Lab 7. Making Visualizations That Look Great and Work Well

This lab will cover the following topics:

- Leveraging formatting in Tableau
- Adding value to visualizations

As you think about why you should adjust a given visualization, there are several things to consider. We'll start with those considerations.

Leveraging formatting in Tableau

Tableau employs default formatting that includes default fonts, colors, shading, and alignment. Additionally, there are several levels of formatting you can customize, as shown in the following diagram:
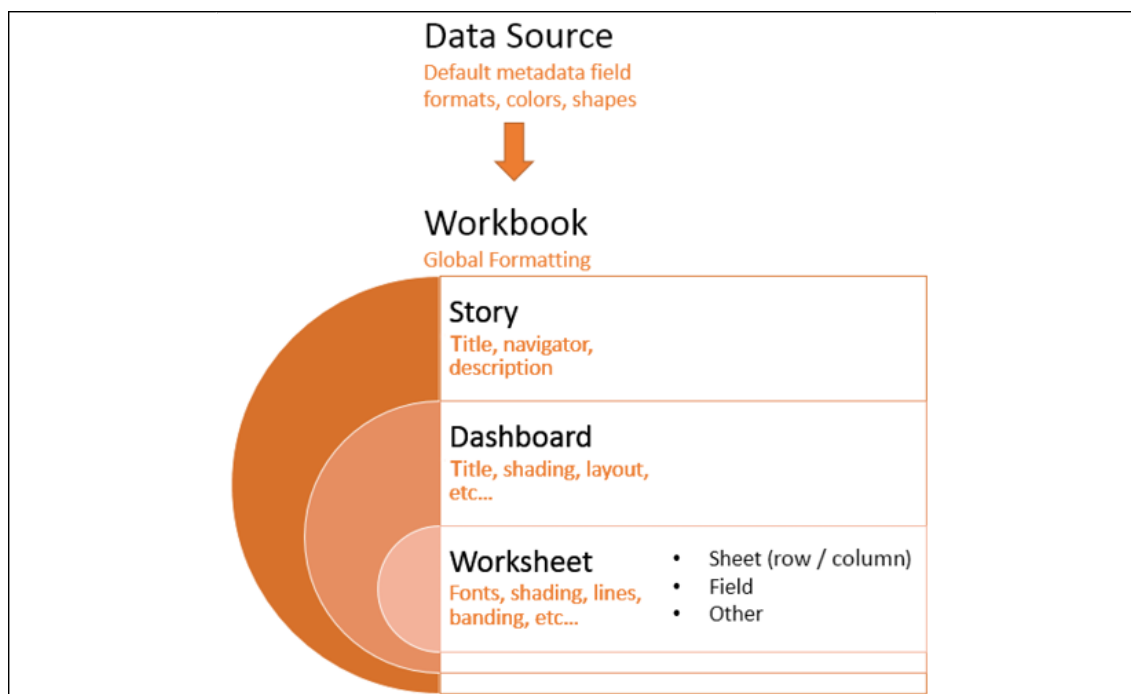

Figure 7.1: Levels of formatting in Tableau

Let's go into them in more detail:

- **Data source level**: We've already seen how you can set default formats for numeric and date fields. Other defaults, such as colors and shapes, can also be set using the **Default Properties** menu on the drop-down menu in the data pane.
- **Workbook level**: Various global formatting options may be set. From the menu, select **Format** | **Workbook**.
- **Story level**: Navigate to a story tab and select **Format** | **Story** (or **Story** | **Format**) to edit formatting for story-specific elements. These include options for customizing shading, title, navigator, and description.
- **Dashboard level**: Dashboard-specific elements can be formatted. When viewing a dashboard, select **Format** | **Dashboard** (or **Dashboard** | **Format**) to specify the formatting for dashboard titles, subtitles, shading, and text objects.

- **Worksheet level**: We'll consider the various options. The following types of formatting are available for a worksheet:
  - **Sheet formatting**: This formatting includes font, alignment, shading, borders, and lines. You may override the formatting for the entire sheet for row-and column-specific formatting.
  - **Field-level formatting**: This formatting includes fonts, alignment, shading, and number and date formats. This formatting is specific to how a field is displayed in the current view. The options you set at the field level override defaults set at a worksheet level. Number and date formats will also override the default field formatting.
  - **Additional formatting**: Additional formatting can be applied to titles, captions, tooltips, labels, annotations, reference lines, field labels, and more.
- **Rich-text formatting**: Titles, captions, annotations, labels, and tooltips all contain text that can be formatted with varying fonts, colors, and alignment. This formatting is specific to the individual text element.

Let's start by examining workbook-level formatting.

Workbook-level formatting

Tableau allows you to set certain formatting defaults at a workbook level. To view the options and make changes to the defaults, click **Format | Workbook....** The left pane will now show formatting options for the workbook:
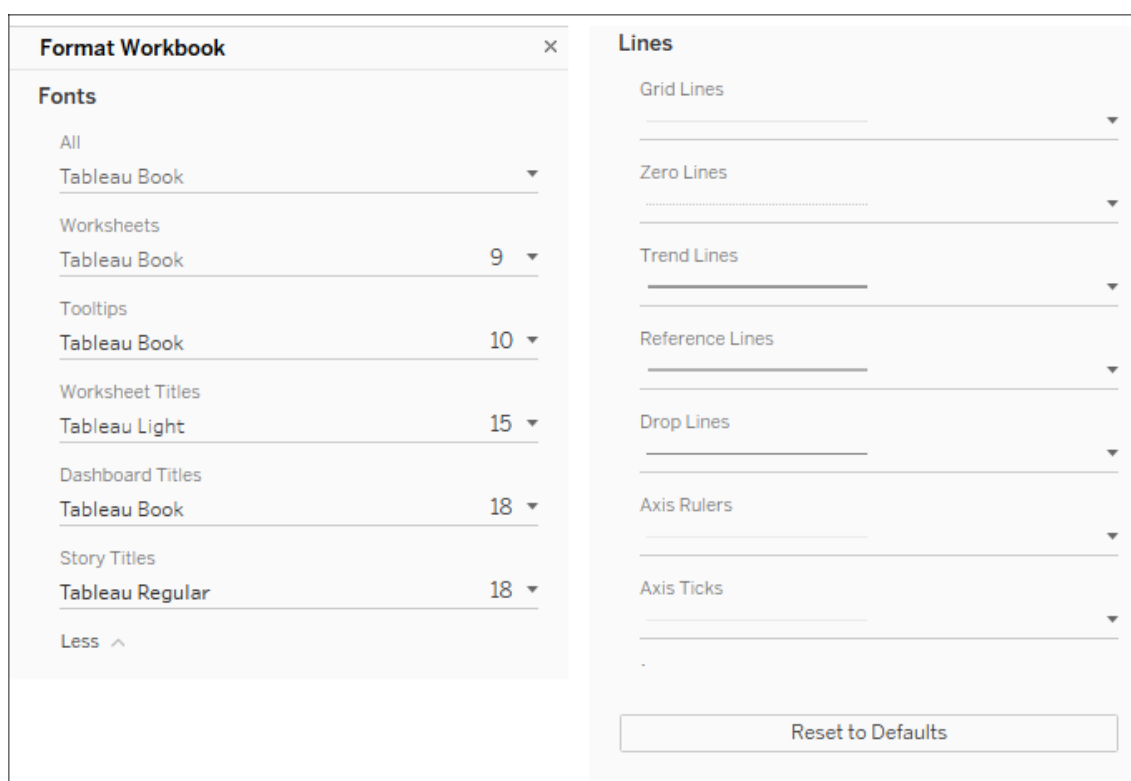

Figure 7.2: Workbook formatting options

The options include the ability to change default **Fonts**, which apply to various parts of a view or dashboard, and default **Lines**, which apply to the various types of lines used in visualizations. Notice also the **Reset to Defaults** button, should you wish to revert to the default formatting. Any changes here will impact the whole workbook.

At times, you'll want to apply formatting specific to a given sheet, and we'll consider that next.

Worksheet-level formatting

You've already seen how to edit metadata in previous labs, and we'll cover dashboards and stories in detail in future labs. So, we'll shift our attention to worksheet-level formatting.

Before we look at specifically how to adjust formatting, consider the following parts of a view related to formatting:

Figure 7.3: Parts of a view that can be formatted using worksheet-level formatting

This view consists of the following parts, which can be formatted:

1. **Field labels for rows**: Field labels can be formatted from the menu (**Format | Field Labels…**) or by right-clicking them in the view and selecting **Format….** Additionally, you can hide field labels from the menu (**Analysis | Table Layout** and then uncheck the option for showing field labels) or by right-clicking them in the view and selecting the option to hide. You can use the **Analysis | Table Layout** option on the top menu to show them again, if needed.
2. **Field labels for columns**: These have the same options as labels for rows, but they may be formatted or shown/hidden independently from the row-field labels.
3. **Row headers**: These will follow the formatting of headers in general, unless you specify different formatting for headers for rows only. Notice that subtotals and grand totals have headers. The subtotal and grand total headers are marked **a** and **b** respectively.
4. **Column headers**: These will follow the formatting of headers in general, unless you specify different formatting for headers for the columns only. Notice that subtotals and grand totals have headers. The grand total header marked in the preceding screenshot is a column header.
5. **Pane**: Many formatting options include the ability to format the pane differently than the headers.

6. **Grand totals (column) pane**: This is the pane for grand totals that can be formatted at a sheet or column level.

7. **Grand totals (row) pane**: This is the pane for grand totals that can be formatted at a sheet or row level.

Worksheet-level formatting is accomplished using the format window, which will appear on the left side, in place of the data pane.

To view the format window, select **Format** from the menu and then **Font...**, **Alignment...**, **Shading...**, **Borders...**, or **Lines...**:

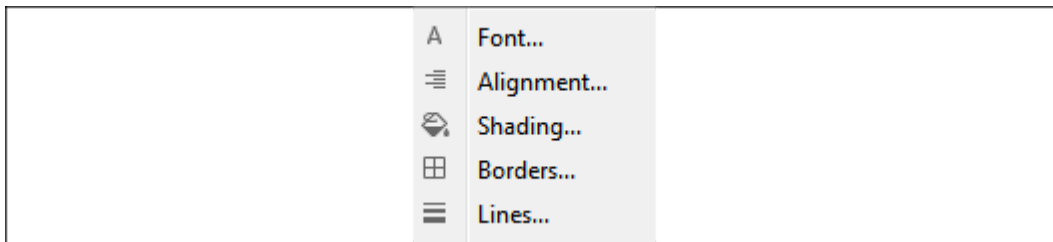|	
A	Font...
≡	Alignment...
🖌	Shading...
⊞	Borders...
≡	Lines...

Figure 7.4: Formatting options for a worksheet

Tip:

You can also right-click nearly any element in the view and select **Format**. This will open the format window specific to the context of the element you selected. Just be sure to verify that the title of the format window matches what you expect. When you make a change, you should see the view update immediately to reflect your formatting. If you don't, you are likely working in the wrong tab of the formatting window, or you may have formatted something at a lower level (for example, **Rows**) that overrides changes made at a higher level (for example, **Sheet**).

You should now see the format window on the left, in this case, **Format Font**. It will look like this:
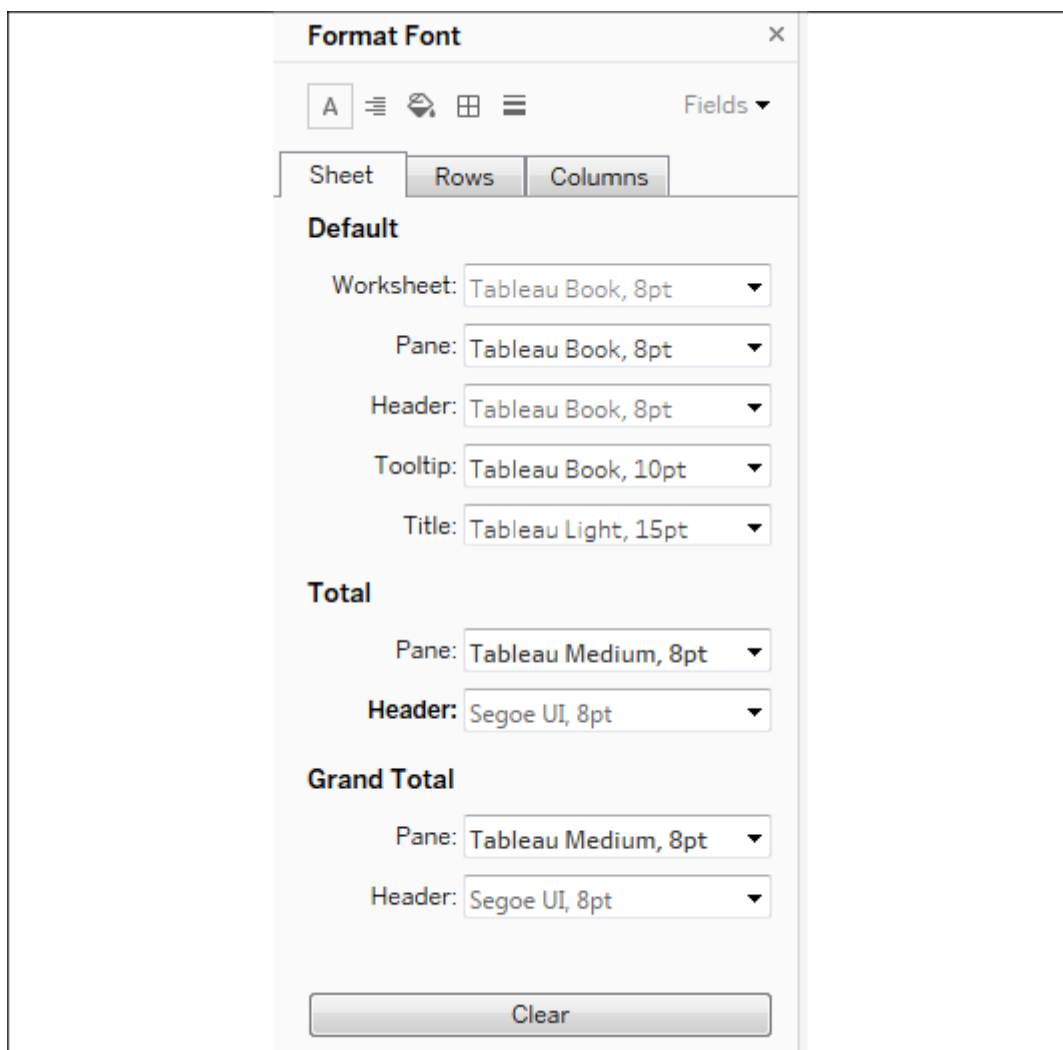
Figure 7.5: The Format Font pane

Notice these key aspects of the formatting window:

- The title of the window will give you the context for your formatting selections.
- The icons at the top match the selection options of the **Format** menu. This allows you to easily navigate through those options without returning to the menu each time.
- The three tabs, **Sheet**, **Rows**, and **Columns**, allow you to specify options at a sheet level and then override those options and defaults at a row and column level. For example, you could make the **Row** grand totals have different pane and header fonts than the **Column** grand totals (though this specific choice would likely be jarring and is not recommended!).
- The **Fields** dropdown in the upper-right corner allows you to fine-tune formatting at the field level.
- Any changes that you make will be previewed and result in a bold label to indicate that the formatting option has been changed from the default (notice how the font for **Header** under **Total** has been customized, resulting in the label text of **Header** being shown in bold).

Tip:

The three options for clearing the format are as follows:

Clear Single Option: In the format window, right-click the label or control of any single option you have changed and select **Clear** from the pop-up menu.

Clear All Current Options: At the bottom of the format window, click the **Clear** button to clear all visible changes. This applies only to what you are currently seeing in the format window. For example, if you are viewing **Shading** on the **Rows** tab and click **Clear**, only the shading options on the **Rows** tab will be cleared.

Clear Sheet: From the menu, select **Worksheet | Clear | Formatting**. You can also use the dropdown from the **Clear** item on the toolbar. This clears all custom formatting on the current worksheet.

The other format options (such as alignment and shading) all work very similarly to the font option. There are only a few subtleties to mention:

- **Alignment** includes options for horizontal and vertical alignment, text direction, and text wrapping.
- **Shading** includes an option for row and column banding. The banding allows alternating patterns of shading that help to differentiate or group rows and columns. Light row banding is enabled by default for text tables, but it can be useful in other visualization types, such as horizontal bar charts as well. Row banding can be set to different levels that correspond to the number of discrete (blue) fields present on the **Rows** or **Columns** shelves.
- **Borders** refers to the borders drawn around cells, panes, and headers. It includes an option for row and column dividers. You can see in the view the dividers between the departments. By default, the level of the borders is set based on the next-to-last field in the rows or columns.
- **Lines** refers to lines that are drawn on visualizations using an axis. This includes grid lines, reference lines, zero lines, and axis rulers. You can access a more complete set of options for reference lines and drop lines from the **Format** option of the menu.

We've considered how to adjust formatting at the entire workbook level as well as for a given sheet. Let's turn our attention to formatting at the field level.

Field-level formatting

In the upper-right corner of the format window is a little drop-down menu labeled **Fields**. Selecting this drop-down menu gives you a list of fields in the current view, and selecting a field updates the format window with options appropriate for the field. Here, for example, is the window as it appears for the `SUM(Sales)` field:
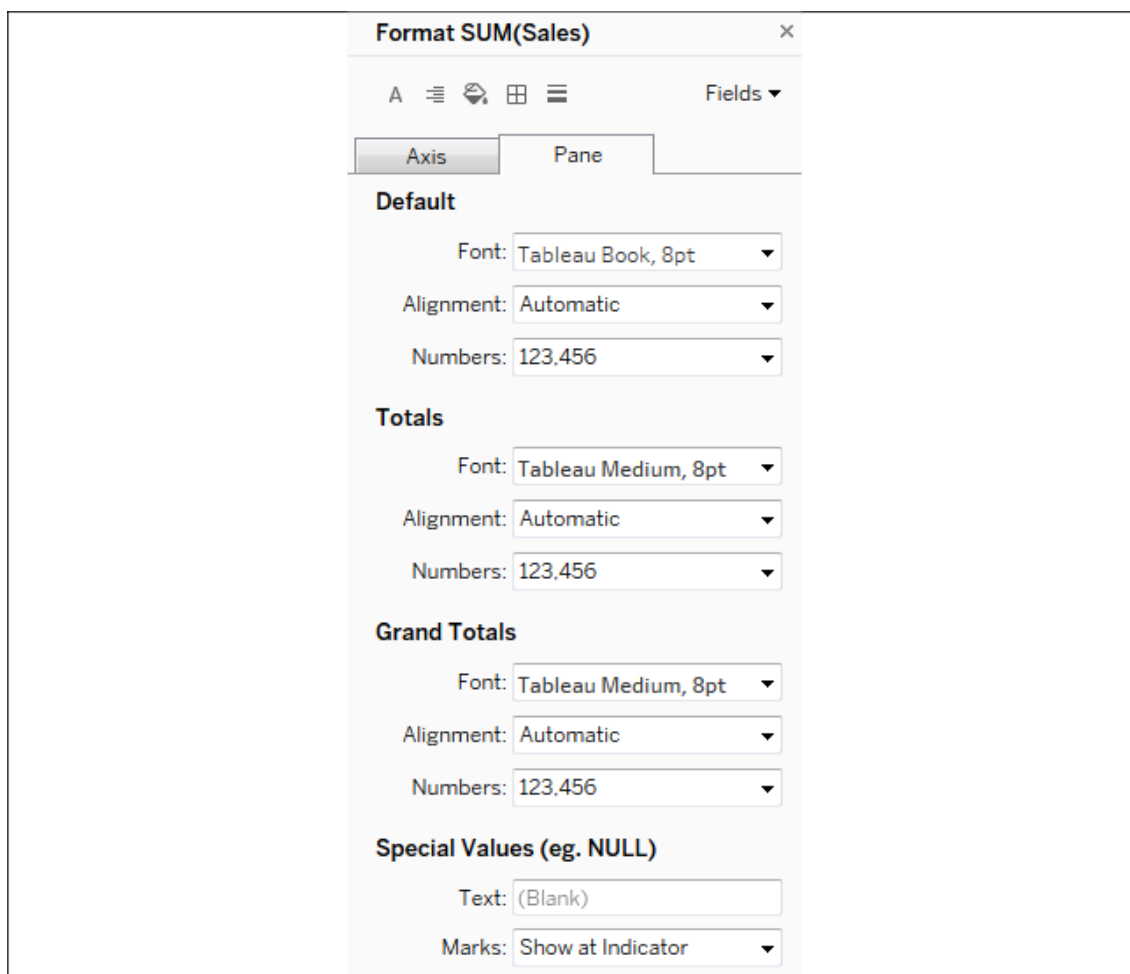
Figure 7.6: Format pane for field-level formatting

Tip:

The title of the format window will alert you to the field you are formatting. Selecting an icon for **Font**, **Alignment**, and so on from the top-left corner of the window will switch back to sheet-level formatting. However, you can switch between the tabs of **Axis** and **Pane**. These two tabs allow you to have different formatting for a field when it is used in the header or as an axis label versus how it is formatted in the pane of the view. The options for fields include **Font**, **Alignment**, **Shading**, and **Number** and **Date** formats. The last two options will override any default metadata formats.

You'll notice special options for formatting certain types of fields. Numbers allow a wide range of formatting options and even include the ability to provide custom formatting, which we'll consider next.

Custom number formatting

When you alter the format of a number, you can select from several standard formats, as well as a custom format. The custom format allows you to enter a format string that Tableau will use to format the number. Your format string may use combinations of hash/pound (#), commas, negative signs, and parentheses, along with a literal string enclosed in quotation marks to indicate how the number should display.

The format string allows up to three entries, separated by semi-colons to represent positive, negative, and zero formats.

Here are some examples, assuming the positive number is `34,331.336` and the negative number is `-8,156.7777`:

Format String	Resulting Value
#;-#	34331 and -8157
#,###.##; (#,###.##)	34,331.34 and (8,156.78)
#,###.00000;-#,###.00000	34,331.33600 and -8,156.77770
"up "#,###;"down "#,###;"same"	up 34,331 and down 8,157
#,###"▲"; #,###"▼"	34,331▲ and 8,157▼

Figure 7.7: Examples of format strings and resulting values

You can replicate these examples and experiment with other format strings using the **Custom Number Formatting** view in the `Starter` or `Complete` workbooks:
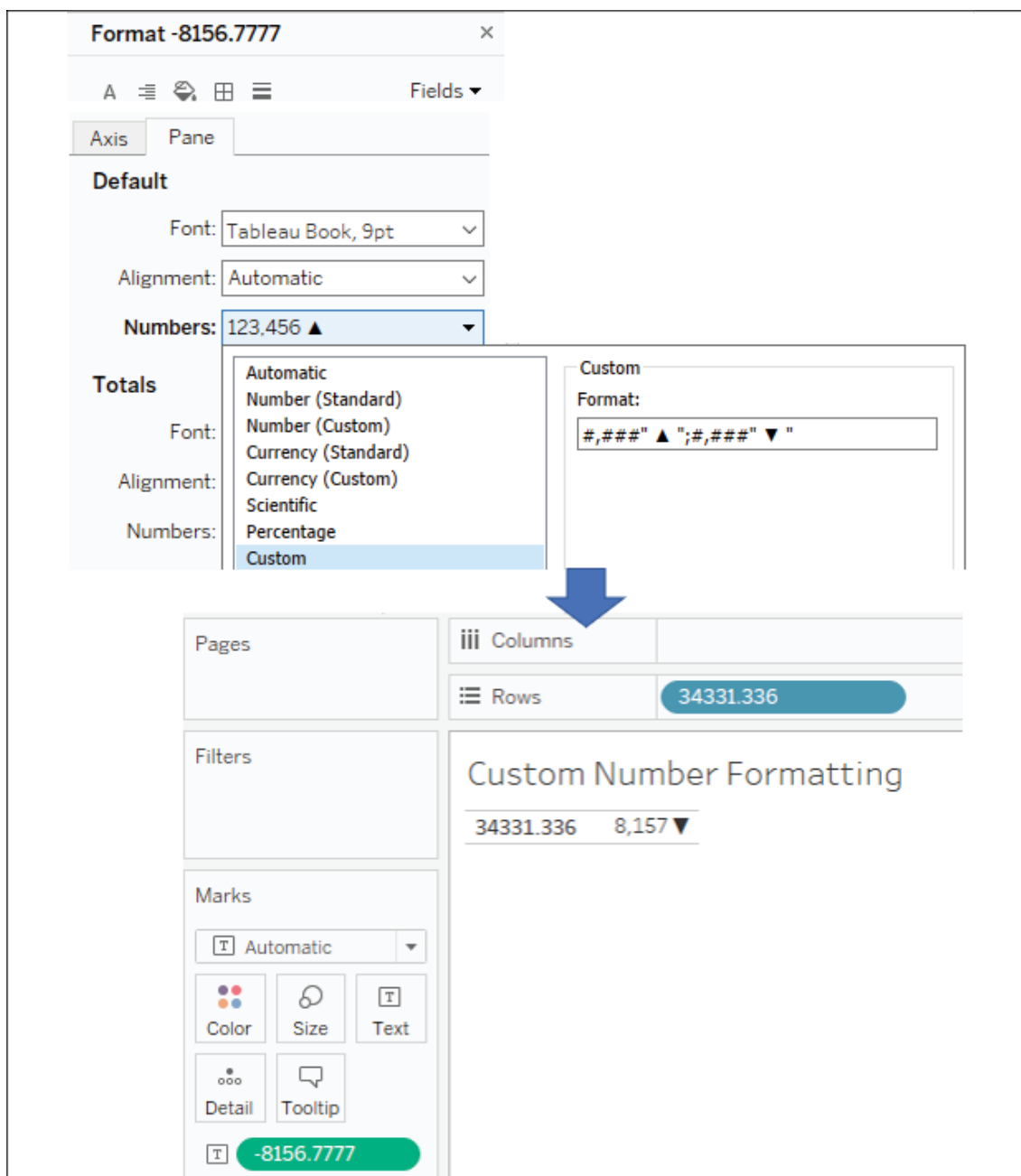
Notice how Tableau rounds the display of the number based on the format string. Always be aware that numbers you see as text, labels, or headers may have been rounded due to the format.

Also observe how you can mix format characters such as the pound sign, commas, and decimal points with strings. The fourth example shown would provide a label where a value of zero would normally be displayed.

Finally, notice that the last example uses Unicode characters that give you a wide range of possibilities, such as displaying degrees or other units of measure. Unicode characters may be used throughout Tableau in text boxes, titles, field names and labels, aliases, and more!

Tip:

Selecting a predefined format that is close to what you want, and then switching to custom, will allow you to start with a custom format string that is close to your desired format.

Custom date formatting

In a similar way, you can define custom date formatting using a custom string. The following table illustrates some possible formatting of the date value of 11/08/2018, 1:30 PM based on various format strings:

Format String	Resulting Value
m/d/yyyy	11/8/2018
dd/mm/yyyy	08/11/2018
"The date is" m/d/yyyy	The date is 11/8/2018
mmm d, yyyy	Nov 8, 2018
mmmm dd yyyy	November 08 2018
mm/dd/yyyy h:mm AM/PM	11/08/2018 1:30PM
ttttt	1:30:28 PM
dddd, mmmm d, HH:MM:ss	Thursday, November 8, 13:30:28
ddd	Thu

Figure 7.9: Some possible date formatting examples

These are merely examples, and you may include as many literal strings as you'd like.

Note:

For a complete list of custom date format string options, check out [https://onlinehelp.tableau.com/current/pro/desktop/en-us/dates_custom_date_formats.html].

Notice how applying some custom date formatting improves the readability of the axis for a small timeline in this example:
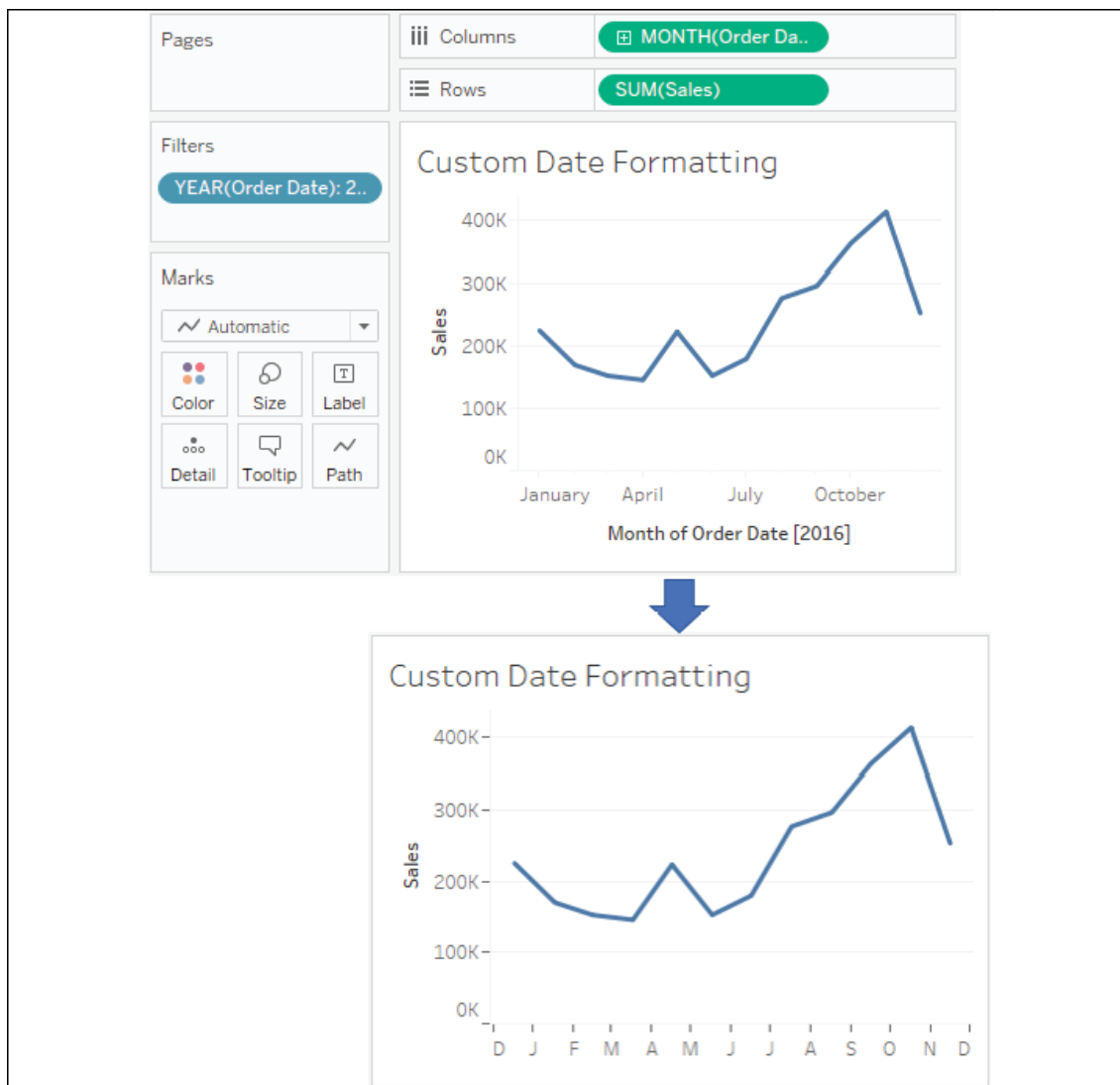
Figure 7.10: The custom format string used here is mmmmm, which results in a single letter for the month

Custom number and date formats are fine when you have values that need to be formatted. But what if there is no value? That is, how can we format `NULL` values? Let's consider that next.

Null formatting

An additional aspect of formatting a field is specially formatting **Null** values. When formatting a field, select the **Pane** tab and locate the **Special Values** section, as shown in the following screenshot:

Figure 7.11: The Special Values options appear on the Format pane

Enter any text you would like to display in the pane (in the **Text** field) when the value of the field is null. You can also choose where marks should be displayed. The **Marks** drop-down menu gives multiple options that define where and how the marks for null values should be drawn when an axis is being used. You have the following options:

- **Show at Indicator** results in a small indicator with the number of null values in the lower right of the view. You can click the indicator for options to filter the null values or show them at the default value. You can right-click the indicator to hide it.
- **Show at Default Value** displays a mark at the default location (usually 0).
- **Hide (Connect Lines)** does not place a mark for null values but does connect lines between all non-null values.
- **Hide (Break Lines)** causes the line to break where there are gaps created by not showing the null values.

You can see these options in the following screenshots, with the location of two null values indicated by a gray band.

Show at Indicator reveals no marks in the gray band with the number of null values indicated in the lower-right corner:
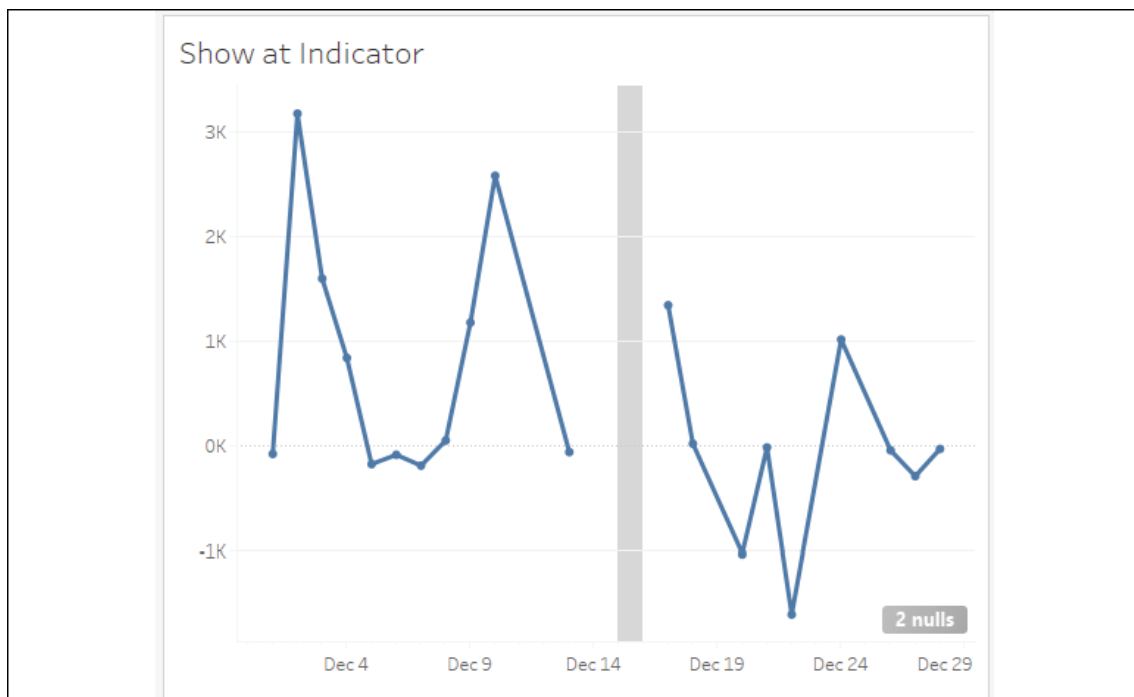

Figure 7.12: Show at Indicator

Show at Default Value places marks at 0 and connects the lines:
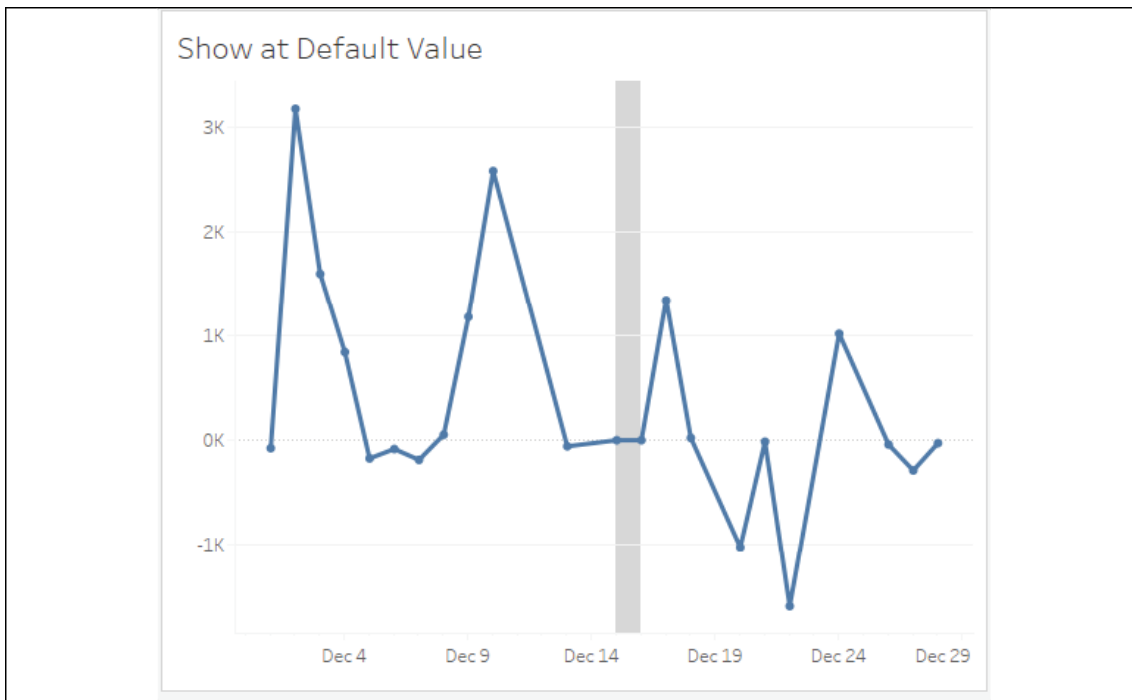
Figure 7.13: Show at Default Value

Hide (Connect Lines) removes marks for the missing values, but does connect the existing marks:
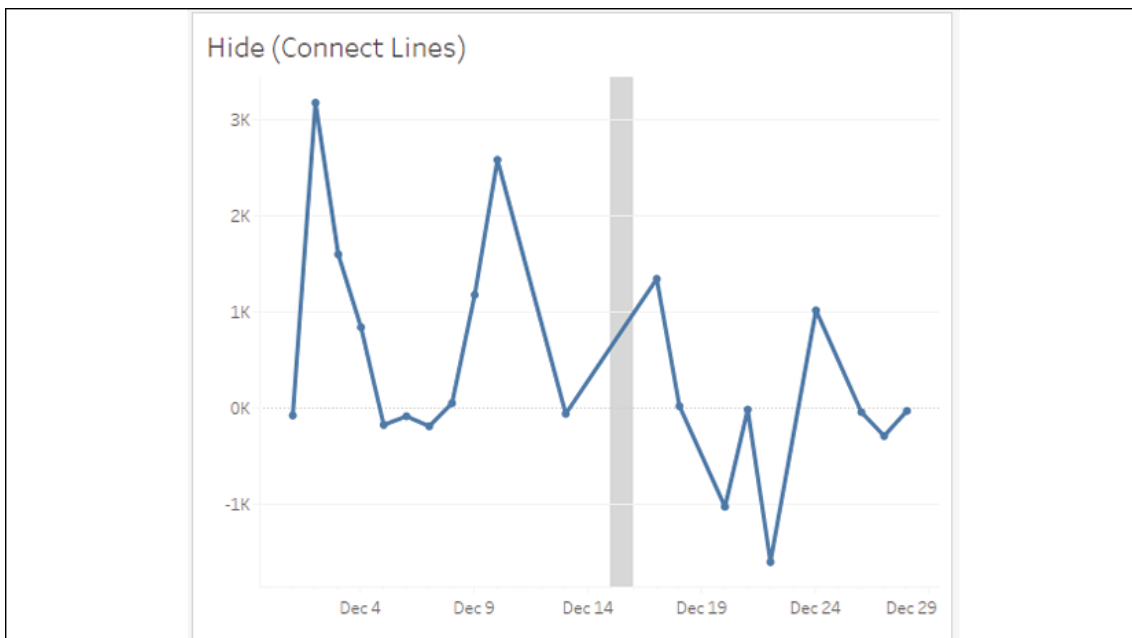

Figure 7.14: Hide (Connect Lines)

Hide (Break Lines) removes the marks for the missing values and does not connect the existing marks:
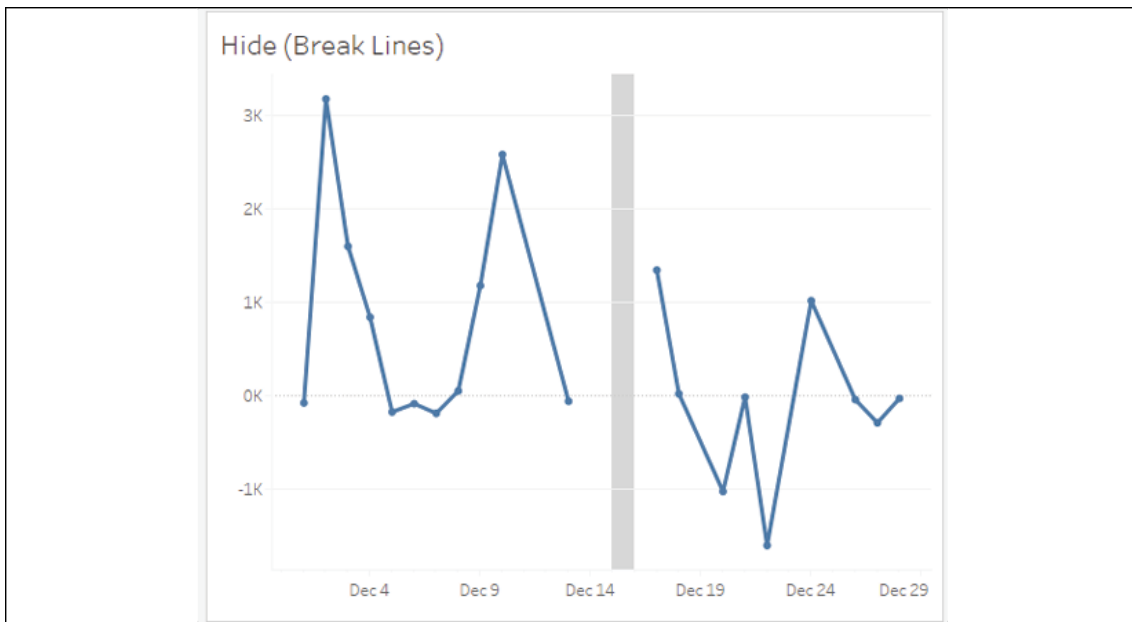
Figure 7.15: Hide (Break Lines)

Any of these options might have a good use but consider how each communicates the information. Connecting the lines might help communicate a movement over time but may also minimize the existence of missing data. Breaking the lines might help highlight missing values but might take away from the overall message. You'll need to decide which option best meets your goals based on the considerations mentioned at the beginning of this lab.

Note:

You'll notice that the preceding line charts have little circle markers at the location of each mark drawn in the view. When the mark type is a line, clicking on the color shelf opens a menu that gives options for the markers. All mark types have standard options, such as color and transparency. Some mark types support additional options such as border and/or halo, as shown here:
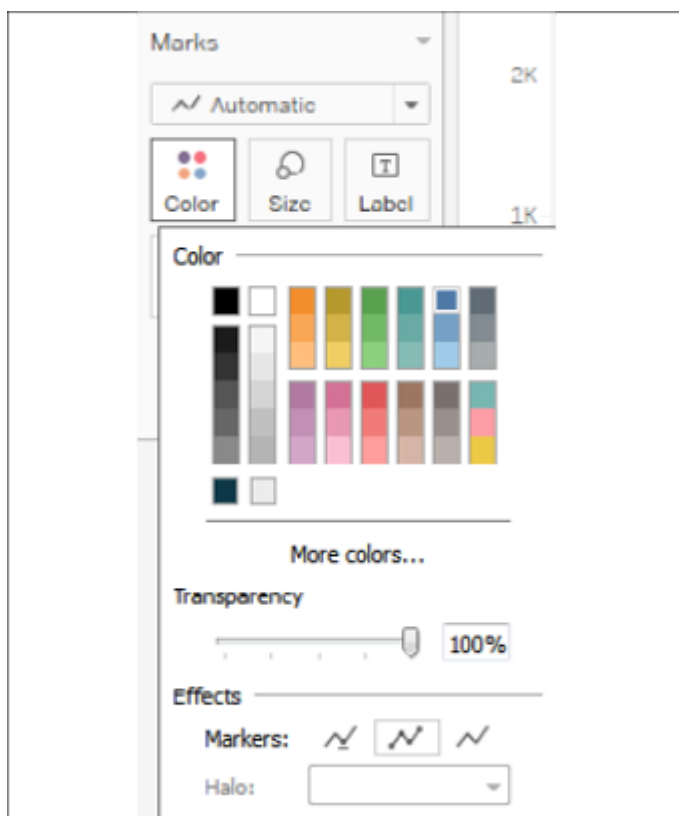
Figure 7.16: Adding Markers to lines

Knowing these options will help you as you think about how to communicate missing data, but always consider that another visualization type such as a bar chart might be even more effective in communicating missing values:
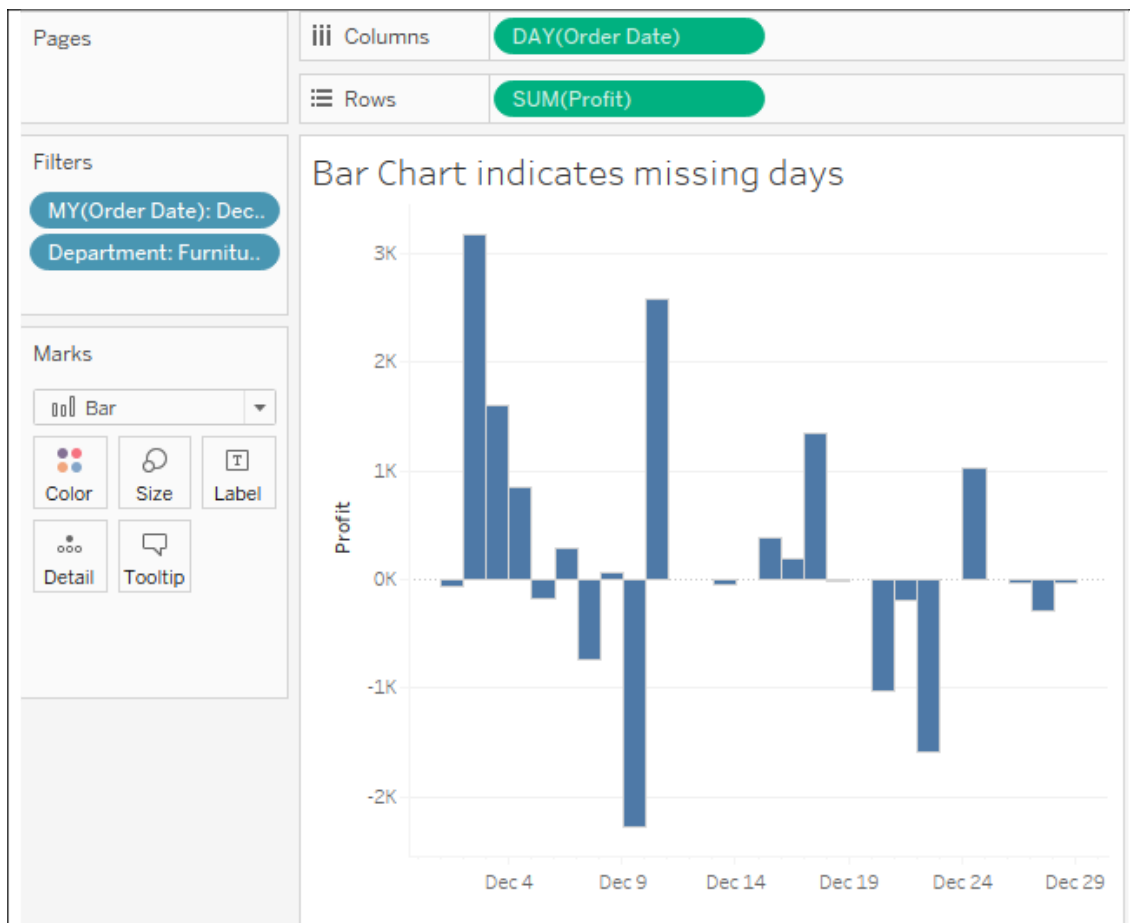
Figure 7.17: Bar charts are sometimes better than line charts for showing missing values

Knowing how to format null values gives you some options as you consider how to communicate the data. Let's take a look at a few additional options.

Additional formatting options

Additional formatting options can also be accessed from the formatting window. These options include the following:

- A myriad of options for **Reference Lines**
- Line and text options for **Drop Lines**
- Shading and border options for **Titles** and **Captions**
- Text, box, and line options for **Annotations**
- Font, shading, alignment, and separator options for **Field** labels
- Title and body options for **Legends**, **Quick Filters**, and **Parameters**
- **Cell** size and **Workbook** theme options

You'll find most of these relatively straightforward. A few options might not be as obvious:

- **Drop Lines**, which appear as lines drawn from the mark to the axis, can be enabled by right-clicking any blank area in the pane of the view with an axis and selecting **Drop Lines** | **Show Drop Lines**. Additional options can be accessed by using the same right-click menu and selecting **Edit Drop Lines**. Drop lines are only displayed in Tableau Desktop and Reader but are not currently available when a view is published to Tableau Server, Online, or Public.

- **Titles** and **Captions** can be shown or hidden for any view by selecting **Worksheet** from the menu and then selecting the desired options. In addition to standard formatting, which can be applied to titles and captions, the text of a title or caption can be edited and specifically formatted by double-clicking the title or caption, right-clicking the title or caption and selecting **Edit**, or by using the drop-down menu of the title or caption (or the drop-down menu of the view on a dashboard). The text of titles and captions can dynamically include the values of parameters, the values of any field in the view, and certain other data and worksheet-specific values.
- **Annotations** can be created by right-clicking a mark or space in the view, selecting **Annotate**, and then selecting one of the following three types of annotations:
  - **Mark** annotations are associated with a specific mark in the view. If that mark does not show (due to a filter or axis range), then neither will the annotation. Mark annotations can include a display of the values of any fields that define the mark or its location.
  - **Point** annotations are anchored to a specific point in the view. If the point is ever not visible in the view, the annotation will disappear. Point annotations can include a display of any field values that define the location of the point (for example, the coordinates of the axis).
  - **Area** annotations are contained within a rectangular area. The text of all annotations can dynamically include the values of parameters, and certain other data and worksheet-specific values.

Tip:

You can copy formatting from one worksheet to another (within the same workbook or across workbooks) by selecting **Copy Formatting** from the **Format** menu while viewing the source worksheet (or selecting the **Copy Formatting** option from the right-click menu on the source worksheet tab). Then, select **Paste Formatting** on the **Format** menu while viewing the target worksheet (or select the option from the right-click menu on the **Target** worksheet tab).

This option will apply any custom formatting present on the source sheet to the target. However, specific formatting applied during the editing of the text of titles, captions, labels, and tooltips is not copied to the target sheet.

We've now considered a lot of options for formatting the workbook, individual sheets, fields, numbers, dates, and null values. Now, let's consider how we can leverage some of these techniques to truly bring better understanding of the data.

Adding value to visualizations

Now that we've considered how formatting works in Tableau, let's look at some ways in which formatting can add value to a visualization.

When you apply custom formatting, always ask yourself what the formatting adds to the understanding of the data. Is it making the visualization clearer and easier to understand? Or is it just adding clutter and noise?

In general, try a minimalistic approach. Remove everything from the visualization that isn't necessary. Emphasize important values, text, and marks, while de-emphasizing those that are only providing support or context.

Consider the following visualization, all using default formatting:
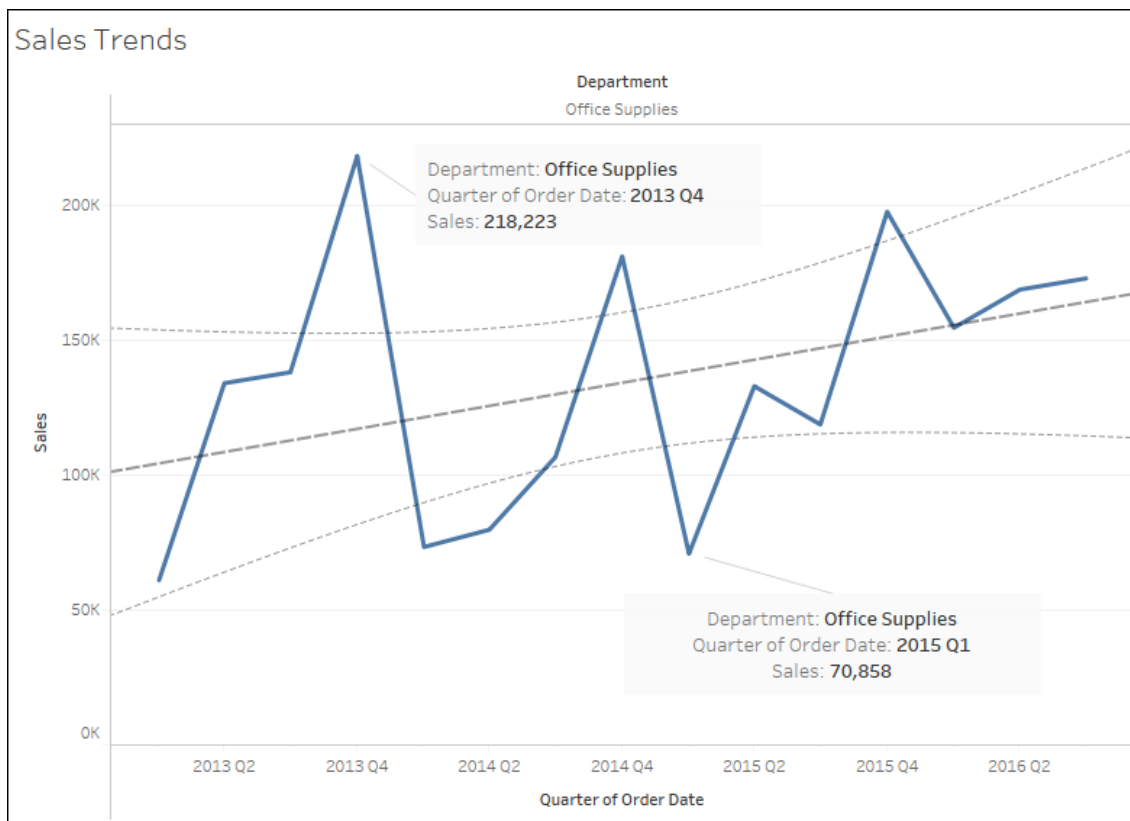
Figure 7.18: The default formatting is often great for data discovery and quick analysis but may be more cluttered than desired for clearly communicating and emphasizing the data story to others

The default format works fairly well, but compare that to this visualization:
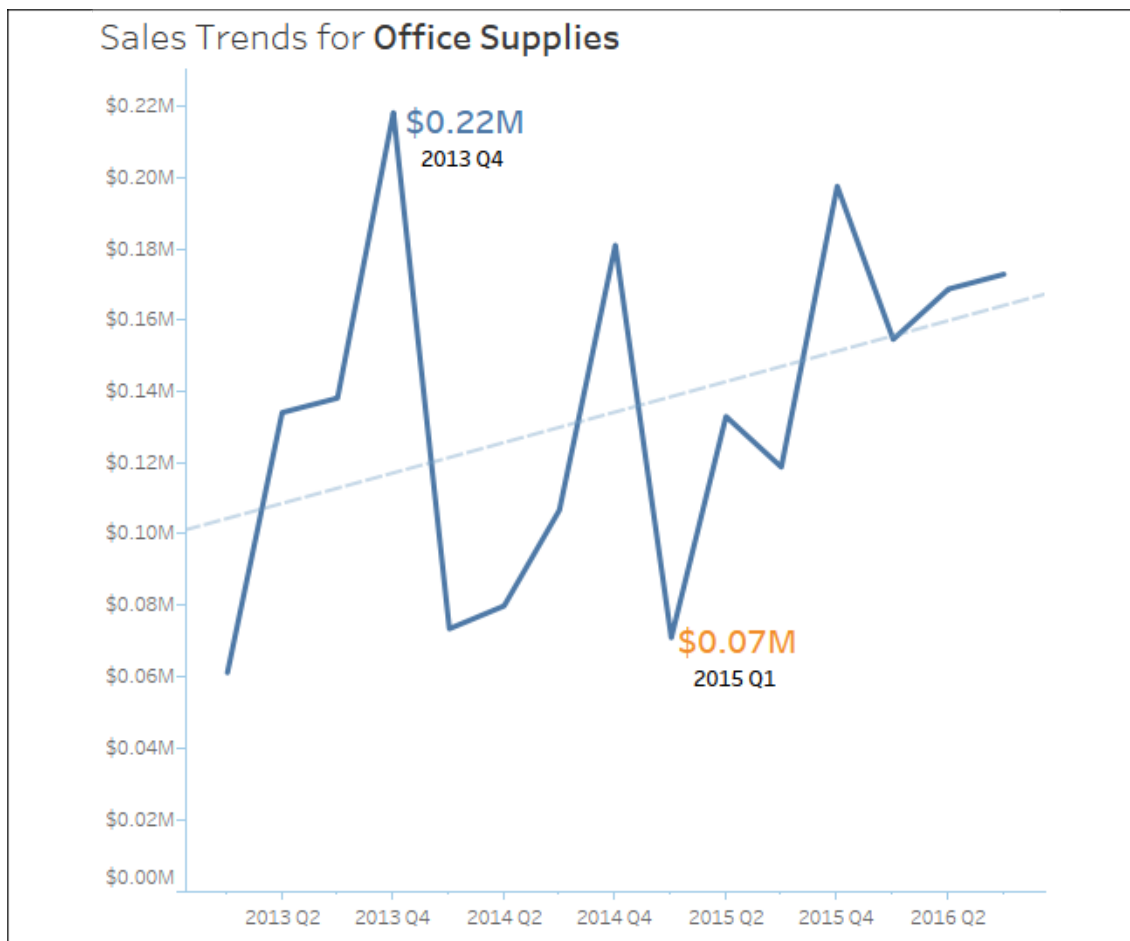
Figure 7.19: Formatting can make a visualization less cluttered and communicate the data more effectively

Both of the preceding diagrams show sales by the quarter, filtered to the **Office Supplies** department. The first view uses the default formatting. The second view has some formatting adjustments, including the following:

- **Title** has been adjusted to include the department name.
- **Sales** has been formatted to be shown using a custom currency with two decimal places and units of millions. This is true for the axis and the annotations. Often, a high level of precision can clutter a visualization. The initial view of the data gives us the trend and enough detail to understand the order of magnitude. Tooltips or additional views can be used to reveal detail and increase precision.
- The axis labels have been removed by right-clicking the axis, selecting **Edit Axis**, and then clearing the text. The title of the view clearly indicates that you are looking at `Sales`. The values alone reveal the second axis to be by the quarter. If there are multiple dates in the data, you might need to specify which one is in use. Depending on your goals, you might consider hiding the axes completely.
- The gridlines on **Rows** have been removed. Gridlines can add value to a view, especially in views where being able to determine values is of high importance. However, they can also clutter and distract. You'll need to decide, based on the view itself and the story you are trying to tell, whether gridlines are helpful.
- The trend line has been formatted to match the color of the line, though it is lighter and thinner, to de-emphasize it. Additionally, the confidence bands have been removed. You'll have to decide whether they add context or clutter based on your needs and audience.
- The lines, shading, and boxes have been removed from the annotations to reduce clutter.
- The size and color of the annotations have been altered to make them stand out. If the goal had been to simply highlight the minimum and maximum values on the line, labels might have been a better choice, as

they can be set to display at only **Min/Max**. In this case, however, the lower number is actually the second-lowest point in the view.

- Axis rulers and ticks have been emphasized and colored to match the marks and reference line (axis rulers are available under the **Lines** option on the **Format** window).

Formatting can also be used to dramatically alter the appearance of a visualization. Consider the following chart:
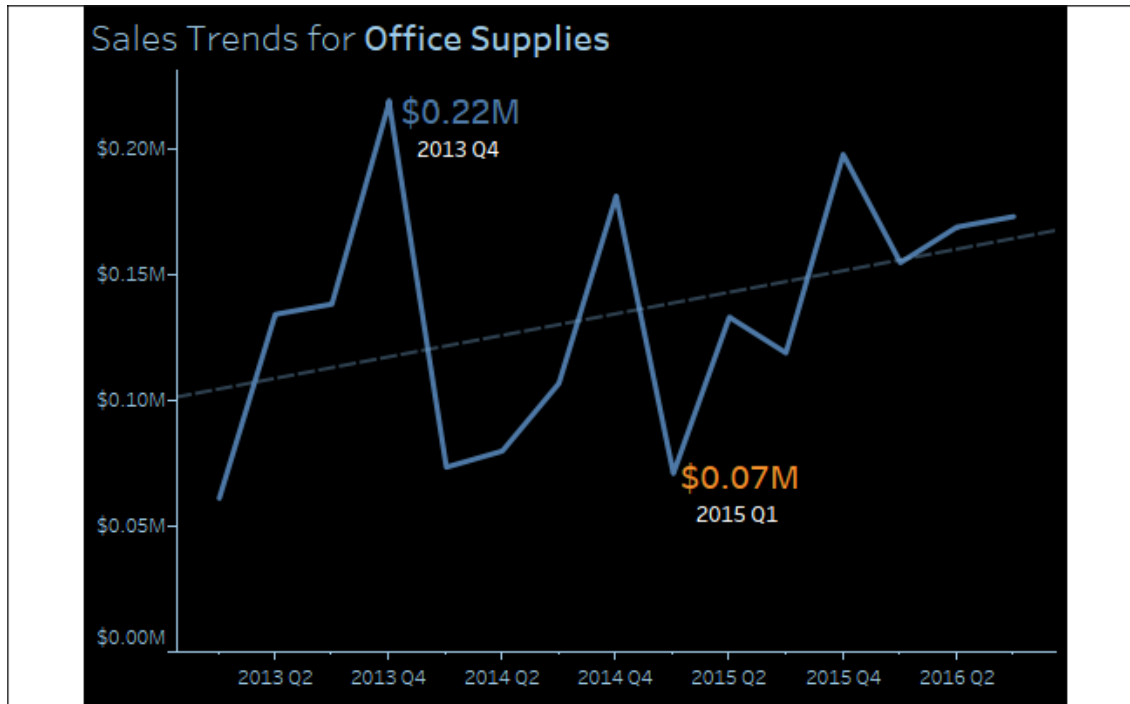

Figure 7.20: A dark background can be set by formatting the shading of a view

This visualization is nearly identical to the previous view. However, shading has been applied to the worksheet and the title. Additionally, fonts were lightened or darkened as needed to show up well on a dark background. Some find this format more pleasing, especially on mobile devices. If the view is to be embedded into a website with a dark theme, this formatting may be very desirable. However, you may find some text more difficult to read on a dark background. You'll want to consider your audience, the setting, and the mode of delivery as you consider whether such a format is the best for your situation.

Tip:

Sequential color palettes (a single color gradient based on a continuous field) should be reversed when using a dark background. This is because the default of lighter (lower) to darker (higher) works well on a white background, where darker colors stand out and lighter colors fade into white. On a black background, lighter colors stand out more and darker colors fade into black. You'll find the reverse option when you edit a color palette using the drop-down menu on double-clicking the legend or right-clicking the legend selecting **Edit Colors...** and checking **Reversed**.

Tooltips

As they are not always visible, tooltips are an easily overlooked aspect of visualizations. However, they add a subtle professionalism. Consider the following default tooltip that displays when the end user hovers over one of the marks shown in the preceding screenshot:
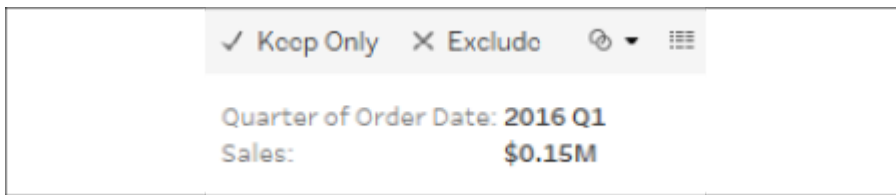
Figure 7.21: Default tooltip

Compare it to this tooltip:

Figure 7.22: Customized tooltip

The tooltip was edited by clicking **Tooltip** on the **Marks** card, which brought up an editor allowing the rich editing of text in the tooltip:
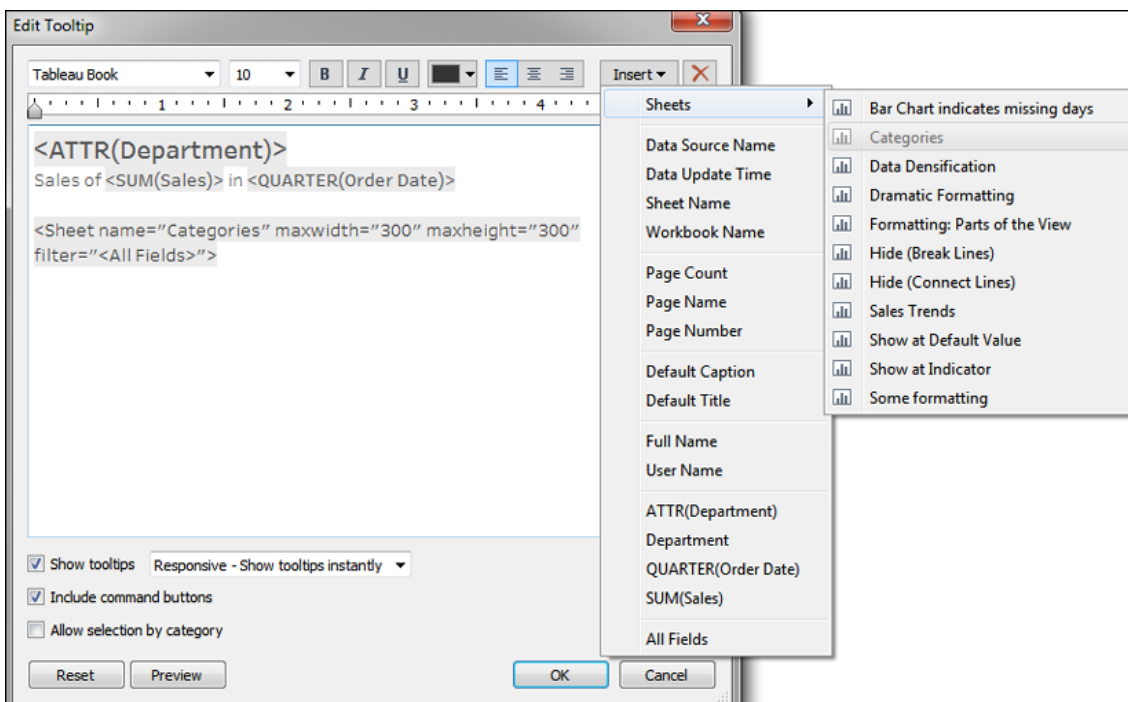

Figure 7.23: Tooltip editor

This editor is similar to those used for editing the text of labels, titles, captions, and annotations. You can input text and format it as desired. Additionally, the **Edit Tooltip** dialog has some additional functionality:

- The **Insert** drop-down menu in the upper-right corner allows you to insert sheets, fields, parameters, and other dynamic values. These special or dynamic text objects are enclosed as a tag in the text editor (for example, `<SUM(Sales)>`). We'll consider the special case of sheets in a moment.
- A checkbox option to **Show tooltips** and a drop-down menu to indicate the style of the tooltip (**Responsive - show tooltips instantly** or **On Hover**).
- A checkbox option to **Include command buttons**. This is the default, and you can observe the command buttons in the first, unedited tooltip in this section. The command buttons include options such as **Include**, **Exclude**, **Create Sets**, and so on. Many of these options are still available to the end user via a right-click, so removing them from the tooltip does not prevent the user from accessing them completely.
- A checkbox option to **Allow selection by category**. When enabled, this feature allows users to click the values of dimensions shown in the tooltip and thus select all marks associated with that value in the view.

Tip:

Consider unchecking **Show tooltips** for any view where they do not significantly and intentionally add value to the user experience.

Viz in Tooltip

Tableau allows you to embed visualizations in tooltips that are dynamically filtered as you hover over different marks. Often referred to as **Viz in Tooltip**, this greatly extends the interactivity available to end users, the ability to drill down to the details, and the ability to quickly see data in different ways.

In the preceding screenshot, the following tag was added to the tooltip by selecting **Insert** | **Sheets** | **Categories**:

```
<Sheet name="Categories" maxwidth="300" maxheight="300" filter="<All Fields>">
```

This tag, which you may edit by directly editing the text, tells Tableau to show the visualization in the `Categories` sheet as part of the tooltip. The maximum width and height are set to 300 pixels by default. The filter indicates which field(s) act as a filter from the sheet to the Viz in Tooltip. By default, `<All Fields>` means that all dimensions in the view will act as filters. However, you may specify a list of fields to specifically filter by one or more dimensions that are present in the view (for example, `<Department>` , `<Category>`).

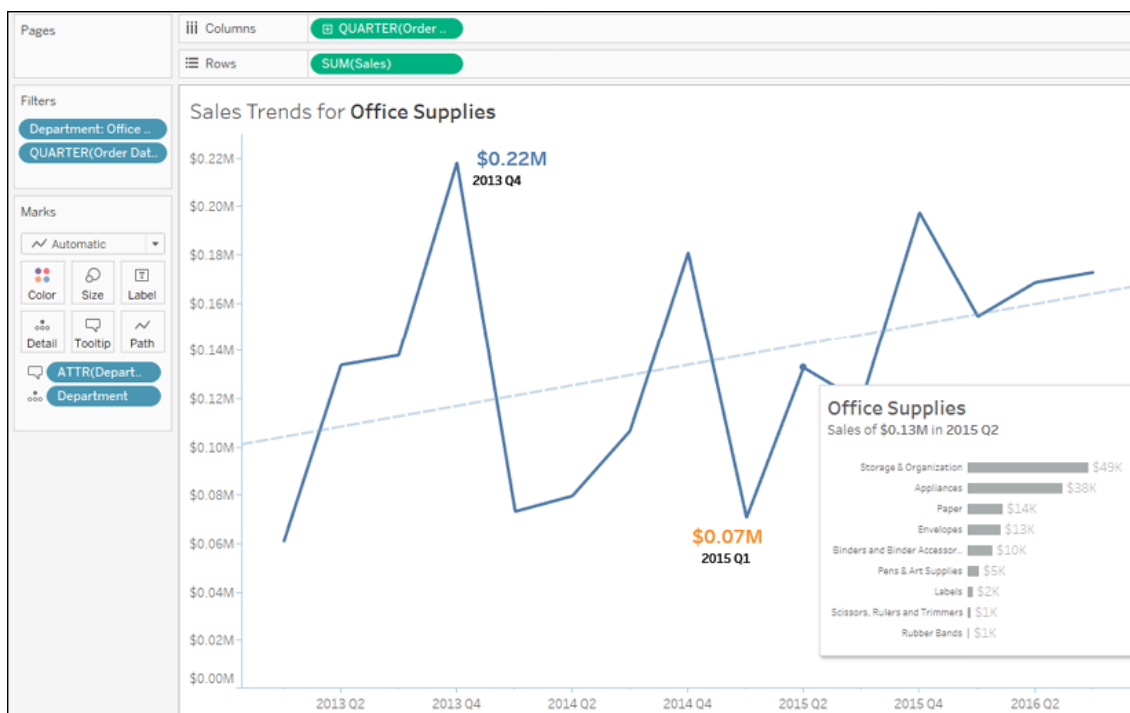Notice the final view with the tooltip:

Figure 7.24: Viz in Tooltip

There are many possibilities with Viz in Tooltip. First, you can leverage the capability to drill down into details without using extra space on a dashboard and without navigating to a separate view. Second, you can show different aspects of the data (for example: geographic location as a tooltip for a time series). Finally, you might consider how to use Viz in Tooltip to allow the end user to see parts of the whole within a broader context.

There are a great many more valuable applications of this feature, but here are a few tips to wrap up our examination of Viz in Tooltip:

- You may have more than one Viz in a single tooltip.
- Setting the **Fit** option to **Entire View** for the sheet being used in a tooltip fits it to the maximum width and height.
- You may hide sheets used in tooltips by right-clicking the tab of the sheet and selecting **Hide**. To restore them, right-click the tab of the sheet being used in the tooltip and select **Unhide Sheets**.

Summary

The goal of formatting is to increase effective communication of the data at hand. Always consider the audience, setting, mode, mood, and consistency as you work through the iterative process of formatting. Look for formatting that adds value to your visualization and avoid useless clutter.

We covered quite a few options for formatting -- from fonts, colors, lines, and more at the workbook level to formatting individual sheets and fields. We discussed how to customize formatting for numbers, dates, and null values and how to use these techniques to bring value to your visualizations.

With an understanding of how formatting works in Tableau, you'll have the ability to refine the visualizations that you created in discovery and analysis into incredibly effective communication of your data story.

In the next lab, we'll look at how this all comes together on dashboards.