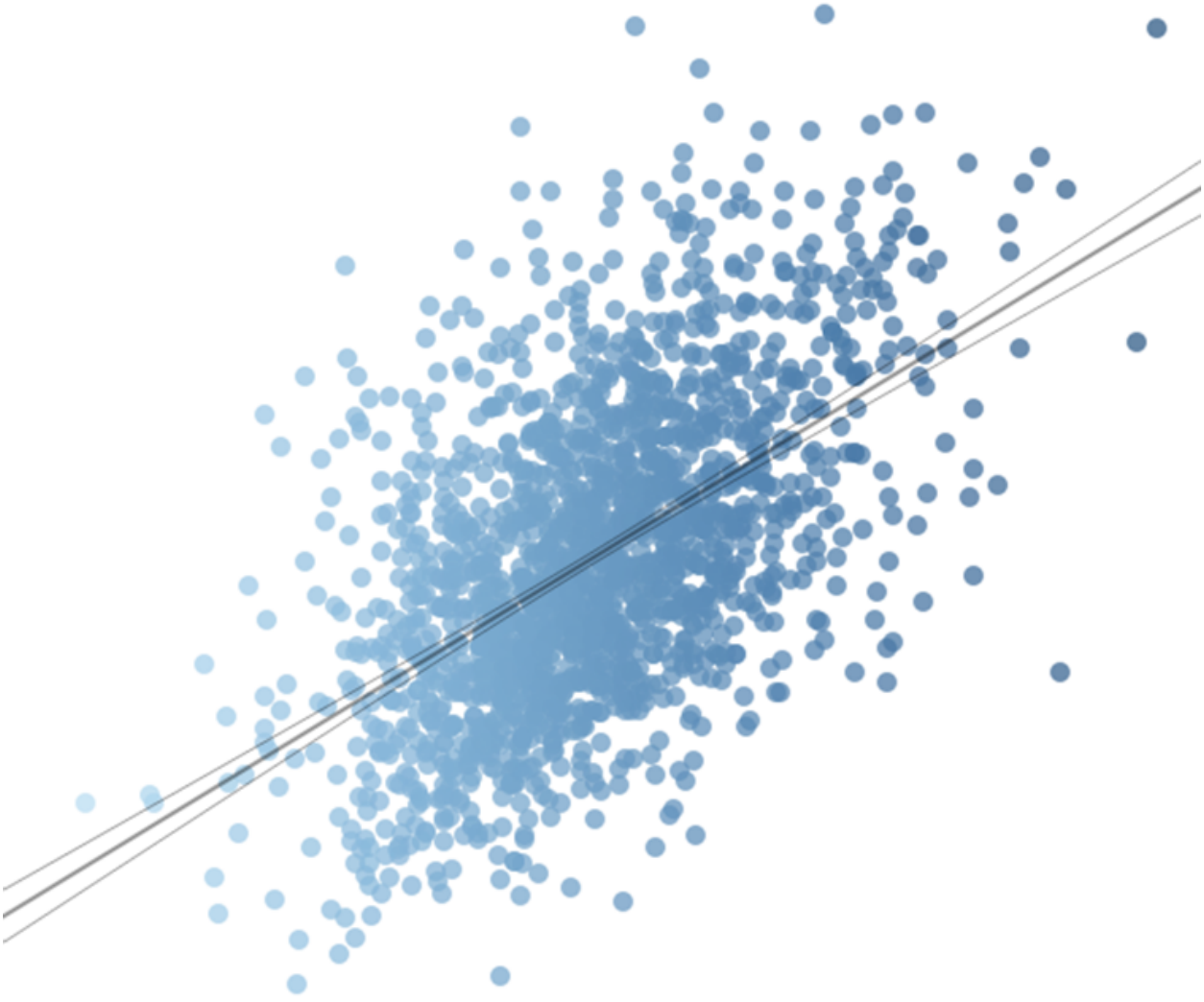
Tableau Classroom Training

Desktop I: Fundamentals

Practice Guide



tableau

Version 2022.3

Contents

How to Use These Materials

Each practice in this book supports and reinforces the skills presented in class. You won't be assigned to do a practice until the instructor has gone over the skills you need to complete it.

The practices include specifications on what you are to create or do in Tableau, often with a graphic of the finished view. (For a challenge, try to complete the practice using just the specification and the graphic as a guide.) This course also includes starter Tableau .twbx (packaged workbook) or data files to use with practices as well as completed solution files for all practices.

Practice Directions

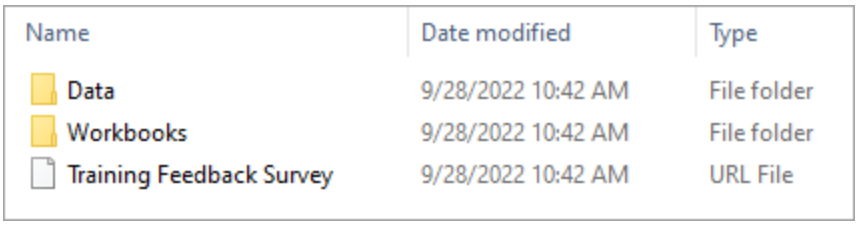
Follow the general **Directions** included in each practice. These appear immediately after the graphic of the finished view. The steps might not include every menu item or mouse click, but they describe what you need to do to create the specified result.

If you need additional help, refer to the detailed **Solution** steps at the back of this book.

Student Files in the Practices Folder

The student **Practices** folder will be provided to you as a download link. The **Practices** folder contains the following:

- **Data** folder, containing the data sources used in the practices for this course. For some practices, you will need to connect to data sources in this folder.
- **Workbooks** folder, containing starter .twbx files for the practices in each module that uses them and completed solution files for each module.
- A brief feedback survey form, which we encourage you to complete at the end of training.



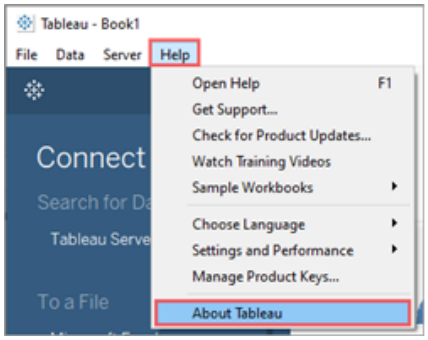
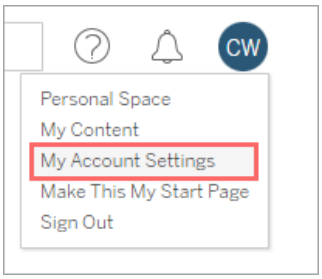
Browse to the starter and solution files: open the **Workbooks** folder, open either the **Starters** or **Solutions** subfolder, and then browse to the module subfolder and the specific starter or solution file you want to view.

NOTE If working with a download link of a zipped folder, right-click the folder and select **Extract All** to complete the download.

Selecting Your Environment

The activities for this course can be completed in the Tableau Desktop application or in the browser, from your Tableau site on Tableau Server or Tableau Cloud.

Refer to your course registration email or details from your instructor to select the tool based on your specific course. Most students will use Tableau Desktop. To ensure that you meet the requirements for the class, refer to the instructions for your environment in the following table.

Using Tableau Desktop:	Or Using a Tableau Site in the Browser:
■ You have downloaded the correct version of Tableau Desktop to your computer, as specified in your confirmation email. ■ To verify the version, open Tableau Desktop, and from the **Help** menu, select **About Tableau**.  ■ The version number is listed in at the top of the **About Tableau** window, to the left of the build number.  ■ You have an active license. If you are using the free trial, note that it lasts for 14 days.	■ You have a Creator license type and at least a Creator site role on a Tableau site. ■ To verify your site role, log into your Tableau site and from the **User** menu at the top right of the screen, select **My Account Settings**.  ■ Your site role is listed under your name at the top of the page. ■ You have publishing permissions to a project on the site. **NOTE** If you are on a company Tableau site or a site owned by another user, we highly recommend that you request a **Test** project be created that you can use for storing files and completing activities. Alternatively, you can store files and complete activities in your **Personal Space**.

In the appendix at the back of this book, you can find detailed directions for accessing and saving the course materials from either the desktop application or the browser.

For Mac Users

The instructions and images in this book were created using the Windows operating system, so people running Tableau Desktop using Mac OS may experience a few differences when doing the activities in the book.

Keyboard and Mouse Differences

Windows-based instruction	Difference on a Mac
CTRL + click	Press and hold the Command ⌘ key while you click.
Right-click	When using a mouse with no right-click button, press and hold the control key while you click.
Right-click and drag	Press the Option ⌥ (Alt) key, and hold it down while you click and drag.
Press CTRL	Press Command ⌘.
Press CTRL + Left Arrow	Press Command ⌘ + Control + Left Arrow

Visual Differences

The Windows-based instructions and images in this book may indicate that the X button to close a dialog box or window is in the top right corner, but on a Mac these buttons may be located in the top left corner instead.

There may also be small differences in the appearance and location of tabs, drop-down menus, and other visual features of Tableau Desktop, but the use and functionality of those features is the same in both operating systems.

Additional Note for Mac Users

When you open multiple workbooks in Tableau Desktop on a Mac, multiple instances of the application are created, each with its own icon in the Dock. This differs from typical Mac application behavior, where one instance of the application handles all open files managed by that application.

1. Introduction to Tableau

This module contains the following:

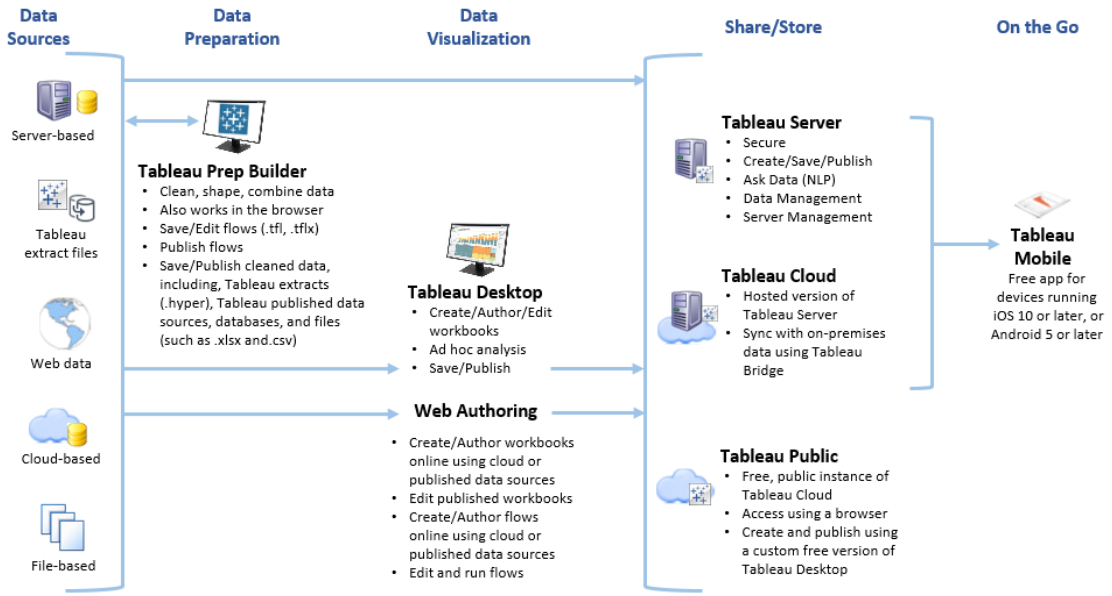
The Tableau Platform

Tableau is an end-to-end data and analytics platform. Using either Tableau's desktop application or Tableau's browser offerings, you can:

- Connect to data.
- Interact with, author, and edit visualizations.
- Share your insights with others.

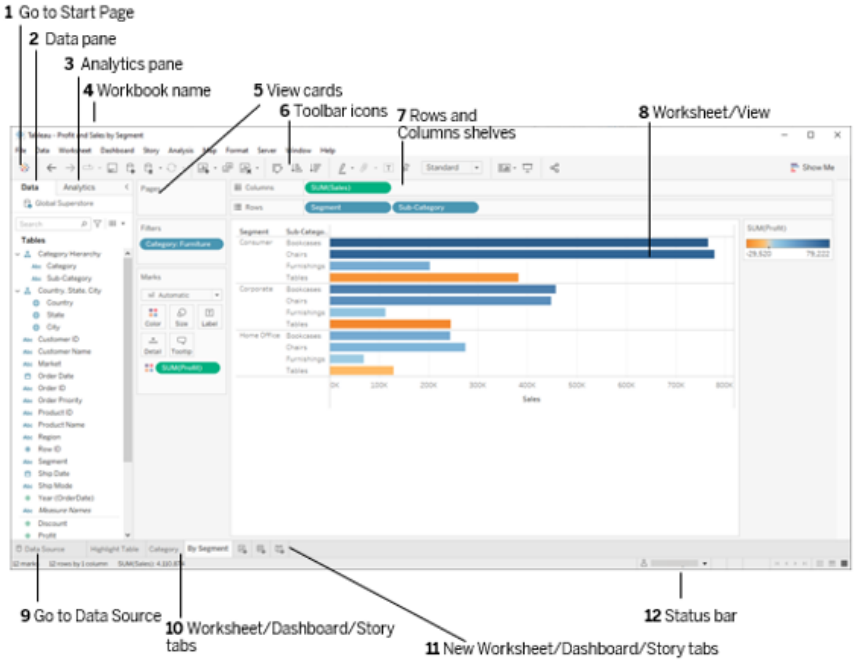
You can complete most exercises in this manual in your choice of environment.

NOTE To complete the activities for this class in the browser, you must have at least an **Explorer (can publish)** site role and publishing permissions. Activities that focus on working with data sources require at least a **Creator** site role and publishing permissions.



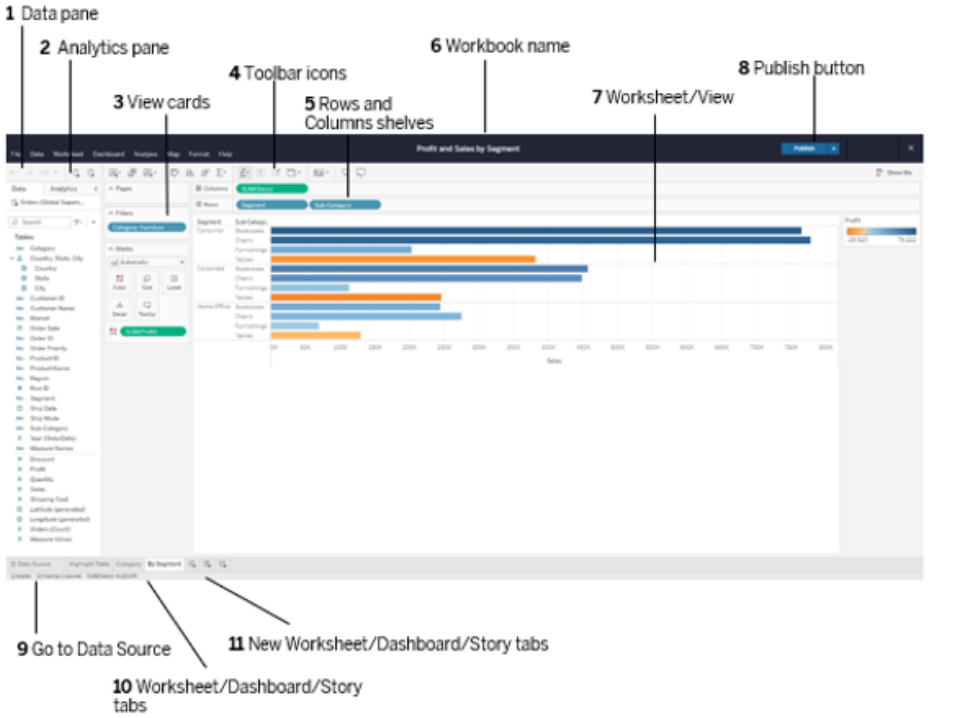
Application Terminology

From the Desktop Application



Term	Description
1 Go to Start Page	Toggle between the active sheet and the Desktop Start Page.
2 Data pane	Includes dimensions and measures, populated from your selected data source. May also include calculated fields, parameters, or sets.
3 Analytics pane	Includes options you can use to apply reference lines, forecasts, trend lines, to add totals to crosstabs, and to build boxplots.
4 Workbook name	The file name of your workbook.
5 View cards	Used for modifying the worksheet.
6 Toolbar icons	Icons are available for quick access to popular features.
7 Rows and Columns shelves	Drag fields here to add them to the visualization.
8 Worksheet/View	Workspace for building your visualizations.
9 Go to Data Source	Returns you to the data source specification page.
10 Worksheet tabs	Click to view a specific worksheet, dashboard, or story.
11 New Worksheet, Dashboard, and Story tabs	Click to create a new Worksheet, Dashboard, or Story.
12 Status bar	Displays data about the user, if signed into a Tableau site.

From the Browser



Term	Description
1 Data pane	Includes dimensions and measures, populated from your selected data source. May also include calculated fields, parameters, or sets.
2 Analytics pane	Includes options you can use to apply reference lines, trend lines, to add totals to crosstabs, and to build boxplots.
3 View cards	Used for modifying the worksheet.
4 Toolbar icons	Icons are available for quick access to popular features.
5 Rows and Columns shelves	Drag fields here to add them to the visualization.
6 Workbook name	The name of your workbook.
7 Worksheet/View	Workspace for building your visualizations.
8 Publish button	Lets you publish your workbook to a project on the site.
9 Go to Data Source	Returns you to the data source specification page.
10 Worksheet tabs	Click to view a specific worksheet, dashboard, or story.
11 New Worksheet, Dashboard, and Story tabs	Click to create a new Worksheet, Dashboard, or Story.

Visual Cues for Fields

Tableau displays the following visual cues in the **Data** pane and the view.

Modifiers

The following table explains how each of the field icons displayed in the **Data** pane can be modified by one of four indicators:

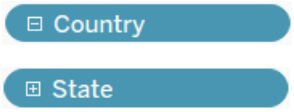
Abc	Blue icons indicate that the field is discrete.
#	Green icons indicate that the field is continuous.
=Abc	Icons preceded by the equal sign (=) indicate that the field is a user-defined calculation or a copy of another field.
Abc Market !	Fields in the Data pane with an exclamation mark next to them indicate that the field is invalid.

Fields in the Data Pane

These are the primary fields you will see in the **Data** pane. For a complete list, see the topic "Visual Cues and Icons in Tableau Desktop" in the Tableau Desktop **Help** menu.

Icon	Description
T|F	Boolean (true/false) values
	Date and time values
	Date only values
	Geographic data
	Group
#	Numeric values
	Table
Abc	Text values
	User-defined set

Fields on Shelves

Icon or Visual Cue	Description
	A blue field on a shelf indicates a discrete field.
	A green field on a shelf indicates a continuous field.
	A (SORT) icon indicates a sorted field.
	The delta icon indicates that the field has a table calculation applied to it.
	The plus and minus controls appear when the field is part of a hierarchy in which you can drill up or down.

2. Tableau Workflow

This module contains the following:

Practice: Exploring Tableau and the Data

Practice: Exploring Tableau and the Data

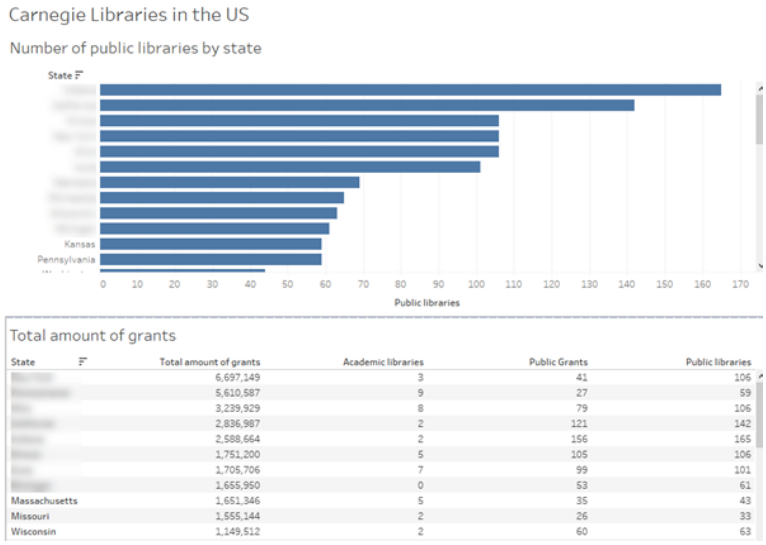
In this practice, you will connect to data in a text file. Then, build a sorted bar chart and a text table so you can find the answer to some questions. Finally, use your views to build an interactive dashboard to share the data for exploration.

Carnegie Library Exploration

Between 1883 and 1929, Andrew Carnegie, an American businessman and philanthropist, donated $45 million to cities across the United States to build libraries. Use the data set provided to answer these questions:

- Which state has the most Carnegie public libraries?
- Which state was granted the most money for libraries overall?

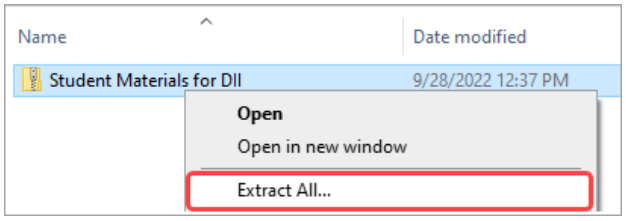
Use the data to create a dashboard like this:



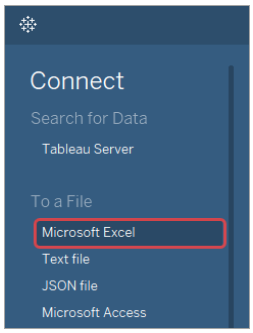
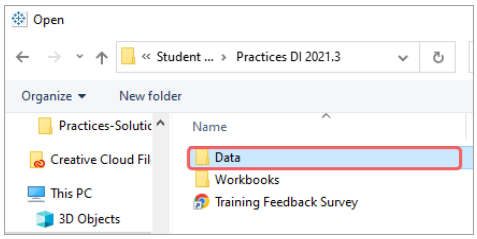
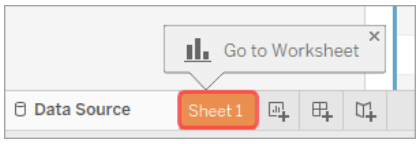
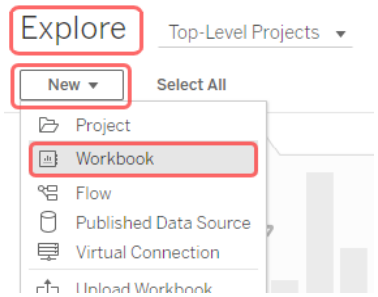
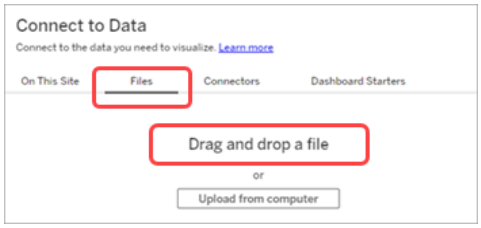
NOTE The image is blurred so the state names don't show.

Connect to Data

1. To begin, if you're working with a download link of a zipped **Materials** folder, right-click the folder and select **Extract All** to download the files.



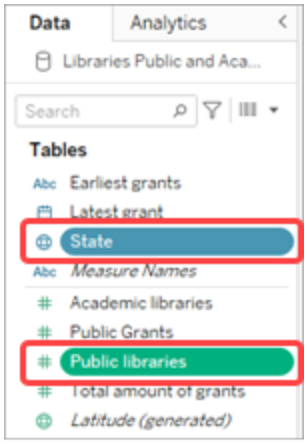
2. **IMPORTANT** You will now connect to data from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions for connecting to data.
   - For **Tableau Desktop**, follow the instructions "Connect to Data from Tableau Desktop".
   - For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Connect to Data from the Browser".

Connect to Data from Tableau Desktop:	Or Connect to Data from the Browser:
1. Open Tableau Desktop, and under **Connect** click **Microsoft Excel**.  2. Navigate to the **Practices** folder and open the **Data** folder.  3. Open the **libraries.xlsx** file. You should now see the data from the Excel file on the lower half of the screen, with the **Libraries Public and Academic** sheet in the area above. 4. Click **Sheet 1** to go to the worksheet.  5. Continue to the section "Analyze the Data and Build Two Views".	1. In the **Student Materials** folder, open the **Data** subfolder. 2. On the **Explore** page of your Tableau site, click **New** and then click **Workbook**.  3. In the **Connect to Data** dialog box, select the **Files** tab. 4. From the **Data** subfolder of the **Student Materials** folder, drag **libraries.xlsx** to the **Connect to Data** dialog box, and drop on **Drag and drop a file**.  5. When the data source finishes loading, the workbook will automatically open to a new worksheet. 6. Continue to the section, "Analyze the Data and Build Two Views".

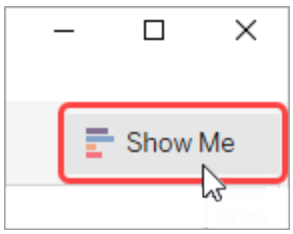
Analyze the Data and Build Two Views

Question 1: Which state has the most Carnegie public libraries? To find out, create a bar chart using the dimension **State** and measure **Public libraries**.

1. In the Data pane, CTRL + click **State** and **Public Libraries**.



2. On the far right side of the toolbar, click **Show Me** to open the **Show Me** menu.



3. On the **Show Me** menu, click the **horizontal bars** icon.

4. Click **Show Me** again to close the **Show Me** menu.

5. Alternatively, to build the view using drag and drop:

Drag this field	To
Public libraries	**Columns**
State	**Rows**

6. On the toolbar, click the **Sort Descending** icon . This sorts the values from highest to lowest.
7. Give your worksheet a title. Double-click the tab **Sheet 1**, and type a name for your view. For example: Number of public libraries by state

The state with the most Carnegie public libraries: _____

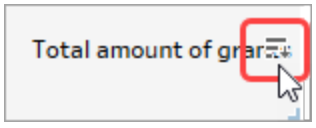
Question 2: Which state was granted the most money to build libraries?

1. Click the **New Worksheet** tab to add a second worksheet:

2. Create a text table (also referred to as a crosstab):

Drag this field	To
Total amount of grants	The middle of the view, labeled **Drop field here**
State	**Rows**

3. Add more measures to the view: drag **Public libraries** to the text table, and when **Show Me** displays in the view, drop the field.
4. Repeat the previous step for the fields **Public grants** and **Academic libraries**.
5. On the toolbar, use the drop-down to change from **Standard** to **Fit Width**. This expands the view so you can read the column headings.
6. Hover your pointer over the **Total amount of grants** column header, and click the **Sort Descending** icon that displays.



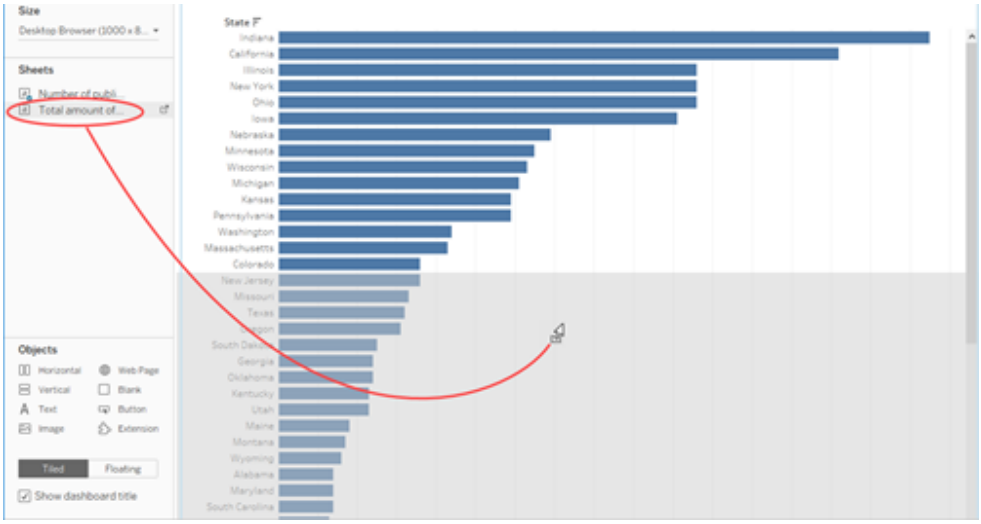
7. Give your worksheet a title. Double-click the tab **Sheet 2**, and type a name for your view. For example: "Total amount of grants"

The state with the highest total amount of grant money: _____

Build a Dashboard

1. Click the **New Dashboard** tab to add a dashboard.

2. Under **Sheets**, drag the worksheet **Number of public libraries by state** to the dashboard on **Drop sheets here**.
3. Drag the worksheet **Total amount of grants** to the bottom half of the dashboard and drop when you see the gray box.



4. On the **Number of public libraries by state** sheet, click the **Use as Filter** button.

5. Use CTRL + click to select both Indiana and New York.

   *Notice how the **Total amount of grants** sheet now displays only the results for Indiana and New York.*

6. Name the dashboard **Carnegie Libraries in the US** and on the **Dashboard** menu, click **Show Title**.

Solution

For the solution to this practice, see "Solution: Exploring Tableau and the Data" on page 69.

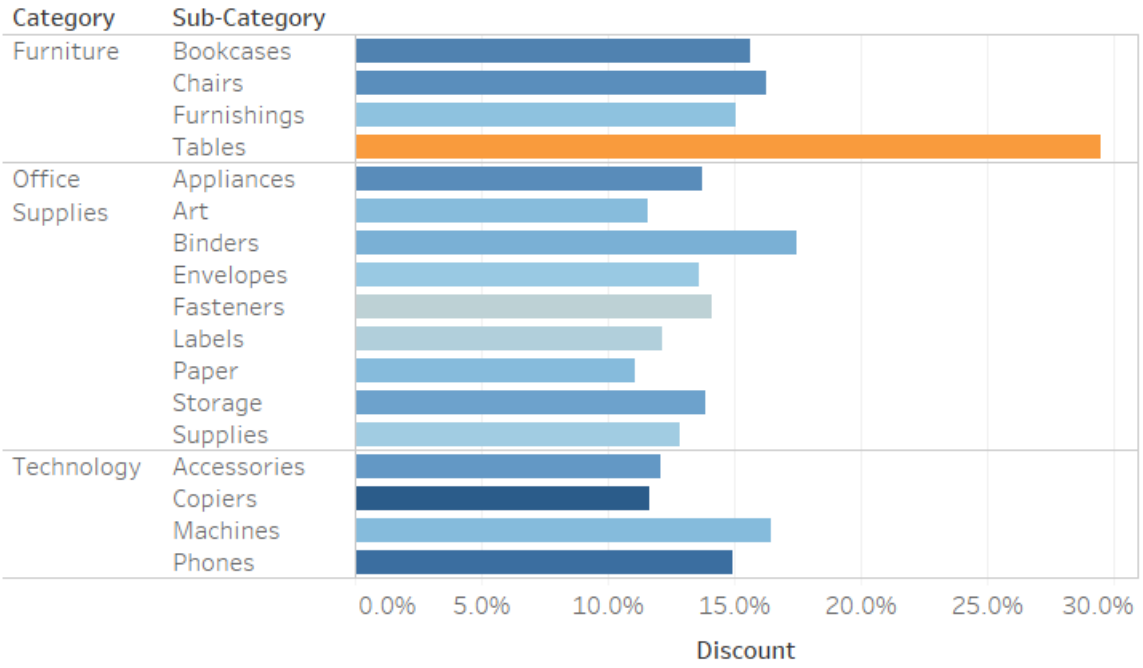
3. Setting Up Connections and Data Sources

This module contains the following:

Practice: Creating and Saving a Data Connection

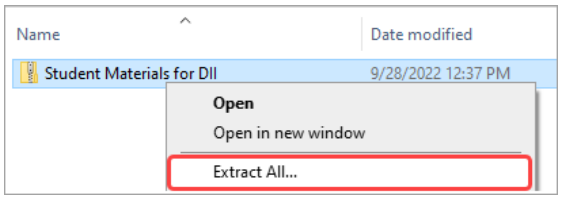
Practice: Creating and Saving a Data Connection

Connect to a data source and edit some data attributes. Save your customizations for reuse in different workbooks and to share with others. Finally, create a visualization.



Create the Connection

1. To begin, if you're working with a download link of a zipped **Materials** folder, right-click the folder and select **Extract All** to download the files if you have not previously done so.

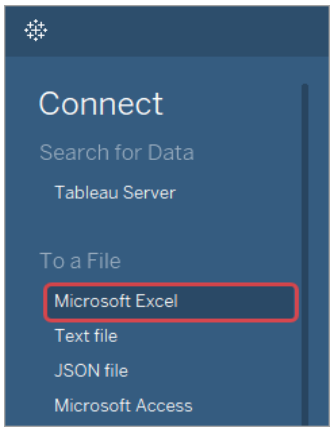


2. **IMPORTANT** You will now create the connection from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions for creating the connection.

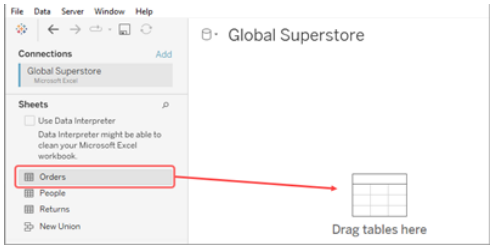
- For **Tableau Desktop**, follow the instructions "Create the Connection from Tableau Desktop".
- For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Create the Connection from the Browser".

Create the Connection from Tableau Desktop:

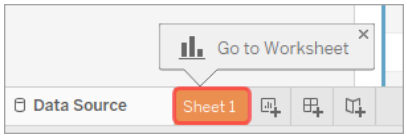
1. Open Tableau Desktop, and under **Connect** click **Microsoft Excel**.



2. In the dialog box that opens, browse to the **Data Connection Practice.xlsx** data source, located in the **Data** folder within the **Practices** folder of **Student Materials** and click **Open**.
3. On the **Data Source** tab, in the **Connections** pane, under **Sheets**, double-click the **Orders** table to add it to the canvas, or drag and drop it to the **Drag tables here** area on the canvas.



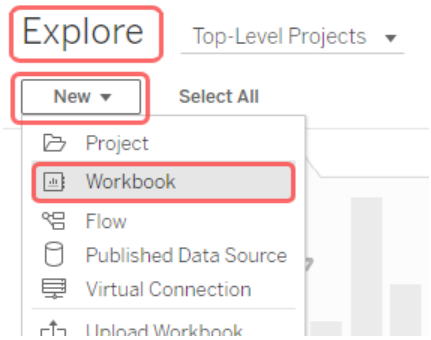
4. Click **Sheet 1** to go to the worksheet.



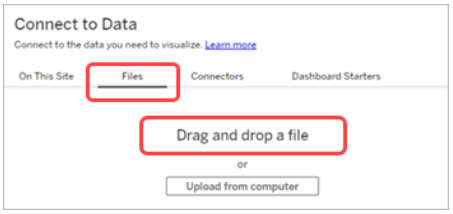
5. Continue to the section "Change Data Attributes".

Or Create the Connection from the Browser:

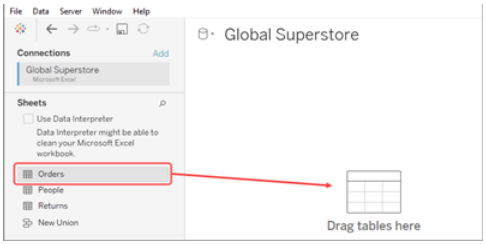
1. In the **Student Materials** folder, open the **Data** subfolder.
2. On the **Explore** page of your Tableau site, click **New** and then click **Workbook**.

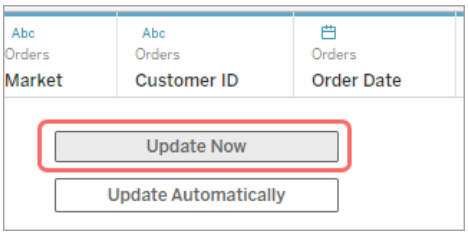


3. In the **Connect to Data** dialog box, select the **Files** tab.
4. From the **Data** subfolder of the **Student Materials** folder, drag **Data Connection Practice.xlsx** to the **Connect to Data** dialog box, and drop on **Drag and drop a file**.



5. On the **Data Source** tab, in the **Connections** pane, under **Sheets**, double-click the **Orders** table to add it to the canvas, or drag and drop it to the **Drag tables here** area on the canvas.



Create the Connection from Tableau Desktop:	Or Create the Connection from the Browser:
	6. In the data grid, click **Update Now** to populate it.  7. Select the **Sheet 1** tab to open a new worksheet. 8. Continue to the section "Change Data Attributes".

Change Data Attributes

1. In the **Data** pane, rename the **Row** field to **Row ID**.
2. Change **Row ID** from a **Measure** to a **Dimension**.

   NOTE Tableau normally displays fields containing numbers as measures; however, Tableau recognized that the **Customer ID** field from the original Excel file should be a dimension because of the " ID" at the end.

3. Rename the **Global Area** field to **Country**, and assign this field a geographic role of **Country/Region**.
4. Change the **Default Aggregation** of the **Profit** and **Discount** fields to **Average**. **NOTE** The Desktop application allows you to change default field properties, including number format, comments, color, and so on.
5. Create a folder named **Customer Info** that contains the **Customer Name** and **Customer ID** fields.
6. In the **Sub-Category** field, create the alias "Art Supplies" for the **Art** value.

   NOTE Changes to the data attributes do not modify the actual data in the underlying data source.

Save the Data Source and Test the Connection

You can save your customizations for reuse in different workbooks and to share with others. To do so in the Desktop application environment, save your customizations to a local file in the Tableau data source (.tds) format. In the browser environment, publish your customized data source to a project where you have appropriate permissions.

IMPORTANT You will now save your customizations from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions.

- For **Tableau Desktop**, follow the instructions "Save Customizations from Tableau Desktop".

- For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Save Customizations from the Browser".

Save Customizations from Tableau Desktop:	Or Save Customizations from the Browser:
1. Add **Orders (Data Connection Practice)** to **Saved Data Sources** as "My Superstore" and ensure it is saved in the **Data Sources** subfolder of the **My Tableau Repository** folder, which is located in the **Documents** folder on your computer. 2. Close the current workbook without saving changes, and then open a new workbook. On the **Connect** pane, under **Saved Data Sources** select the new "My Superstore" data source, and observe the data attribute changes that were saved. 3. Continue to the section, "Create a Visualization". **NOTE** A .tds file does not contain the actual data, but rather the information necessary to connect to the data as well as any data attribute modifications you've made, such as different default properties.	1. At the top of the **Data** pane, right-click the **Orders (Data Connection Practice)** data source and select **Save As Published Data Source**. 2. In the **Publish Data Source** dialog box: ■ Under **Name**, type "My Superstore". ■ Select a project where you have publishing permissions. **NOTE** If you are on a company Tableau site or a site owned by another user, we highly recommend that you request a **Test** project be created that you can use for publishing your work. 3. Close the current workbook without publishing, and then open a new workbook. 4. In the **Connect to Data** dialog box, on the **On This Site** tab, select the new "My Superstore" data source, and click **Connect**. Observe the data attribute changes that were saved. 5. Continue to the section, "Create a Visualization".

Create a Visualization

1. Build a bar chart showing the average **Discount** by **Category** and **Sub-Category**.
2. From the **Data** pane, drag **Profit** to **Color** on the **Marks** card.
3. Observe that **Discount** and **Profit** are displayed with the saved attribute changes.

Add Additional Formatting (Optional)

1. On **Columns**, right-click **AVG(Discount)**, and format it as a percentage with **2** decimal places.
2. On the **Marks** card, right-click **Profit**, and format it as **Currency** with **0** decimal places.

Solution

For the solution to this practice, see "Solution: Creating and Saving a Data Connection" on page 73.

4. Simplifying and Sorting Your Data

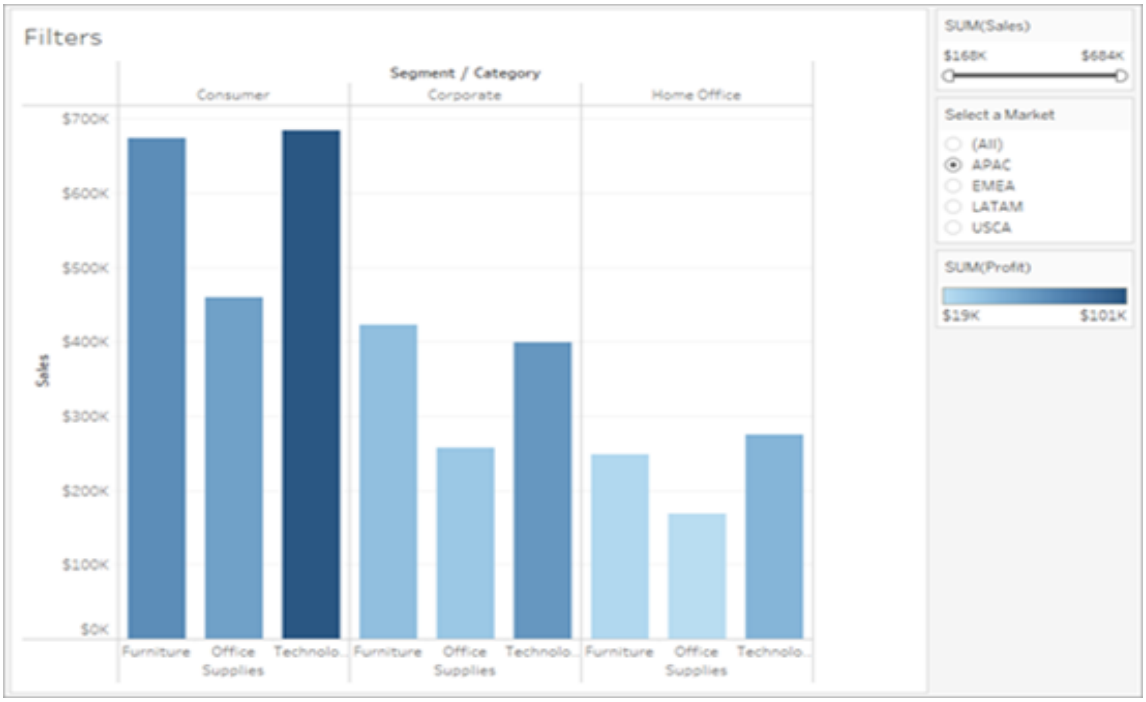
This module contains the following:

Practice: Filtering

Practice: Sorting

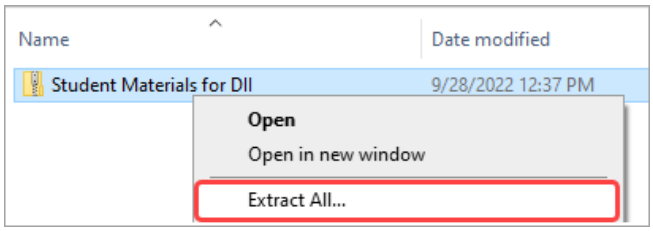
Practice: Filtering

You have a view that shows sales data for all of your inventory. Add filters to the view in order to only show information for the selected market and within a range of the sum of sales.



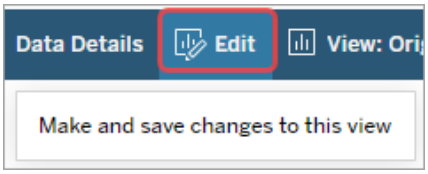
Access the Starter Workbook

1. To begin, if you're working with a download link of a zipped **Materials** folder and you have not already done so, right-click the folder and select **Extract All** to download the files.



2. **IMPORTANT** You will now access the starter workbook from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. Follow the instructions for your environment.

Access the Starter from Tableau Desktop:	Or Access the Starter from the Browser:
1. From the **Student Materials** folder, open the **Practices** folder. Within the	1. On the **Explore** page of your Tableau site, click **New** and then click **Workbook**.

Access the Starter from Tableau Desktop:	Or Access the Starter from the Browser:
Practices folder, open the subfolders **Workbooks** > **Starters** > **04_ Simplifying and Sorting Your Data** to navigate to the **Filtering_ Starter.twbx** starter file. 2. Click **Open** to open the file. 3. Continue to the section "Create the Filters".	2. In the **Upload Workbook** dialog box, name the workbook under **Name**, and under **Project**, select a project where you have publishing permissions. **NOTE** If you are on a company Tableau site or a site owned by another user, we highly recommend that you request a **Test** project be created that you can use for storing files and completing activities. 3. Click **Choose a file**. 4. Navigate to the file: From the **Student Materials** folder, open the **Practices** folder. Within the **Practices** folder, open the subfolders **Workbooks** > **Starters** > **04_Simplifying and Sorting Your Data** to navigate to the **Filtering_Starter.twbx** starter file. 5. Select **Filtering_Starter.twbx**, and click **Open**. 6. Click **Upload** in the **Upload Workbook** dialog box. 7. The view will automatically open in Tableau. Click **Edit** on the toolbar to make the view editable so that you can complete the practice.  8. Continue to the section, "Create the Filters".

Create the Filters

1. Create a filter for **Market**, displayed as a single value list, and titled "Select a Market".
2. Create a filter for **Sum** of **Sales**, displayed as a slider, and titled "Adjust view by Sales".
3. Experiment with the sliders and notice the "AND" logic being used. The results shown are those that match the criteria of both filters.

SELF CHECK Which **Segment** / **Category** had the greatest sales for the **EMEA Market** when the sum of sales was between $300K and $800K?

Solution

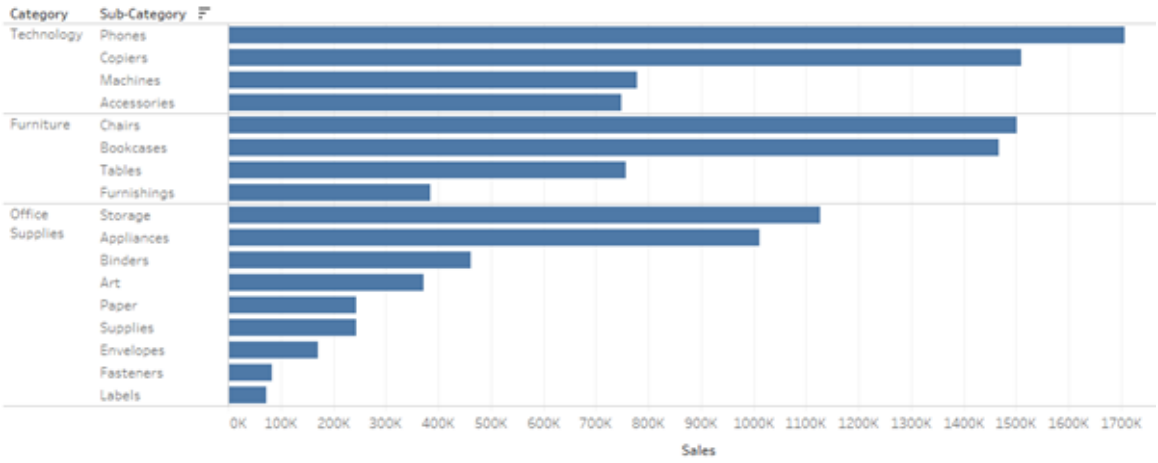
For the solution to this practice, see "Solution: Filtering" on page 78.

Practice: Sorting

You currently have a view that shows sales broken down by product category and sub-category.

View One

Sort the data in order to make it easier to compare your sales within sub-categories. Manually change the order of the categories so you can keep an eye on Technology sales.



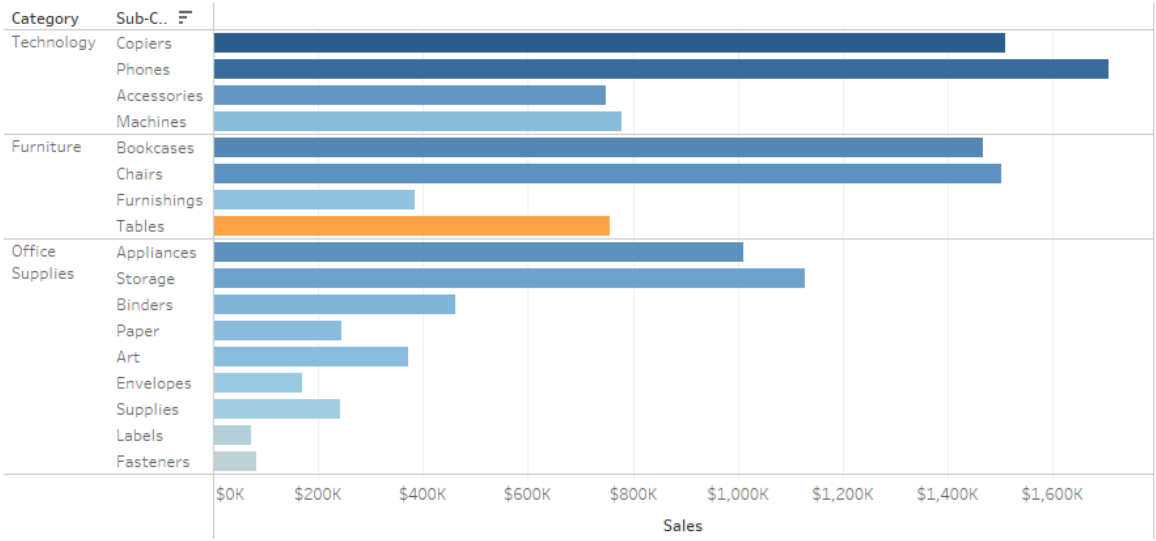
Directions

1. Use the **Sorting_Starter.twbx** file (found in the **Practices\Workbooks\Starters** folder).
2. On the **View One** worksheet:
   - Sort **Sub-Category** by **SUM(Sales)** in descending order.
   - Create a manual sort for **Category**, with values ordered by **Technology**, **Furniture**, and then **Office Supplies**.

SELF CHECK 1 In **Office Supplies**, which **Sub-Category** has slightly higher sales than **Supplies**? How do you know?

View Two

Starting with a duplicate of the first worksheet, use color and a computed sort to compare the sum of profit for the sub-categories.



Directions

1. Duplicate the **View One** worksheet to create a **View Two** worksheet.
2. On the **View Two** worksheet:
   - Color encode the bars by **Profit**, and edit the color palette to Orange-Blue Diverging.
   - Edit the sort applied to **Sub-Category** so the field selected is **Profit** aggregated by sum.

SELF CHECK 2 Which **Sub-Category** is the least profitable? Does it have higher or lower sales than the **Furnishings Sub-Category**? How do you know?

Solution

For the solution to this practice, see "Solution: Sorting" on page 79.

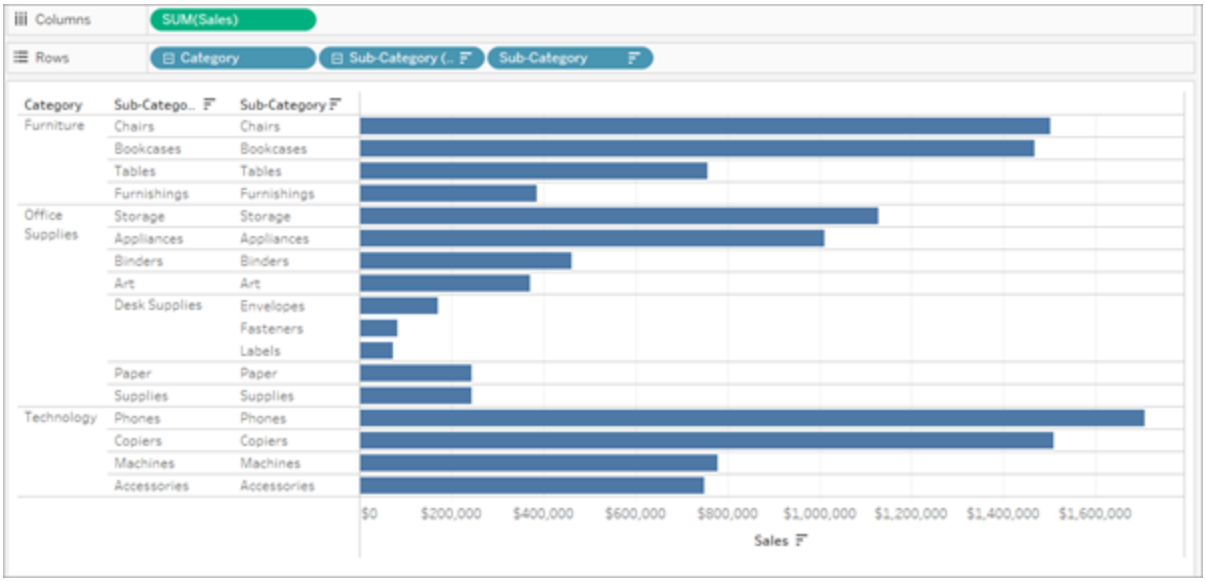
5. Organizing Your Data

This module contains the following:

Practice: Creating Groups and Hierarchies

Practice: Creating Groups and Hierarchies

You currently have a view that displays sales broken down by product sub-category. Create a group to compare the sales of desk supplies with other products in the same category. Then, create a product hierarchy to drill up and down so you can quickly compare sales by category, sub-category (group), or sub-category.



Directions

1. Use **Creating_Groups_and_Hierarchies_Starter.twbx** (found in the **Practices\Workbooks\Starters** folder).
2. On the worksheet, create a new group from the following items in **Sub-Category**: **Envelopes**, **Fasteners**, and **Labels**. (**HINT**: Group the sub-categories by selecting their names in the header. Avoid clicking the bars in the view.)
3. In the **Data** pane, right-click **Sub-Category (group)**, and then click **Edit Group**.
4. In the **Edit Group** dialog box, rename the new **Envelopes, Fasteners, Labels** group to "Desk Supplies".
5. In the **Data** pane, create a hierarchy called "Products", organized as follows:
   Category

   Sub-Category (group)

   Sub-Category

   Product Name
6. Drag the new **Products** hierarchy on top of **Sub-Category** to overwrite it.
7. In the view, drill down to **Sub-Category (group)** and then **Sub-Category**.

SELF CHECK Use the hierarchy in the view to answer the following questions: Which **Category** has the greatest sales? What are the total sales for the **Desk Supplies** group?

Solution

For the solution to this practice, see "Solution: Creating Groups and Hierarchies" on page 81.

6. Viewing Specific Values

This module contains the following:

Practice: Totals and Aggregation

Practice: Highlight Table

Practice: Totals and Aggregation

View One: Total Sales

Create a crosstab that shows total product sales broken down by category, sub-category, and market. Use your crosstab to compare totals across different dimensions.

		Market				
Category	Sub-Categ..	APAC	EMEA	LATAM	USCA	Grand Total
Furniture	Bookcases	504,823	538,720	302,415	120,614	1,466,572
	Chairs	512,974	354,836	302,219	331,652	1,501,682
	Furnishings	101,038	129,571	62,456	92,514	385,578
	Tables	225,099	179,248	144,880	207,815	757,042
	Total	1,343,934	1,202,374	811,971	752,595	4,110,874
Office Supplies	Appliances	307,621	405,896	182,075	115,473	1,011,064
	Art	63,008	236,661	41,185	31,238	372,092
	Binders	63,527	148,743	43,140	206,502	461,912
	Envelopes	52,112	60,392	41,357	17,044	170,904
	Fasteners	28,097	32,497	19,145	3,504	83,242
	Labels	22,323	24,618	13,555	12,908	73,404
	Paper	59,901	66,202	38,190	79,999	244,292
	Storage	216,076	534,543	142,036	234,431	1,127,086
	Supplies	71,655	80,197	43,239	47,983	243,074
	Total	884,320	1,589,749	563,921	749,081	3,787,070
Technology	Accessories	186,235	249,410	141,739	171,854	749,237
	Copiers	494,594	541,527	316,322	156,994	1,509,436
	Machines	190,307	354,299	40,941	193,513	779,060
	Phones	486,354	590,665	289,711	340,093	1,706,824
	Total	1,357,490	1,735,901	788,714	862,453	4,744,557
Grand Total		3,585,744	4,528,024	2,164,605	2,364,129	12,642,502

Directions

1. Connect to the Excel data source **Global Superstore.xlsx** (in the **Practices\Data** folder).
2. Use the **Orders** sheet for your analysis.
3. Rename **Sheet 1** to **Total Sales**.
4. On the **Total Sales** worksheet, create a crosstab that shows the total **Sales** of each **Category** and **Sub-Category** of product broken down by **Market**.
5. Show all subtotals.
6. Show all row and column grand totals.

SELF CHECK 1 Which **Market** had a higher **Grand Total** for **Sales** than the entire **Furniture Category**?

Bonus: Maximum Sales View (Optional)

If desired, create a new crosstab that shows maximum product sales, broken down by category, sub-category, and market.

			Market			
Category	Sub-Category	Grand Total	APAC	EMEA	LATAM	USCA
Grand Total		22,638	6,999	7,959	3,474	22,638
Furniture	Total	5,760	5,760	5,729	3,473	4,416
	Bookcases	5,668	5,668	3,499	2,751	4,405
	Chairs	5,760	5,760	5,729	3,473	4,416
	Furnishings	1,519	880	1,519	785	1,336
	Tables	5,451	5,451	5,451	3,117	4,298
Office Supplies	Total	9,893	4,864	7,959	3,243	9,893
	Appliances	7,959	4,864	7,959	3,243	2,625
	Art	1,113	513	769	479	1,113
	Binders	9,893	609	720	434	9,893
	Envelopes	605	486	570	435	605
	Fasteners	271	226	271	119	116
	Labels	786	160	158	104	786
	Paper	734	498	677	315	734
	Storage	2,963	1,981	2,963	1,455	2,934
	Supplies	8,188	540	667	431	8,188
Technology	Total	22,638	6,999	5,785	3,474	22,638
	Accessories	3,450	3,079	3,450	2,298	3,347
	Copiers	17,500	4,448	5,301	2,366	17,500
	Machines	22,638	2,195	2,910	1,601	22,638
	Phones	6,999	6,999	5,785	3,474	4,549

Directions for Bonus View

1. Create a duplicate crosstab named **Maximum Sales**.
2. Change **Sales** to be aggregated using **Maximum**.
3. Show the row totals on the left and the column totals on the top in the crosstab.

SELF CHECK 2 Which **Market** had the **Maximum Sales** for any product? Which **Category** and **Sub-Category** product was responsible for that maximum?

Solution

For the solution to this practice, see "Solution: Totals and Aggregation" on page 82.

Practice: Highlight Table

Create a highlight table that shows profit for category and sub-category broken down by market and region. Include grand totals for the rows in the color encoding to see which sub-categories were the most and least profitable.

		Market / Region																		
		APAC				EMEA					LATAM				USCA					Grand Total
Category	Sub-Categ..	Central Asia	North Asia	Oceania	Southeast Asia	Africa	Central	EMEA	North	South	Caribbean	Central	North	South	Canada	Central	East	South	West	
Furniture	Bookcases	21,944	25,657	13,389	6,667	7,165	20,290	7,938	15,289	20,829	1,949	11,167	4,977	6,794	1,343	-1,998	-1,168	1,339	-1,647	161,924
	Chairs	17,435	26,509	15,028	3,230	2,784	22,218	-610	4,754	-7,181	5,416	8,278	5,215	9,872	857	6,593	9,358	6,612	4,028	140,396
	Furnishings	5,367	5,486	3,862	1,452	2,302	11,023	1,441	-2,801	5,428	-1,205	2,436	-3,523	2,527	114	-3,906	5,881	3,443	7,641	46,967
	Tables	4,190	-5,471	-230	-18,618	4,011	-15,321	2,764	3,296	-8,974	63	-2,670	3,716	-13,415	300	-3,560	-11,025	-4,623	1,483	-64,083
Office Supplies	Appliances	6,269	12,859	12,444	10,557	3,670	18,184	3,024	7,785	20,369	5,597	4,136	12,189	4,226	2,234	-2,639	8,391	4,124	8,261	141,681
	Art	2,172	4,101	2,255	-1,190	3,977	19,464	1,452	4,016	7,314	964	1,722	3,675	590	913	1,195	1,900	1,059	2,374	57,954
	Binders	2,767	2,907	2,728	2,395	2,659	12,825	2,910	2,470	4,466	1,145	1,186	2,756	228	786	-1,044	11,268	3,901	16,097	72,450
	Envelopes	2,182	3,421	1,262	-1,641	1,518	4,732	811	1,704	2,205	994	1,647	3,286	346	171	1,778	1,812	1,465	1,909	29,601
	Fasteners	1,025	1,480	774	-1,602	854	2,997	945	533	898	467	360	1,297	408	140	237	264	174	275	11,525
	Labels	896	1,300	1,158	-870	786	2,006	391	480	802	366	659	946	415	129	1,073	1,129	1,041	2,303	15,011
	Paper	3,006	3,032	2,693	-1,859	2,063	4,871	887	1,320	2,693	1,292	1,356	2,517	909	374	6,972	9,015	5,947	12,119	59,208
	Storage	6,138	8,482	7,706	2,418	11,915	24,845	3,453	6,484	-3,379	2,616	3,649	8,687	1,256	2,912	1,970	8,389	2,274	8,645	108,461
	Supplies	2,649	3,344	2,286	-4,034	1,038	6,484	997	933	2,208	1,378	1,311	3,326	1,556	297	-662	-1,155	2	626	22,583
Technology	Accessories	8,026	8,796	7,702	-8,642	6,478	18,861	3,583	5,000	9,581	3,346	6,423	11,123	6,116	1,295	7,252	11,196	7,005	16,485	129,626
	Copiers	17,812	30,090	21,597	11,356	14,009	22,602	8,178	15,539	18,059	7,179	6,540	21,343	5,983	2,664	15,609	17,023	3,659	19,327	258,568
	Machines	7,494	10,308	3,958	4,783	5,948	11,930	2,742	9,559	-4,201	-2,604	441	3,680	839	608	-1,486	6,929	-1,439	-619	58,868
	Phones	23,108	23,277	21,477	13,452	17,695	27,523	2,991	15,421	-5,600	5,608	7,522	17,608	-560	2,680	12,323	12,315	10,767	9,111	216,717

Directions

1. Connect to the Excel data source **Global Superstore.xlsx** (in the **Practices\Data** folder).
2. Use the **Orders** sheet for your analysis.
3. Create a view that shows **Profit** as colored text. (**HINT**: Use the **Marks** card.)
   Continue making the view by showing profit for **Category** and **Sub-Category**.
4. Refine the view by adding in **Market** and **Region**.
5. Change the **Mark** type to **Square**.
6. Use **Show Row Grand Totals**.
7. Edit **Color** on the **Marks** card to include totals.

SELF CHECK Which product **Sub-Category** was the most profitable? Which was the least profitable?

Solution

For the solution to this practice, see "Solution: Highlight Table" on page 83.

7. Slicing Your Data by Date

This module contains the following:

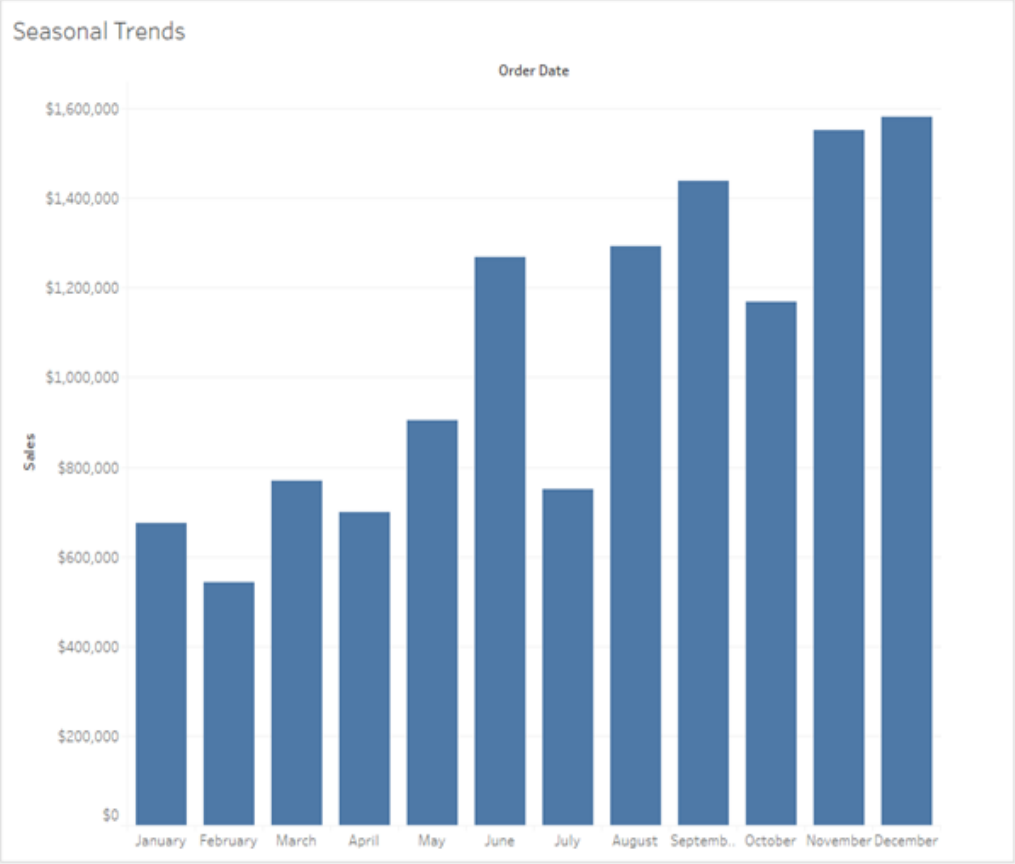
Practice: Date Parts and Date Values

Practice: Date Parts and Date Values

Create a Bar Chart to Show Seasonal Trends

Create a bar chart to show seasonal trends in sales by discrete month of order date. Use your visualization to determine which months of the year see highest and lowest sales.

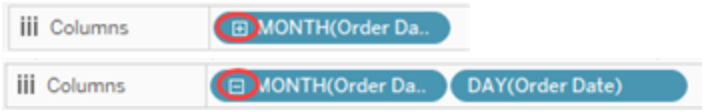
SELF CHECK Which format, date part or date value, would better show seasonal trends?



Directions for Seasonal Trends View

1. Connect to the Excel data source **Global Superstore.xlsx** (in the **Practices\Data** folder).
2. Use the **Orders** sheet for your analysis.
3. Name **Sheet 1** "Seasonal Trends."
4. Create a view that shows **Sales** by **Order Date**.
5. Change the chart type to **Bar**. (**HINT**: Use the **Marks** card.)
6. Right-click the **Order Date** and select the **Month** date part (May) format.

7. On the date on columns, use the plus and minus sign icons to drill down and up to different levels of detail.



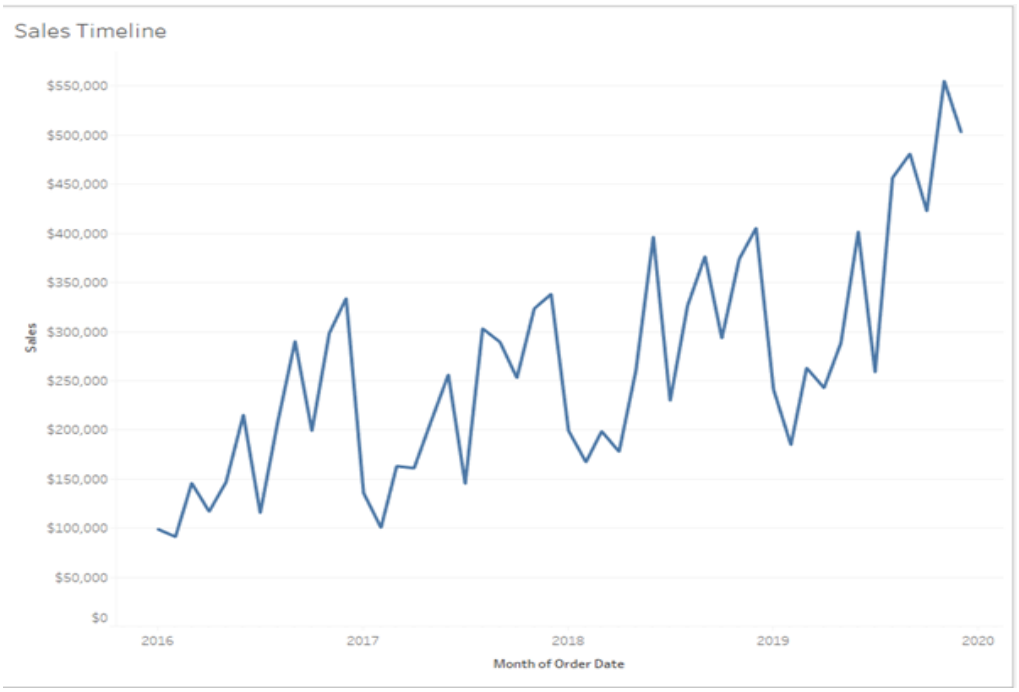
8. Create a filter for years.
9. Show the filter and observe the results.
10. Apply the filter to all worksheets using this data source. **HINT** Right click the field on the **Filters** shelf and point to **Apply to Worksheets** to view the menu options.

SELF CHECK When the most recent year is included, what was the sales total for all years in the highest selling month? The lowest? Are these results different when the most recent year is excluded?

Create a Timeline to Show Sales Over Time

On **Sheet 2**, create a line chart to show sales for each month of the order date in a continuous timeline. Use your visualization to see highs and lows for sales over time and to determine sales for a particular month and year.

SELF CHECK Which format, date part or date value, would better show sales on a chronological timeline?



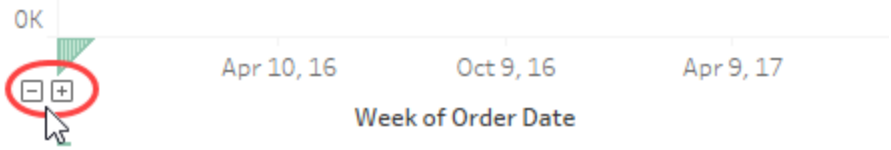
Directions for Sales Timeline View

1. Name **Sheet 2** "Sales Timeline."
2. Create a view that shows **Sales** by **Order Date**. **NOTE** the applied filter appears on the **Filters** shelf once a field is added to the view.

3. Right-click the **Order Date** and select the **Month** date value (May 2015) format.

NOTE The field for **Order Date** is now green, indicating it is continuous.

4. On the **Order Date** axis, use the plus and minus sign icons to drill down and up to different levels of detail.



5. Show the filter and observe the results.

SELF CHECK When the most recent year is included, which month has had the highest sales so far? Does this change when the most recent year is excluded? How do these results compare with data shown on the "Seasonal Trends" visualization?

Solution

For the solution to this practice, see "Solution: Date Parts and Date Values" on page 84.

8. Using Multiple Measures in a View

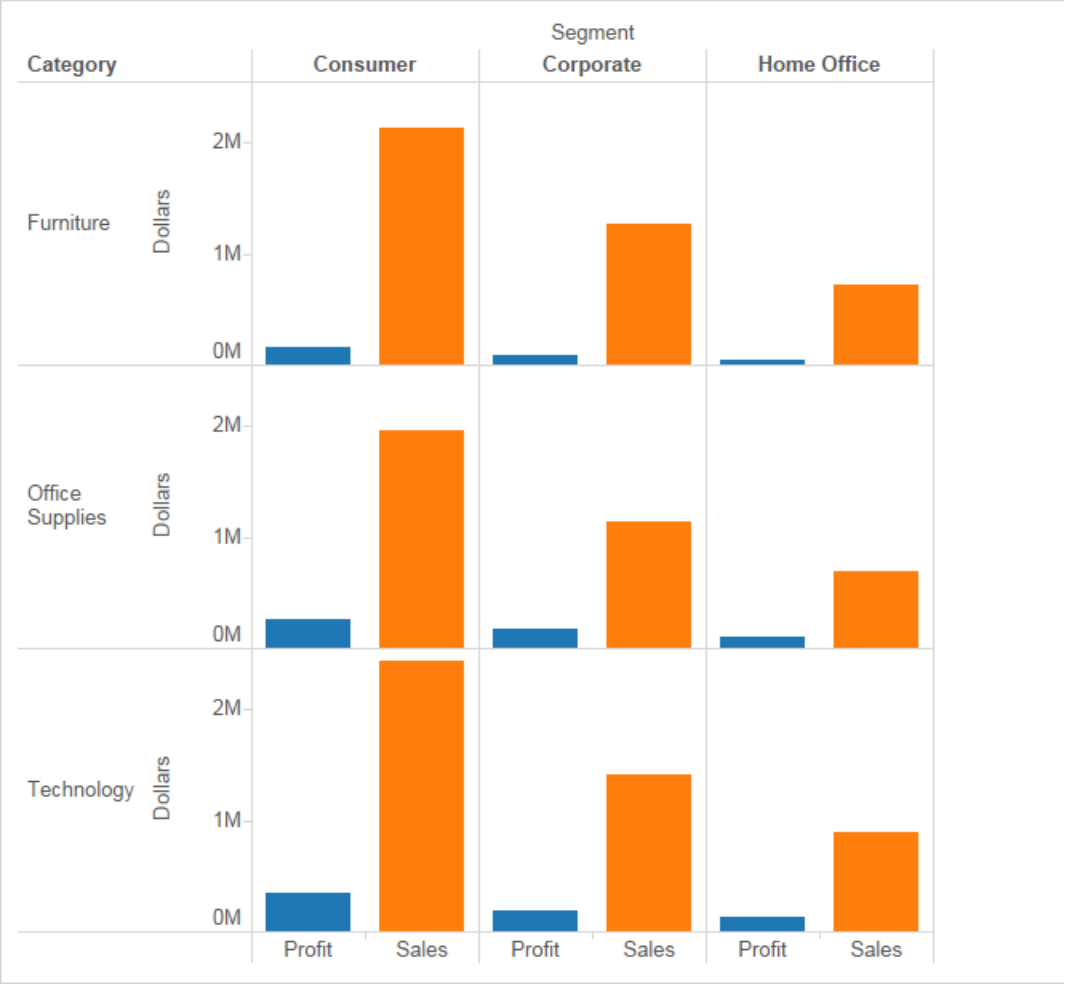
This module contains the following:

Practice: Combined Axis Chart

Practice: Dual Axis Chart

Practice: Combined Axis Chart

Create a bar chart broken down by **Segment** and **Category** that shows **Profit** and **Sales** on the same axis. Use your chart to compare measures within dimensions.



Directions

1. Connect to the Excel data source **Global Superstore.xlsx** (in the **Practices\Data** folder).
2. Use the **Orders** sheet for your analysis.
3. Create an initial view showing **Sales** broken down by **Category** and **Segment**.
4. Show **Profit** on the same vertical axis as **Sales**, and then format the view.
   IMPORTANT Follow the instructions for either Tableau Desktop or your browser-based Tableau Cloud or Tableau Server site.

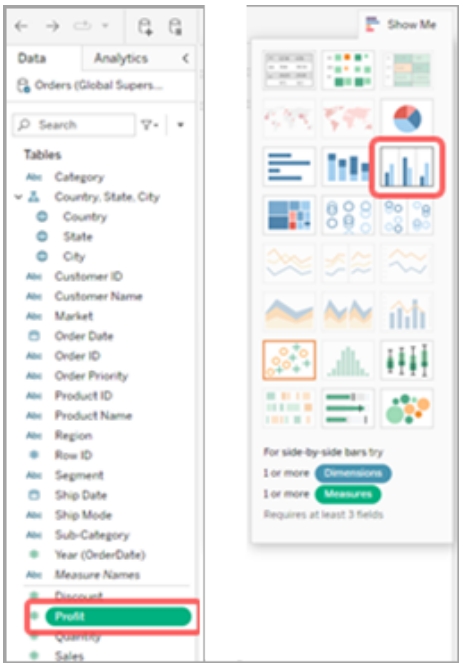
Create a Combined Axis View from Tableau Desktop:

- Drag **Profit** to the vertical axis and drop when the mouse icon changes to a double ruler.

- Show **Sales** and **Profit** in different colors. (**HINT**: Use **Measure Names**.)
- Rename the "Value" axis "Dollars."

Or Create a Combined Axis View from the Browser:

- Select **Profit** in the **Data** pane, and then click the **side-by-side-bars** icon on the **Show Me** menu.



- Drag **Segment** from **Columns** to **Rows** (to the left of **Measure Values**).
- Rename the "Value" axis "Dollars."

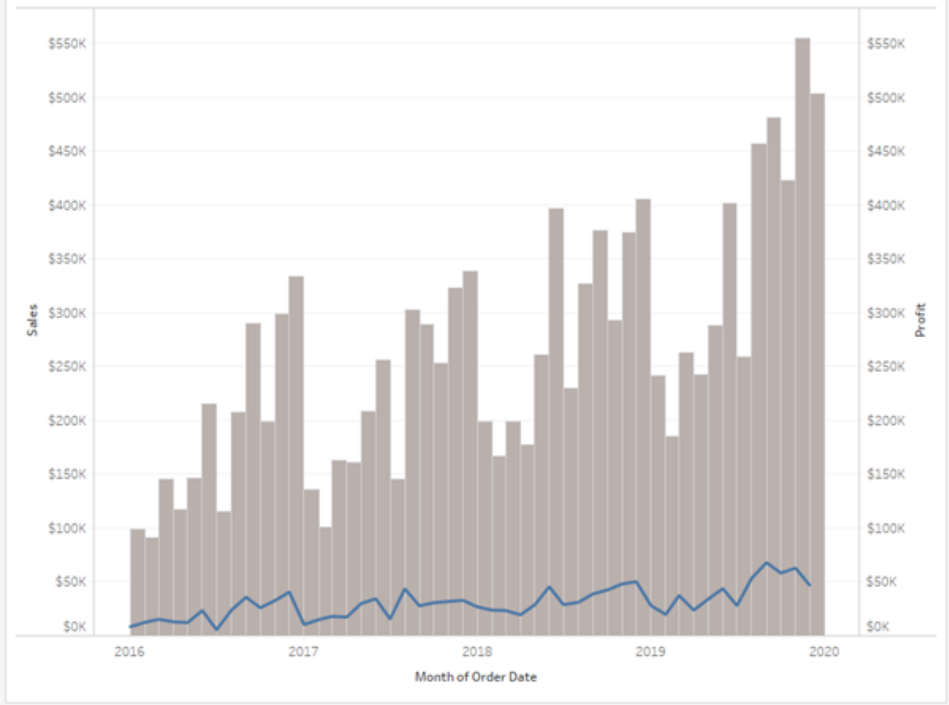
SELF CHECK Which **Category** looks like it made less **Profit** for the amount of **Sales** compared to other categories?

Solution

For the solution to this practice, see "Solution: Combined Axis Chart" on page 86.

Practice: Dual Axis Chart

Create a dual axis chart with synchronized axes in order to compare sales and profit using different mark types. Use your chart to analyze the measures over time.



Directions

1. Connect to the Excel data source **Global Superstore.xlsx** (in the **Practices\Data** folder).
2. Use the **Orders** sheet for your analysis.
3. Create an initial view showing **Sales** by **Order Date**.
4. Right-click **Order Date** on **Columns** and select the **Month** date value (May 2015) format.
5. Change the mark type to **Bar**.
6. Create a dual axis chart using **Profit**. (**HINT**: Bring **Profit** to **Rows** and then use the context menu.)
7. Change the mark type to **Line** for the newly-created **Profit** axis.
8. Synchronize the **Profit** axis to the **Sales** axis.
9. Edit the colors so **Sales** is shown as light gray bars instead of orange. (**HINT**: use the **Tableau 20** color palette.)

SELF CHECK Which month had the greatest sales? Is this the same month that had the greatest profit?

Solution

For the solution to this practice, see "Solution: Dual Axis Chart" on page 87.

9. Showing the Relationship Between Numerical Values

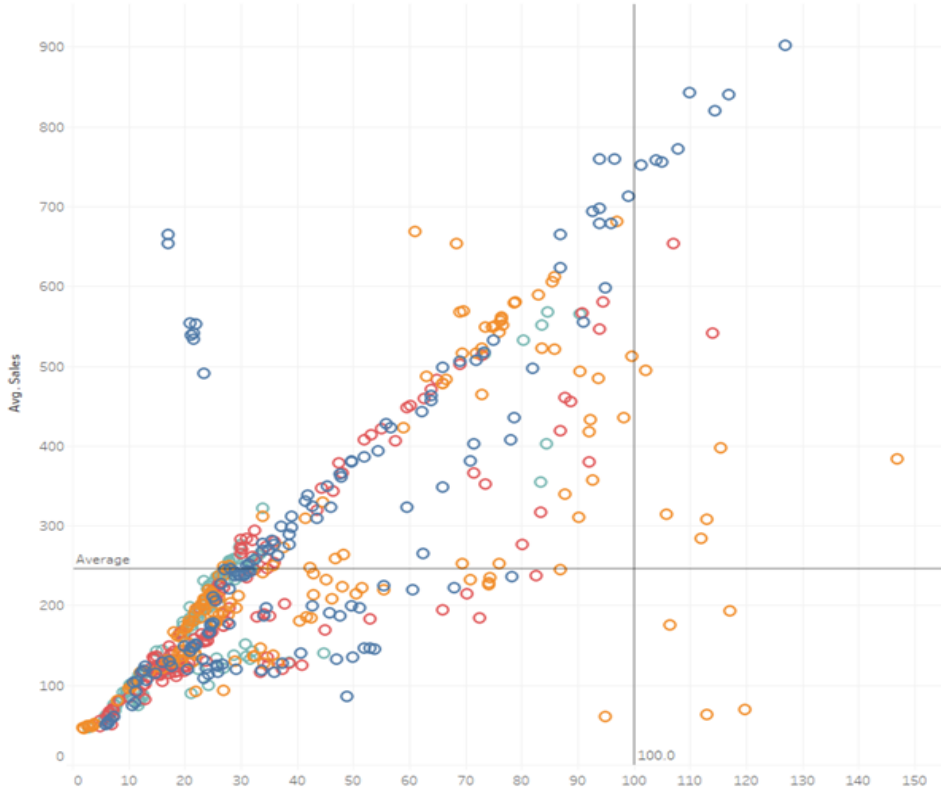
This module contains the following:

Practice: Marketing Expenses Scatter Plot

Practice: Marketing Expenses Scatter Plot

View One

Create a scatter plot to compare average sales with average marketing expenses, broken down by area code and product type. Use reference lines, a highlighter, and Explain Data to examine outliers and to compare specific marks with others in the data set.



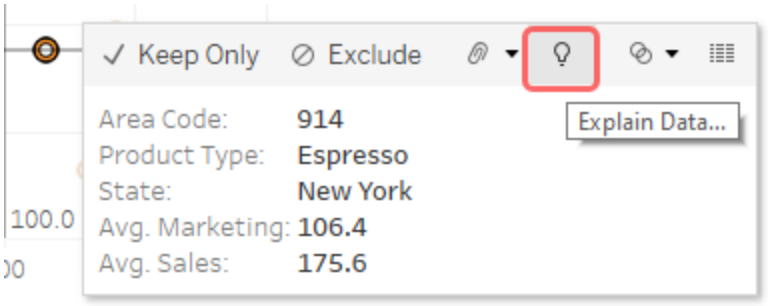
Directions

1. Connect to the Excel data source **CoffeeChain_Query.xlsx** (in the **Practices\Data** folder).
2. Create a scatter plot that compares average **Marketing** expenses with average **Sales** values.
3. Add **Area Code** and **State** to the worksheet's level of detail.
4. Use color to show the **Product Type**.
5. Add a constant line for **Marketing**, set at $100.
6. Add an average line for **Sales**.
7. Add a highlighter for **Area Code**.

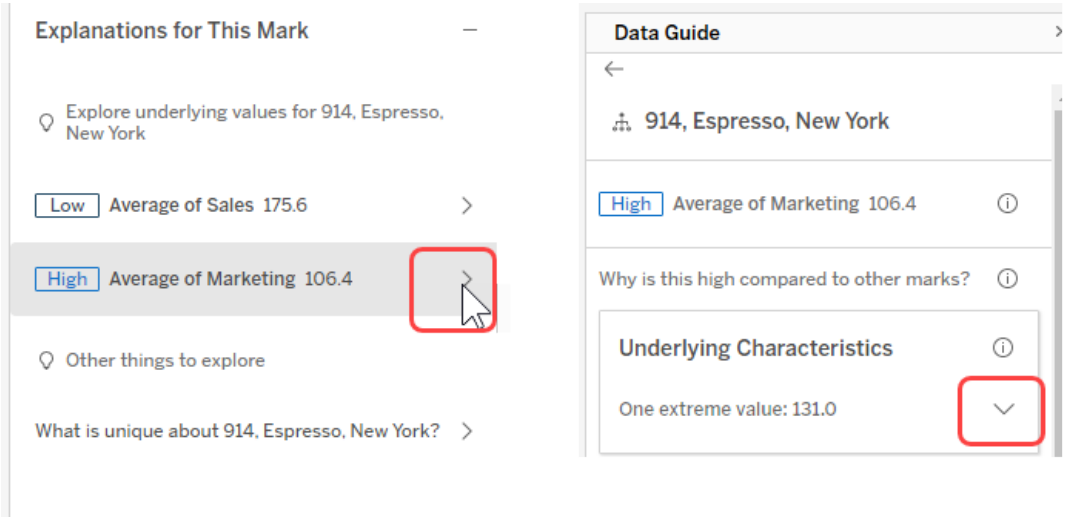
SELF CHECK 1 Which product type has 4 area codes with over $100 in average marketing expenses while yielding below average sales?

Analyze with the Highlighter and with Explain Data

1. Use the highlighter to select the 914 area code. Note that the espresso **Product Type** is the only one in this area code with below average sales and average marketing expenses that exceed $100.
2. Click the mark and select the **Explain Data** icon in its tooltip.



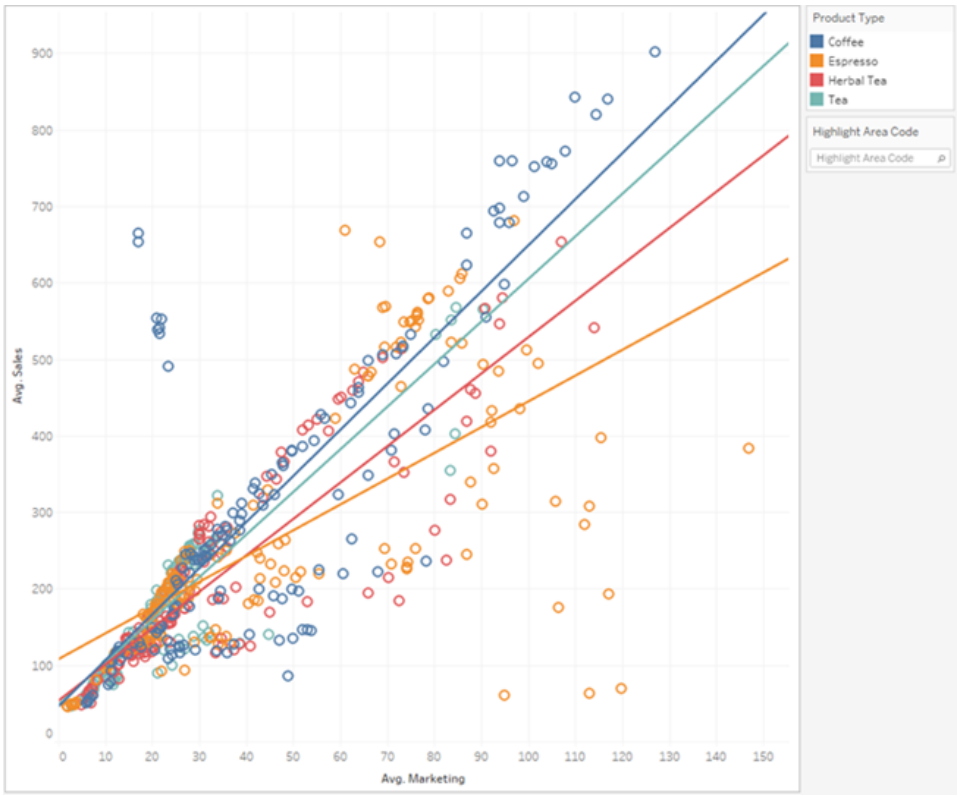
3. At the top of the **Data Guide** pane, confirm that **914, Espresso, New York** is the selected mark.
4. Below the section called **Explanations For This Mark**, review the explanations related to the underlying values, and then click the drop-down arrow next to **High - Average of Marketing 106.4** to further explore the value. If desired, use the drop-down arrows to open the explanations for underlying characteristics, contributing dimensions and contributing measures.



SELF CHECK 2 When reviewing the underlying characteristics, what is a possible explanation given for the higher than expected average marketing expenses for espresso in area code 914?

View Two

Starting with a duplicate of the first worksheet, delete the constant and average lines from the view, and add trend lines.



Directions

1. Duplicate the **View One** worksheet and name the new worksheet **View Two**.
2. Remove the constant and average lines.
3. Add trend lines to the view.

SELF CHECK 3 Which product type's trend line has the flattest slope? Which has the steepest?

Solution

For the solution to this practice, see "Solution: Marketing Expenses Scatter Plot" on page 88.

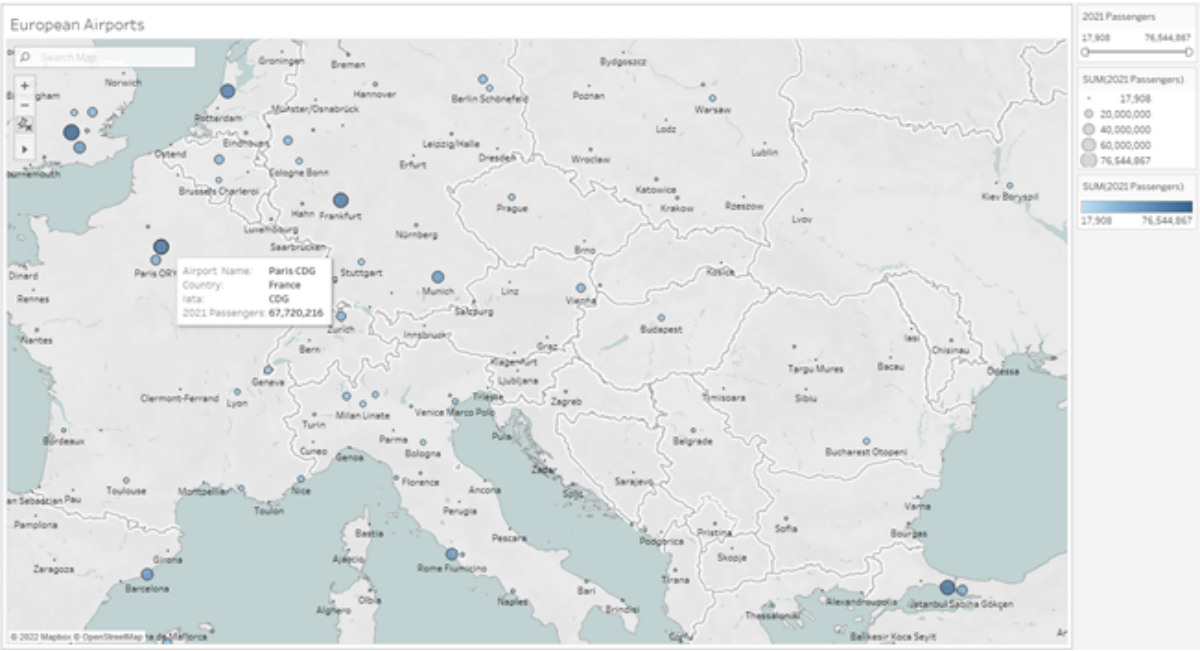
10. Mapping Data Geographically

This module contains the following:

Practice: Airport Geographic Mapping

Practice: Airport Geographic Mapping

You're working with passenger data for European airports, and you'd like to determine which airports were the busiest during a span of time. Using the three-character IATA airport industry codes, create a symbol map of the airport data, using size and color to compare the number of passengers for each airport in 2021. Limit map clutter by removing unnecessary map background layers. Add a filter to the view to help show which airports were the busiest.



Directions

1. Connect to the Excel data source **European Airports 2021.xlsx** (in the **Practices\Data** folder).
2. Use the **Airports** sheet for your analysis.
3. Rename **Sheet 1** to **European Airports**.
4. Create a map by dragging the **IATA** airport code to **Detail**.
5. Add **Country** to **Detail**.
6. Show the number of **2021 Passengers** using **Size** and **Color**.
7. Label the map with the **Airport Name**.
8. Adjust the **Map Background Layers** to select the **Normal** map style and show the **Coastline**. Clear **Country/Region Names** and **State/Province Borders** to remove those layers from the map.
9. Edit the color of the marks to set the **Opacity** to 75%, add a black **Border**, and remove the **Halo**.

   NOTE You may need to adjust the level of zoom of the map in order to check or clear certain layer options.

10. Test the levels of zoom, and map selection options on your map.
11. Add a filter to the view with a slider for **2021 Passengers**. Test the filter.

SELF CHECK Use the **SUM(2021 Passengers)** filter slider to answer the following question: Which were the five busiest airports in 2021?

BONUS Reset the **SUM(2021 Passengers)** filter slider to show all airports. Then, use a Top 5 filter on a different field to check your answer to the question: Which were the five busiest airports in 2021?

Solution

For the solution to this practice, see "Solution: Airport Geographic Mapping" on page 90.

11. Customizing Your Data

This module contains the following:

Practice: Calculations and Aggregations in Profit Ratio

Practice: Using String and Type Conversion Calculations

Practice: Using Date Calculations

Practice: Calculations and Aggregations in Profit Ratio

Create a view showing the results of a profit ratio calculation broken down by year and product category. Experiment with the calculation to see how the aggregation level impacts your results. Use your visualization to compare the profit ratio of products, and then use your calculation in additional analysis.

	Category		
Year of Order Date	Furniture	Office Supplies	Technology
2016	7.10%	12.73%	13.20%
2017	6.77%	12.99%	14.26%
2018	7.52%	14.77%	13.59%
2019	6.48%	13.78%	14.54%

Directions for View One

1. Use **Calculations_and_Aggregations_Starter.twbx**.
2. Create a view called "Profit Ratio by Category" that uses **Order Date** and **Category** and that shows **Profit** as colored text.
   (**HINT**: Use the **Marks** card.)
3. Use the Calculated Field Editor to create a calculation for **Profit Ratio**, using the formula: `[Profit]/[Sales]`.
4. Replace the original **[Profit]** fields on the **Marks** card with the new calculation.
5. Format the calculation as a percentage with two decimal places.

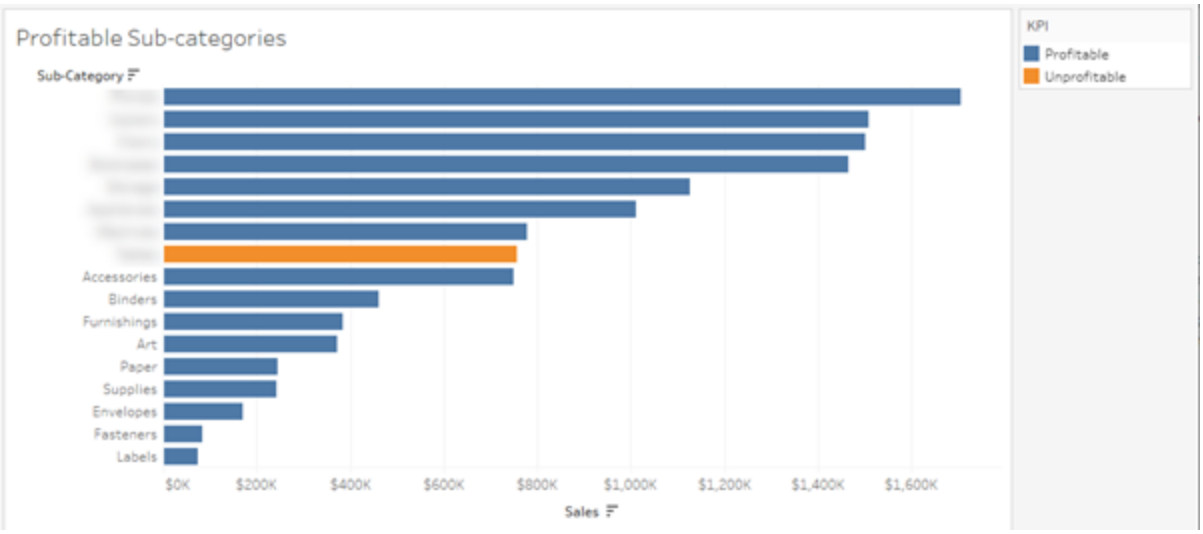
SELF CHECK 1 Examine the results of the calculation. Do percentages appear accurate? Why do you think the numbers are so large?
How could you fix the calculation?

6. Edit the calculation to `SUM([Profit])/SUM([Sales])`.
7. Drag the edited calculation on top of the original **Profit Ratio** calculation to replace it, and observe the difference.

NOTE Because you modified a field that was already in the view with a different level of aggregation, you must now replace that field with the new computation. You may need to reapply the percentage number format.

SELF CHECK 2 Which **Category** has the lowest profit ratio?

Now that you have demonstrated the profit ratios for categories, create a second visualization that shows the profitability for sub-categories using a simple logic calculation



NOTE Some of the image is blurred so some of the sub-category names don't show.

Directions for View Two

1. Create a new worksheet called "Profitable Sub-Categories" and then make a bar chart using **Sales** and **Sub-Category**.
2. Use a descending sort by Sum of **Sales**.
3. Create a new calculated field called **Profitable Sub-Category?**

```
IF [Profit Ratio] > 0 THEN "Profitable"

ELSE "Unprofitable"

END
```

4. Drag **Profitable Sub-Category?** to **Color** on the **Marks** card.
5. Edit the title of the legend to KPI.
6. Format the tooltip to include **Profit** and **Profit Ratio**.

SELF CHECK Which sub-category is not profitable? What insights related to profit ratios do the**Profit Ratio by Category** and **Profitable Sub-Categories** worksheets show?

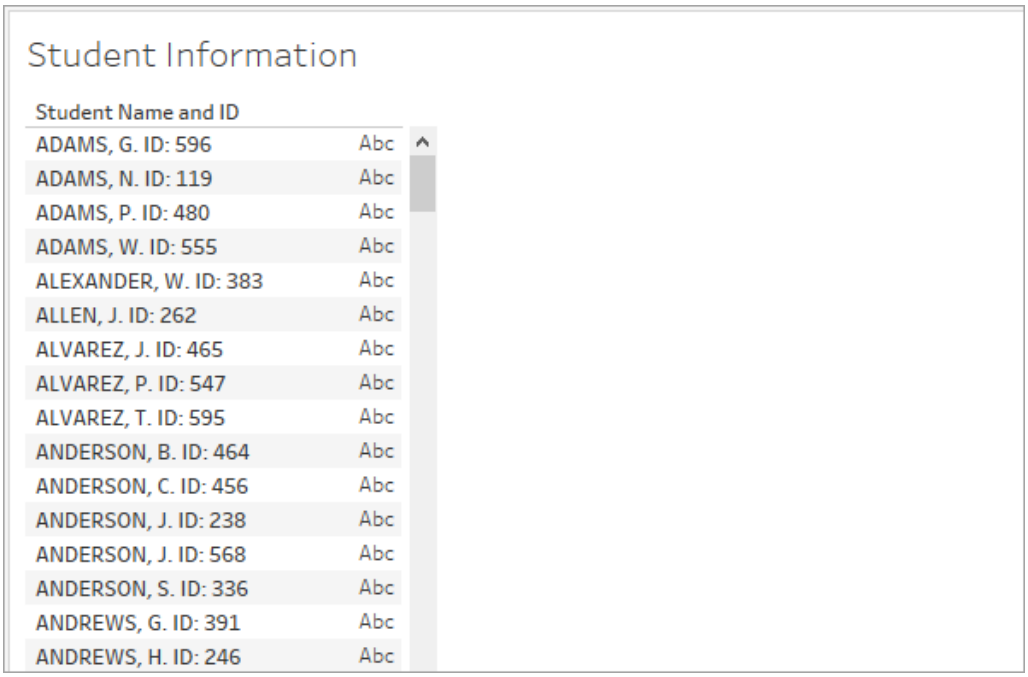
Solution

For the solution to this practice, see "Solution: Calculation and Aggregation in Profit Ratio" on page 92.

Practice: Using String and Type Conversion Calculations

You have data that contains information about students. You would like to create a field, Student Name and ID, that contains:

- The student's last name in all capitals
- The student's first initial
- The student's ID
- A comma and space after the last name, a period and space after the first initial, and the fixed string "ID:" and a space before the ID number.



Directions

1. Connect to the Excel file **Student Age, ID, and GPA.xlsx** (in the **Practices\Data** folder).
2. Use the **Sheet 1** worksheet and title it **Student Information**.
3. Create a calculated field named **Student Name and ID** that contains uppercase student last names.
   HINT Use the `UPPER` string function.
4. Apply the calculation to the view without closing the calculation editor.
   NOTE If you accidentally close the editor by pressing **OK**, right-click the field in the **Data** pane and then select **Edit** to reopen the editor.
5. Add students' first initials to the calculation:
   - Combine the uppercase student last names with a string function that converts students' first names to first initials. **HINT** Use the `LEFT` string function and the desired number of letters to return.

- Format the calculation to have a comma and space after the last name and a period and space after the first initial. **HINT** Use the fixed strings `", "` and `". "`

6. Apply the calculation to the view without closing the calculation editor.
7. Add students' IDs to the calculation:
   - Combine the uppercase student last names, first initial with a type conversion function that converts students' IDs to strings. **HINT** Use the `STR` function.
   - Be sure to include "ID:" with a space after the colon. **HINT** Use the fixed string `"ID: "`
8. Apply the changes to the view without closing the calculation editor, and then save the changes and close the editor.

SELF CHECK If you wanted to display the first two letters of the **Student First Name** field, what calculation would you use?

Solution

For the solution to this practice, see "Solution: Using String and Type Conversion Calculations" on page 94.

Practice: Using Date Calculations

Create a calculated field to determine the average number of days it takes for an order to ship. Then, create a crosstab so you can compare the average days to ship to the average shipping costs by customer segment and order priority.

Order Priority	Segment	Avg. Days to Ship	Avg. Shipping Cost
Critical	Consumer	1.8	$58.25
	Corporate	1.9	$62.07
	Home Office	1.6	$60.10
High	Consumer	3.0	$33.34
	Corporate	3.1	$32.52
	Home Office	3.1	$32.05
Medium	Consumer	4.5	$18.02
	Corporate	4.5	$19.02
	Home Office	4.5	$18.67
Low	Consumer	6.5	$26.26
	Corporate	6.5	$27.41
	Home Office	6.5	$28.47

Directions

1. Connect to the Excel data source **Global Superstore.xlsx** (in the **Practices\Data** folder).
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (or drag and drop it onto the **Drag tables here** area).

3. Create a calculated field named "Days to Ship" that calculates the number of days between the date an order was placed and the date the order was shipped. Use the `DATEDIFF` function to create this calculation.
4. Create a crosstab showing **Days to Ship** broken down by **Order Priority** and **Segment**.
5. Change **SUM(Days to Ship)** to use the **Average (AVG)** aggregation.
6. Change the number format of **Days to Ship** to show only one decimal place.
7. Add **Shipping Cost** to your crosstab.
8. Change **SUM(Shipping Cost)** to also use the **Average (AVG)** aggregation.

BONUS Sort the **Order Priority** panes so that they are ordered: **Critical**, **High**, **Medium**, **Low**.

SELF CHECK What is the approximate difference between the average **Days to Ship** for **Critical** priority orders compared to **Low** priority orders? For that same comparison, what is the approximate difference in average shipping costs?

Solution

For the solution to this practice, see "Solution: Using Date Calculations" on page 95.

12. Analyzing Data with Quick Table Calculations

This module contains the following:

Practice: Running Total of Sales

Practice: Nested Sorting for Top N with Rank

Practice: Running Total of Sales

You have a crosstab that shows yearly sales broken down by category and quarter. Add a running total by quarter, and restart the total for each category. Then use your crosstab to look up specific running totals.

Quarterly Sales by Category

		Order Date							
		2016		2017		2018		2019	
Category1	Quarter of Order Date	Sales	Running Sum of Sal..	Sales	Running Sum of Sal..	Sales	Running Sum of Sal..	Sales	Running Sum of Sal..
Furniture	Q1	109,885	109,885	135,479	135,479	206,246	206,246	217,208	217,208
	Q2	154,694	264,579	199,144	334,623	244,284	450,530	305,043	522,250
	Q3	196,399	460,978	222,301	556,924	311,870	762,399	384,429	906,679
	Q4	295,214	756,192	301,978	858,903	355,324	1,117,724	471,377	1,378,056
Office Supplies	Q1	90,199	90,199	125,283	125,283	178,544	178,544	209,414	209,414
	Q2	157,863	248,062	180,773	306,056	241,935	420,479	299,630	509,044
	Q3	200,995	449,057	222,450	528,506	274,183	694,663	366,765	875,809
	Q4	226,550	675,606	266,589	795,095	316,055	1,010,718	429,842	1,305,652
Technology	Q1	135,696	135,696	138,606	138,606	180,229	180,229	262,585	262,585
	Q2	166,313	302,009	245,676	384,282	348,621	528,850	328,314	590,899
	Q3	215,913	517,922	293,017	677,299	346,984	875,834	445,289	1,036,188
	Q4	309,730	827,652	346,143	1,023,442	401,471	1,277,305	579,970	1,616,159

Directions

1. Use **Running_Total_of_Sales_Starter.twbx**.
2. Edit **Sales** to use a Quick Table Calculation so that it shows the Running Total of **Sales**.

   NOTE The Running Total table calculation defaults to run across the rows instead of down the columns. If the calculation can't run across the rows, then it will default to run down the columns.

3. Edit the table calculation so the Running Total is computed with the total calculated down each column, restarting for each new **Category**.
4. Add **Sales** to the view so that it is before **Running Sum of Sales**.
5. On **Columns**, move **Measure Names** to the right of **Year(Order Date)**.

   SELF CHECK 1 What were the running totals for **Furniture** in **Q3** and **Q4** of 2018?

6. Duplicate the worksheet and title the new worksheet "Percent of Total Sales by Category".
7. Edit the Quick Table Calculation applied to the **Sales** field to change it from a Running Total to a Percent of Total.
8. Add subtotals to the view.

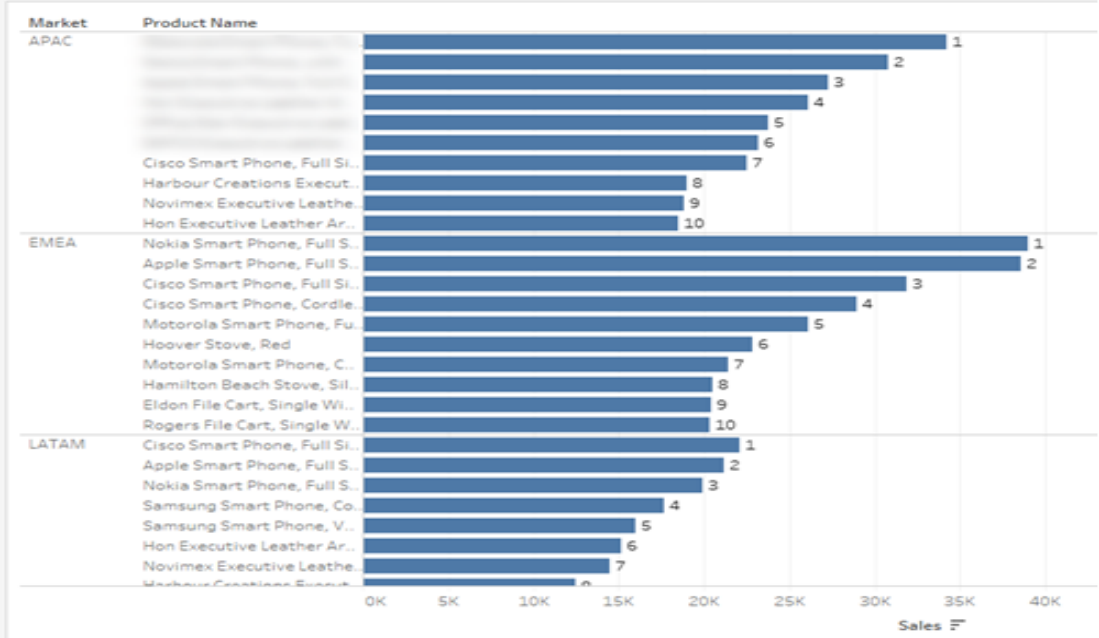
SELF CHECK 2 In 2019, what percentage of all **Technology** sales happened in **Q3**?

Solution

For the solution to this practice, see "Solution: Running Total of Sales" on page 96.

Practice: Nested Sorting for Top N with Rank

Create a bar chart showing the top 10 best-selling products for each market in the data source.



NOTE Some of the image is blurred so some of the product names don't show.

Directions

1. Connect to the Excel data source **Global Superstore.xlsx** (in the **Practices\Data** folder).
2. Use the **Orders** sheet for your analysis.
3. Rename the tab **Sheet 1** to **Top N with Rank**.
4. Create a bar chart showing **Sales** broken down by **Market** and **Product Name**.
5. Sort **Sales** in descending order.

   NOTE *The nested sort feature on the* ***Sales*** *axis will sort products within each* ***Market****.*

6. Drag a new instance of **Sales** to **Label** on the **Marks** card, and then right-click to add the **Rank Quick Table Calculation**, using **Pane (Down)**.
7. Filter the **Sales** field with the **Rank** table calculation applied to show the top 10 products for each market. **IMPORTANT** You will now complete this from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions.

From Tableau Desktop:	Or From the Browser:
▪ CTRL+click-drag a copy of **SUM(Sales)** with the **Rank** calculation from the **Marks** card to **Filters**, and set the range	▪ CTRL+click-drag a copy of **SUM(Sales)** with the **Rank** calculation from the **Marks** card to the **Data** pane, and name

From Tableau Desktop:	Or From the Browser:
of values from 1 to 10.	the field "Rank of Sales". ■ Drag **Rank of Sales** to the **Filters** shelf, reset the scope to **Pane (Down)**, and then edit the filter to show a range of values from 1 to 10.

SELF CHECK Which product is ranked as the 3rd best-selling in the **APAC Market**?

Solution

For the solution to this practice, see "Solution: Nested Sorting for Top N with Rank" on page 97.

13. Showing Breakdowns of the Whole

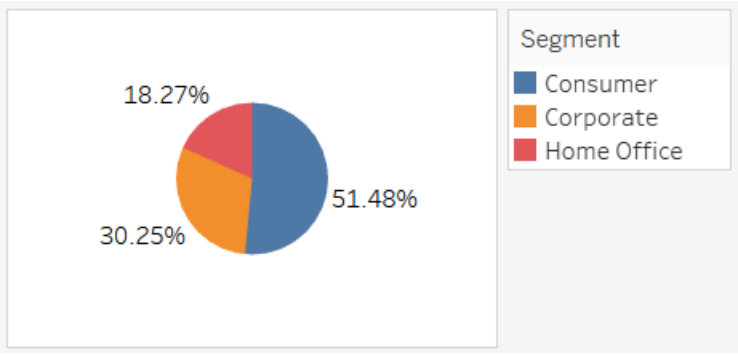
This module contains the following:

Practice: Percent of Total Sales

Practice: Tree Map

Practice: Percent of Total Sales

Create a pie chart to show how sales for each segment compare as a percentage of total sales.



Directions

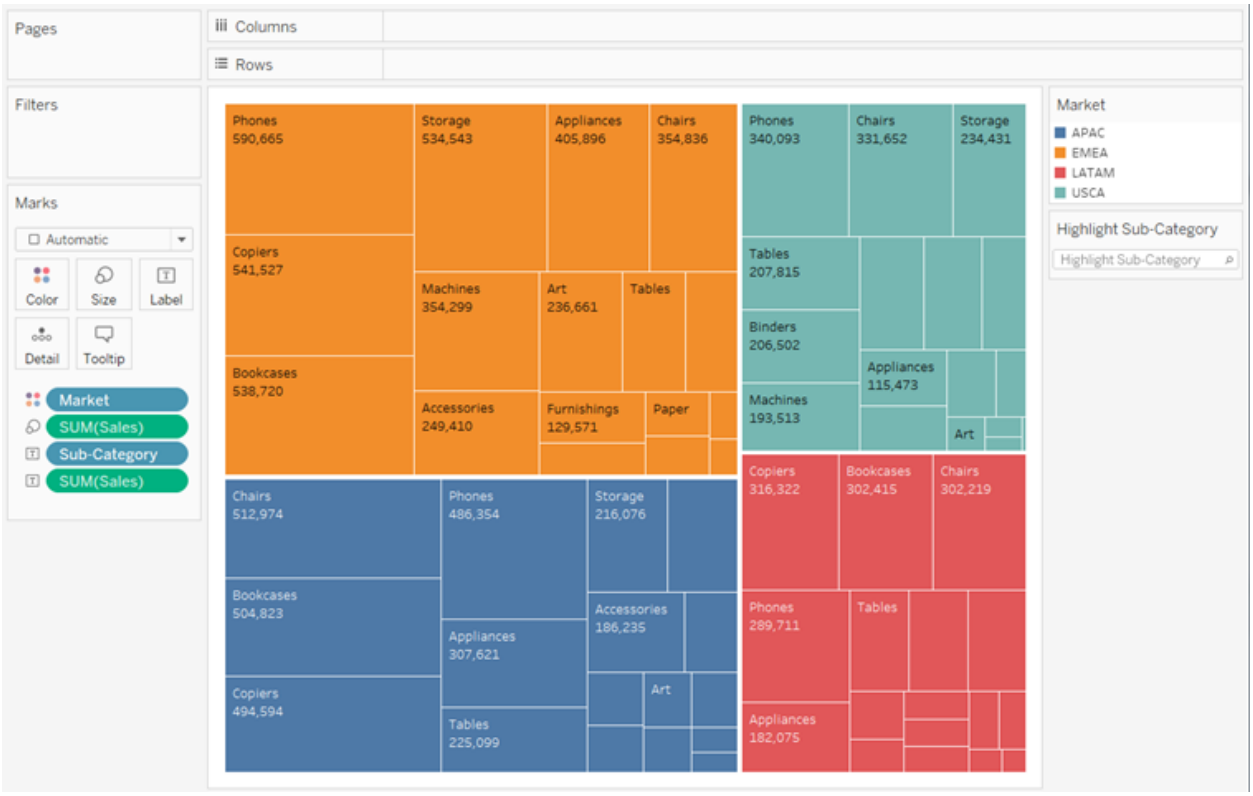
1. Connect to the Excel data source **Global Superstore.xlsx** (in the **Practices\Data** folder).
2. Use the **Orders** sheet for your analysis.
3. Change the mark type to **Pie**.
4. Show each **Segment** by **Color** in the pie chart.
5. Use **Sales** to determine the **Angle** for each pie section.
6. **Label** each pie section with the **Sales** amount.
7. Calculate **Sales** for each pie section as a **Percent of Total**. (**HINT**: use the **Sales** field on the label).
8. Resize the chart. (**HINT**: Use the drop-down toolbar to change the view from **Standard** to **Entire View**.)

Solution

For the solution to this practice, see "Solution: Percent of Total Sales" on page 98.

Practice: Tree Map

Create a tree map that uses color for each market and size to visualize sales. Add a highlighter to the view so you can compare sales for specific sub-categories.



Directions

1. Connect to the Excel data source **Global Superstore.xlsx** (in the **Practices\Data** folder).
2. Use the **Orders** sheet for your analysis.
3. Create a tree map with **Market** on **Color** and **Sales** on **Size**.
4. Label the tree map with **Sub-Category** and **Sales**.
5. **Show Highlighter** for **Sub-Category**.

SELF CHECK In which market do **Appliances** have higher sales, **EMEA** or **APAC**? What is the approximate difference?

Solution

For the solution to this practice, see "Solution: Tree Map" on page 98.

14. Making Your Views Available

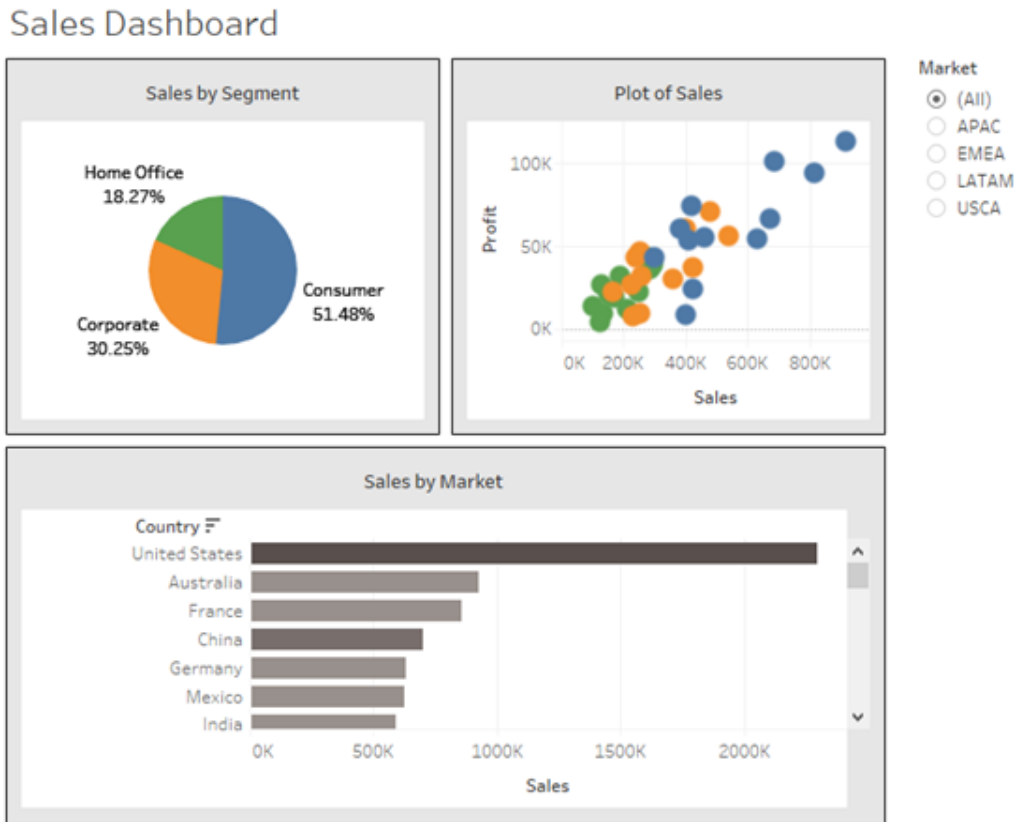
This module contains the following:

Practice: Building a Dashboard

Practice: Creating an Interactive Dashboard

Practice: Building a Dashboard

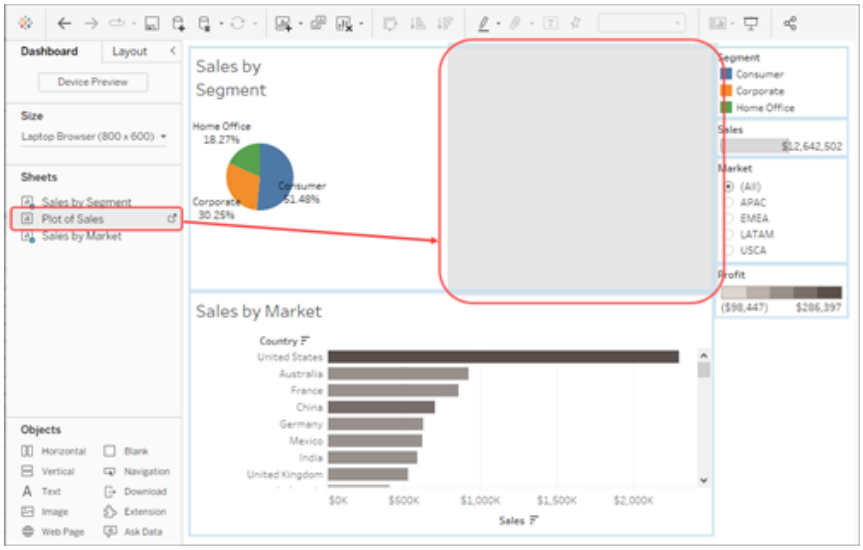
Create a dashboard for laptops that shows all of the worksheets in the starter workbook. Remove unnecessary legends, and change the market filter to apply to all of the worksheets. Then, use the pie chart as a filter for the rest of the dashboard.



Directions

1. Use **Building_a_Dashboard_Starter.twbx** (found in the **Practices\Workbooks\Starters** folder).
2. Use the **Dashboard 1** tab. Note that two worksheets are already in the view.
3. Rename the dashboard "Sales Dashboard" and show the title.

4. Drag **Plot of Sales** to the canvas to the right of **Sales by Segment**. Drop the sheet in the gray box on the dashboard that previews its placement.



5. Set the top two views to fit the **Entire View** within their layout containers.
6. Set **Sales by Market** to **Standard** fit.
7. Remove unnecessary legend items, or move them closer to the view they reference.
8. To each view (**Sales by Segment**, **Plot of Sales**, and **Sales by Market**), add a black border, a light gray background, and set inner padding to "10".
9. To the **Market** filter, set the top and bottom outer padding to "5".
10. Make the **Market** filter global (that is, the filter applies to all worksheets using this data source).
11. Make the pie chart interactive by choosing **Use as Filter**.

Optional Bonus

If desired, create a new dashboard and experiment with worksheet placement.

1. Add a **Dashboard** sheet and give it a unique name.
2. Drag the three worksheets onto the dashboard space in a way that is visually appealing.

Solution

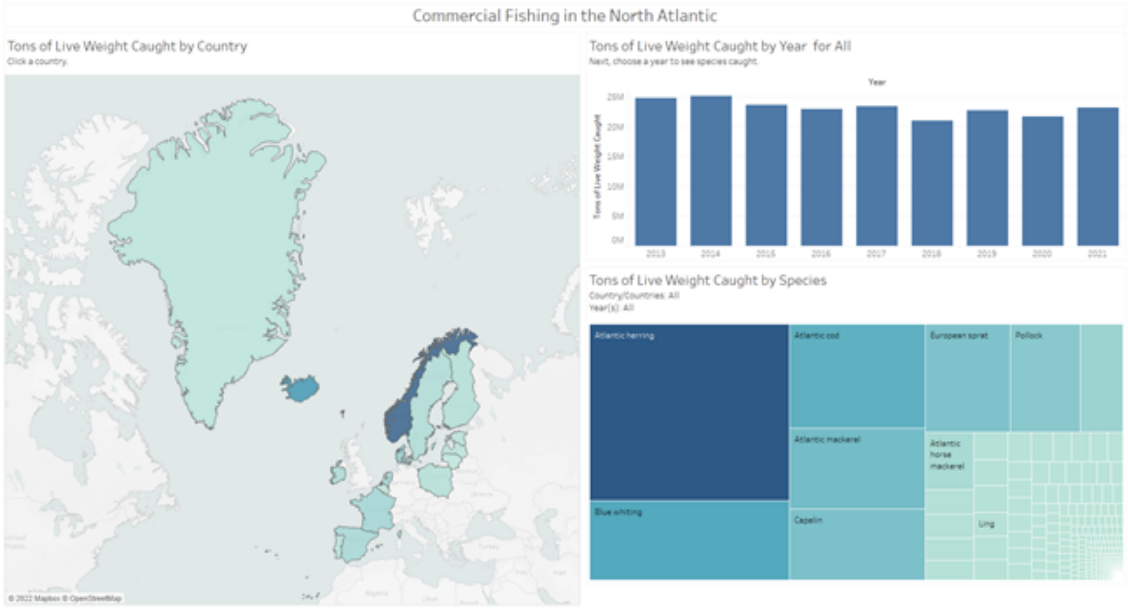
For the solution to this practice, see "Solution: Building a Dashboard" on page 99.

Practice: Creating an Interactive Dashboard

Create a dashboard that shows all of the worksheets in the starter workbook. Add dashboard actions to support the following interactions:

- Filter all other worksheets when you select a mark on the map.
- Filter the tree map when you select a mark on the bar chart.
- Show a web page with more information about individual species when you click on a tooltip context menu link.

Then, add instructive text and field name references to titles to support user interaction.



Create the Dashboard

1. Use **Creating_an_Interactive_Dashboard_Starter.twbx** (found in the **Practices\Workbooks\Starters** folder).
2. Add a new dashboard tab named "Commercial Fishing in the North Atlantic" and show the title.
   NOTE If desired, you may also complete this practice using the starter view, **Commercial Fishing Dashboard Starter**. If you choose this option, rename the dashboard tab, skip step 3, and then proceed to step 4.
3. Drag the three worksheets onto the dashboard space as shown, or in another way that is visually appealing.
4. Adjust the fit of the views, as desired.

Add Dashboard Actions

1. Add a dashboard filter action to the map that runs when a mark is selected. Change the settings so that clearing the selection will show all values again. Ensure that the default setting to target all other worksheets remains unchanged.
2. Create a second filter action for the bar chart that targets only the tree map. Change the settings so that clearing the selection will show all values again.
3. Test both dashboard filter actions.
4. Create a dashboard URL action to look up a specific species on Wikipedia from the tooltip context menu on the tree map:
   http://en.wikipedia.org/wiki/**<Species>**

   NOTE A field value can be referenced by surrounding the field name with the "<" and ">" symbols.

5. Test the URL action.

Edit Titles to Support User Interaction

1. Edit the title for the map to add instructive text:
   "Click a country"
   and format to fit, as needed.
2. Similarly, edit the bar chart title to add instructive text:
   "Next, choose a year to see species caught"
   and format to fit, as needed.
3. Edit the title for the bar chart to leave the reference for the sheet name, and add a reference for the country:
   "**<Sheet Name>** for **<Country>**"
4. Edit the title for the tree map to add the following lines below the title:
   - "Country/countries: **<Country>**"
   - "Year(s): **<Year>**"
5. Test the interactive titles.

SELF CHECK 1 What was the most caught species of fish for all countries in **2021**?

SELF CHECK 2 What was the most caught species of fish for **Iceland** in **2021**?

Solution

For the solution to this practice, see "Solution: Creating an Interactive Dashboard" on page 102.

15. Appendix A: Practice Solutions

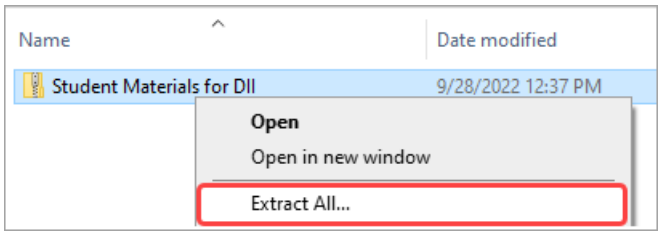
This section contains the solutions for all practices contained in this training manual.

Solution: Exploring Tableau and the Data

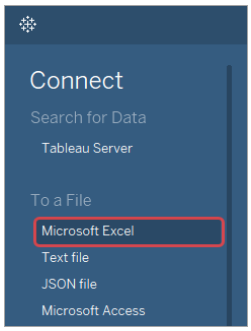
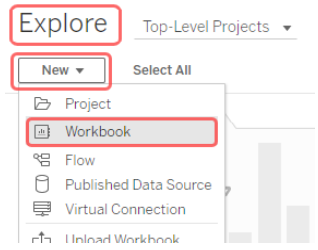
The following is a solution to "Practice: Exploring Tableau and the Data" on page 8.

Connect to Data

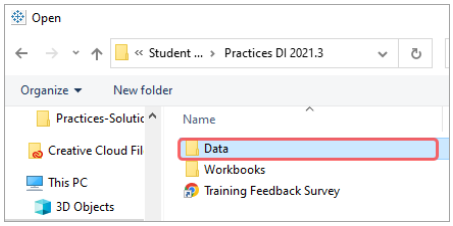
1. To begin, if you're working with a download link of a zipped **Materials** folder, right-click the folder and select **Extract All** to download the files.



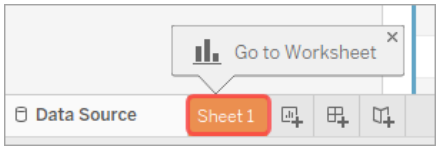
2. **IMPORTANT** You will now connect to data from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions.
   - For **Tableau Desktop**, follow the instructions "Connect to Data from Tableau Desktop".
   - For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Connect to Data from the Browser".

Connect to Data from Tableau Desktop:	Or Connect to Data from the Browser:
1. Open Tableau Desktop, and under **Connect** click **Microsoft Excel**.  2. Navigate to the **Practices** folder and open the **Data** folder.	1. In the **Student Materials** folder, open the **Data** subfolder. 2. On the **Explore** page of your Tableau site, click **New** and then click **Workbook**.  3. In the **Connect to Data** dialog box, select the **Files** tab.

Connect to Data from Tableau Desktop:



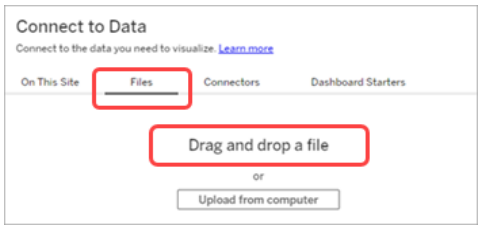
3. Open the **libraries.xlsx** file. You should now see the data from the Excel file on the lower half of the screen, with the **Libraries Public and Academic** sheet in the area above.
4. Click **Sheet 1** to go to the worksheet.



5. Continue to the section "Analyze the Data and Build Two Views".

Or Connect to Data from the Browser:

4. From the **Data** subfolder of the **Student Materials** folder, drag **libraries.xlsx** to the **Connect to Data** dialog box, and drop on **Drag and drop a file**.

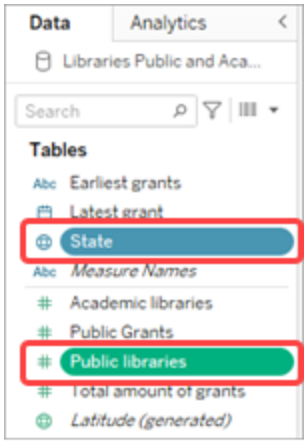


5. When the data source finishes loading, the workbook will automatically open to a new worksheet.
6. Continue to the section, "Analyze the Data and Build Two Views".

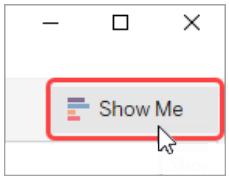
Analyze the Data and Build Two Views

Question 1: Which state has the most Carnegie public libraries? Create a bar chart using the dimension **State** and measure **Public libraries**.

1. In the **Data** pane, use CTRL + click to select **State** and **Public Libraries**.



2. On the far right side of the toolbar, click **Show Me** to open **Show Me**.



3. On the **Show Me** menu, click the **horizontal bars** icon.

4. Click **Show Me** again to close the **Show Me** menu.
5. Alternatively, to build the view using drag and drop:

Drag this field from the Data pane:	To:
Public libraries	**Columns**
State	**Rows**

6. On the toolbar, click the **Sort Descending** icon. This sorts the values from highest to lowest.
7. Double-click the tab **Sheet 1**, and type a name for your view. For example: "Number of public libraries by state"

The state with the most Carnegie public libraries: Indiana.

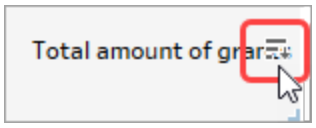
Question 2: Which state was granted the most money to build libraries?

1. Click the **New Worksheet** tab to add a second worksheet:

2. Create a text table (also referred to as a crosstab):

Drag this field from the Data pane:	To:
Total amount of grants	The middle of the view, labeled **Drop field here**
State	**Rows**

3. From the **Data** pane, add more measures to the view: drag **Public libraries** to the text table, and when **Show Me** displays in the view, drop the field.
4. Repeat the previous step for the fields **Public grants** and **Academic libraries**.
5. On the toolbar, use the drop-down to change from **Standard** to **Fit Width**. This expands the view so you can read the column headings.
6. Hover your pointer over the **Total amount of grants** column header, and click the **Sort Descending** icon that displays.



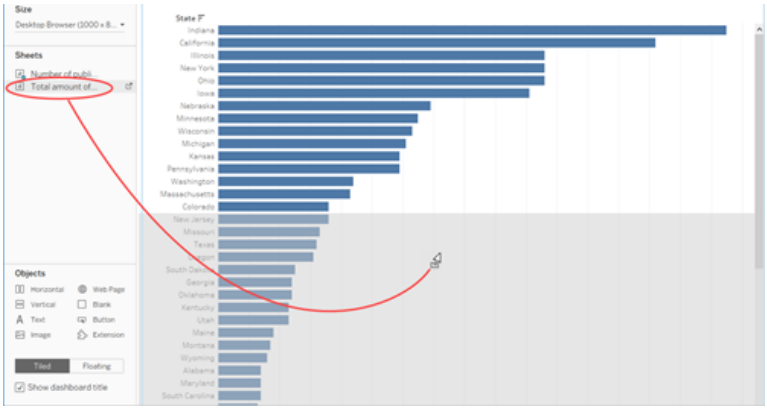
7. Give your worksheet a title. Double-click the tab **Sheet 2**, and type a name for your view. For example: "Total amount of grants"

The state with the highest total amount of grant money: New York.

Build a Dashboard

1. Click the **New Dashboard** tab to add a dashboard.

2. Under **Sheets**, drag the worksheet **Number of public libraries by state** to the dashboard on **Drop sheets here**.
3. Drag the worksheet **Total amount of grants** to the bottom half of the dashboard and drop when you see the gray box.



4. Click the **Number of public libraries by state** sheet to select it, and then click the **Use as Filter** button.

5. Use CTRL + click to select both Indiana and New York.

   *Notice how the **Total amount of grants** sheet now displays only the results for Indiana and New York.*

6. Name the dashboard **Carnegie Libraries in the US** and, on the **Dashboard** menu, click **Show Title**.

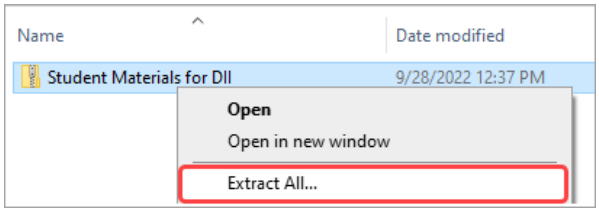
NOTE For an example of a complete solution to this practice, see **Exploring Tableau and the Data Solution.twbx**.

Solution: Creating and Saving a Data Connection

The following is a solution to "Practice: Creating and Saving a Data Connection" on page 14.

Create the Connection

1. To begin, if you're working with a download link of a zipped **Materials** folder, right-click the folder and select **Extract All** to download the files if you have not previously done so.



2. **IMPORTANT** You will now create the connection from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions.

- For **Tableau Desktop**, follow the instructions "Create the Connection from Tableau Desktop".
- For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Create the Connection from the Browser".

Create the Connection from Tableau Desktop:	Or Create the Connection from the Browser:
1. Open Tableau Desktop, and under **Connect** click **Microsoft Excel**. 2. In the dialog box that opens, browse to the **Data Connection Practice.xlsx** data source, located in the **Data** folder within the **Practices** folder of **Student**	1. In the **Student Materials** folder, open the **Data** subfolder. 2. On the **Explore** page of your Tableau site, click **New** and then click **Workbook**. 3. In the **Connect to Data** dialog box,

Create the Connection from Tableau Desktop:	Or Create the Connection from the Browser:
Materials and click **Open**. 3. On the **Data Source** tab, in the **Connections** pane, under **Sheets**, double-click the **Orders** table to add it to the canvas, or drag and drop it to the **Drag tables here** area on the canvas. 4. Click **Sheet 1** to go to the worksheet. 5. Continue to the section "Change Data Attributes".	select the **Files** tab. 4. From the **Data** subfolder of the **Student Materials** folder, drag **Data Connection Practice.xlsx** to the **Connect to Data** dialog box, and drop on **Drag and drop a file**. 5. On the **Data Source** tab, in the **Connections** pane, under **Sheets**, double-click the **Orders** table to add it to the canvas, or drag and drop it to the **Drag tables here** area on the canvas. 6. In the data grid, click **Update Now** to populate it. 7. Select the **Sheet 1** tab to open a new worksheet. 8. Continue to the section "Change Data Attributes".

Change Data Attributes

IMPORTANT You will now change data attributes from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions.

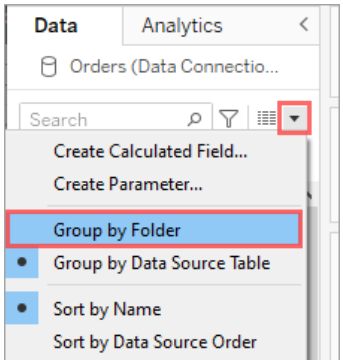
- For **Tableau Desktop**, follow the instructions "Change Data Attributes from Tableau Desktop".
- For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Change Data Attributes from the Browser".

Change Data Attributes from Tableau Desktop:	Or Change Data Attributes from the Browser:
1. In the **Data** pane, right-click the **Row** field, and select **Rename** from the context menu. Type "Row ID", and press the **Enter** key. 2. In the **Data** pane, right-click the **Row ID** field again, and select **Convert to Dimension** from the context menu. 3. In the **Data** pane, right-click the **Global Area** field, and select **Rename** from the context menu.	1. In the **Data** pane, right-click the **Row** field, and select **Rename** from the context menu. Type "Row ID", and press **OK**. 2. In the **Data** pane, right-click the **Row ID** field again, and select **Convert to Dimension** from the context menu. 3. In the **Data** pane, right-click the **Global Area** field, and select **Rename** from the context menu. Type "Country" and press **OK**.

Change Data Attributes from Tableau Desktop:	Or Change Data Attributes from the Browser:

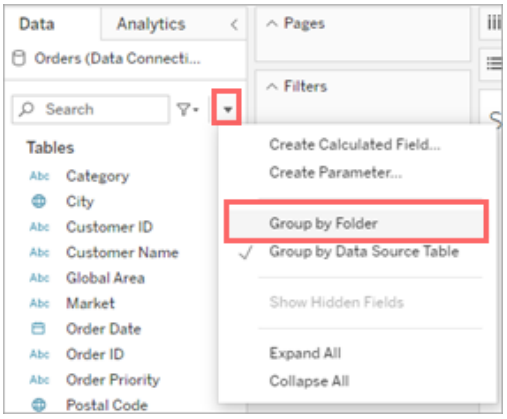
Type "Country" and press the **Enter** key.

4. In the **Data** pane, right-click the **Global Area** field again, point to **Geographic Role** on the context menu and then select **Country/Region**.
5. In the **Data** pane, right-click the **Profit** field, point to **Default Properties** and then **Aggregation** on the context menu, and then select **Average**.
6. On the **Data** pane menu, select **Group by Folder**.



7. Now complete the following:
   - Right-click the **Customer Name** field, point to **Folders** on the context menu and then select **Create Folder**.
   - In the **Create Folder** dialog box, type "Customer Info" and click **OK**.
   - In the Data pane, right-click the **Customer ID** field, point to **Folders** and then **Add to Folder** on the context menu, and then select **Customer Info**.
8. In the **Data** pane, right-click the **Sub-Category** field, and select **Aliases** from the context menu. In the **Edit**

4. In the **Data** pane, right-click the **Global Area** field again, point to **Geographic Role** on the context menu and then select **Country/Region**.
5. In the **Data** pane, right-click the **Profit** field, point to **Default Aggregation** on the context menu and then select **Average**.
6. On the **Data** pane menu, select **Group by Folder**.



7. Now complete the following:
   - Right-click the **Customer Name** field, point to **Folders** on the context menu and then select **Create Folder**.
   - In the **Create Folder** dialog box, type "Customer Info" and click **OK**.
   - In the Data pane, right-click the **Customer ID** field, point to **Folders** and then **Add to Folder** on the context menu, and then select **Customer Info**.
8. In the **Data** pane, right-click the **Sub-Category** field, and select **Aliases** from the context menu. In the **Edit Aliases** dialog box, do the following:
   - Under **Value (Alias)**, select **Art**.
   - Type "Art Supplies" and press the **Enter** key.
   - Click the **X** to close the dialog box.
9. Continue to the section "Save the Data Source and Test the Connection".

Change Data Attributes from Tableau Desktop:	Or Change Data Attributes from the Browser:
Aliases dialog box, do the following: ■ Under **Value (Alias)**, select **Art**. ■ Type "Art Supplies" and press **OK**. 9. Continue to the section "Save the Data Source and Test the Connection".	

Save the Data Source and Test the Connection

IMPORTANT You will now save your customizations from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions.

- For **Tableau Desktop**, follow the instructions "Save Customizations from Tableau Desktop".
- For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Save Customizations from the Browser".

Save Customizations from Tableau Desktop:	Or Save Customizations from the Browser:
1. At the top of the **Data** pane, right-click the **Orders (Data Connection Practice)** data source and select **Add to Saved Data Sources**. 2. Add **Orders (Data Connection Practice)** to **Saved Data Sources** as "My Superstore" and ensure it is saved in the **Data Sources** subfolder of the **My Tableau Repository** folder, which is located in the **Documents** folder on your computer. 3. On the **File** menu, click **Close**, and close the workbook without saving any changes. 4. Open a new workbook. On the **Start** page, under **Saved Data Sources**, select the new **My Superstore** data source, and observe the metadata changes for the fields that were saved. 5. Continue to the section, "Create a Visualization".	1. At the top of the **Data** pane, right-click the **Orders (Data Connection Practice)** data source and select **Save As Published Data Source**. 2. In the **Publish Data Source** dialog box: ■ Under **Name**, type "My Superstore". ■ Select a project where you have publishing permissions. **NOTE** If you are on a company Tableau site or a site owned by another user, we highly recommend that you request a **Test** project be created that you can use for publishing your work. 3. Close the current workbook without publishing, and then open a new workbook. 4. In the **Connect to Data** dialog box, on the **On This Site** tab, select the new "My Superstore" data source, and click **Connect**. Observe the data attribute changes that were saved.

Save Customizations from Tableau Desktop:	Or Save Customizations from the Browser:
	5. Continue to the section, "Create a Visualization".

Create a Visualization

1. Build the bar chart:

Drag this field	To
Discount	**Columns**
Category	**Rows**
Sub-Category	**Rows** (place it to the right of **Category**)
Profit	**Color** on the **Marks** card

Add Additional Formatting (Optional)

IMPORTANT You will now save your customizations from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions.

- For **Tableau Desktop**, follow the instructions "Add Formatting from Tableau Desktop".
- For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Add Formatting from the Browser".

Add Formatting from Tableau Desktop:	Or Add Formatting from the Browser:
1. Format **Discount** as a percentage: ▪ On **Columns**, right-click **AVG (Discount)**, and select **Format**. ▪ In the **Format** pane, on the **Axis** tab, under **Numbers**, click the drop-down arrow, select **Percentage**, keep **2** decimal places selected, and click anywhere to close the dialog box. 2. Format **Profit** as currency: ▪ On the **Marks** card, right-click **AVG (Profit)**, and select **Format**. ▪ In the **Format** pane, click the **Pane** tab. ▪ Under **Default**, under **Numbers**, click the drop-down arrow, select **Currency (Custom)**. ▪ In the dialog box, under **Decimal Places**, use the down arrow to	1. Format **Discount** as a percentage: ▪ On **Columns**, right-click **AVG (Discount)**, and select **Format Number**. ▪ Select the **Percentage** radio button, keep **2** decimal places selected, and click anywhere to close the dialog box. 2. Format **Profit** as currency: ▪ On the **Marks**, right-click **AVG (Profit)**, and select **Format Number**. ▪ Select the **Currency** radio button. ▪ In the dialog box, under **Decimal Places**, use the down arrow to decrease decimal places selected to **0**, and click anywhere to close the dialog box.

Add Formatting from Tableau Desktop:	Or Add Formatting from the Browser:
decrease decimal places selected to **0**, and click anywhere to close the dialog box.	

NOTE For an example of a complete solution to this practice, see **Creating_and_Saving_a_Data_Connection_Solution.twbx**.

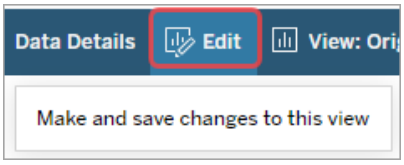
Solution: Filtering

The following is a solution to "Practice: Filtering" on page 20.

Access the Starter Workbook

1. To begin, if you're working with a download link of a zipped **Materials** folder and you have not already done so, right-click the folder and select **Extract All** to download the files.
2. **IMPORTANT** You will now access the starter workbook from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions.
   - For **Tableau Desktop**, follow the instructions "Access the Starter from Tableau Desktop".
   - For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Access the Starter from the Browser".

Access the Starter from Tableau Desktop:	Or Access the Starter from the Browser:
1. From the **Student Materials** folder, open the **Practices** folder. Within the **Practices** folder, open the subfolders **Workbooks** > **Starters** > **04_Simplifying and Sorting Your Data** to navigate to the **Filtering_Starter.twbx** starter file. 2. Click **Open** to open the file. 3. Continue to the section "Create the Filters".	1. On the **Explore** page of your Tableau site, click **New** and then click **Workbook**. 2. In the **Upload Workbook** dialog box, name the workbook under **Name**, and under **Project**, select a project where you have publishing permissions. 3. Click **Choose a file**. 4. Navigate to the file: From the **Student Materials** folder, open the **Practices** folder. Within the **Practices** folder, open the subfolders **Workbooks** > **Starters** > **04_Simplifying and Sorting Your Data** to navigate to the **Filtering_Starter.twbx** starter file. 5. Select **Filtering_Starter.twbx**, and click **Open**. 6. Click **Upload** in the **Upload Workbook**

Access the Starter from Tableau Desktop:	Or Access the Starter from the Browser:
	dialog box. 7. The view will automatically open in Tableau. Click **Edit** on the toolbar to make the view editable so that you can complete the practice.  8. Continue to the section, "Create the Filters".

Create the Filters

1. From the **Data** pane, drag **Market** to the **Filters** shelf.
2. In the **Filter** dialog box, select **All**, and then click **OK**.
3. On the **Filters** shelf, right-click **Market** and select **Show Filter** from the context menu.
4. On the **Market** filter in the view, click the drop-down arrow, and choose **Single Value (List).**
5. Click the drop-down arrow for the **Market** filter in the view again, and choose **Edit Title**.
6. Name the filter "Select a Market" and then click **OK** to close the dialog box.
7. From the **Data** pane, drag **Sales** to **Filters**.
8. In the **Filter Field** dialog box, click **Sum**, click **Next**, and then click **OK**.
9. Right-click the **SUM(Sales)** filter, and choose **Show Filter**.
10. Click the drop-down arrow for the **SUM(Sales)** filter in the view, and choose **Edit Title**.
11. Name the filter "Adjust View by Sales" and click **OK**.
12. Experiment with the sliders and notice the "AND" logic being used. The results shown are those that match the criteria of both filters.

SELF CHECK ANSWER **Consumer Furniture** had the greatest sales for the **EMEA Market** when the sum of sales was between $300K and $800K.

NOTE For an example of a complete solution to this practice, see **Filtering_Solution.twbx**.

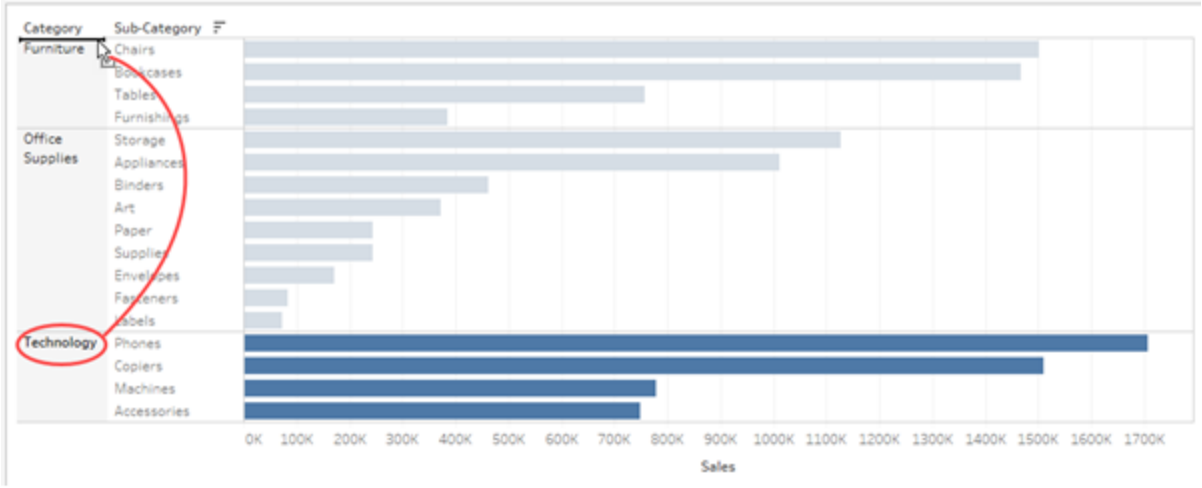
Solution: Sorting

The following is a solution to "Practice: Sorting" on page 22.

View One

1. Use **Sorting_Starter.twbx** (found in the **Practices\Workbooks\Starters** folder).
2. Hover on the **Sales** axis, and click the **Sort** icon  to toggle between the default sort (**Data source order**), and an ascending or descending sort by Sum of Sales. Leave it as a descending sort.

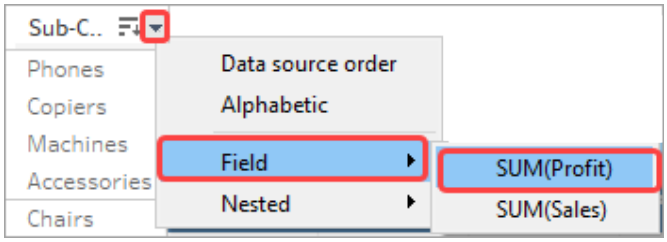
3. In the view, drag the **Technology** category header so it is first, before **Furniture**.



SELF CHECK 1 ANSWER In **Office Supplies**, the **Paper Sub-Category** has slightly higher sales than **Supplies**, which can be seen in the view since the data is sorted descending by **Sales**.

View Two

1. Right-click the **View One** worksheet tab, and then click **Duplicate**.
2. Right-click the **View One (2)** worksheet tab, click **Rename**, type "View Two" and press the **ENTER** key.
3. From the **Data** pane, drag **Profit** to **Color** on the **Marks** card.
4. On the **SUM(Profit)** legend, click the drop-down arrow, click **Edit Colors**, and, on the **Edit Colors** dialog box, choose **Orange-Blue Diverging** from the **Palette** drop-down. Click **OK**.
5. In the view, hover over the **Sub-Category** label, click the drop-down arrow, point to **Field** and then select **SUM (Profit)** to perform a descending sort by **Profit**.



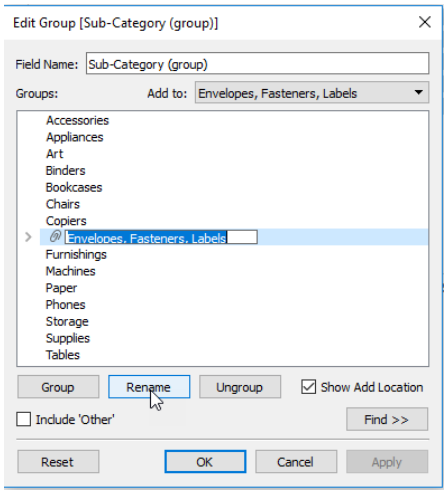
SELF CHECK 2 ANSWER The **Tables Sub-Category** is the least profitable, which you can see using the color of the bars. It has higher sales than the **Furnishings Sub-Category**, which you can see because the length of the bar is longer.

NOTE For an example of a complete solution to this practice, see **Sorting_Solution.twbx**.

Solution: Creating Groups and Hierarchies

The following is a solution to "Practice: Creating Groups and Hierarchies" on page 26.

1. Use **Creating_Groups_and_Hierarchies_Starter.twbx** (found in the **Practices\Workbooks\Starters** folder).
2. On the worksheet, near the bottom of the vertical axis, CTRL + click to select these items by clicking on the names: **Envelopes**, **Fasteners**, and **Labels**. (Be sure to select the sub-category names in the header. Avoid clicking the bars that represent their sales amounts.)
3. Hover over the selected items, and then, in the tooltip menu, click the **Group** (🖇) icon.
4. In the **Data** pane, right-click **Sub-Category (group)**, and then click **Edit Group**.
5. Click the new **Envelopes, Fasteners, Labels** group and then click **Rename.**



6. Type "Desk Supplies" as the name.
7. Apply the change and close the dialog box. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
■ Click **OK**.	■ Press **ENTER** and then click the **X** to close the dialog box.

8. In the **Data** pane, select and drag **Sub-Category (group)** onto **Category** to create a hierarchy. The **Create Hierarchy** dialog box appears.
   - In the **Create Hierarchy** dialog box, type "Products" and click **OK**.
9. Click and drag **Sub-Category** into the **Products** hierarchy, placing it below **Sub-Category (group)**.
10. Click and drag **Product Name** into the **Products** hierarchy, placing it below **Sub-Category**.
11. Drag the **Products** hierarchy to **Rows**, placing it on top of **Sub-Category**.
12. On **Rows**, click the plus (+) next to **Category**, if needed, and then **Sub Category (group)** to expand to **Sub-Category**.

SELF CHECK ANSWER The **Technology** category has the greatest sales. The total sales for the **Desk Supplies** group are $327,551.

NOTE For an example of a complete solution to this practice, see **Creating_Groups_and_Hierarchies_Solution.twbx**.

Solution: Totals and Aggregation

The following is a solution to "Practice: Totals and Aggregation" on page 30.

View One

1. Connect to **Global Superstore.xlsx**.
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (or drag and drop it onto the **Drag tables here** area).
3. Click **Sheet 1** to select it, and then double-click it to rename it to **Total Sales**.
4. Use the worksheet named **Total Sales** and create the following view:

Drag this field	To
Market	**Columns**
Category	**Rows**
Sub-Category	**Rows** to the right of **Category**
Sales	to the view and drop on the **Abc** placeholders.

5. On the **Analysis** menu:
   - Choose **Totals**, and click **Show Row Grand Totals**.
   - Choose **Totals** again, and click **Show Column Grand Totals**.
   - Choose **Totals** again, and click **Add All Subtotals**.

SELF CHECK ANSWER 1 The **EMEA Market** had a higher **Grand Total** for **Sales** of $4,528,024 than the entire **Furniture Category** which made $4,110,874.

Bonus: Maximum Sales View (Optional)

1. Right-click the **Total Sales** worksheet tab and choose **Duplicate**.
2. Double-click the new worksheet tab, and then type "Maximum Sales" to rename it.
3. On the **Marks** card, click the **SUM(Sales)** drop-down arrow, select **Measure (Sum)**, and click **Maximum**.
4. On the **Analysis** menu:
   - Choose **Totals**, and click **Row Totals to Left**.
   - Choose **Totals**, and click **Column Totals to Top**.

SELF CHECK ANSWER 2 The **USCA Market** had the **Maximum Sales** of $22,638 for the **Machines** product in the **Technology Category**.

NOTE For an example of a complete solution to this practice, see **Crosstabs_and_Totals_Solution.twbx**.

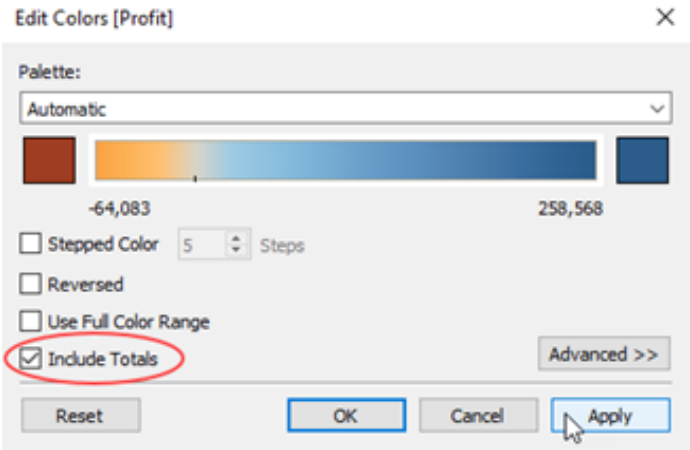
Solution: Highlight Table

The following is a solution to "Practice: Highlight Table" on page 32.

1. Connect to **Global Superstore.xlsx**.
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (or drag and drop it onto the **Drag tables here** area).
3. Create the starting view:

Drag this field	To
Profit	**Text** on the **Marks** card
Profit	**Color** on the **Marks** card
Category	**Rows**
Sub-Category	**Rows** (to right of **Category**)
Market	**Columns**
Region	**Columns** (to the right of **Market**)

4. On the **Marks** card, change the mark type to **Square**.
5. On the **Analysis** menu, choose **Totals**, and click **Show Row Grand Totals**.
6. On the **Marks** card, click **Color**, and then click **Edit Colors**.
7. In the **Edit Colors** dialog box, select **Include Totals**.



8. Apply the change and close the dialog box. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
■ Click **OK**.	■ Click the **X**.

SELF CHECK ANSWER The **Copiers** product **Sub-Category** was the most profitable with a total profit of $258,568. **Tables** was the least profitable product with a total profit of -$64,083.

NOTE For an example of a complete solution to this practice, see **Highlight_Table_Solution.twbx**.

Solution: Date Parts and Date Values

The following is a solution to "Practice: Date Parts and Date Values" on page 34.

Create a Bar Chart to Show Seasonal Sales Trends

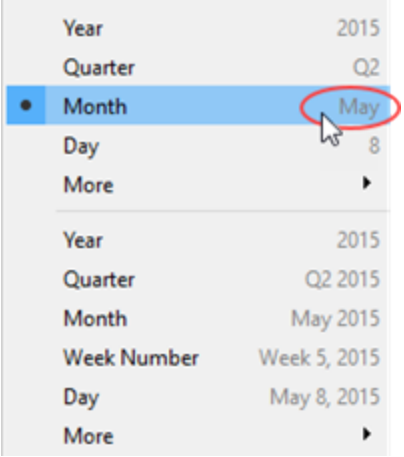
SELF CHECK 1 ANSWER The date part format would better show seasonal trends.

Directions for Seasonal Trends View

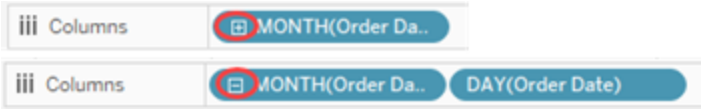
1. Connect to **Global Superstore.xlsx**.
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (or drag and drop it onto the **Drag tables here** area).
3. Double-click the **Sheet 1** worksheet tab, type "Seasonal Trends", and press the **ENTER** key.
4. Build the view:

Drag this field	To
Sales	**Rows**
Order Date	**Columns**

5. On the **Marks** card, click the mark type drop-down list and change it from **Automatic** to **Bar**.
6. On **Columns**, right-click **Order Date**, and select the **Month** date part format (May), as shown below.



7. On the date on columns, use the plus and minus sign icons to drill down and up to different levels of detail.



8. From the **Data** pane, drag **Order Date** to **Filters**.
   - In the **Filter Field** dialog box, select **Years** and click **Next**.
   - In the **Filter [Year of Order Date]** dialog box, select **All** and press **OK**.
9. On the **Filters** shelf, right-click **Year(Order Date)** and select **Show Filter**.
10. On the **Filters** shelf, right-click **Year(Order Date)**, point to **Apply to Worksheets** and select **All Using This Data Source**.

SELF CHECK 2 ANSWER In the **Filter** card, select the check box for All. December has the highest total sales for all years at $1,580,781 while February has the lowest total sales for all years at $543,739. In the **Filter** card, deselect the check box for 2019. December still has the highest total sales for all years at $1,077,637 while February remains the lowest selling month for all years at $358,902.

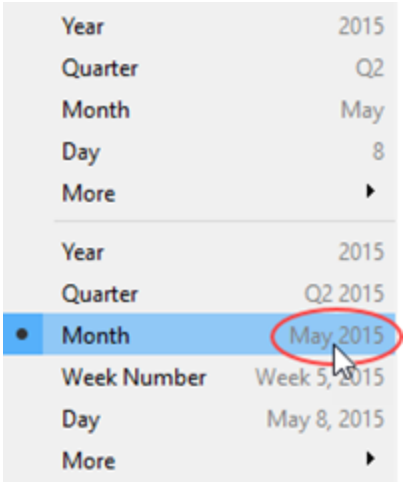
Create a Timeline to Show Sales Over Time

SELF CHECK 3 ANSWER The date value format would better show sales on a chronological timeline.

1. Select **Sheet 2**.
2. Double-click the **Sheet 2** worksheet tab, type "Sales Timeline", and press the **ENTER** key.
3. Build the view:

Drag this field	To
Sales	**Rows**
Order Date	**Columns**

4. On **Columns**, right-click **Order Date**, and select the **Month** date value format (May 2015), as shown below:



5. On the **Order Date** axis, click the plus and minus sign icons to drill down and up to different levels of detail.
6. On the **Filters** shelf, right-click **Year(Order Date)** and select **Show Filter**.

SELF CHECK 4 ANSWER In the **Filter** card, select the check box for All. November 2019 has the highest sales so far at $555,279. Comparatively, the month of December has the highest total sales for all years. In the **Filter** card, deselect the check box for 2019. December 2018 has the highest sales so far at $405,454. Comparatively, the month of December also has the highest total sales for all years.

NOTE For an example of a complete solution to this practice, see **Using_Discrete_and_Continuous_Dates_Solution.twbx**.

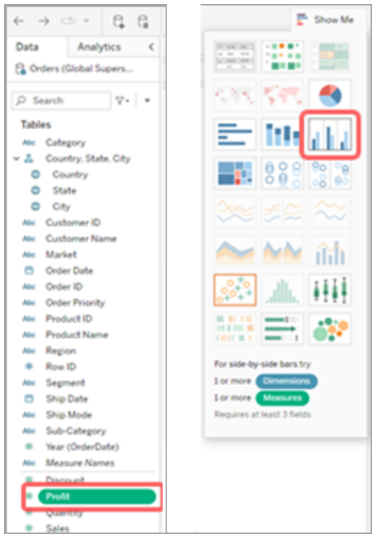
Solution: Combined Axis Chart

The following is a solution to "Practice: Combined Axis Chart" on page 38.

1. Connect to **Global Superstore.xlsx**.
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (or drag and drop it onto the **Drag tables here** area).
3. Create an initial view showing **Sales** broken down by **Category** and **Segment**:

Drag this field	To
Sales	**Rows**
Category	**Rows**
Segment	**Columns**

4. Show **Profit** on the same vertical axis as **Sales**, and then format the view.
   IMPORTANT You will now create a combined axis and format the view from the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions for connecting to data.
   - For **Tableau Desktop**, follow the instructions "Create a Combined Axis View from Tableau Desktop".
   - For a browser-based site on **Tableau Cloud or Tableau Server**, follow the instructions "Create a Combined Axis View from the Browser".

Create a Combined Axis View from Tableau Desktop:	Or Create a Combined Axis View from the Browser:
■ Drag **Profit** to the vertical axis and drop when the mouse icon changes to a double ruler.  ■ From the **Data** pane, drag **Measure Names** to the **Marks** card. ■ On the axis marked **Value**, right-click, select **Edit Axis**, in the **Title** box, type "Dollars" and then click **X** to close the dialog box.	■ Select **Profit** in the **Data** pane, and then click the **side-by-side-bars** icon on the **Show Me** menu.  ■ Drag **Segment** from **Columns** to **Rows**

Create a Combined Axis View from Tableau Desktop:	Or Create a Combined Axis View from the Browser:
	(to the left of **Measure Values**). ■ On the axis marked **Value**, right-click, select **Edit Axis**, in the **Title** box, type "Dollars" and then click **X** to close the dialog box.

SELF CHECK ANSWER Compare the height of the bars to see that the **Furniture Category** looks like it made less **Profit** for the amount of **Sales** compared to other categories.

NOTE For an example of a complete solution to this practice, see **Combined Axis Chart _Solution.twbx**.

Solution: Dual Axis Chart

The following is a solution to "Practice: Dual Axis Chart" on page 40.

1. Connect to **Global Superstore.xlsx**.
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (or drag and drop it onto the **Drag tables here** area).
3. On a new worksheet, create the following view:

Drag this field	To
Sales	**Rows**
Order Date	**Columns**

4. On **Columns**, right-click **YEAR(Order Date)** and select the **Month** date value (May 2015) format.
5. On the **Marks** card, select **Bar** from the mark type drop-down list.
6. From the **Data** pane, drag **Profit** to Rows to the right side of **Sales**.
7. On **Rows**, right-click **Profit**, and select **Dual Axis** from the context menu.
8. On the **Marks** card, select **SUM(Profit)**, and, on the mark type drop-down list, select **Line**.
9. Right-click the **Profit** axis, and select **Synchronize Axis**.
10. Click the **Measure Names** color legend drop-down arrow, and choose **Edit Colors**.
11. Under **Select Data Item**, click **Sales**.
12. In the **Select Color Palette** drop-down list, select **Tableau 20**, and then select the light gray color.
13. Apply the change and close the dialog box. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
■ Click **OK**.	■ Click the **X**.

SELF CHECK ANSWER September 2019 had the greatest profit and November 2019 had the greatest sales.

NOTE For an example of a complete solution to this practice, see **Dual Axis Chart_Solution.twbx**.

Solution: Marketing Expenses Scatter Plot

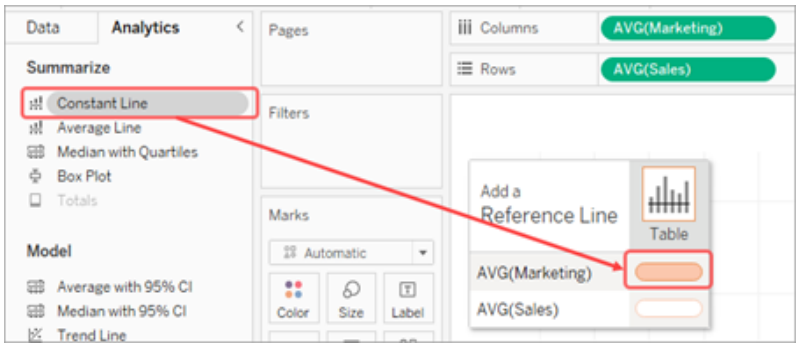
The following is a solution to "Practice: Marketing Expenses Scatter Plot" on page 42.

View One

1. Connect to **CoffeeChain_Query.xlsx**.
2. From the **Data** pane:
   - Drag **Marketing** to **Columns**.
   - Drag **Sales** to **Rows**.
3. Change the aggregation of **Marketing** to an average. **IMPORTANT** Follow the directions for your environment:

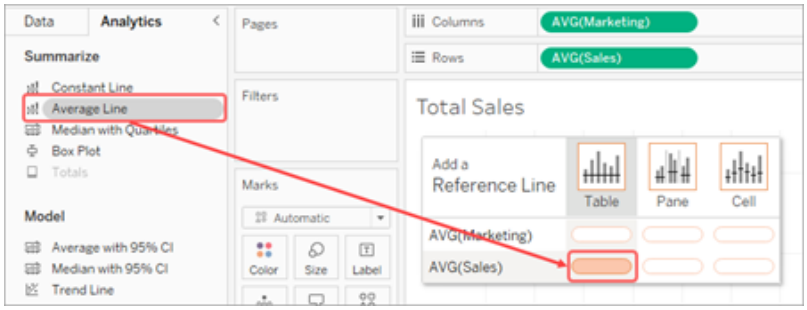
From Tableau Desktop:	Or From the Browser:
■ Right-click the **SUM(Marketing)** field on **Columns**, point to **Measure (Sum)**, and click **Average**.	■ Right-click the **SUM(Marketing)** field on **Columns**, point to **Measure**, and click **Average**.

4. Repeat this process to change the aggregation of **Sales** to an average.
5. From the **Data** pane:
   - Drag **Area Code** to **Detail** on the **Marks** card.
   - Drag **State** to **Detail** on the **Marks** card.
   - Drag **Product Type** to **Color** on the **Marks** card.
6. Right-click **Area Code** on the **Marks** card, and choose **Show Highlighter**.
7. At the top of the **Data** pane, click the **Analytics** tab to open the **Analytics** pane.
8. From the **Analytics** pane, drag **Constant Line** into the view and drop it on **AVG(Marketing)** under **Table** in the **Add a Reference Line** dialog box.



9. For **Value**, type 100, and then press the **ENTER** key. (If needed, click the line and then click **Edit** to open the **Edit Reference Line** dialog box).

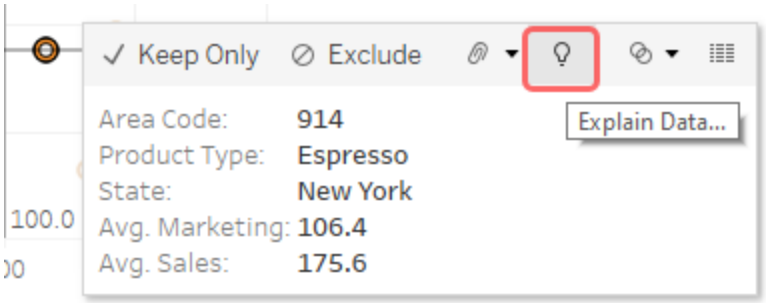
10. From the **Analytics** pane, drag **Average Line** into the view and drop it on **AVG(Sales)** under **Table** in the **Add a Reference Line** dialog box.



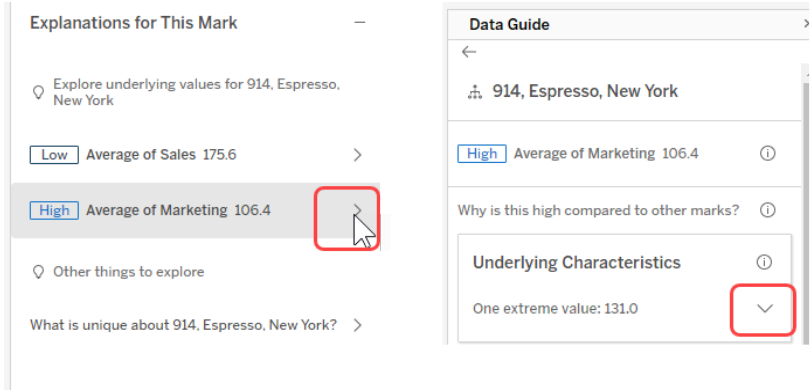
SELF CHECK 1 ANSWER Espresso.

Analyze with the Highlighter and with Explain Data

1. In the **Highlighter** drop down, select **914**. Alternatively, type this value into the **Highlighter** field.
2. Click the mark for espresso and select the **Explain Data** icon in its tooltip.



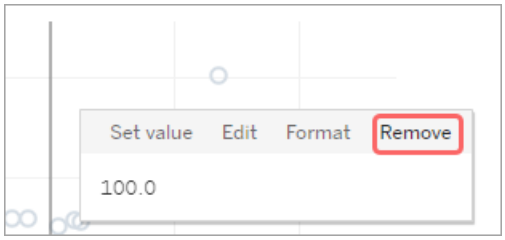
3. In the **Data Guide** pane, confirm that **914, Espresso, New York** is the selected mark.
4. Below the section called **Explanations for This Mark**, click the dropdown next to **High - Average of Marketing 106.4**, and then click the drop-down under the section called **Underlying Characteristics** to read an explanation of this value.



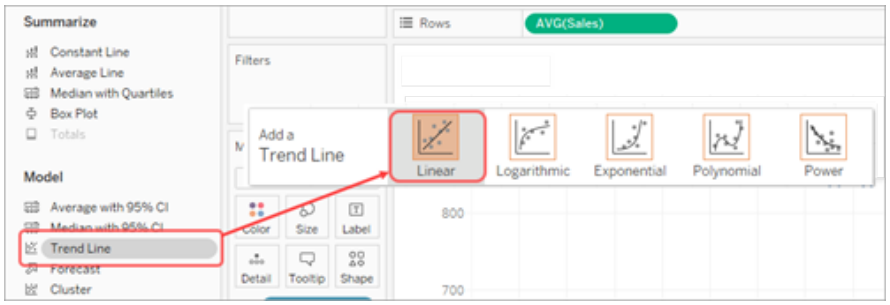
SELF CHECK 2 ANSWER One record with a value of 131 is increasing the average marketing expenses.

View Two

1. On the **View One** worksheet tab, right-click and choose **Duplicate**.
2. In the view, click the constant line for marketing expenses and select **Remove** on the tooltip.



3. Repeat this process to remove the average line for sales values.
4. At the top of the **Data** pane, click the **Analytics** tab to open the **Analytics** pane.
5. From the **Analytics** pane, drag **Trend Line** into the view and drop it on the **Linear** icon.



SELF CHECK 3 ANSWER Espresso has the flattest slope of all the product types. Coffee has the steepest slope.

NOTE For an example of a complete solution to this practice, see **Marketing_Expenses_Scatter_Plot_Solution.twbx**.

Solution: Airport Geographic Mapping

The following is a solution to "Practice: Airport Geographic Mapping" on page 46.

1. Connect to **European Airports 2021.xlsx**.
2. Double-click **Sheet 1** and rename it to **European Airports**.
3. From the **Data** pane, drag the **IATA** airport code to **Detail** on the **Marks** card.
4. Update the view using the following table:

Drag this	Here
Airport Name	**Label** on the **Marks** card
Country	**Detail** on the **Marks** card
2021 Passengers	**Size** on the **Marks** card
2021 Passengers	**Color** on the **Marks** card

5. On the **Map** menu, click **Background Layers**.

6. Under **Background**, set the following options:

Section	Option
Background	In the **Style** drop-down menu, select **Normal**.
Map Layers	Check **Coastline**.
Map Layers	Clear **Country/Region Names**.
Map Layers	Clear **State/Province Borders**.

NOTE You may need to adjust the level of zoom of the map in order to check or clear certain layer options.

7. Click **X** to close the **Layers** pane.
8. On the **Marks** card, click **Color**:
   - Move the **Opacity** slider to 75%.
   - On the **Border** drop-down list, select the black color square.
   - On the **Halo** drop-down list, select **None**.
9. Use the Zoom controls to select and zoom in to see more details on the map.
10. From the **Data** pane, drag **2021 Passengers** to the **Filters** shelf:
    1. In the **Filter** dialog box, click **All Values**, and then click **Next**.
    2. Keep the default **Range of Values**, and click **OK**.
11. On the **Filters** shelf, right-click **2021 Passengers** and select **Show Filter**.

SELF CHECK ANSWER Use the **SUM(2021 Passengers)** filter slider to determine the five busiest airports in 2021: **London Heathrow**, **Paris CDG** (Charles de Gaulle), **Amsterdam**, **Istanbul Ataturk**, and **Frankfurt**.

BONUS Reset the **SUM(2021 Passengers)** filter slider to show all airports. Then, add a filter for **Airport Name** using **Top** 5 by the **SUM** of the **2021 Passengers** field. Verify that the five busiest airports in 2021 were: **London Heathrow**, **Paris CDG** (Charles de Gaulle), **Amsterdam**, **Istanbul Ataturk**, and **Frankfurt**.

NOTE For an example of a complete solution to this practice, see **European Airports Solution.twbx**.

Solution: Calculation and Aggregation in Profit Ratio

The following is a solution to "Practice: Calculations and Aggregations in Profit Ratio" on page 50.

View One

1. Use **Calculations_and_Aggregations_Starter.twbx**.
2. Double-click the **Sheet 1** worksheet tab, type "Profit Ratio by Category" and press the **ENTER** key.
3. Create the starting view:

Drag this field	To
Order Date	**Rows**
Category	**Columns**
Profit	**Color** on the **Marks** card
Profit	**Label** on the **Marks** card

4. On the **Marks** card, change the mark type to **Square**.

Add a Calculation to the View

1. On the **Analysis** menu, select **Create Calculated Field**.
   - Name the calculated field "Profit Ratio" and, in the white space, type the following formula: `[Profit]/[Sales]`.
   - Click **OK** to complete the calculation.
     TIP **Apply** applies the calculation, but allows you to continue revising the calculation until you click **OK**.
2. From the **Data** pane, drag **Profit Ratio** on top of the **Profit** field on the **Marks** card to replace it.
3. Format **Profit Ratio** as a percentage with 2 decimal places. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
■ In the **Data** pane, right-click **Profit Ratio**, point to **Default Properties** on the context menu, and select **Number Format**. ■ In the **Default Number Format** dialog box, select **Percentage**, and under **Decimal places**, use the arrows to select 2. ■ Click **OK**.	■ On the **Marks** card, right-click **Profit Ratio** and click **Format Number**. ■ In the **Number Type** dialog box, select **Percentage**, and under **Decimal Places**, use the arrows to select 2. ■ Click outside the **Number Type** dialog box to close it.

SELF CHECK ANSWER 1 The **Profit Ratio** numbers are so large because Tableau is evaluating **SUM (Profit/Sales)**. This means the ratio is being calculated at the row level, and then the **Sum** aggregation is being applied, adding up the ratios.
To fix this, use the aggregated sums to determine the ratio, for example: **SUM(Profit)/SUM(Sales)**.

4. In the **Data** pane, right-click the **Profit Ratio** field and select **Edit**.
   - In the **Calculated Field** editor, revise the calculation to `SUM([Profit])/SUM([Sales])` and then click **OK**.
5. From the **Data** pane, drag the edited calculation on top of the **Profit Ratio** calculation on the **Marks** card to replace it. **NOTE** From the browser, you will need to repeat Step 3 to format the field as a percentage again.

SELF CHECK ANSWER 2 The **Furniture Category** has the lowest profit ratio.

View Two

1. Click the **New Worksheet** button.
2. Double-click the **Sheet Two** worksheet tab, type "Profitable Sub-Categories" and press the **ENTER** key.
3. Create the starting view:

Drag this field	To
Sub-Category	**Rows**
Sales	**Columns**

4. On the toolbar, click the **Sort Descending** icon.
5. On the **Analysis** menu, click **Create Calculated Field**.
6. In the **Calculated Field** editor do the following:
   - Name the calculation "Profitable Sub-category?"
   - In the white space, type this formula:

```
IF [Profit Ratio] > 0 THEN "Profitable"

ELSE "Unprofitable"

END
```

   - Click **OK**.
7. From the **Data** pane, drag **Profitable Sub-Category?** to **Color** on the **Marks** card.
8. On the **AGG(Profitable Sub-Category?)** legend, click the drop-down arrow and select **Edit Title**.
9. In the **Edit Legend** dialog box do the following:
   - Delete everything, and then type "KPI".
   - Click **OK**.
10. From the **Data** pane, drag **Profit** and **Profit Ratio** to **Tooltip** on the **Marks** card. **NOTE** From the browser, you will need to format the **Profit Ratio** field as a percentage again.

SELF CHECK ANSWER The **Tables Sub-Category** is the only sub-category with a negative (or unprofitable) profit ratio of (8.46%). The **Furniture Category**, which encompasses the **Tables Sub-category**, has the lowest profit ratios. This insight could inform further research to understand and correct this issue.

NOTE For an example of a complete solution to this practice, see **Calculations_and_Aggregations_Solution.twbx**.

Solution: Using String and Type Conversion Calculations

The following is a solution to "Practice: Using String and Type Conversion Calculations" on page 52.

1. Connect to **Student Age, ID, and GPA.xlsx**.
2. Click the **Sheet 1** tab to open a new worksheet.
3. Double-click **Sheet 1**, type "Student Information" and press the **ENTER** key.
4. On the **Analysis** menu, click **Create Calculated Field**.
5. In the **Calculated Field** dialog box, type "Student Name and ID" into the name field, and then in the calculation area, type and use autocomplete to enter the following:
   ```
   UPPER ([Student Last Name])
   ```
6. Click **Apply** to add the calculation to the **Data** pane without closing the editor. **NOTE** If you accidentally close the editor by pressing **OK**, right-click the field in the **Data** pane and then select **Edit** to reopen the editor.
7. Without closing the editor, drag **Student Name and ID** from the **Data** pane to **Rows**.
8. In the calculation area of the editor, type the fixed string **", "** after the **UPPER** string function, using the following syntax. Be sure to add a space after the comma and before the end quotes:
   ```
   UPPER ([Student Last Name]) + ", "
   ```
9. Next, add the **LEFT** string function applied to the **Student First Name** field, using the following syntax. The number 1 tells the calculation to return only the first letter of the name:
   ```
   UPPER ([Student Last Name]) + ", "
   + LEFT ([Student First Name], 1)
   ```
10. Type the fixed string **". "** after the **LEFT** string function, using the following syntax. Be sure to use a space after the period and before the end quotes:
    ```
    UPPER ([Student Last Name]) + ", "
    + LEFT ([Student First Name], 1) + ". "
    ```
11. Click **Apply** to preview the changes in the view without closing the editor.
12. In the calculation area of the editor, add the fixed string **"ID: "** to the end of the calculation, using the following syntax. Be sure to use a space after the colon and before the end quotes:
    ```
    UPPER ([Student Last Name]) + ", "
    + LEFT ([Student First Name], 1) + ". "
    + "ID: "
    ```
13. Next, add the **STR** type conversion function applied to the **ID** field, using the following syntax:
    ```
    UPPER ([Student Last Name]) + ", "
    + LEFT ([Student First Name], 1) + ". "
    + "ID: " + STR ([ID#])
    ```
14. Click **Apply** to preview the changes in the view, and then click **OK** to save the changes and close the editor.

SELF CHECK ANSWER SELF CHECK If you wanted to display the first two letters of the **Student First Name** field, you would use the calculation: `LEFT([Student First Name], 2)`

NOTE For an example of a complete solution to this practice, see **Using String and Type Conversion Calculations Solution.twbx**.

Solution: Using Date Calculations

The following is a solution to "Practice: Using Date Calculations" on page 53.

1. Connect to **Global Superstore.xlsx**.
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (or drag and drop it onto the **Drag tables here** area).
3. Click the **Sheet 1** tab to open a new worksheet.
4. In the **Data** pane, right-click the **Order Date** field, and choose **Create** and then click **Calculated Field**.
5. In the **Calculated Field** dialog box, build the following calculation, and name it "Days to Ship":
   ```
   DATEDIFF ('day', [Order Date], [Ship Date])
   ```
6. Click **OK**.
7. Create a crosstab:

Drag this field	To
Order Priority	**Rows**
Segment	**Rows** to the right of **Order Priority**
Days to Ship	**Text** on the **Marks** card

8. Change the aggregation of **Days to Ship** to an average. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
▪ On the **Marks** card, right-click **SUM (Days to Ship)**, point to **Measure (Sum)**, and select **Average**.	▪ On the **Marks** card, right-click **SUM (Days to Ship)**, point to **Measure**, and select **Average**.

9. Format the number for the **Days to Ship** field. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
▪ In the **Data** pane, right-click the **Days to Ship** field, select **Default Properties**, and choose **Number Format**. ▪ In the **Default Number Format** dialog box, select **Number (Custom)**, set **Decimal places** to 1, and click **OK**.	▪ On the **Marks** card, right-click the **Days to Ship** field and click **Format Number**. ▪ Under **Number Type**, select **Number**, and under **Decimal Places**, use the downward arrow to select 1. ▪ Click outside the dialog box to close it.

10. From the **Data** pane, drag **Shipping Cost** into the view, and drop it over the existing **Avg. Days to Ship** measure when **Show Me** appears.
11. Change the aggregation of **Shipping Costs** to an average. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
■ On the **Marks** card, right-click **SUM (Shipping Costs)**, point to **Measure (Sum)**, and select **Average**.	■ On the **Marks** card, right-click **SUM (Shipping Costs)**, point to **Measure**, and select **Average**.

BONUS: In the view, drag the header for the **Medium Order Priority** field so that its pane is between **High** and **Low**.

SELF CHECK ANSWER The approximate difference between the average **Days to Ship** for **Critical** priority orders compared to **Low** priority orders is about four and a half days. For that same comparison, the approximate difference in average shipping costs is about $30.

NOTE For an example of a complete solution to this practice, see **Using_Date_Calculations_Solution.twbx**.

Solution: Running Total of Sales

The following is a solution to "Practice: Running Total of Sales" on page 56.

1. Use **Running_Total_of_Sales_Starter.twbx** (found in the **Practices\Workbooks\Starters** folder) and use the **Quarterly Sales by Category** worksheet.
2. On the **Marks** card:
   - Right-click the **SUM(Sales)** field, select **Quick Table Calculation**, and click **Running Total**. Note that the calculation defaults to computing across the table.
   - Right-click **SUM(Sales)** again, select **Compute Using**, and then click **Pane (Down)**.
3. From the **Data** pane, drag another instance of **Sales** and drop it into the center of the view.
4. On the **Measure Values** legend, move the **SUM(Sales)** field with the table calculation icon underneath **SUM(Sales)**.

5. On **Columns**, move the **Measure Names** field to the right of the **YEAR(Order Date)** field.

   SELF CHECK ANSWER 1 The running totals for **Furniture** were $762,399 and $1,117,724 for **Q3** and **Q4** in 2018.

6. Right-click the **Quarterly Sales** view and select **Duplicate**.
7. Double-click the sheet title, type "Percent of Total Sales by Category" and press the **ENTER** key.
8. On the **Marks** card, right-click the **SUM(Sales)** field with the table calculation icon, select **Quick Table Calculation**, and click **Percent of Total**.
9. On the **Analysis** menu, point to **Totals** and click **Add All Subtotals**. Note that the calculation continues to compute down each pane.

SELF CHECK ANSWER 2 In 2019, 27.55% of all **Technology** sales happened in **Q3**.

NOTE For an example of a complete solution to this practice, see **Running_Total_of_Sales_Solution.twbx**.

Solution: Nested Sorting for Top N with Rank

The following is a solution to "Practice: Nested Sorting for Top N with Rank" on page 57.

1. Connect to **Global Superstore.xlsx**.
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (alternatively, drag and drop onto the **Drag tables here** area).
3. Double-click the **Sheet 1** worksheet tab, type "Top N with Rank", and then press the **ENTER** key.
4. Create the view:

Drag this	To
Sales	**Columns**
Market	**Rows**
Product Name	**Rows** to the RIGHT of **Market**

   NOTE *If a warning dialog box appears, choose* ***Add All Members****.*

5. Click the **Sort Descending** icon on the toolbar to perform a nested sort of **Sales** by **Product Name**.
6. From the **Data** pane, drag another instance of **Sales** to **Label** on the **Marks** card.
7. On the **Marks** card, right-click the new instance of the **Sales** field you just placed there, select **Quick Table Calculation**, and choose **Rank**.
8. Right-click the **Sales** field on the **Marks** card again, select **Compute Using**, and choose **Pane (Down)**.
9. Filter the **Sales** field with the **Rank** table calculation applied to show the top 10 products for each market. **IMPORTANT** You will now complete this from either the Tableau Desktop application or from your browser-based site on Tableau Cloud or Tableau Server. The following table contains both sets of instructions.

From Tableau Desktop:	Or From the Browser:
■ CTRL+click-drag a copy of **SUM(Sales)** with the **Rank** calculation from the **Marks** card to **Filters**. ■ In the **Filter** dialog box, set the range of values from 1 through 10, and click **OK**	■ CTRL+click-drag a copy of **SUM(Sales)** with the **Rank** calculation from the **Marks** card to the **Data** pane. ■ Right-click the field in the **Data** pane, click **Rename**, type "Rank of Sales", and click **OK**. ■ Drag **Rank of Sales** to the **Filters** shelf, and click **OK** in the **Filter** dialog box without making changes. ■ Right-click **Rank of Sales** on the **Filters** shelf, point to **Compute Using**, and click **Pane (Down)**.

From Tableau Desktop:	Or From the Browser:
	■ Right-click **Rank of Sales** on the **Filters** shelf again, and click **Edit Filter**. ■ In the **Filter** dialog box, set the range of values from 1 through 10, and click **OK**

SELF CHECK ANSWER The **Apple Smart Phone, Full Size** product is ranked as the 3rd best-selling in the **APAC Market.**

NOTE For an example of a complete solution to this practice, see **Nested Sorting for Top N with Rank Complex Solution.twbx**.

Solution: Percent of Total Sales

The following is a solution to "Practice: Percent of Total Sales" on page 60.

1. Connect to **Global Superstore.xlsx**.
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (or drag and drop it onto the **Drag tables here** area).
3. Click **Sheet 1** to open a new worksheet.
4. On the **Marks** card, click the drop-down list of marks, and choose **Pie**.
5. Create the initial view:

Drag this field	To
Segment	**Color** on the **Marks** card
Sales	**Angle** on the **Marks** card
Sales	**Label** on the **Marks** card

6. On the **Marks** card, right-click the **SUM(Sales)** field that is a label, point to **Quick Table Calculations** and click **Percent of Total**.
7. On the toolbar, use the drop-down to change from **Standard** to **Entire View**. This will resize the chart.

NOTE For an example of a complete solution to this practice, see **Percent_of_Total_Solution.twbx**.

Solution: Tree Map

The following is a solution to "Practice: Tree Map" on page 61.

1. Connect to **Global Superstore.xlsx**.
2. On the **Data Source** tab, in the left pane under **Sheets**, double-click **Orders** (or drag and drop it onto the **Drag tables here** area).
3. Click **Sheet 1** to open a new worksheet.

4. Create the tree map:

Drag this field	To
Market	**Color** on the Marks card
Sales	**Size** on the Marks card
Sub-Category	**Label** on the Marks card
Sales	**Label** on the Marks card

5. Right-click **Sub-Category** in the **Marks** card, and choose **Show Highlighter**.

SELF CHECK ANSWER Use the highlighter on **Sub-Category** to see that **Appliances** sales are about $100K higher in **EMEA** than **APAC**.

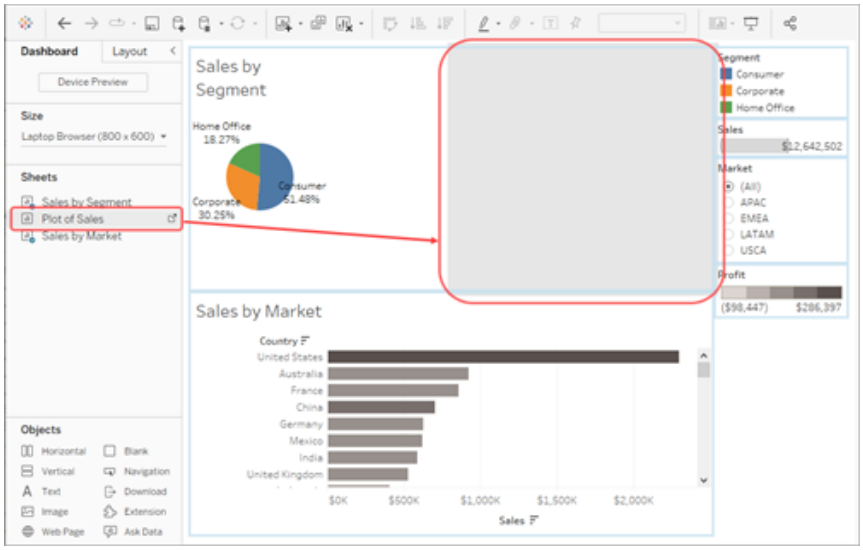
NOTE For an example of a complete solution to this practice, see **Tree_Map_Solution.twbx**.

Solution: Building a Dashboard

The following is a solution to "Practice: Building a Dashboard" on page 64.

Create the Dashboard

1. Use **Building_a_Dashboard_Starter.twbx** (found in the **Practices\Workbooks\Starters** folder).
2. Use the **Dashboard 1** tab.
3. Double-click the dashboard tab to activate editing, type "Sales Dashboard", and press the **ENTER** key.
4. At the bottom of the **Dashboard** pane, select **Show Dashboard title**.
5. Drag the **Plot of Sales** worksheet to the right of **Sales by Segment**. Drop the sheet in the gray box on the dashboard that previews its placement.

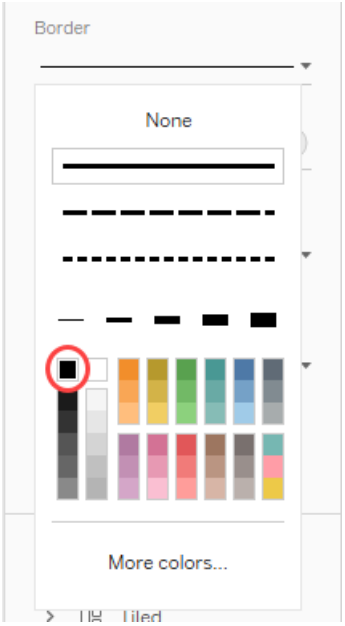


6. Select **Sales by Segment**, click the drop-down arrow on the view's toolbar, and then choose **Fit** and **Entire View** on the menu.
7. Repeat Step 6 for **Plot of Sales**.

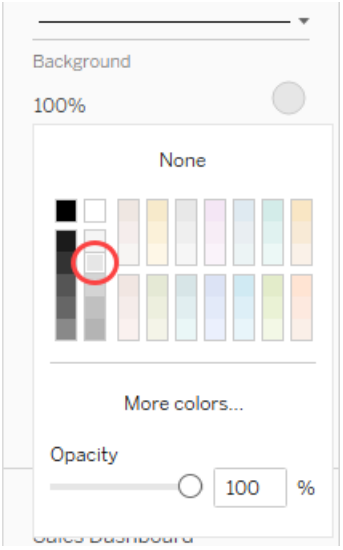
8. To remove the **Profit**, **Sales**, and **Segment** legends: click each to select, and then click **X** on each legend's toolbar.

Add Padding, Borders, and Background Colors Around Items

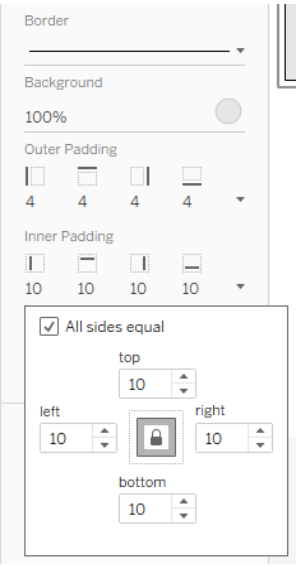
1. On the dashboard, select the **Sales by Segment** view, and then click the **Layout** tab on the **Dashboard** pane. In the **Layout** pane:
   - Click the drop-down arrow to the right of **Border**, and then select a black line. Click the drop-down arrow again to close the line menu.



   - Click the round color sample to the right of **Background**, and then select a light gray. Click the round color sample again to close the color menu.



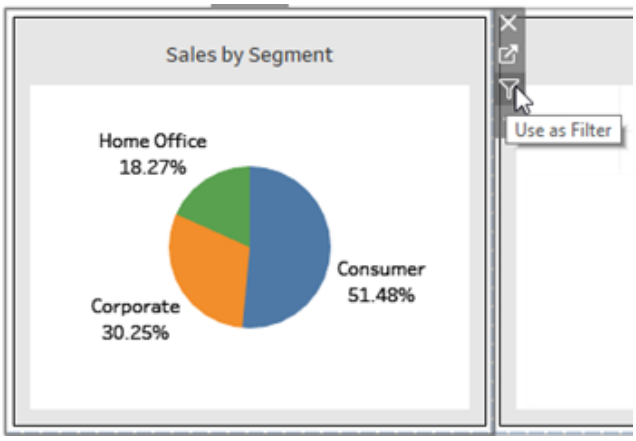
- Click the drop-down arrow to the right of **Inner Padding**, and then, with **All sides equal** selected, enter "10" into one of the specifiers (for example, **top**) and press the **ENTER** key. This will cause all of the specifiers to display **10**. Click the drop-down arrow again to close the padding menu.



2. Repeat Step 1 for **Plot of Sales** and **Sales by Market**.
3. Select the **Market** filter, and in the **Layout** tab on the left, do the following steps:
   - Click the drop-down arrow to the right of **Outer Padding**, and then clear the **All sides equal** check box. Then change the values for **top** and **bottom** to 5.

Create the Dashboard Filters

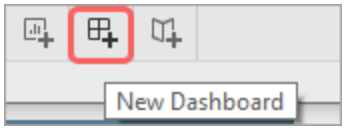
1. On the **Market** filter in the view, click the drop-down arrow on the filter's toolbar, select **Apply to Worksheets**, and click **All Using this Data Source**.
2. Click the **Sales by Segment** view to select it, and then click the **Use as Filter** button.



3. Test the filters in the dashboard.

Optional Bonus

1. In the view, on the bottom of the screen, click the **New Dashboard** tab to add a new dashboard sheet.



2. Double-click the new dashboard tab to activate editing, and type a unique name.
3. Drag and drop each worksheet onto the dashboard, using the gray boxes to preview placement.

NOTE For an example of a complete solution to this practice, see **Building_a_Dashboard_Solution.twbx**.

Solution: Creating an Interactive Dashboard

The following is a solution to "Practice: Creating an Interactive Dashboard" on page 66.

Create the Dashboard

1. Use **Creating_an_Interactive_Dashboard_Starter.twbx** (found in the **Practices\Workbooks\Starters** folder). If desired, you may complete this practice using the starter view, **Commercial Fishing Dashboard Starter**. If you choose this option, rename the dashboard tab to "Commercial Fishing in the North Atlantic", skip steps 2-7, and then proceed to step 8.
2. Click the **New Dashboard** tab.

3. Double-click the new dashboard tab and name it "Commercial Fishing in the North Atlantic" and press the **ENTER** key.
4. At the bottom of the **Dashboard** pane, select **Show dashboard title**.
5. Drag the **Tons of Live Weight Caught by Country** worksheet onto the dashboard.
6. Drag the **Tons of Live Weight Caught by Year** worksheet onto the dashboard to the right of **Tons of Live Weight Caught by Country**.
7. Drag the **Tons of Live Weight Caught by Species** worksheet onto the dashboard beneath **Tons of Live Weight Caught by Year**.
8. Click to select the **Tons of Live Weight Caught by Species** view. On its toolbar, click the drop-down arrow, select **Fit**, and then select **Fit Width**.

Add Dashboard Filter Actions

1. On the **Dashboard** menu at the top of the screen, click **Actions**, then click **Add Action**, and select **Filter**.

2. Use the following settings for the map filter:

Setting	Value
Name	"Map Filter"
Source Sheets	**Commercial Fishing in the North Atlantic** dashboard / **Tons of Live Weight Caught by Country**
Run action on	**Select**
Target Sheets	Ensure that all available sheets are selected.
Clearing the selection will	**Show all values**

3. Click **OK**.
4. Create another filter action for the bar chart with the following settings:

Setting	Value
Name	"Filter for Years"
Source Sheets	**Tons of Live Weight Caught by Year**
Run action on	**Select**
Target Sheets	**Tons of Live Weight Caught by Species**
Clearing the selection will	**Show all values**

5. Click **OK**, and then click **OK** again to close the **Actions** dialog box.
6. Test the filter actions you just added:
   - Click a mark for a country on the map to filter the other views.
   - Click the map again to show all values.
   - Click a mark for a year in the bar chart to filter the species in the tree map.
   - Click the bar chart again to show all values.

Add a Dashboard URL Action

1. On the **Dashboard** menu, select **Actions**.
2. Click **Add Action**, and select **Go to URL**.
3. Create a URL action with these settings:

Setting	Value
Name	Look up information about <Species>
Source Sheets	**Tons of Live Weight Caught by Species**
Run Action On	**Menu**
URL	http://en.wikipedia.org/wiki/<Species>

4. Click **OK**, and then click **OK** again to close the **Actions** dialog box.

5. Test the URL action you just added:
   - Click on a mark in the tree map, then click on the URL link in the tooltip context menu to test.

Edit Titles to Support User Interaction

1. Right-click the title for **Tons of Live Weight Caught by Country**, click **Edit Title**, and on the next line below the title, type "Click a country", and then format the font to size 10. Click **OK**.
2. Right-click the title for **Tons of Live Weight Caught by Year**, and click **Edit Title**.
3. Leave the reference for the sheet name, and then add "for <Country>", so the title looks like this: **<Sheet Name>** for **<Country>**
4. Press **ENTER** and on the next line, type:
   "Next, choose a year to see species caught" and format to font size 10.
5. Right-click the title for **Tons of Live Weight Caught by Species**, click **Edit Title**:
   - On the next line below the title, type "Country/countries: **<Country>**" and press **ENTER** to go to the next line.
   - On the new line, type: "Year(s): **<Year>**"
   - Format the font to size 10 for both added lines.
   - Click **OK**.
6. Test the titles you just edited:
   - Click a mark for a country in the map to check the title on the bar chart and tree map.
   - Click a mark for a year in the bar chart to check the title on the tree map.

SELF CHECK ANSWER 1 **Atlantic herring** was the most caught species of fish in **2021**.

SELF CHECK ANSWER 2 **Atlantic cod** was the most caught species of fish for **Iceland** in **2021**.

NOTE For an example of a complete solution to this practice, see **Creating_an_Interactive_Dashboard_Solution.twbx**.

16. Appendix B: Bonus Practices (with Solutions)

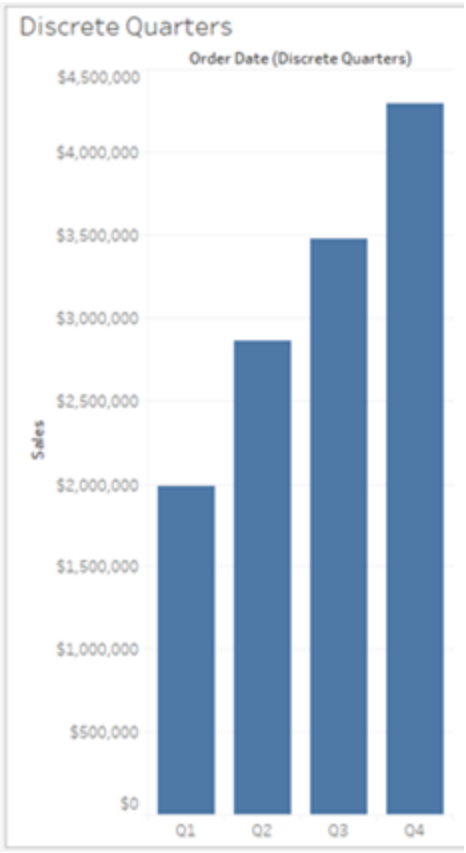
This section contains bonus practices and solutions.

Bonus Practice: Custom Dates

Practice creating custom dates, then build a hierarchy to control and simplify your view so you only see sales by the date parts you need for more efficient analysis.

Discrete Custom Dates

Create a bar chart that shows sales by order date using a custom discrete date in quarters.

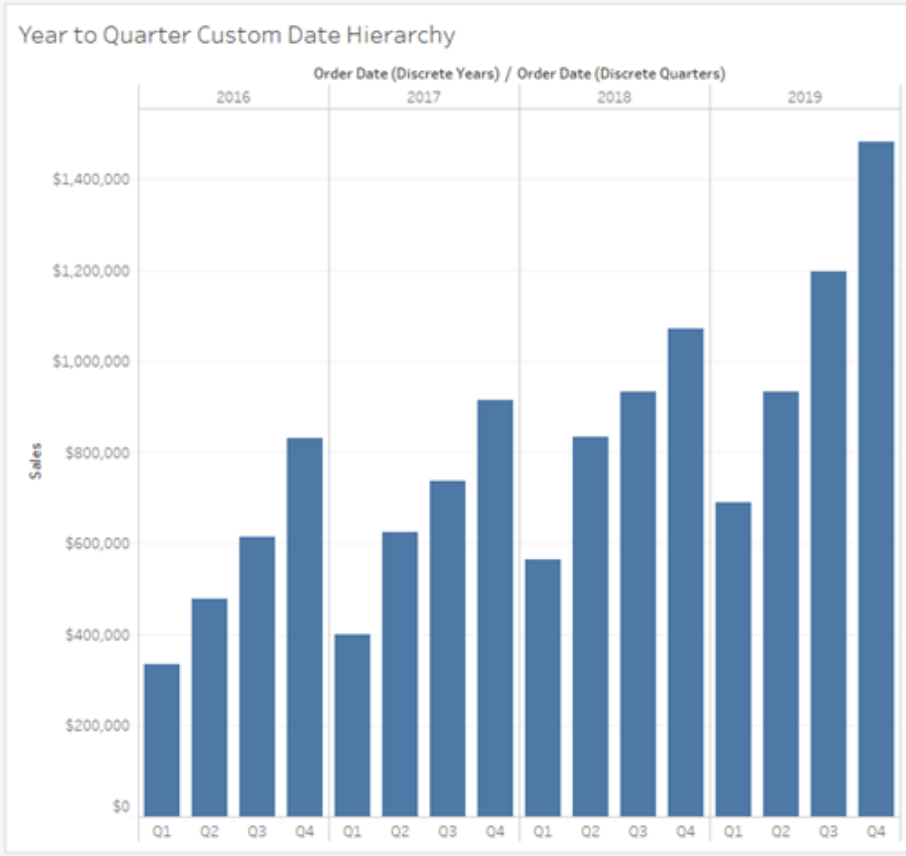


Directions

1. Use **Bonus Practice_Custom_Dates_Starter.twbx** (found in the **Practices\Data** folder).
2. On the sheet named **Discrete Quarters**, create a custom **date part** with a date value of quarters, and name this field "Order Date (Discrete Quarters)".
3. Remove the date field on the **Columns** shelf, and drag this new field to **Columns**.
4. Change the mark type to **Bar**.

Discrete Year to Quarters Hierarchy

Create a bar chart that shows sales by order date using a custom discrete date hierarchy of years to quarters.



Directions

1. On the sheet named **Year to Quarter Custom Date Hierarchy**, create a custom **date part** with a date value of years, and name this field "Order Date (Discrete Years)".
2. In the **Data** pane, drag **Order Date (Discrete Quarters)** on top of **Order Date (Discrete Years)** to create a hierarchical group, and name the group "Order Date (Discrete Years to Quarters)".
3. On **Columns**, drag **MONTH(Order Date)** off of the view.
4. Drag the hierarchical group you just created to **Columns**, and then expand to show both years and quarters.
5. Change the mark type to **Bar**.

SELF CHECK 1 What are the total sales in all of 2019? What are the total sales in Q4 of 2019?

SELF CHECK 2 What trends over time can you see in the sales data?

Solution

For the solution to this practice, see "Bonus Solution: Custom Dates" on page 107.

Bonus Solution: Custom Dates

The following is a solution to "Bonus Practice: Custom Dates" on page 105.

Discrete Custom Dates

1. Use **Bonus Practice_Custom_Dates_Starter.twbx** (found in the **Practices\Data** folder).
2. Use the sheet named **Discrete Quarters**.
3. Create a custom date for quarters. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
■ In the **Data** pane, right-click on **Order Date**, click **Create**, and then click **Custom date...**. ■ In the **Create Custom Date** dialog box, name the custom date "Order Date (Discrete Quarters)", select **Quarters** from the **Detail** drop-down list, and select **Date Part**. ■ Click **OK**	■ In the **Data** pane, right-click on **Order Date**, click **Create**, and then click **Calculated Field...**. ■ In the **Calculation Editor**: ■ Name the calculation "Order Date (Discrete Quarters)" ■ Enter the formula: `DATEPART ('quarter',[Order Date])` ■ Click **OK** ■ In the **Data** pane, right-click the newly created **Order Date (Discrete Quarters)** field and select **Convert to Dimension**.

4. Drag the newly created **Order Date (Discrete Quarters)** to **Columns**, and remove the other instance of **Order Date** from **Columns**.
5. On the **Marks** card, change the mark type to **Bar**.

Discrete Custom Date Hierarchy (Years to Quarters)

1. Switch to the sheet named **Year to Quarter Custom Date Hierarchy**.
2. Create a custom date for years. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
■ In the **Data** pane, right-click on **Order Date**, click **Create**, and then click **Custom date...**. ■ In the **Create Custom Date** dialog box, name the custom date "Order	■ In the **Data** pane, right-click on **Order Date**, click **Create**, and then click **Calculated Field...**. ■ In the **Calculation Editor**: ■ Name the calculation "Order Date

From Tableau Desktop:	Or From the Browser:
Date (Discrete Years)", select **Years** from the **Detail** drop-down list, and select **Date Part**. ■ Click **OK**	(Discrete Years)" ■ Enter the formula: `DATEPART ('year',[Order Date])` ■ Click **OK** ■ In the **Data** pane, right-click the newly created **Order Date (Discrete Years)** field and select **Convert to Dimension**.

3. In the **Data** pane, drag **Order Date (Discrete Quarters)** on top of **Order Date (Discrete Years)** to create a hierarchical group.
4. Double-click the hierarchical group name and type "Order Date (Discrete Years to Quarters)".
5. On **Columns**, replace **MONTH(Order Date)** with the newly created hierarchy **Order Date (Discrete Years to Discrete Quarters)**, and expand to show both years and quarters.
6. On the **Marks** card, change the mark type to **Bar**.

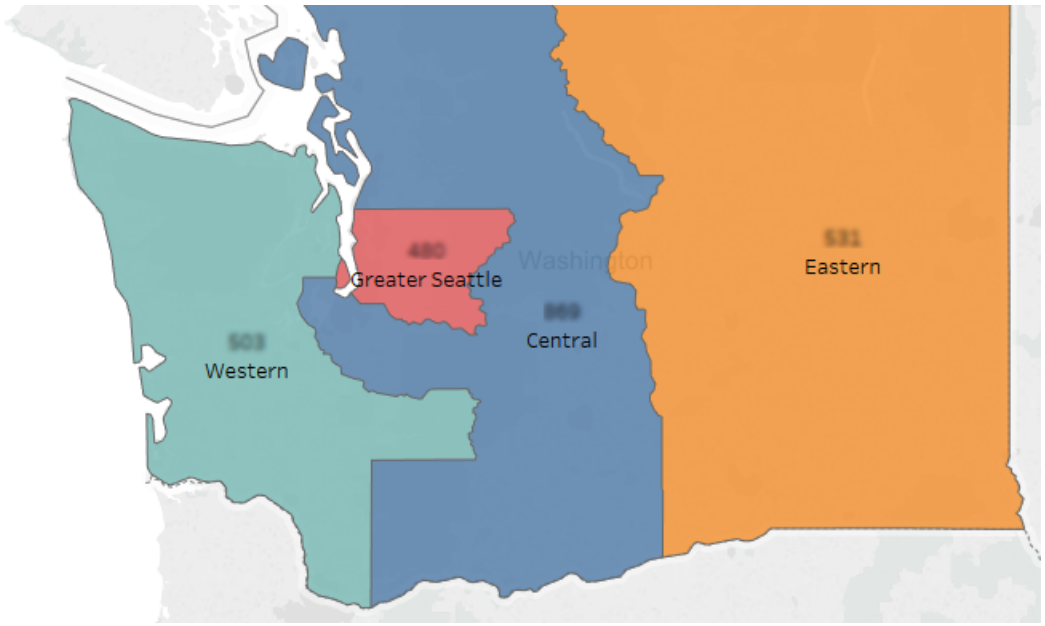
SELF CHECK ANSWER 1 Use the custom date hierarchy to drill up and down to determine the total sales in all of 2019 is $4,299,866, and the total sales in Q4 of 2019 is $1,481,189.

SELF CHECK ANSWER 2 Possible answers include: Sales are increasing over time; sales increase over each complete quarter within each year.

NOTE For an example of a complete solution to this practice, see **Bonus Practice_Custom_Dates_Solution.twbx**.

Bonus Practice: Creating Geographic Groups

Use geographic groups to show the total number of schools in custom sales territories for your company in Washington state. Use your map to explore whether you should consider splitting one of your territories.



Create a Map

1. Connect to the Excel data source **school data.xlsx** (in the **Practices\Data** folder).
2. Rename **Sheet 1** to **Geographic Groups**.
3. Create a map with **State** and **County Name**, labeled with the number of **Schools** for each county.

Create Geographic Groups

1. Use the map selection tools or **CTRL+click** to select counties for the first geographic group.
2. On the toolbar, use the **Group** icon with **County Name, State** to create custom sales territories using geographic groups.
   Note that a new group named **County Name & State (group)** appears in the **Data** pane.
3. To create the other territories, as shown, **CTRL+click** to select counties, and use the **Group** icon on the toolbar.

NOTE It is not necessary to create the territories exactly as shown. A reasonable resemblance will suffice.

See Number of Schools by Geographic Group

1. Use **Edit Group** to rename the territories as shown.

2. Remove **County Name** from the view to show only the territories. Note that the number of schools is now aggregated for each territory and when you click on the map, each territory acts as a geographical group.
3. Add a copy of the group to **Label** on the **Marks** card.

SELF CHECK If you were the regional sales manager for Washington state, which territory would you consider splitting? Why?

Solution

For the solution to this practice, see "Bonus Solution: Creating Geographic Groups" on page 110.

Bonus Solution: Creating Geographic Groups

The following is a solution to "Bonus Practice: Creating Geographic Groups" on page 109.

Create a Map

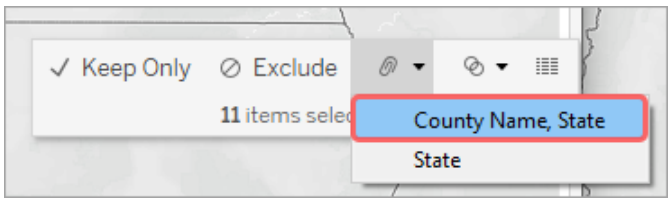
1. Connect to **school data.xlsx**.
2. Click the **Sheet 1** tab to select it, and then double-click it to rename it to **Geographic Groups**.
3. Create the view using the following table:

Drag this	To
State	**Detail** on the **Marks** card
County Name	**Detail** on the **Marks** card
Schools	**Label** on the **Marks** card

4. On the **Marks** card, click the mark type drop-down list and change it from **Automatic** to **Map**.

Create Geographic Groups

1. Use the map selection tools or **CTRL+click** to select counties on the map for the **Eastern** geographic group.
2. On the toolbar, with these counties selected, click the **Group** icon ( ) and then select **County Name, State** so that the group uses both **State** and **County Name** as the level of detail.



3. To create the other geographic groups, **CTRL+click** to select counties on the map. On the toolbar, with these counties selected, click the **Group** icon ( ).

NOTE It is not necessary to create the territories exactly as shown. A reasonable resemblance will suffice.

See Number of Schools by Geographic Group

1. In the **Dimensions** area in the **Data** pane, right-click **County Name & State (group)**, and choose **Edit Group**.
2. In the **Edit Group** dialog box, change the **Field Name** to "Custom Territories."
3. In the **Edit Group** dialog box, select the first group, and click **Rename**.
4. In the activated text box for the group, type "Eastern".
5. Repeat this process for the **Central**, **Greater Seattle**, and **Western** sales territories as they correspond with their locations on the map.
6. Close the dialog box. **IMPORTANT** Follow the directions for your environment:

From Tableau Desktop:	Or From the Browser:
■ Click **OK**.	■ Click the **X**.

7. Drag **County Name** off of the **Marks** card to remove the dimension from the view.
   Note that the number of schools is now aggregated for each territory and when you click on the map, each territory acts as a geographical group.
8. Drag **Custom Territories** from the **Data** pane to **Label** on the **Marks** card.

SELF CHECK ANSWER Consider splitting the Central territory because it has many more schools than the other territories. Note that you may have a different answer if your groups are different.

NOTE For an example of a complete solution to this practice, see **Bonus Practice_Creating_Geographic_Groups_Solution.twbx**.

17. Appendix C: Reference

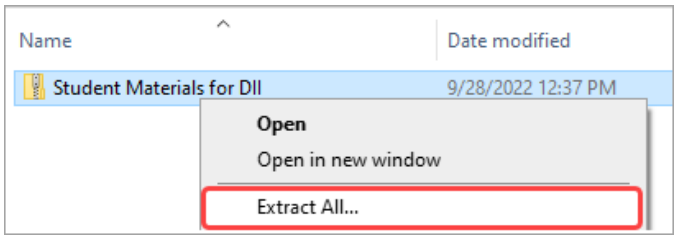
Working in the Desktop Application

If you are completing the practices for this course in the Tableau Desktop application, read the following to learn how to access and save the course materials.

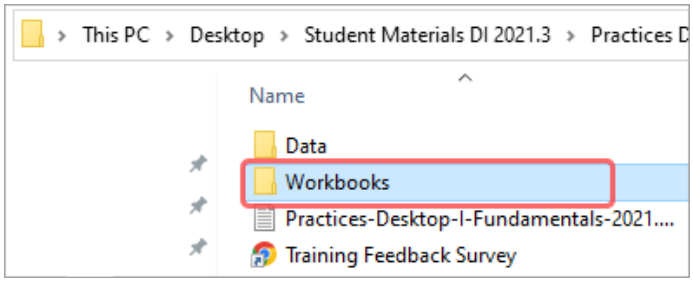
Working with .twbx Files in the Desktop Application

Some practices in this course have starter workbooks for you to use. All practices in this course also have solution files for you to compare against your own completed work. These files are the .twbx (Tableau Packaged Workbook) file type. Follow these directions to access them.

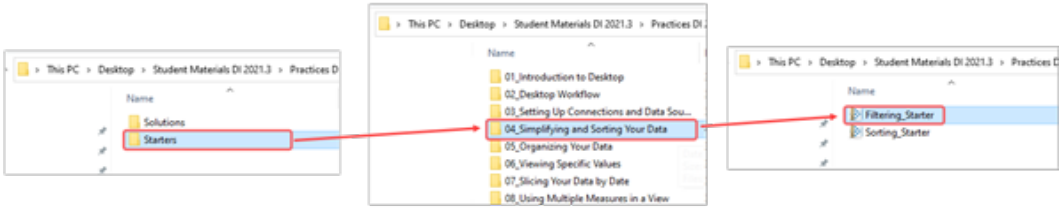
1. If you have not already done so, download the **Student Materials** zipped file, right-click, and select **Extract All** to unzip and save the files to your local computer.



2. Browse to the **Workbooks** subfolder within **Practices** in the **Student Materials** folder.



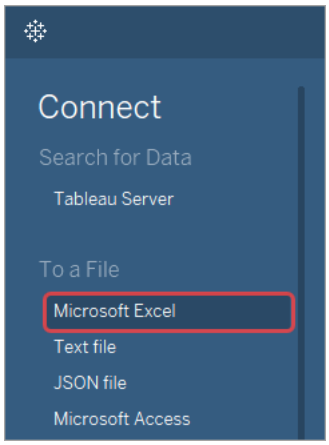
3. Open either the **Starters** or **Solutions** subfolder, and then browse to the module subfolder and the specific starter or solution file you want to open, for example, **Filtering_Starter.twbx**, found in the subfolder for the fourth module of the Tableau Fundamentals course.



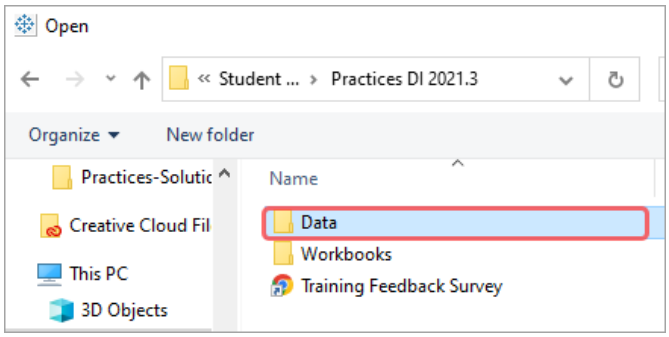
Working with Data Source Files in the Desktop Application

Many of the practices in this course will not contain starter workbooks, and will require you to connect to data source files from Tableau Desktop. Follow these directions to connect to data source files.

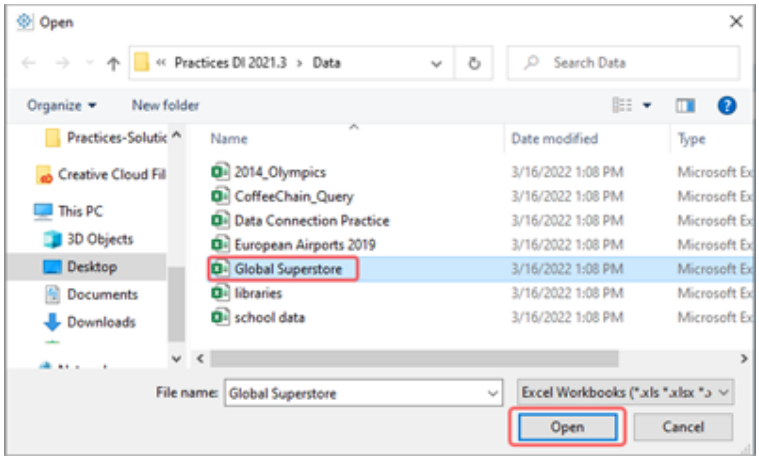
1. If you have not already done so, download the **Student Materials** zipped file, right-click, and select **Extract All** to unzip and save the files to your local computer.
2. Open Tableau Desktop, and under **Connect** click the file type used in the practice, for example, **Microsoft Excel**.



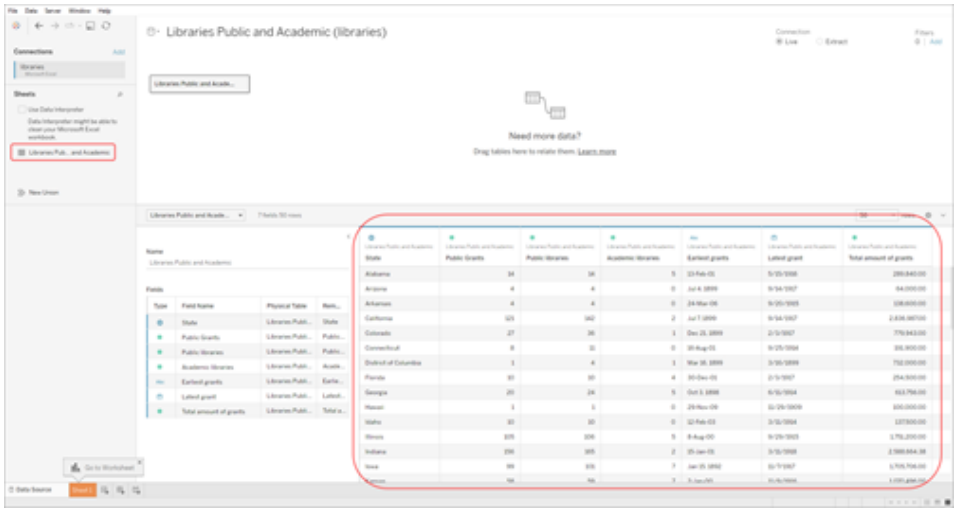
3. Navigate to the **Practices** folder within **Student Materials** and open the **Data** folder.



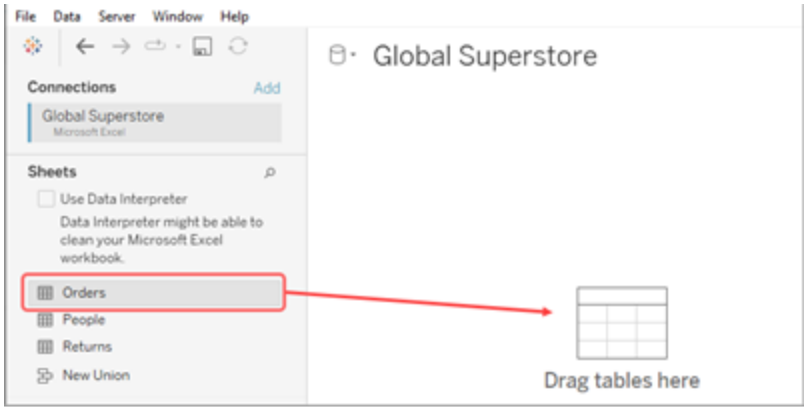
4. Open the file specified in the instructions for the practice, for example, **Global Superstore.xlsx**.



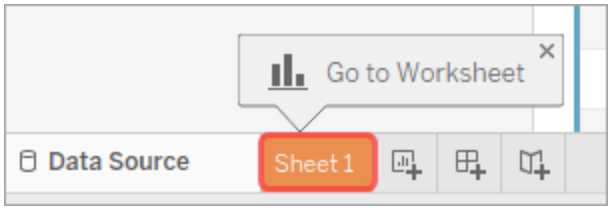
5. The **Data Source** page will automatically display in Tableau Desktop.
   - If the file contains one table, you will see the data from that table in the data grid automatically.



   - If the file contains multiple tables, on the **Data Source** tab, in the **Connections** pane under **Sheets**, double-click the table specified in the practice instructions (for example, **Orders**) or drag and drop it onto the **Drag tables here** area.

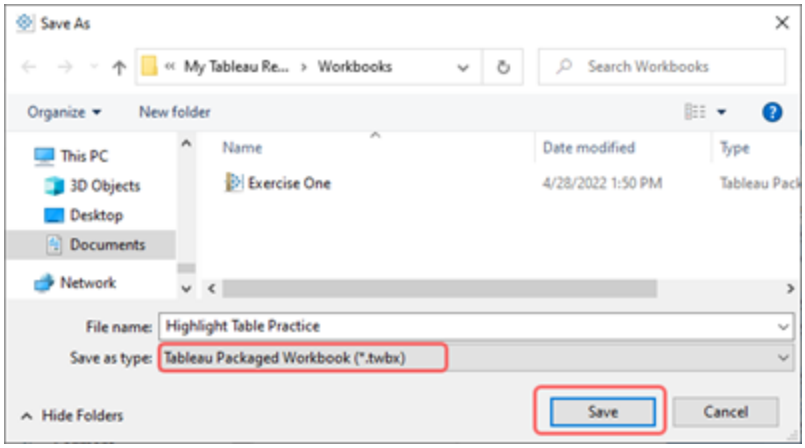


6. Click **Sheet 1** to go to the worksheet.



Saving Your Work in the Desktop Application

1. On the **File** menu of the workbook, select **Save** or **Save As**. Your work will automatically save to the folder **My Tableau Repository**.
2. In the dialog box, name your workbook, and select the .twbx file type (this will package the underlying data with the workbook).



3. Click **Save**.

You can also find instructions for working with .twbx and data source files in the Desktop application in the first few practices.

Working in the Browser

If you are completing the practices for this course in the browser from your Tableau site on Tableau Server or Tableau Cloud, read the following to learn how to access and save the course materials.

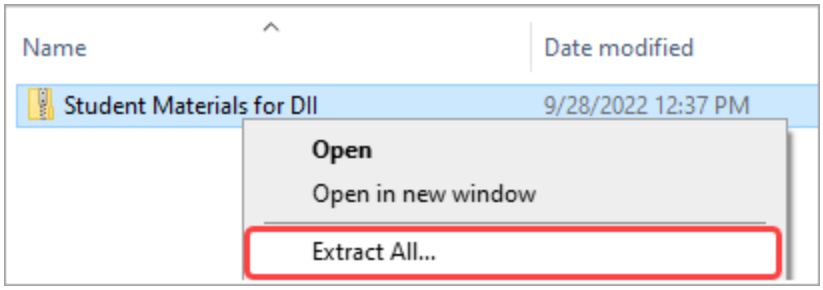
NOTE To complete the activities for this class in the browser, you must have a **Creator** site role and publishing permissions.

Working with .twbx Files in the Browser

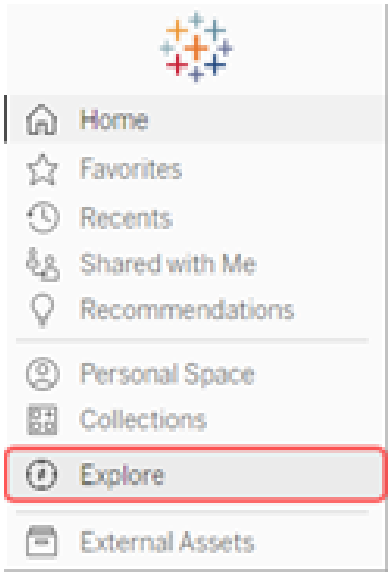
Some practices in this course have starter workbooks for you to use. All practices in this course also have solution files for you to compare against your own completed work. These files are the .twbx (Tableau Packaged Workbook) file type. Follow these directions to access them from the **Practices** folder and upload them to your Tableau site.

NOTE If you are on a company Tableau site or a site owned by another user, we highly recommend that you request a **Test** project be created that you can use for storing files and completing activities.

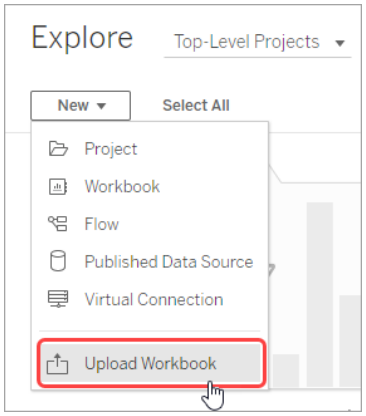
1. If you have not already done so, download the **Student Materials** zipped file, right-click, and select **Extract All** to unzip and save the files to your local computer.



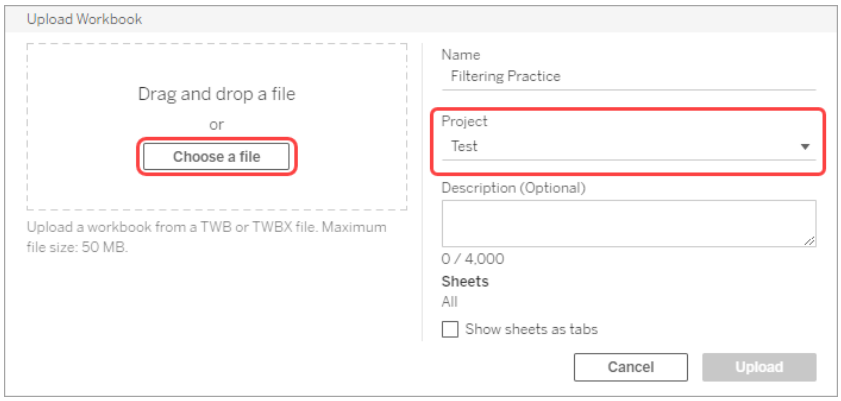
2. Log in to your Tableau site, and use the **Navigation** panel to navigate to the **Explore** page.



3. On the **Explore** page, click **New** and then click **Upload Workbook**.

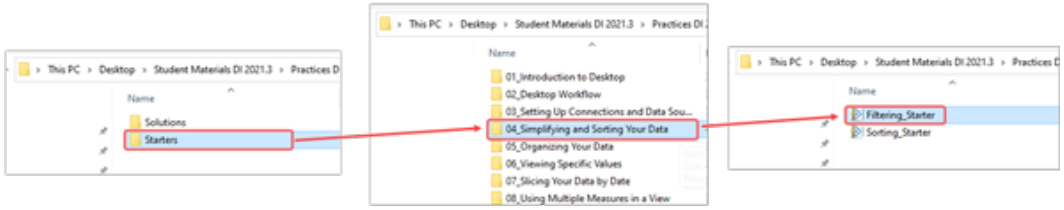


4. In the **Upload Workbook** dialog box, name the workbook under **Name**, and under **Project**, select a project where you have publishing permissions.
5. Click **Choose a File**.



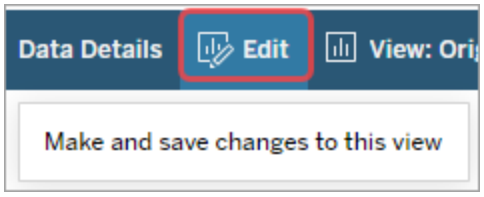
6. Browse to the **Workbooks** subfolder within **Practices** in the **Student Materials** folder.

7. Open either the **Starters** or **Solutions** subfolder, and then browse to the module subfolder and the specific starter or solution file you want to open, for example, **Filtering_Starter.twbx**, found in the subfolder for the fourth module of the Tableau Fundamentals course. Click **Open**.



8. In the **Upload Workbook** dialog box, click **Upload**.

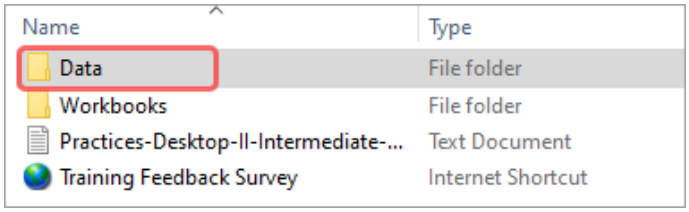
9. The view will automatically open in Tableau. Click **Edit** on the toolbar to make the view editable so that you can complete the practice.



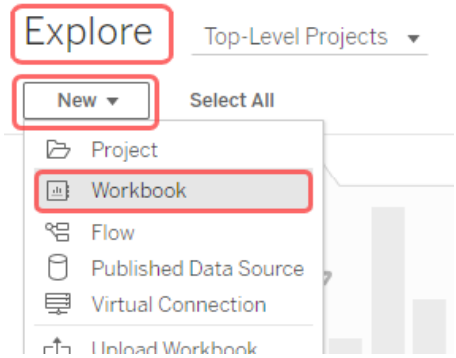
Working with Data Source Files in the Browser

If you're completing the practice exercises in the browser from your Tableau site, do the following:

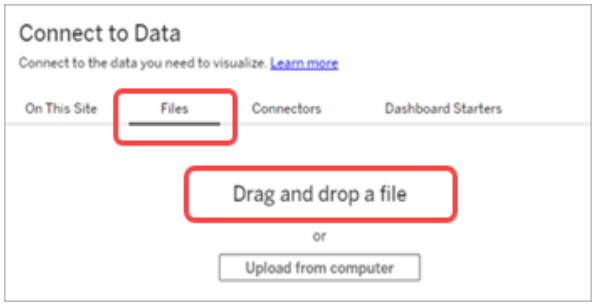
1. Download the **Student Materials** zipped file, right-click, and select **Extract All** to unzip and save the files to your local computer.
2. In the **Student Materials** folder, open the **Data** subfolder within **Practices**.



3. On the **Explore** page of your Tableau site, click **New** and then click **Workbook**.

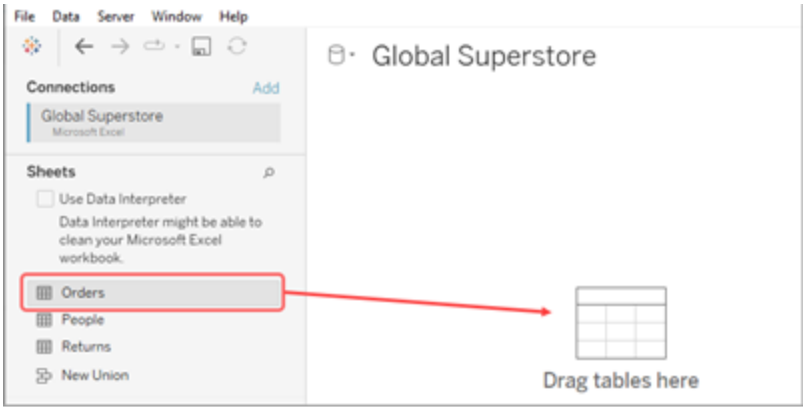


4. In the **Connect to Data** dialog box, select the **Files** tab.
5. From the **Data** subfolder of the **Practices** folder within **Student Materials**, drag the file specified in the instructions for the practice to the **Connect to Data** dialog box, and drop on **Drag and drop a file**.

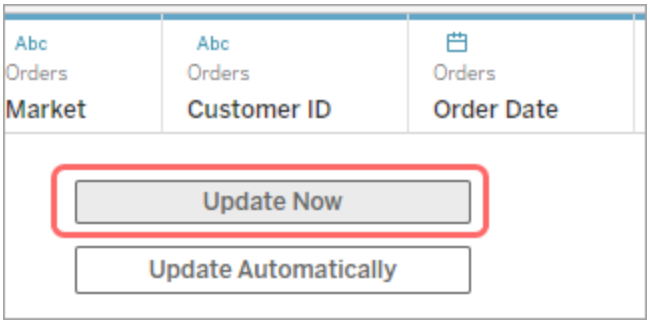


- If the file contains one table, a workbook will automatically open to a new worksheet, and you can begin to follow the directions for the practice.

- If the file contains multiple tables, the **Data Source** page will open automatically. Complete the following:
  - On the **Data Source** tab, in the **Connections** pane, under **Sheets**, double-click the table specified in the practice instructions (for example, **Orders**) or drag and drop it onto the **Drag tables here** area.



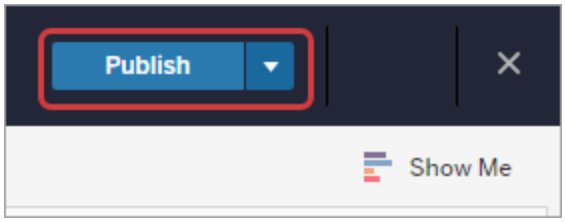
  - In the data grid, click **Update Now** to populate it.



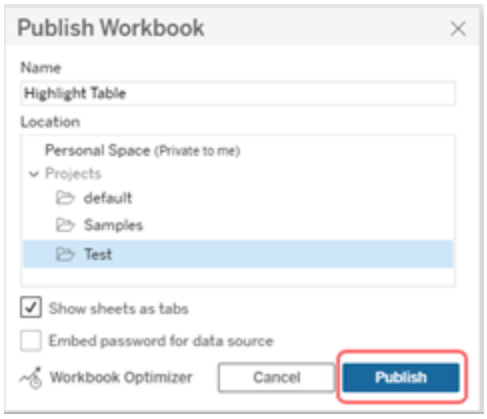
  - At the bottom of the workbook, click the **Sheet 1** tab to open a new worksheet, and begin to follow the directions for the practice.

Saving Your Work in the Browser

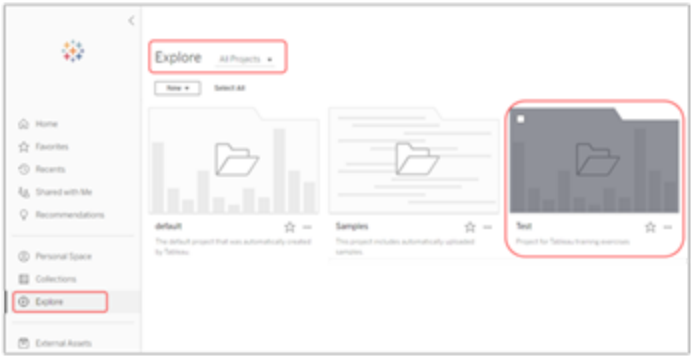
1. At the upper right corner of the screen, click **Publish**.



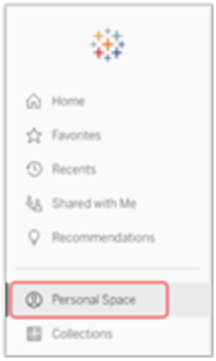
2. In the **Publish** dialog box, type a name for the workbook, select a project where you have publishing permissions (such as your **Personal Space** or a sandbox/test project), select the **Show Sheets as Tabs** checkbox (for workbooks with multiple worksheets), and click **Publish**.



3. To view the workbook on the site after publishing, navigate to the project where you published the workbook. (Use **All Projects** on the **Explore** menu and then click the project thumbnail to open a sandbox or test project, or select **Personal Space** on the **Navigation** panel to open your personal space).



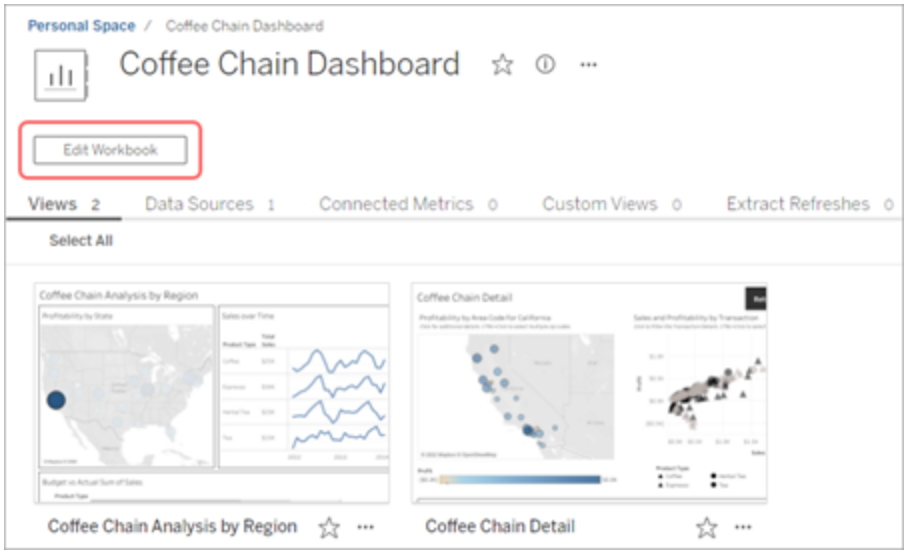
Navigate to a project



Navigate to Personal Space

4. Click the thumbnail for the published workbook to open its page.

5. On the workbook's page, click the thumbnail to for the desired view (if more than one worksheet) to open the workbook, or click **Edit Workbook** to edit it.



You can also find instructions for working with .twbx and data source files in the browser in the first few practices.

Permissions in Tableau

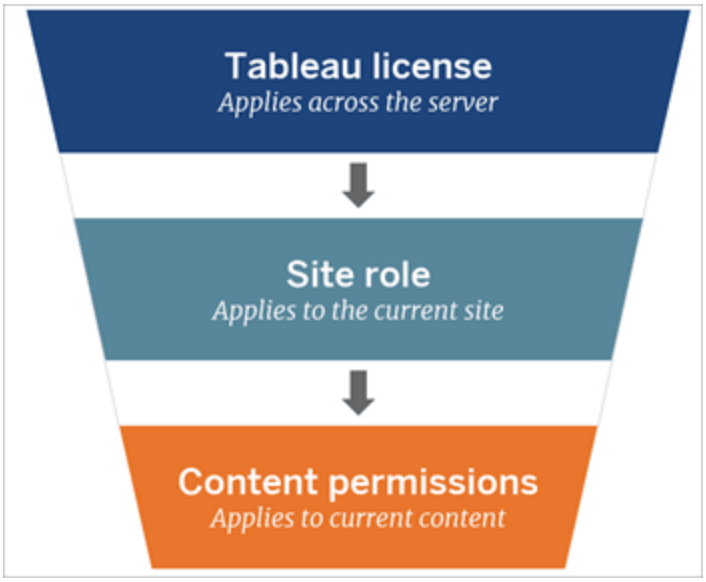
To complete the activities for this class in the browser, you must have at least a **Creator** site role and publishing permissions.

This topic introduces the permission structure for sites.

When working in the browser using Tableau Cloud or Tableau Server, there are three factors that impact what actions a user can perform:

- The Tableau license assigned to the user
- A user's current site role
- The actual permissions set on the content (projects, workbooks, data sources, and so on)

Together, these three factors form a user's capability hierarchy. At the top layer of the hierarchy is the Tableau license. The middle layer is the site role. The bottom layer is content permissions. As you work down the layers, a user's capabilities become more and more specific.



Top Layer: Tableau License

At the top layer of the capability hierarchy is the user's Tableau license. A user's Tableau license defines the maximum capabilities that a user can have anywhere on Tableau Server/Tableau Cloud, determines which site roles are available to that user, and corresponds to the highest-level site role assigned to the user.

A user can have only one of the following licenses on a server:

License Type	Description and Capabilities
Creator:	■ Creators get access to Tableau Prep, Tableau Desktop, and Tableau Server/Tableau Cloud as standard. ■ Creators make new connections to data in the browser and create new content in the browser using data sources they publish or data sources already published to the site.
Explorer and Explorer (can publish)	■ Explorers interact with, edit, and use published visualizations on Tableau Server/Tableau Cloud. ■ Explorers create new workbooks using data sources already published to a particular site, but they cannot publish data sources. ■ Explorers (can publish) can save workbooks they create.
Viewer	■ Viewers can see published and custom views others have created. ■ Viewers can interact with the data in a view using filters and legends, sorting, and tooltips. ■ Viewers are unable to create content.

Middle Layer - Site Role

In the middle layer of the capability hierarchy is the user's current site role. Site roles are defined by the user's license, define the maximum capabilities that a user can have on the current site, and can vary from site to site.

A user can have only one of the following site roles per site:

Capability Level by License Type	Site Roles
Maximum site roles for **Creator** license	■ Server Administrator (Tableau Server only) ■ Site Administrator Creator ■ Creator
Maximum site roles for **Explorer** license	■ Site Administrator Explorer ■ Explorer (can publish) ■ Explorer
Maximum site role for **Viewer** license	■ Viewer

Bottom Layer - Content Permissions

At the bottom layer of the capability hierarchy are the content's permissions.

In a site, each piece of content has its own permissions.

A content's permissions consist of a combination of capabilities that have either been granted or denied to a specific group or user.

Content permissions:

- Combine with a user's site role to define the specific capabilities that a user can have with that content.
- Vary from resource (project, workbooks, views, data sources, flows, data roles, and metrics) to resource.

Navigating a Tableau Site

If you plan to complete activities for this course in the browser, using a site on Tableau Cloud or Tableau Server, this topic will provide a basic introduction to navigating a Tableau site.

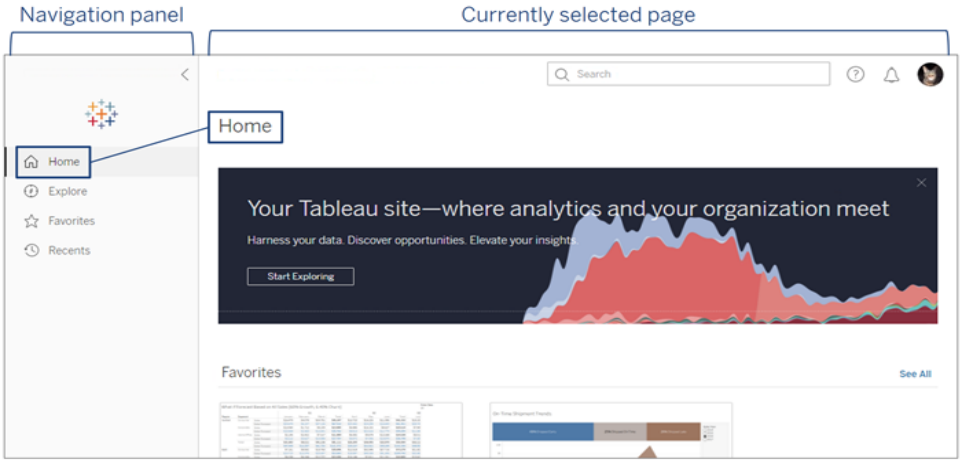
On Tableau Cloud or Tableau Server, you can create and edit visualizations in the browser, without Tableau Desktop. Creators and Explorers with publishing permissions can also save the visualizations they create to share with others. Creators can also publish data sources for others to use.

You complete all the tasks listed above in your Tableau Site on Tableau Server or Tableau Cloud. Once you receive your account information from your Server or Site Administrator, and you log in, you'll find that the user interface has many built-in features that make it easy to navigate.

The User Interface

The user interface has two main sections:

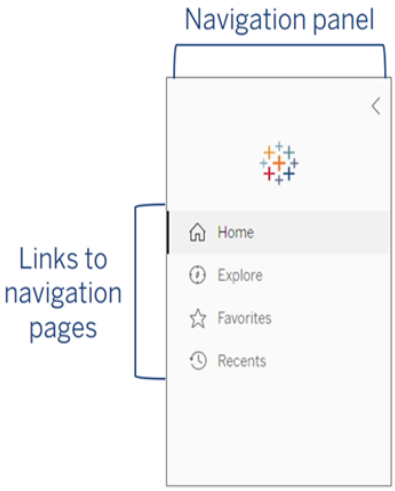
- The navigation panel on the left side.
- The currently selected page on the right side. The first page you see is the **Home** page. The **Home** page gives you quick access to newly added favorites, recently visited views, and popular content.



The Home page selected in the Navigation Panel (left) and displayed (right)

The Navigation Panel

The left navigation panel lets you quickly jump between important navigation pages on your site, Use the navigation panel to quickly link to a navigation page to start your content exploration.



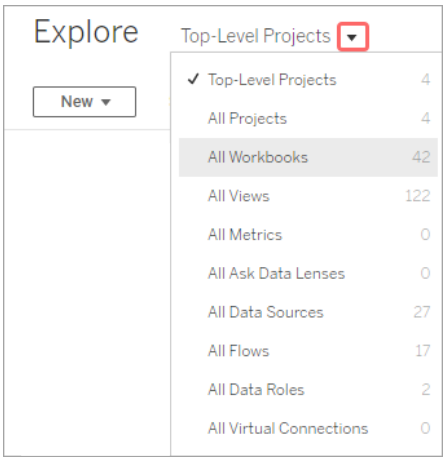
The Explore Page

To see all of the content you have access to, select **Explore** from the navigation pane. On the **Explore** page, you can create new content as well as see all the content on your site in one place. You'll also find a number of features to help you find the content you need.

- **Content type menu**: Navigate to the content on the site, such as a project, view, or a data source.
- **Quick search**: Use keywords to quickly search for a view or a project.
- **Your content and settings**: Determine your permission and access level to the content on the site.
- **Filtered search**: Search for content on the site using various filters.

Content Types on a Tableau Site

Use the content type menu from the **Explore** page to select different content types.



Some of the most common content types include:

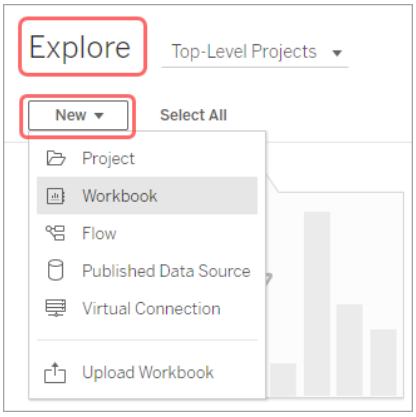
- **Projects**: Projects are a way to organize the content on your site. Top-level projects can contain other (nested) projects, forming a hierarchy that you navigate like the file system on your computer. When you open a project, you see all of the content that the project contains on a single page, including any nested projects, workbooks, data sources, and so forth.
- **Workbooks**: Workbooks are packages of views A workbook page shows the views included in the workbook and the data sources used by the workbook. It also provides a list of user subscriptions to either the workbook or to individual views.
- **Views**: A view page displays options for interacting with the view, including sharing and editing.
- **Data Sources**: A data source page shows connections to databases or file-based data, as well as the workbooks connected to the data source.

Creating New Content from the Explore Page

Create new content directly from the **Explore** page by clicking the **New** button and selecting the content type from the menu.

The options on this menu allow you to create a new project, workbook, or flow, or to upload a workbook to then author on the web, depending on your site role.

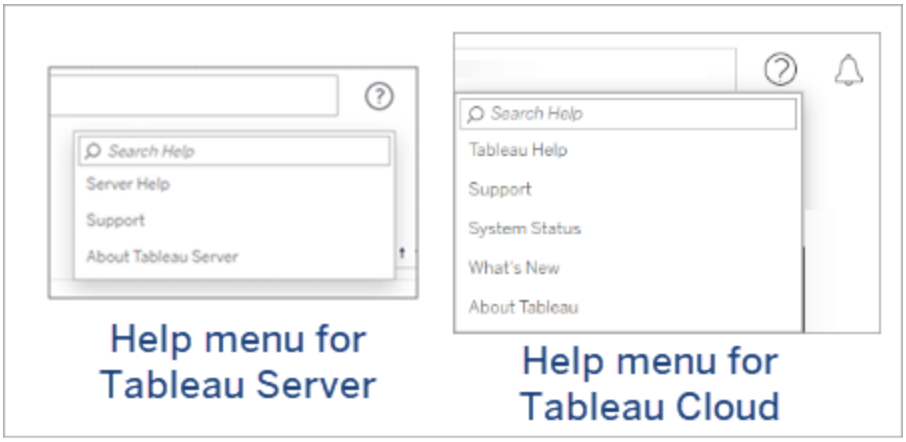
- Only administrators can create projects.
- Creators and administrators can create workbooks and flows using published or uploaded data sources.
- Explorers, creators, and administrators can upload existing workbooks or create new workbooks using published data sources.



Finding Help

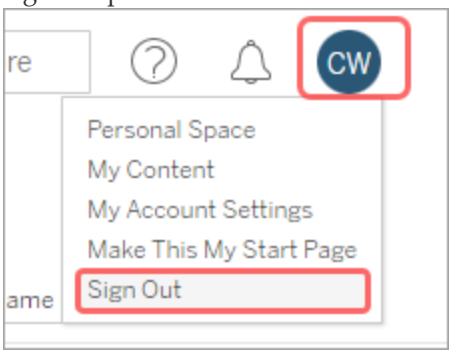
To open the **Help** menu, click the "?" icon in the upper-right of the user interface. The **Help** menu provides the following options:

- A search box that you can use to search the Tableau Support site (link opens in a new tab) for a given term or terms. After entering your search term, press **Enter**, and you'll immediately go to a list of appropriate search results on the Tableau Support page.
- **Tableau Help** opens the online help content for Tableau Server or Tableau Cloud.
- **Support** opens the Tableau Support site where you can explore support by product, submit a support case, download drivers, or download Tableau products.
- **What's New** (available only on Tableau Cloud) opens the Tableau Cloud Release Notes page, where you can see what the latest online features are.
- **About Tableau** displays the version and build number for the current instance.



Signing Out of Your Tableau Site

When you are done interacting with data and finding great data insights, it's time to sign out. To sign out, click your profile image or initials in the upper right corner, and select **Sign Out**. Be aware that the sign-out process is immediate. You will not be prompted for a confirmation.



Accessibility Compliance

Accessibility typically describes how easily someone with a disability can use or access a system, such as a website or a software application. Incorporating good design practices (listed below) into your visualizations can benefit all users, regardless of ability, and can help make your workbooks and dashboards more effective and easy to use.

However, to create views that are compliant with accessibility requirements, for example, the Web Content Accessibility Guidelines (WCAG 2.0 AA) and U.S. Section 508 requirements, you must follow these steps:

1. Create views in Tableau Desktop following best practice guidelines.
2. Publish the views to Tableau Server or Tableau Cloud.
3. Embed the views in an accessibility-compliant web page for users to access the content.

These embedded views will be accessible to users who operate assistive technology, such as screen readers, and/or use accessibility techniques such as keyboard-only navigation.

Accessibility Principles

The WCAG principles help support authors to create accessible visualizations.

WCAG 2.0 AA Principle	Description
Perceivable	Information and user interface components must be presented to users in a way that they can perceive. Consider including text alternatives and alternate ways to present the content.
Operable	The user interface components and navigation must be accessible to users from the different devices or methods that they use to interact with the view. This is accomplished by publishing your view to Tableau Server or Tableau Cloud and then embedding your view in an accessibility compliant web page.
Understandable	The information presented in the view must be understandable to your users. For example, using clear names and labels for different elements shown in your view.

Best Practices

When creating your views, follow these guidelines:

Guidelines	Principles	Technique Examples
Keep it simple	Understandable	Limit the number of marks. Orient labels and headers horizontally for legibility. Limit the number of colors and shapes.
Show more text and make it helpful	Perceivable, Understandable	Provide descriptive text in titles and captions to provide context. Use mark labels. Add explanatory text.
Use color thoughtfully and provide contrast	Perceivable, Understandable	Select the color-blind palette for dimensions or discrete marks. Use the blue or orange-blue diverging palette with stepped color for measures or continuous marks. Use contrast analyzer tools to select the text and color backgrounds with sufficient contrast ratios of 4.5:1 (large text 3:1)
Provide visual cues beyond color	Perceivable, Understandable	Use additional encoding, such as size and shape, to differentiate marks. Identify spatial relationships of marks using location, for example, with reference lines, trend lines, calculated fields to identify quadrants. Add mark labels to help distinguish marks, for example line endpoints and/or minimum and maximum values.

More Information

For more information on these topics and the common keystrokes for navigation in a Tableau embedded view, please search for "accessibility compliant" in Tableau Help.

Further Assistance

Want to learn more? Tableau offers a variety of training and enablement solutions designed to meet the needs of your organization.

eLearning

With guided, role-based learning paths, Tableau eLearning allows you to easily educate your team in a consistent and scalable way. Learning paths help users learn the ins and outs of Tableau at their own pace, when their schedules allow. Skills assessments, knowledge checks, and hands-on activities ensure that information is retained.

To find out more, visit tableau.com/learn/learning-paths.

Classroom Training

Classroom training offers in-depth learning experiences with expert instructors. Training is offered across the globe, at your location or in virtual classrooms.

To find out more, visit tableau.com/learn/classroom.

Consulting

Tableau consultants deliver a wide range of services, including remote coaching sessions, on-site rapid deployments, and ongoing consulting to enable Tableau adoption at your organization.

To find out more, visit tableau.com/support/consulting.

Other resources

Knowledge Base—Access a compilation of the top online resources for different topical areas at tableau.com/support/knowledgebase.

Community Forums—Explore a place to connect with other users and find answers to your Tableau-related questions at tableau.com/community.

Tableau Blueprint—Discover an enablement framework for becoming a data-driven organization at tableau.com/blueprint.

Whitepapers—Access a library of whitepapers covering data visualization, best practices and industry trends at tableau.com/learn/whitepapers.

Tableau Viz Gallery —See the possibilities when visualizing data in Tableau at tableau.com/solutions/gallery.

Tableau Public—Explore how users are building unique, informative stories with their data with Tableau Public. Visit public.tableau.com/s/.

Sample workbooks—Access workbooks through Tableau Desktop by clicking on the **Help** menu and selecting **Sample workbooks**.

Technical Support—Search for an answer in the support resources and if you don't find an answer, create a support case at tableau.com/support.

Ready to Test Your Skills?

Show off your Tableau knowledge and experience by earning badges. Our skills assessments and certification programs test a wide range of skills, whether you're just beginning or an expert.

Skills Assessments

Skills Assessments help determine whether you have the necessary skills to be productive in your Tableau role. You can access skills assessments through Tableau's eLearning platform. Users in every Tableau role in your organization can pass one of these low-stakes assessments and earn a Skills Badge to build confidence in their skills.

To find out more, visit tableau.com/learn/learning-paths.

Certification

Build your resume, advance your career, and showcase your skills by becoming #CertifiablyTableau. Tableau Certification allows you to communicate your skills confidently and clearly and to join a community of skilled Tableau users.

Exam	Exam Focus
Tableau Desktop Specialist	Prove your core understanding of Tableau Desktop.
Tableau Certified Data Analyst	Prove you can solve business problems with the power of the Tableau Platform.
Tableau Server Certified Associate	Prove your Tableau Server and site administration skills.

To learn more about the exams, visit tableau.com/learn/certification.

Training Feedback Survey

Our training team relies on customer feedback from students to evaluate performance and help improve our educational offerings. Please take five minutes after class to complete a brief but important online survey to share your thoughts on the instructor, the training environment, and the learning materials.

Survey Link

To open the survey on your computer, either click the **Training Feedback Survey** link in the **Practices** folder, or navigate to: https://www.tableau.com/training-csat

NOTE Be sure to enter the class code provided by your instructor, and the email address you used to register for the class.

For Mobile Devices

To complete the survey on a mobile device, point your device's camera at the QR code below.