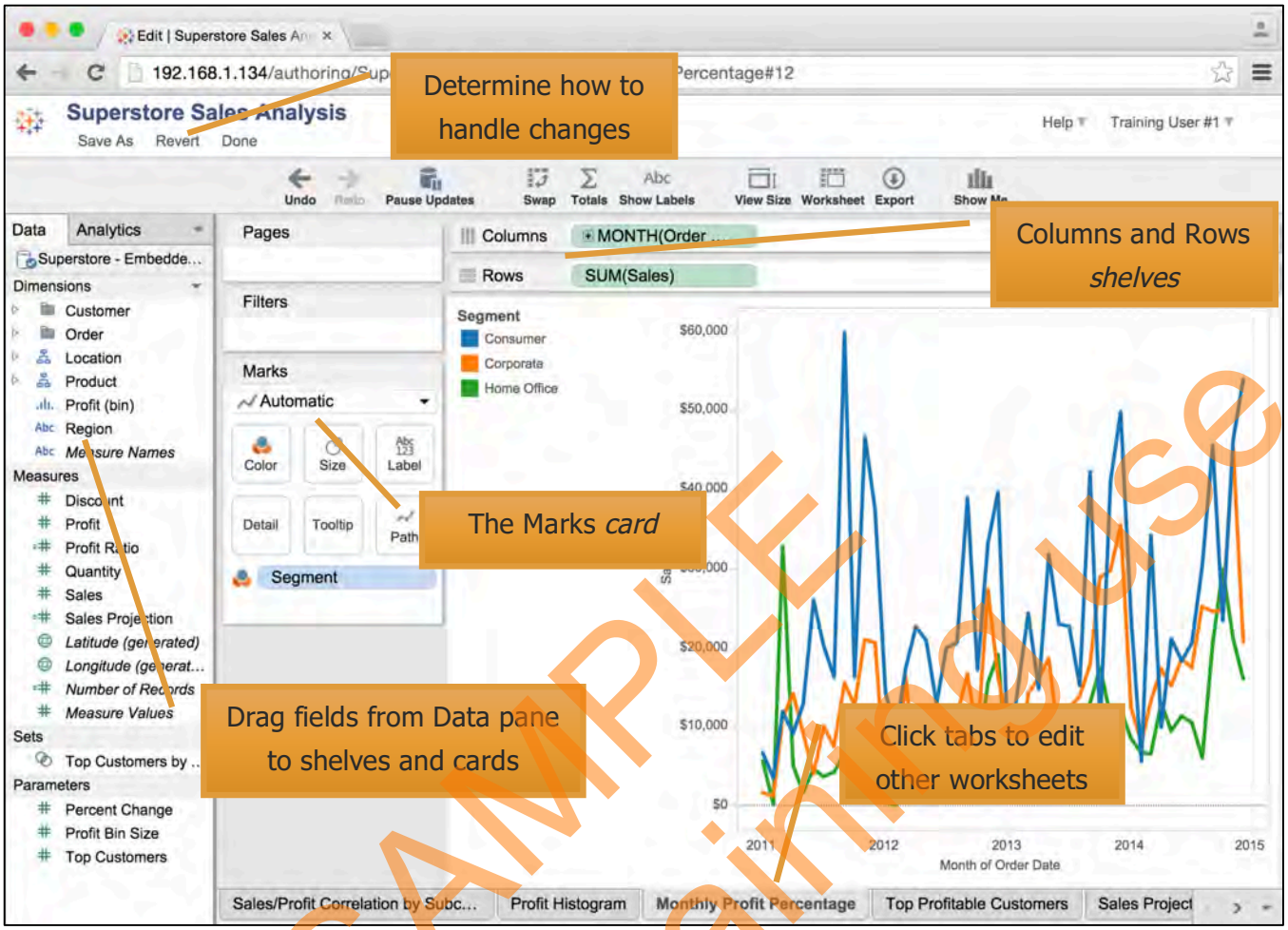
The remainder of this course focuses *entirely* on step 2 of this newer process. Specifically, the course covers visualization design with a browser connected to an already-existing data source on Tableau Server.

Modifying Existing Content



Look for the small Edit link at the top of the current chart or dashboard. The link is surprisingly small, considering all the power behind it.

- If the link isn't visible, check with your Tableau Server administrator to make sure you've been granted the Web Edit right on the workbook.
- Stories won't exhibit the link -- stories can only be edited in Tableau Desktop.
- If you click Edit when displaying a dashboard, the first worksheet within the dashboard will appear. You may then select other worksheets within the dashboard from workbook tabs at the bottom of the screen. The dashboard itself, however, can only be edited in Tableau Desktop.



- Drag fields from the Data pane to rows, shelves, and cards. Drag on top of an existing field to replace it. Drag in front of, or behind, an existing field to add the new field to chart in addition to the existing field.
- Hover over a field on a shelf or card and click the small drop-down arrow for options.
- Right-click on fields, or parts of chart, for options.
- Click tabs at bottom to edit other worksheets in the workbook. If there isn't room to show all tabs, click the arrows to left or right of tabs to navigate. Click the New tab  to create a new worksheet.

Explore - Editing Existing Content

1. Navigate to the existing *Superstore Sales Analysis* workbook in the *Ablaze Training* project.
2. Edit the *Top Profitable Customers* worksheet.
    a. Replace Profit on the Rows shelf with Sales.
    b. Hover your mouse near the word Sales in the bottom axis and sort sales in high-to-low order.
    c. Drag Quantity onto the Columns shelf after Sales to create one row with bars for Sales, and another row with bars for Quantity.
    d. Expand the Order folder in the Dimension portion of the Data pane and drag Order Date onto Color on the Marks card. This will create stacked bar charts with one color per year.
    e. Click Done in the top toolbar, but don't save a copy of the updated workbook.
    f. Edit the same worksheet again and notice that your changes were retained. Click Revert to return to the original chart from the workbook. Click Done.
3. Edit the *Sales/Profit Correlation by Subcategory* chart.
    a. Replace Sub-Category with Manufacturer on the Color portion of the Marks card. Notice the results.
    b. Drag Sub-Category off the Filters shelf. Drag Order Date onto the Filters shelf. Pick various date ranges with the slider.
    c. In the Marks card, choose Shape instead of Circle as the mark type.
    d. Click Shape on the Marks card and try various shapes for best visibility.
    e. Click Done and don't save changes.
4. Edit the Superstore Sales Dashboard. Notice that only one worksheet within the dashboard appears when you edit.
    a. If it doesn't appear by default, select the *Sales/State Geography* sheet.

b. Right-click on the sheet tab and choose *Duplicate Worksheet*.

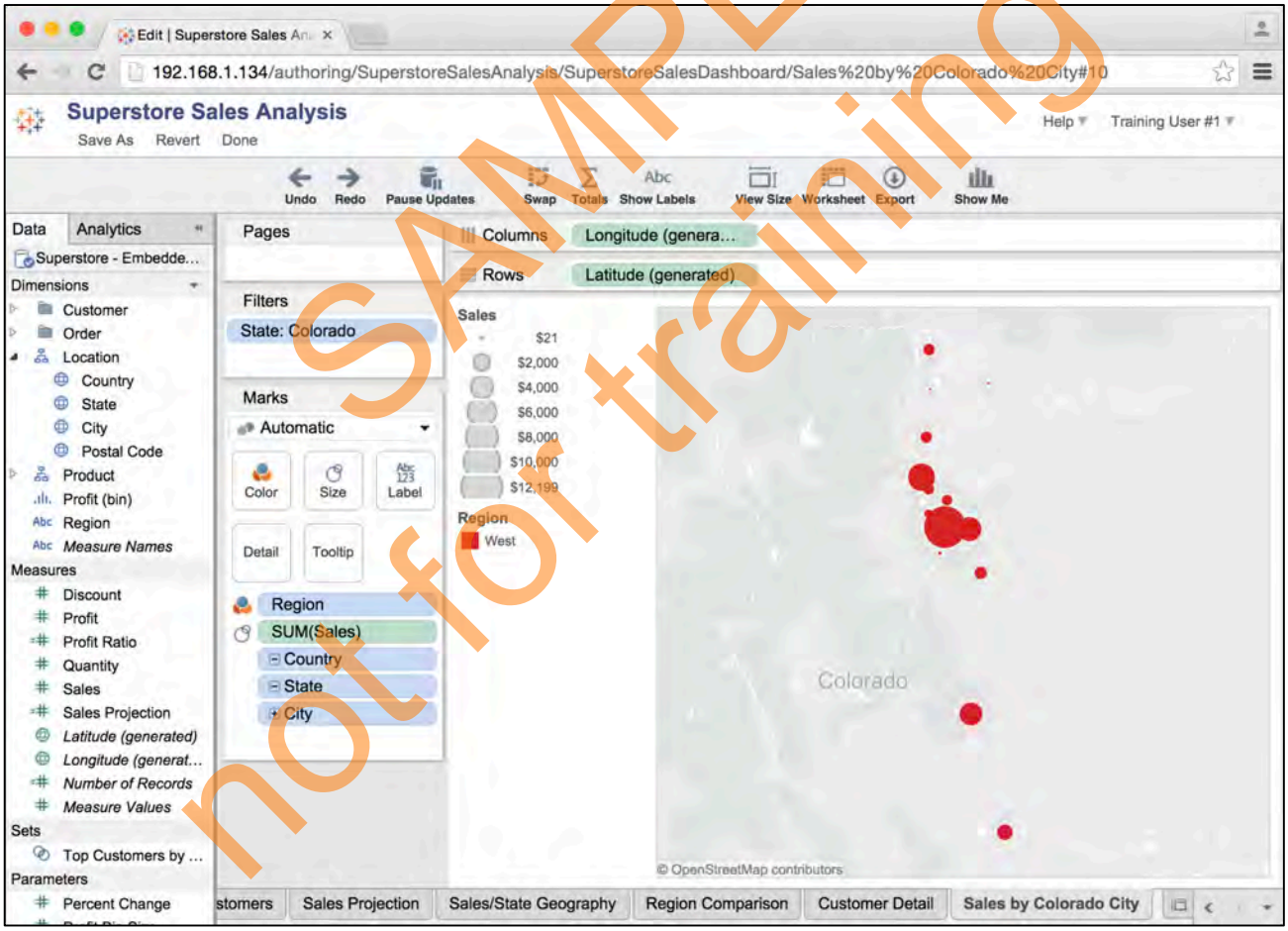
c. Double-click on the new tab and name the sheet *Sales by Colorado City*.

d. On the bottom of the Marks card, click the + sign on State to expand to the next level of the Location hierarchy, City.

e. In the Dimensions box of the Data pane, expand the Location hierarchy and drag State onto the Filters shelf. When the list of states appears on the right side of the chart, select Colorado.

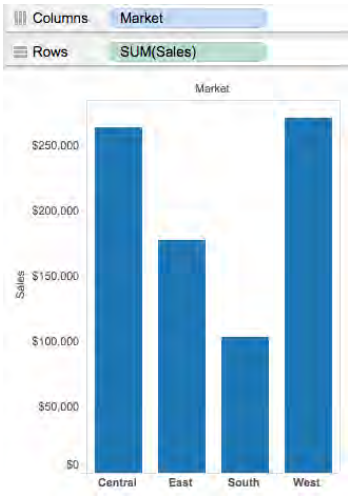
f. Hover over State on the Filters shelf and click the drop-down arrow. Uncheck *Show Filter* from the context menu.

g. Click Save As. Name the new workbook *Copy of Superstore Sales - <your user ID>*. Save in the Ablaze Training project. Click Done.

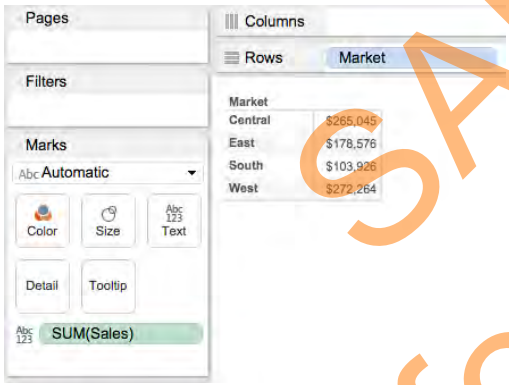


Basic Visual Analysis

There are numerous ways to begin quick visual analysis in Tableau. The most basic is simply double-clicking on a desired dimension or measure from the Data pane. The order in which you double-click determines the end result.



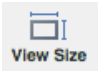
Double-clicking a measure first, then a dimension, creates a vertical bar chart. The measure is placed on the Rows shelf and the dimension is placed on the Columns shelf. The same result may be achieved by dragging a measure to Rows and a dimension to Columns.



Double-clicking a dimension first, then a measure, creates a cross tab (similar to a spreadsheet). The dimension is placed on the Rows shelf and the measure is placed on the Text portion of the Marks card. The same result may be achieved by dragging a dimension to Rows and a measure to Text on the Marks card.

Undo/Redo Back up or move forward one step. DO NOT click the back or forward buttons in your browser. Use Undo and Redo in the toolbar instead!

Swap Swaps contents of the Rows and Columns shelves. For example, if the current chart is a vertical bar chart with a dimension on Columns and a measure on Rows, Swap will result in a horizontal bar chart with the measure on Columns and dimension on Rows.



View Size Automatically size the chart to fill the screen, either vertically, horizontally, or both.

Saving and Sharing Content

- **Save** replaces existing workbook with updated contents.
- **Save As** saves to a new workbook (this is the only option the first time you save a new workbook). You'll be given the opportunity to choose a project to save the workbook in.
- **Revert** abandons changes since the last time you opened the workbook.
- **Done** returns to the list of contents that was visible before you edited or created the current workbook.

Export Exports the current chart/sheet to a variety of file formats (either graphical or data). The results are downloaded to your browser for inclusion in other applications, such as PowerPoint or Excel, e-mail, or saving to a local or network drive.

Explore - Creating and Saving New Content

1. Using the *Sample - Superstore - Ablaze Training* data source in the Ablaze Training project, create a new workbook.
2. Analyze Sales by various dimensions on the first sheet.
    a. Try different combinations of the Sales measure and one or more other dimensions.
    b. Look at different results when using both Rows and Columns shelves.
    c. Sort results in low-to-high, and high-to-low order by hovering over the word Sales in the axis and clicking the sort icon several times.
    d. Try using different Marks card options and evaluate the results.
    e. Filter the worksheet to show data only in the South and West regions. Make this a hard-coded filter by hiding the filter checkboxes.
    f. Give the sheet a meaningful name.
3. Create a new sheet. Analyze how profit and sales correlate to each other with a *Scatter Plot*.

a. Place Sales on the Columns shelf and Profit on the Rows shelf.

b. Drag a dimension to Detail on the Marks card. Notice the results.

c. Either undo and re-drag, or just drag the dimension *from* Detail to Color on the Marks card. Notice the results.

d. Change the mark type to Shape (use the Marks card dropdown).

e. Drag Region to Shape. Notice the results.

f. Size shape by the number of units sold (Quantity). Do you generally see a correlation between sales, profit, and the number of units sold?

g. Name the sheet *Sales/Profit Correlation.*

4. Create at least two other sheets. "Indulge yourself" by exploring the data and analyzing with various dimensions and measures.

5. Create one more sheet that analyzes sales and profit by year and quarter as a horizontal bar chart.

a. Sort by Sales, high-to-low by quarter, within each year (notice the + sign on Year).

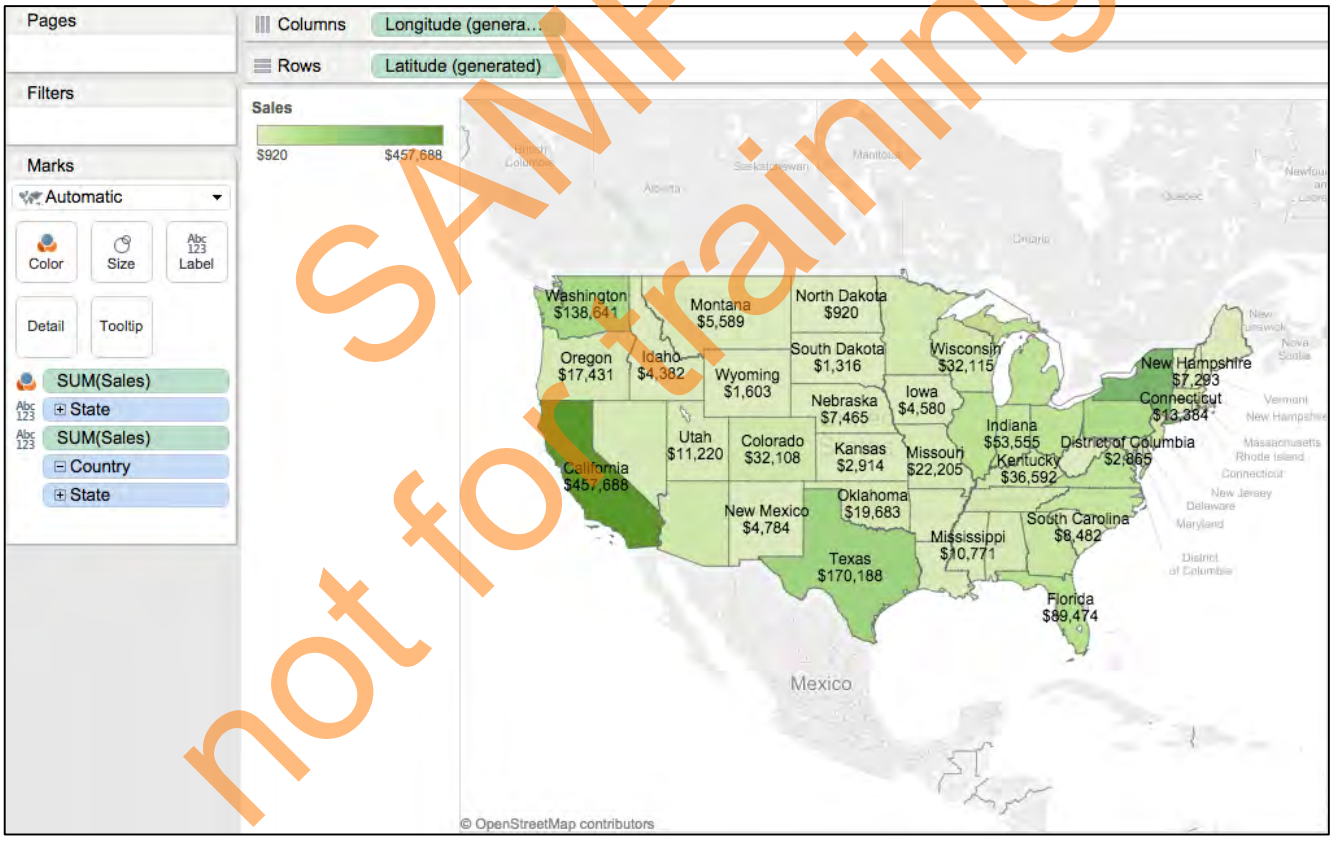
b. Create stacked bars, with the bars stacked/colored by Segment.

c. Add an interactive filter on Category.

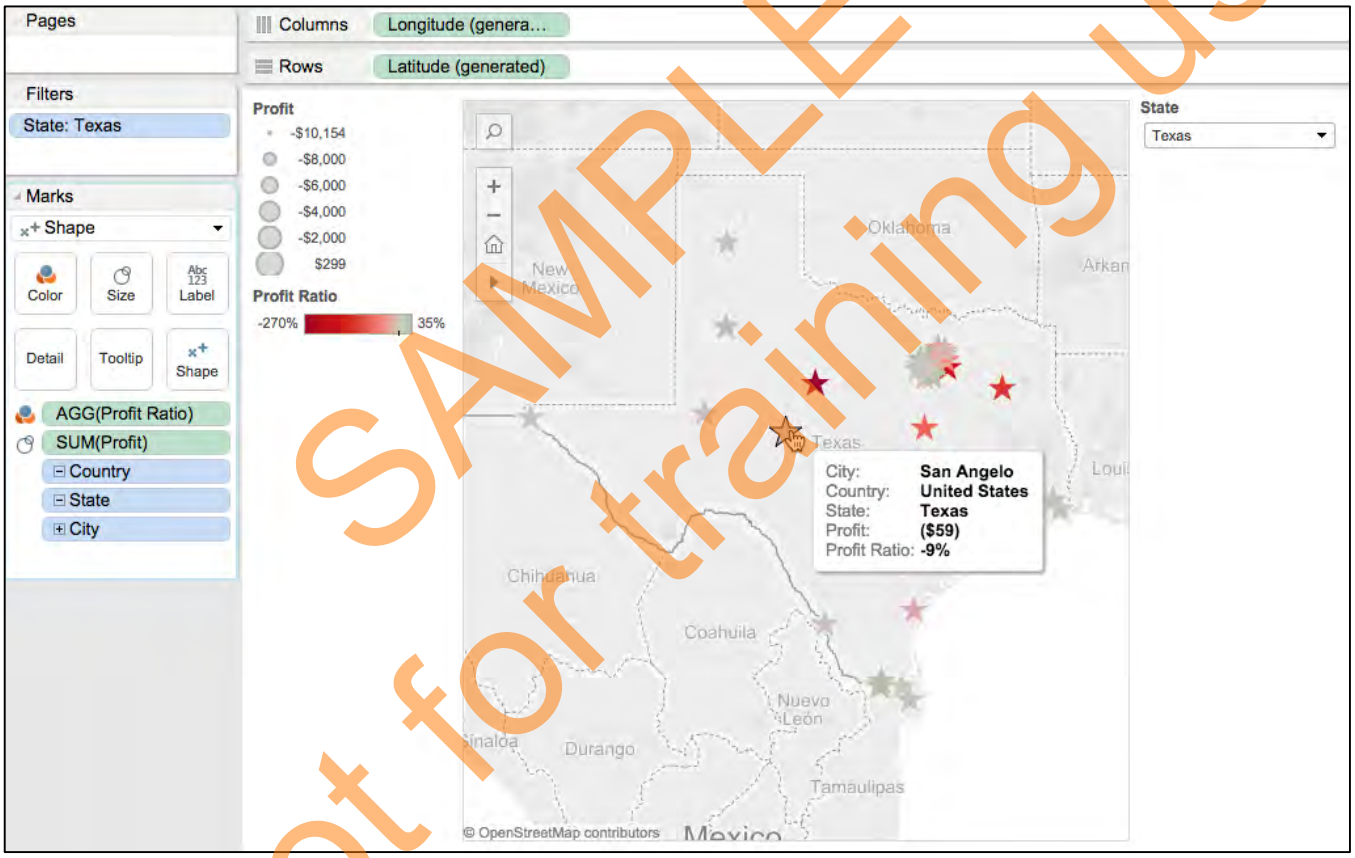
6. Save the new workbook to the Ablaze Training project with a name of your choice, **making sure** you include your Tableau Server user ID as part of the workbook name.

Explore - Tableau Maps

1. Create a new worksheet. Analyze Sales by State as a filled map.
    a. Color states based on Sales.
    b. Label each state with the name of the state, and total sales.
    c. Use the navigation toolbar to search for specific state names. Zoom into just a few states. Pan the map across the states. Use selection tools to select just certain states.
    d. Return to the default full-country view (if the home button doesn't work, just zoom out).
    e. Name the sheet appropriately.



2. Create a new worksheet. Analyze Profit and Profit Ratio by City as a symbol map.
    a. Size marks by Profit.
    b. Color marks by Profit Ratio.
    c. Change marks to appear as stars instead of circles.
    d. Add a State interactive filter that permits selection of just one state at a time from a drop-down list.
    e. Select different states and notice the results.
    f. Name the sheet appropriately.
    g. Save the workbook back to Tableau Server with the same name.



Date Analysis

Date dimensions (denoted by a calendar icon) or date-time dimensions (denoted by a calendar icon with a small clock on top) provide special analytical capabilities within Tableau.

Navigating Date Hierarchies

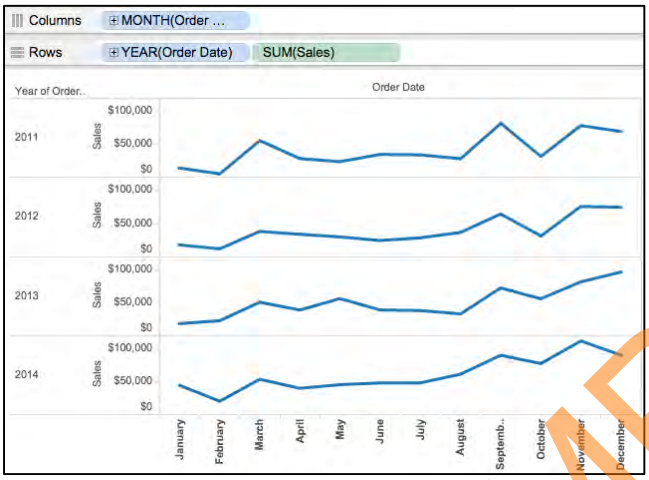
When you initially drag a date dimension to a chart, Tableau rolls up the date to its highest level (typically year, but sometimes something else, depending on the scope of the data source). Click the + sign on the date to navigate one level deeper in the hierarchy. Click the - sign to navigate back up the date hierarchy.

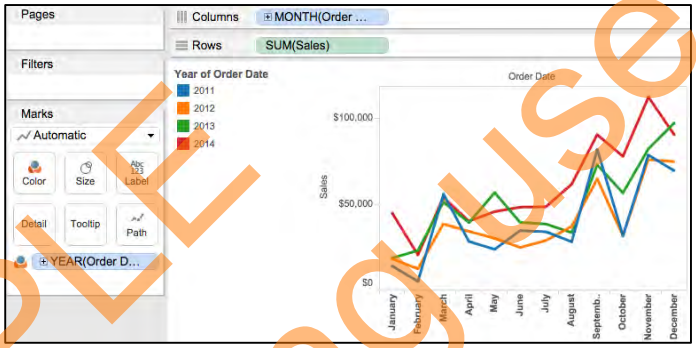
In fact, when you click the + sign, Tableau actually adds the date dimension to the shelf or card again, *at a different date level*. So, this illustration indicates that, initially, Tableau added Order Date to a shelf at the Year level. When + was clicked, Tableau added Order Date to the shelf again at the Quarter level. And another + click added Order Date to the shelf a third time, at the Month level.

This duplication of the date dimension at different date levels permits some very flexible date analysis.

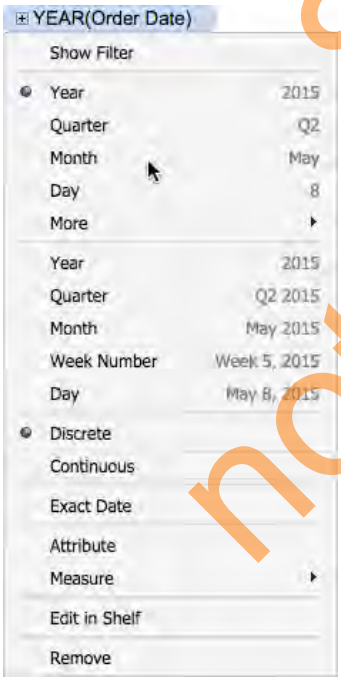
Analyzing with Date Dimensions

Date dimensions automatically create line charts. This is a Tableau best practice, assuming that date data is best analyzed "trended over time." Another mark type may be chosen from the Marks card drop-down, if desired.





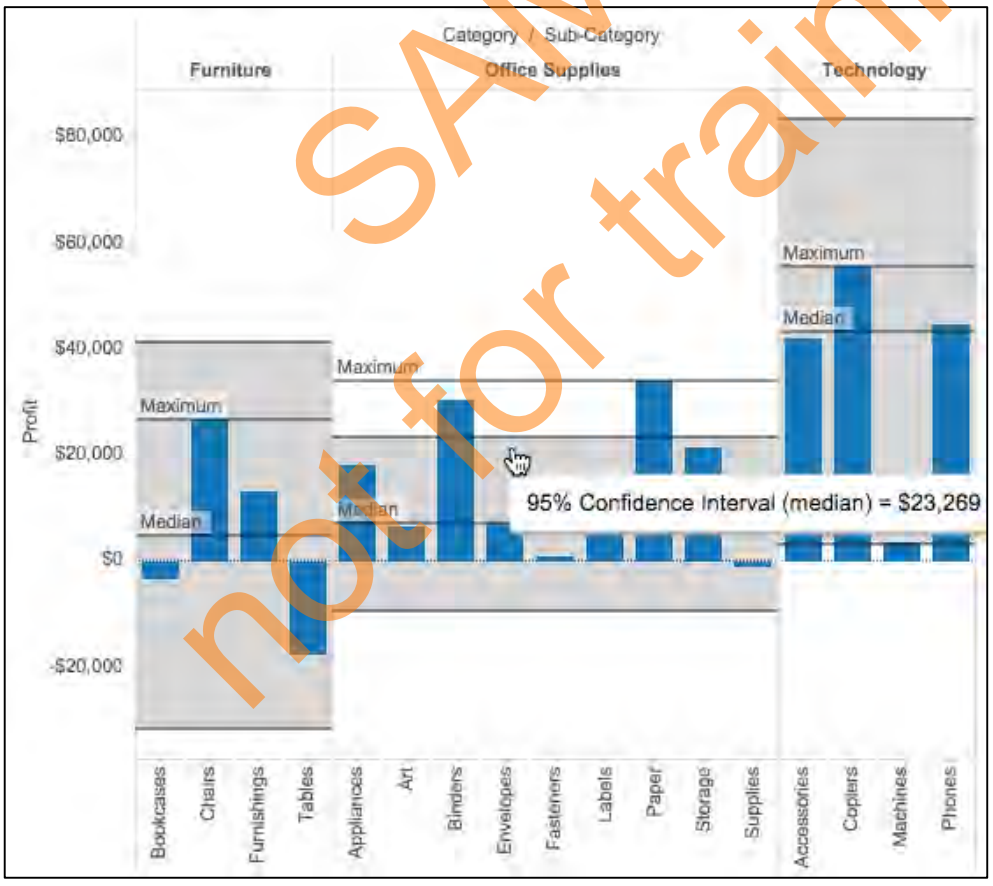
After navigating down the date hierarchy, different date levels may be dragged to different shelves or cards to produce varying date analyses very quickly.



Date analysis is even faster if you just change the default date level to any other desired level from the dimension's context menu. There's no need to navigate down the date hierarchy and drag and drop to other shelves or cards.

Explore - The Analytics Pane

1. Create a new blank sheet.
2. Analyze Profit by Sub-Category, within Category, as a vertical bar chart.
3. Display a constant line for the entire chart that indicates an overall profit goal of $25,000.
4. Add an average line that represents average profit for each category.
5. Change the calculation for the average line within category to Maximum.
6. Analyze the median, including a 95% confidence interval, for each category.
7. Compare the overall Office Supplies median against the median for just Binders, Envelopes, Labels, and Paper.
8. Remove the previously added $25,000 constant line.
9. Name the sheet *Category/Sub-Category Median Profit.*



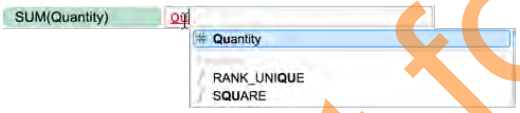
Using Calculated Fields and Table Calculations

While Tableau Server data connections may already have custom calculations added to them (look for fields preceded with the = sign), you'll almost certainly need to customize data beyond what is already provided in the data connection. This is accomplished with *Calculated Fields*.

There are two broad types of calculated fields: *Ad-Hoc* calculated fields, and those using *The Calculation Editor*.

Ad-Hoc Versus The Calculation Editor

Ad-hoc calculated fields are designed for quick one-time use (hence, the name).

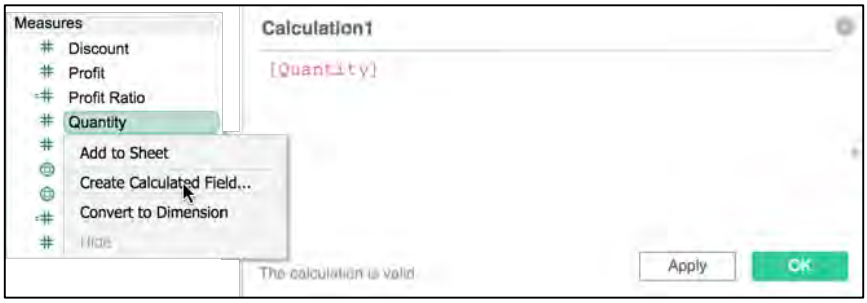


Double-click on the Rows or Columns shelf, or on the bottom of the Marks card, to create an ac-hoc calculation.

- Turn existing dimensions or measures into ad-hoc calculations by double-clicking them.
- Edit existing ad-hoc calculations by double-clicking them.

TIP: If you wish to re-use an ad-hoc calculation elsewhere in the current worksheet, or in other worksheets in the workbook, drag it from its original location to the Data Pane.

The calculation editor provides a larger text area more appropriate for more complex, or multi-line calculated fields. And, the calculation editor can optionally present a list of built-in Tableau functions.



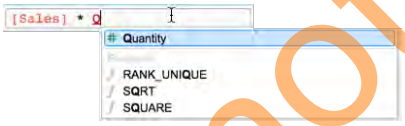
Right-click on an existing dimension or measure and select **Create Calculated Field** from the context menu.

- Give the calculated field a meaningful name.
- If you don't want to use the field that you right-clicked to create the calculation, just highlight and delete it, or backspace it out.
- Once you click OK, Tableau will add the calculated field to the Data pane. The calculated field's data type determines whether it's added as a dimension or measure.
- Edit an existing calculated field by right-clicking on it in the Data pane and choosing *Edit*.

NOTE: Calculated Fields you create in Tableau Server are only available within the workbook where they are created. If you wish to have a new calculated field appear in the underlying data connection, the data connection must be modified with Tableau Desktop.

Parts Of Calculated Fields

The process of creating a calculated field is largely the same, whether creating an ad-hoc calculation, or using the calculation editor.



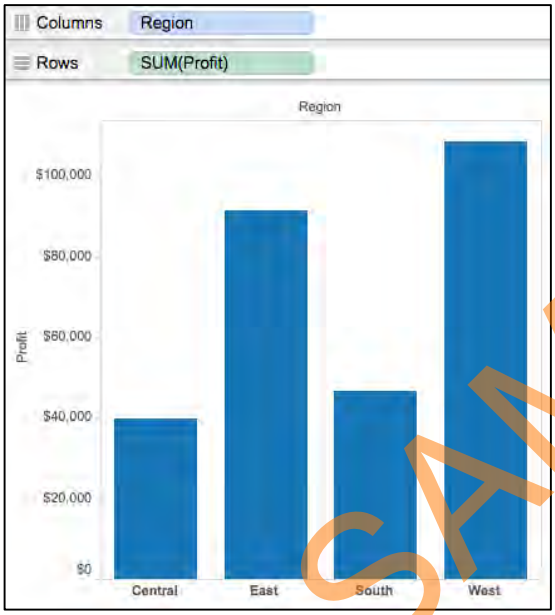
- You may type the calculation directly. As you type, Tableau will auto-complete the calculation. Use cursor keys to move through the list of suggested items. Press TAB to select the item.

- Drag dimensions and measures from the Data pane into the calculated field.

Level-Of-Detail Expressions

Perhaps one of the most anticipated, and least understood, new features of Tableau version 9 is *Level-of-Detail Expressions*. Level-of-detail expressions (sometimes just referred to as LOD Expressions) are calculated field constructs that calculate aggregated results *different from* the current chart's level of detail. LOD Expressions can even bypass chart filters when calculating values.

A chart's *level of detail* is determined by the dimension or dimensions used in the chart.



- This chart's *level of detail* is Region, as that is the dimension being used on the chart.
- Profit is "rolled up" to the chart's level of detail. In this case, Profit is summed (Tableau's default aggregation function) by Region. Each bar represents sum of Profit, by Region.
- If the chart is filtered, aggregated measures are only calculated within the filter, as well as the chart's level of detail.

LOD expressions permit calculated fields to aggregate *completely separate* from the chart's level of detail. LOD expressions can also ignore filters. Using this chart as an example, it's possible to completely IGNORE the chart's level of detail, and any filters, with a FIXED LOD expression:

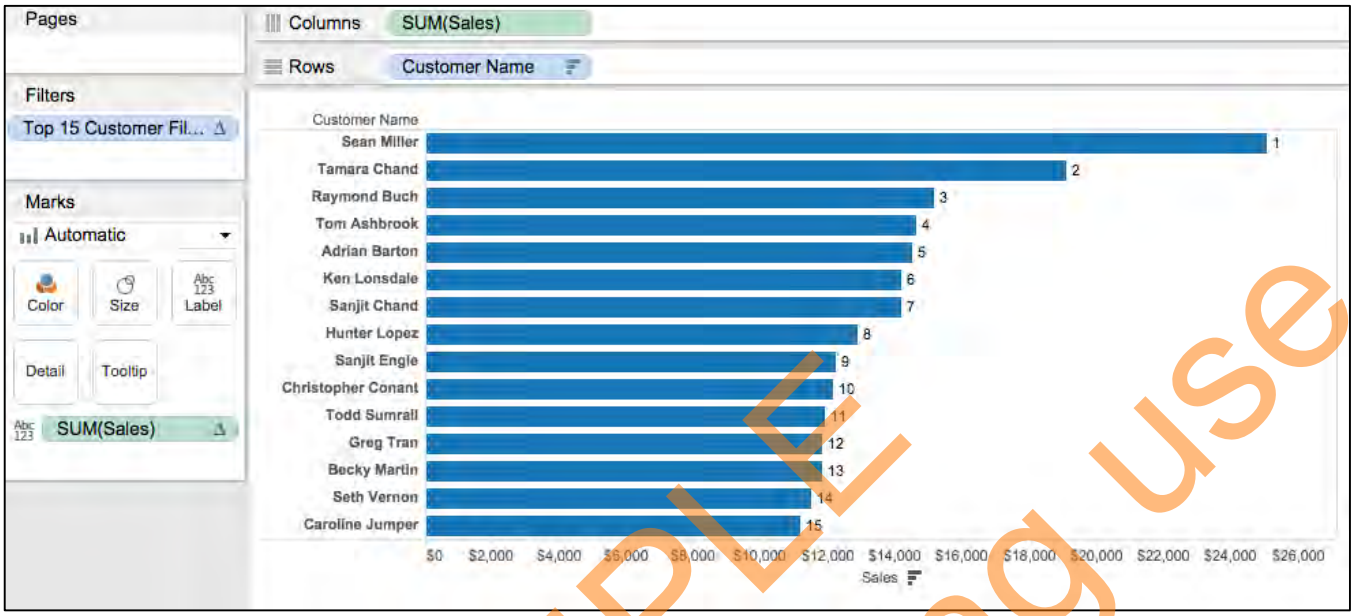
```
{FIXED : SUM([Profit])}
```

Another example can exclude one or more dimensions from the existing chart's level of detail, but still respect chart filters. For example, to calculate a value *ignoring* the Region dimension, but still include any filters, an EXCLUDE LOD expression may be used:

```
{EXCLUDE [Region] : SUM([Profit])}
```

13. Add the calculated field to the Filters shelf as a hard-coded filter.

14. Name the sheet *Top 15 Customers*.

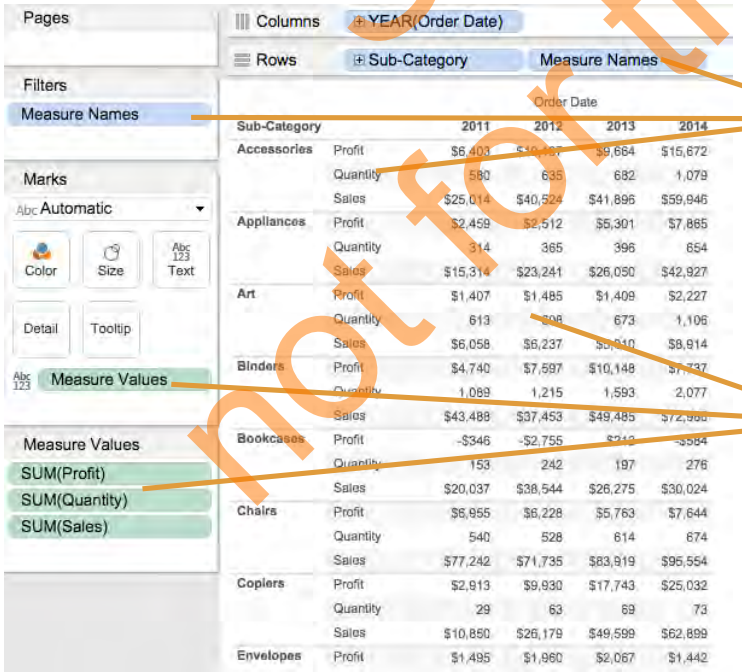


Advanced Chart Techniques

Measure Names And Measure Values

You will occasionally find chart requirements that require more than one measure to share the same "place" (same row or column shelf where each measure doesn't create a separate row or column, same part of the Marks card, and so forth). This is accomplished by using *Measure Names* and *Measure Values*. While you may be tempted to drag these from the Dimensions and Measures portion of the Data pane, it's best to let Tableau invoke them automatically by other means.

Cross-tabs, for example, will automatically invoke Measure Names/Measure Values when you double-click measures to add them to the cross-tab. Other charts enable them when you use Show Me.

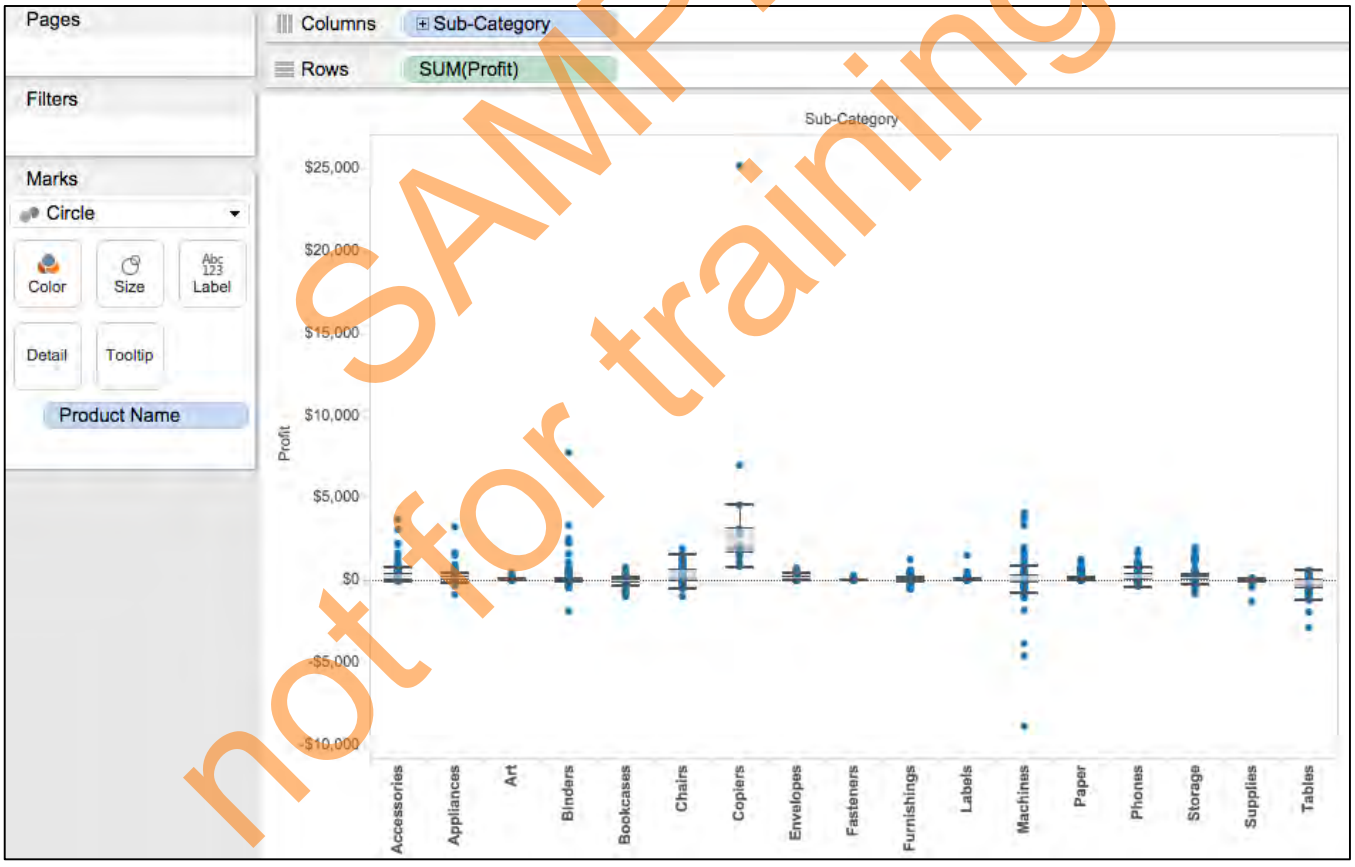


Measure Names - "The Words"
Creates a new row for each measure (Profit, Quantity, Sales)

Measure Values - "The Numbers"
Multiple measures appearing on text on the Marks card

Box Plot

1. Create a new blank sheet.
2. Analyze Profit by Sub-Category.
    a. Notice the poor profit performance for Bookcases, Supplies, and Tables. The desire is to analyze where individual products within these columns fall on the profit scale.
3. Change mark type to Circle.
4. Drag Product Name to Detail on the Marks card.
    a. This creates individual circles for each product Profit sum within Sub-Category.
5. Resize marks so circles are very small.
6. From the Analytics pane, drag a box plot to the chart. Or, using Show Me, select *Box Plot*.
7. Name the sheet *Box Plot*. Save the workbook to the server.



Pareto Chart

1. Create a new blank sheet.
2. Drag Order Date to Columns.
3. Drag Sales to Rows, followed by Profit to Rows.
    a. A dual-row line chart results.
4. Using Show Me, select *Dual Combination*.
5. Drag Sub-Category to Columns. Drag Order Date off Columns.
6. Create a calculated field named *Percent of Running Total* to calculate a two-pass table calculation, calculating a running total first, and percent of total second:

```
RUNNING_SUM(SUM([Sales])) / TOTAL(SUM([Sales]))
```

7. Replace Profit on Rows with the Percent of Running Total calculated field.
8. Re-order the Rows shelf so that Sales appears first and Percent of Running total appears second.
9. Click the sort icon on the Sales axis to sort the chart in high-to-low order, by Sales.
10. Make multi-measure Marks card settings:
    a. Change the Sales mark type to Bar.
    b. Change the Percent of Running Total mark type to Line.
    c. If necessary, use the Marks card to display best-practice colors.
11. Using the Analytics pane, drag a constant line to the Percent of Running Total axis. Set it to .8 (80%).
12. Name the sheet *Pareto Chart*.

Waterfall Chart

1. Create a new blank sheet.
2. Analyze Profit by Discrete Month of Order.
3. Create a hard-coded filter to include just Sub-Category "Tables" and "Copiers."
4. Change mark type to Gantt Bar.
5. Change Profit on Rows to display as a Running Total quick table calculation.
6. Using either the Analytics pane, or Totals toolbar button, show Row Grand Totals.
7. Create a calculated field called *Minus Profit*.
    a. The calculation should simply "negate" Profit (- Profit).
8. Drag the Minus Profit calculated field to Size on the Marks card.
9. Name the sheet *Waterfall Chart*.