



SAS[®] Visual Analytics 1 for SAS[®]9: Basics

Course Notes

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SAS® Visual Analytics 1 for SAS®9: Basics Course Notes

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Book code E71520, course code LWYVA175/YVA175, prepared date 17Jun2019. LWYVA175_001

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For a list of SAS books (including e-books) that relate to the topics covered in this course notes, visit <https://www.sas.com/sas/books.html> or call 1-800-727-0025. US customers receive free shipping to US addresses.

Lesson 1 Getting Started with SAS® Visual Analytics

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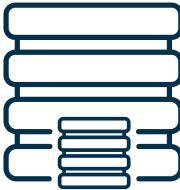
1.1 Introduction to SAS Visual Analytics



What Is SAS Visual Analytics?

SAS Visual Analytics is a web-based product that leverages SAS High-Performance Analytics technologies to empower organizations to explore huge volumes of data very quickly to identify patterns, trends, and opportunities for further analysis.

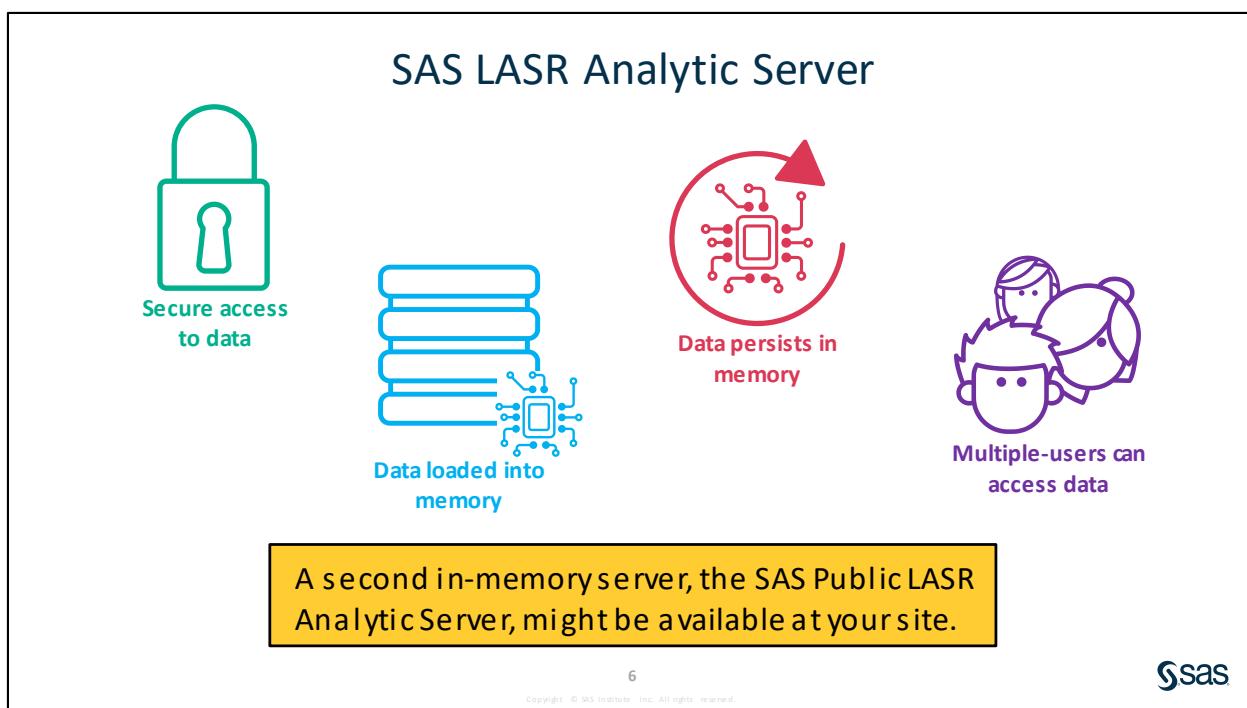
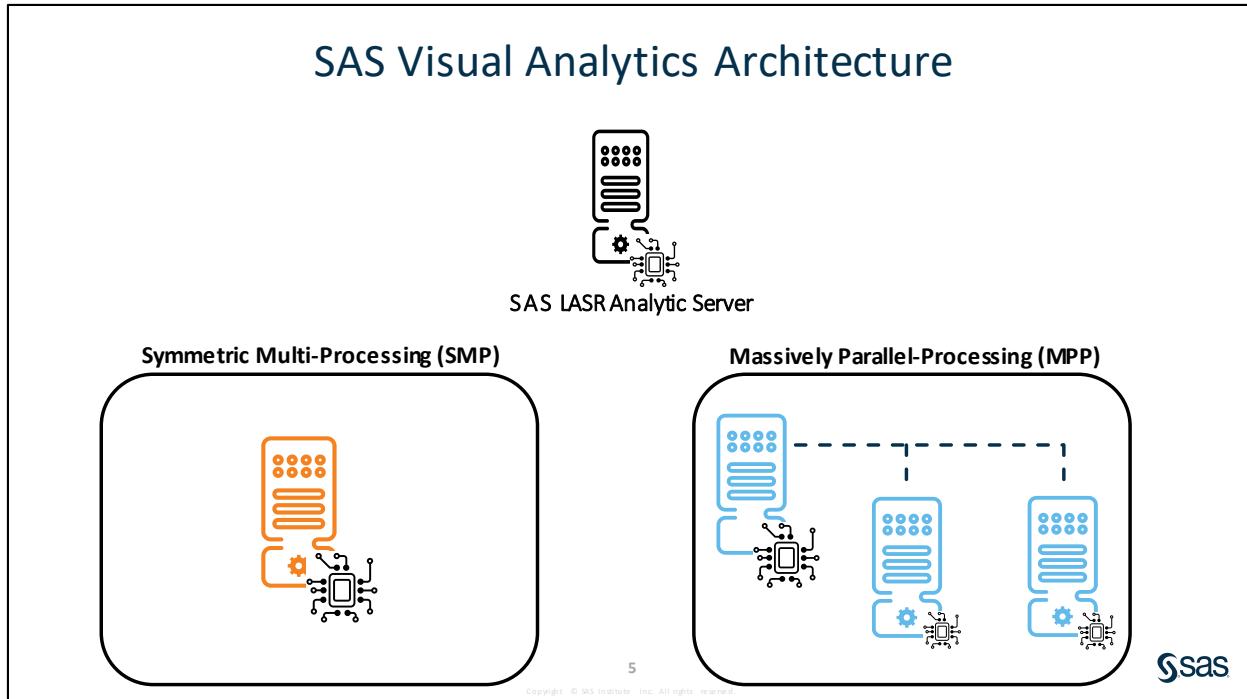
SAS Visual Analytics: Features

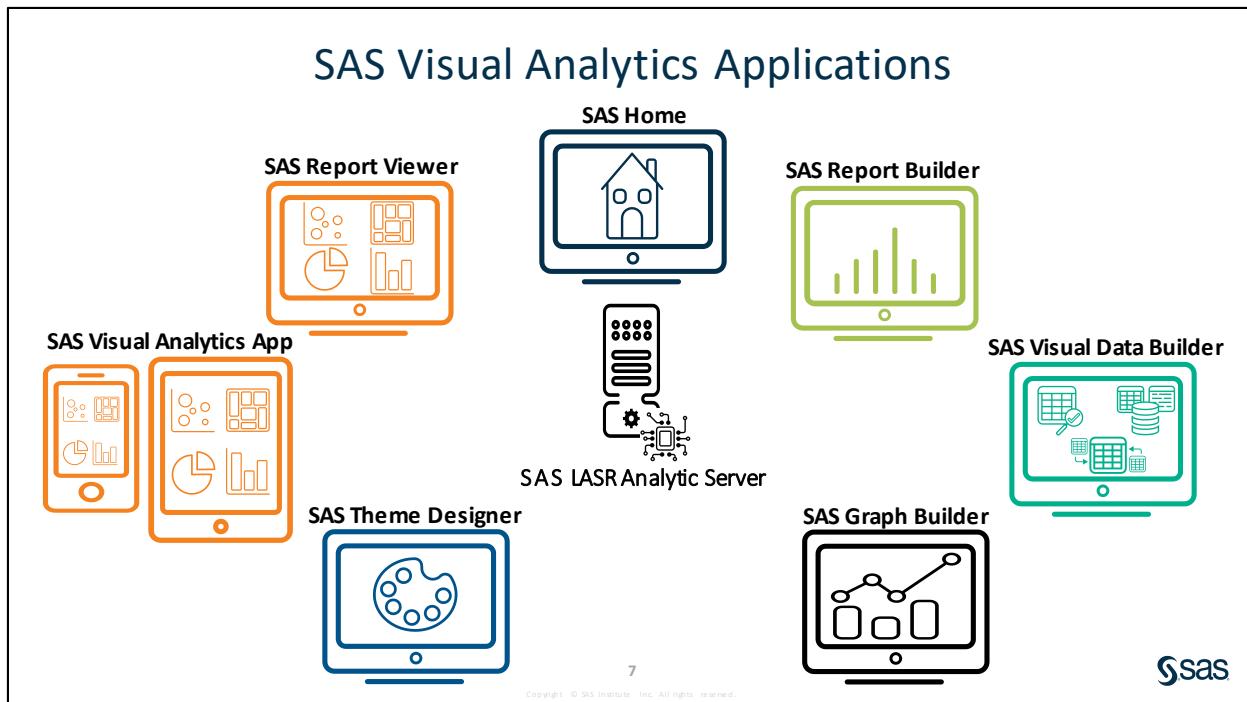
- Analyze massive amounts of data
- Import Data
- Explore data
- Create reports
- Share insights

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* The ability to create powerful statistical models is available if SAS Visual Statistics is licensed at your site.





SAS Application	Description
SAS Home	Access and manage content
SAS Report Viewer	View reports in a browser
SAS Visual Analytics App	View reports on a tablet or mobile device
SAS Report Builder	Visualize data interactively, create interactive reports, build statistical models
SAS Visual Data Builder	Prepare data and build new data sources
SAS Theme Designer	Create custom themes for the applications or reports
SAS Graph Builder	Create customized graph objects
SAS LASR Analytic Server	In-memory server

The following application (not pictured above) is also available with SAS Visual Analytics:

SAS Environment Manager	Manage the environment
-------------------------	------------------------

1.2 Exploring the Visual Analytics Course Environment



Access	In the Access phase, you identify analysis tables that will be used in Visual Analytics and load those tables into LASR.
Investigate	In the Investigate phase, you inspect the tables to determine whether any changes are needed for data items due to data inconsistencies or data quality issues, as well as identify any new data items that need to be calculated.
Prepare	In the Prepare phase, you correct any data quality issues and create any new calculated items needed for analysis.
Analyze	In the Analyze phase, you explore the data to identify any patterns, relationships, and trends.
Report	In the Report phase, you develop interactive reports that are shared via the web or a mobile device.

Orion Star Sports & Outdoors



You have been hired as an analyst and report designer at Orion Star Sports & Outdoors.



3,151 products



64 suppliers



Sales



68,300 customers



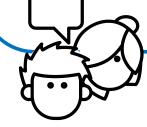
747,953 orders



Marketing¹⁰



648 employees



Human Resources

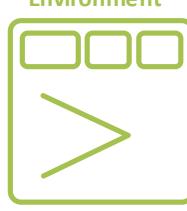
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Business Scenario



Environment



Folder structure

- 
Demos (Marketing)
- 
Exercises (HR)

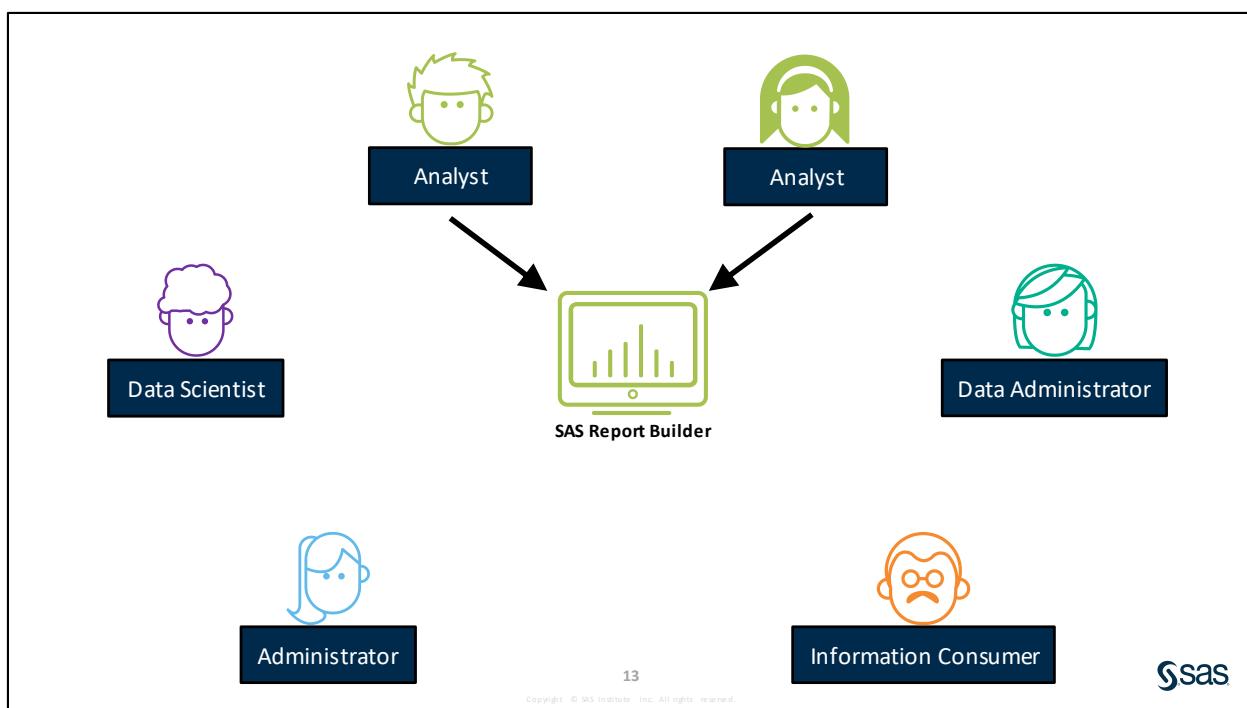
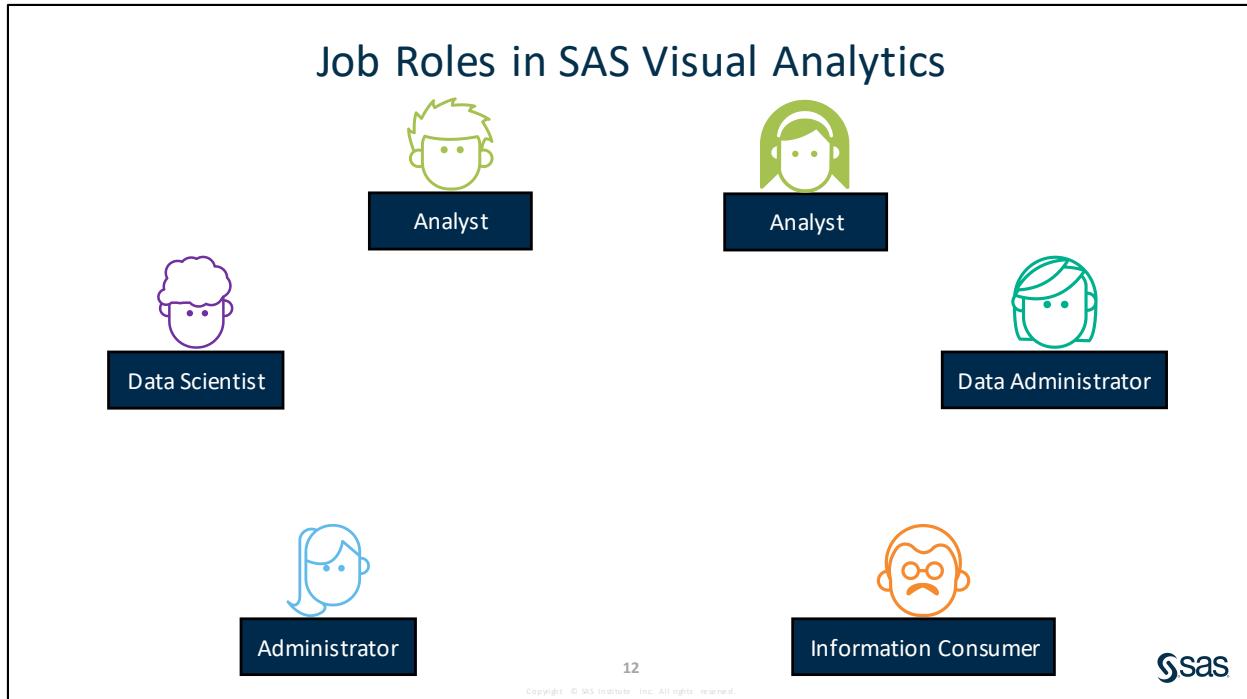
Users and capabilities

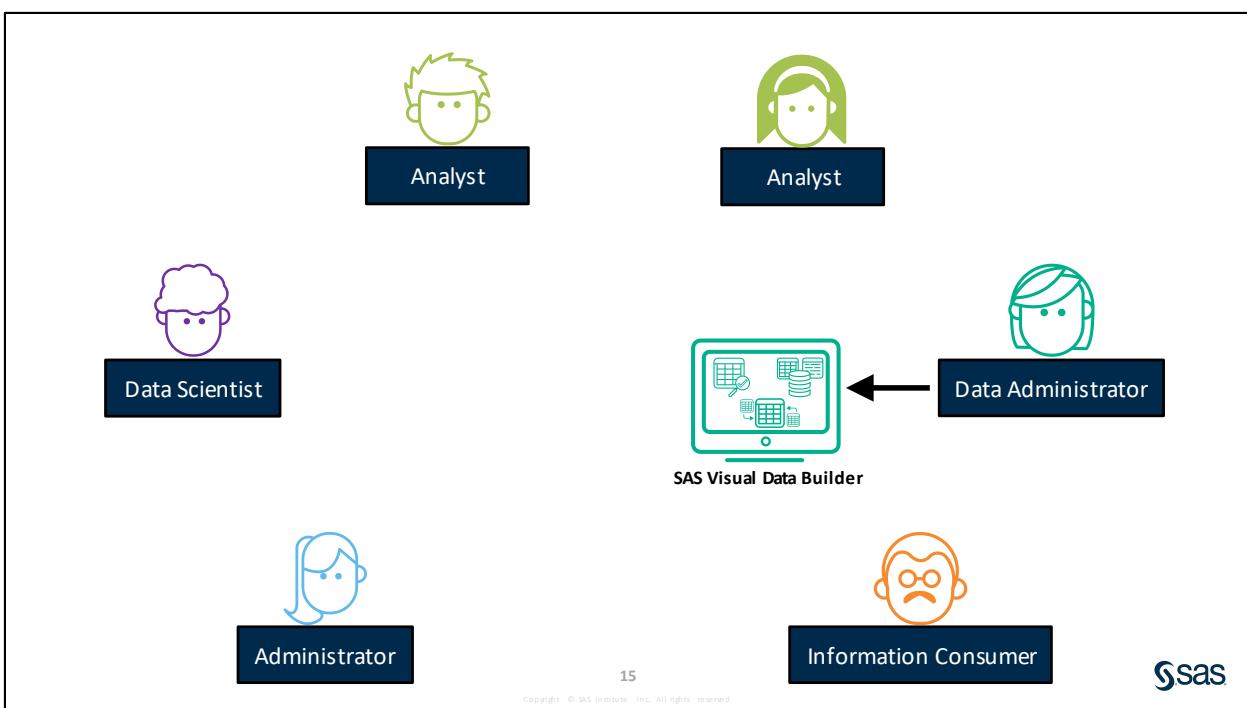
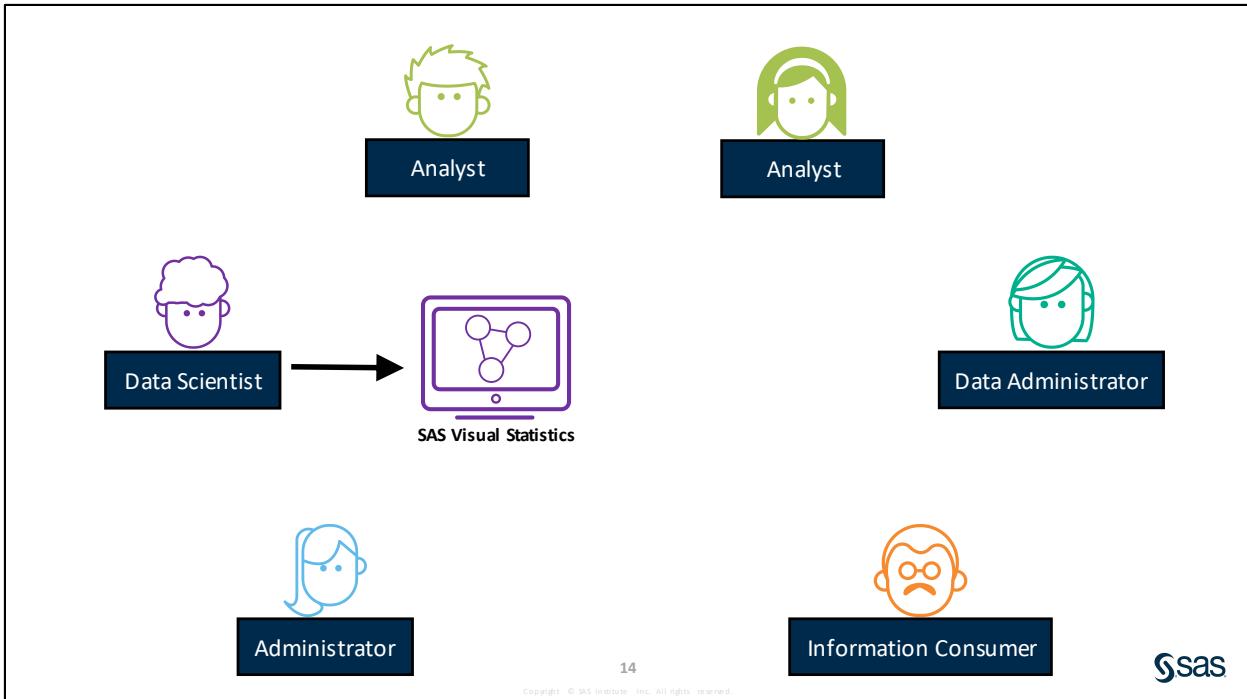


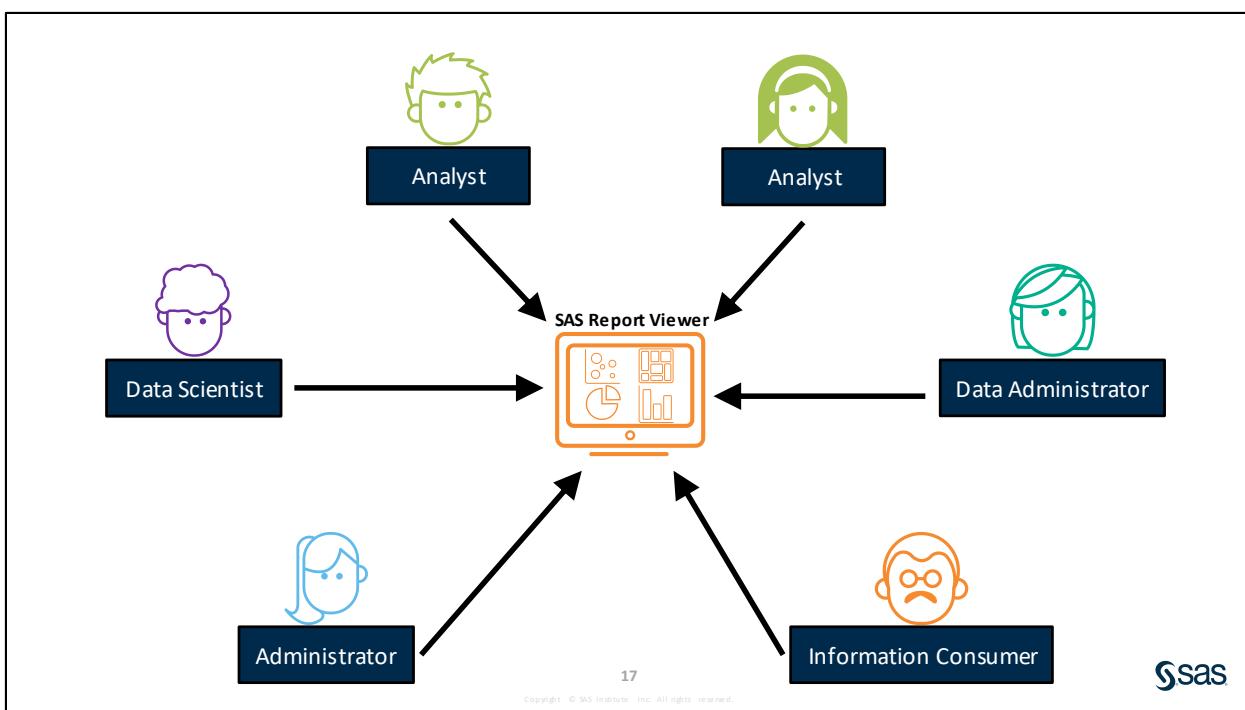
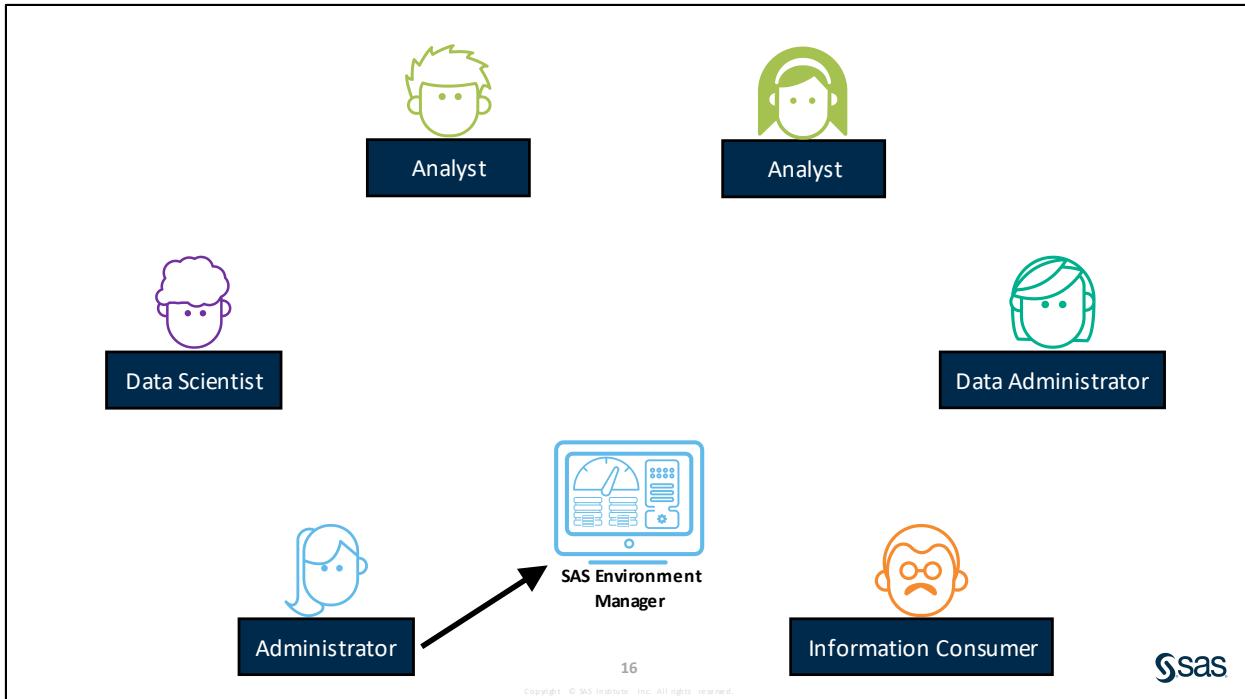
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Note: For the classroom environment, custom groups were created to limit the applications and functionality available for each user.

1.01 Multiple Answer Question

What role (or roles) do you have in your organization?

- a. information consumer
- b. analyst
- c. data scientist
- d. data administrator or data quality steward
- e. administrator

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1.02 Multiple Choice Question

Which of the following statements is true?

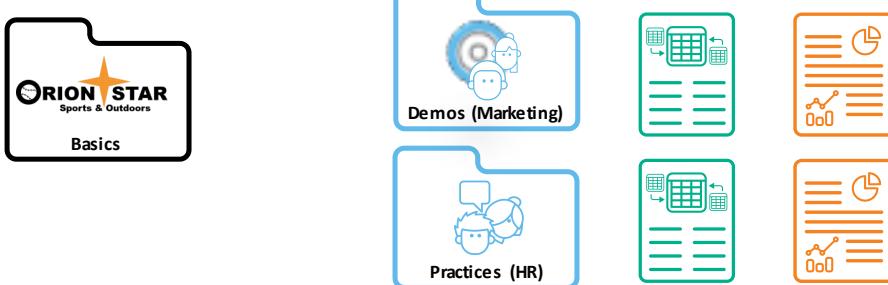
- a. All users have the ability to create reports.
- b. Administrators control access to reports.
- c. Only administrators can create reports.

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Course Environment: Folders

In the course environment, users access and store data, queries, and reports in the folder structure.



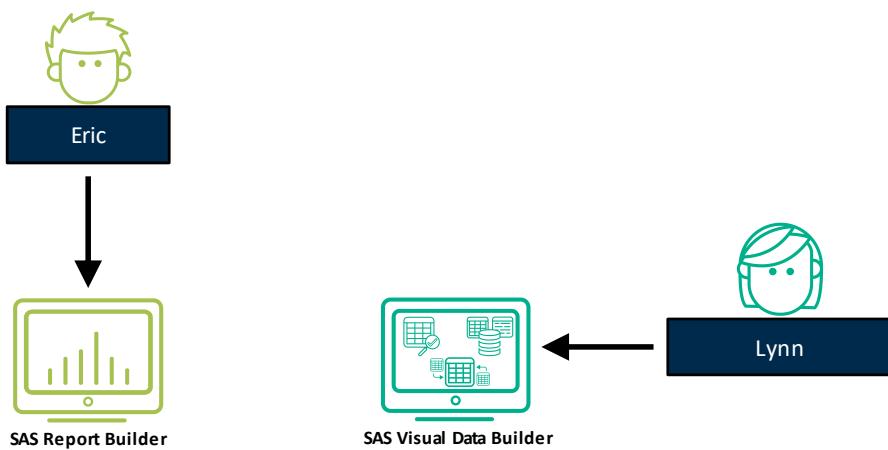
21



Note: The folder structure is specific to your environment and is created and secured by your administrator.

Note: The classroom environment is set up to facilitate training. Each student uses a completely separate environment that has no impact on other students.

Course Environment: Users



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Working with the Home Page



Add favorites



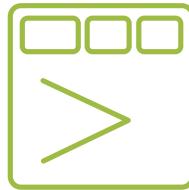
Add collections



View object
inspector



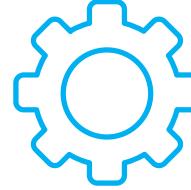
Add links



Add application
shortcuts



Search for content



Modify settings

Sas



Exploring the SAS Visual Analytics Home Page

This demonstration illustrates signing in to SAS Visual Analytics and exploring the components of SAS Home.

- From the browser window, select **SAS Home Page** from the bookmarks bar or from the link on the page.

The SAS Visual Analytics sign-in page appears.

Note: The URL that is used to access the SAS Home page on the classroom machines is specific to the classroom configuration. The URL used at your site will be different.

- Enter **Eric** in the **User ID** field.
- Enter **Student1** in the **Password** field.

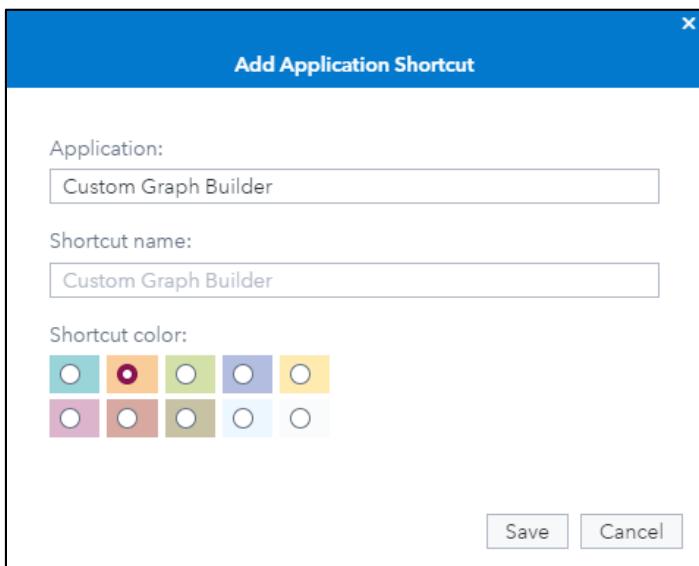
Note: Use caution when you enter the user ID and password because values can be case sensitive.

- Click **Sign In**.

This demonstration illustrates signing in to SAS Visual Analytics and exploring the components of SAS Home.

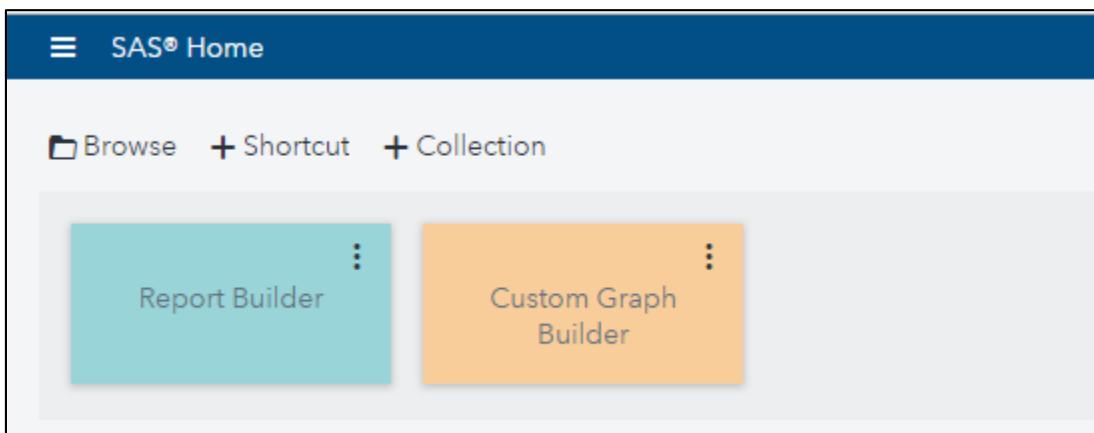
5. Add an application shortcut for the Graph Builder.
 - a. Click **Shortcut** in the Action button area.
 - b. Select **Custom Graph Builder** for the **Application** field.
 - c. Verify that **Custom Graph Builder** is specified for **Shortcut name**.
 - d. Select  (orange) for **Shortcut color**.

The Add Application Shortcut window should resemble the following:



- e. Click **Save** to close the Add Application Shortcut window.

The application shortcut is added to the Action button area.



6. Add an object to the favorites tile.
 - a. Click  (**More**) ⇒ **Edit** on the Favorites tile.
 - b. Click  (**Add**).
 - c. Navigate to **Shared Data\Basics** folder.
 - d. Select **Products Report** ⇒ **Open**.

- e. Click **Save**.

The report is added to the Favorites tile.



- f. Select **Eric** ⇨ **Sign out** in the upper right corner.

End of Demonstration

1.03 Activity

Sign in to SAS Home using Lynn's credentials. What applications can Lynn access?

Hint: Use the Show applications menu of SAS Home.

Do not sign out of SAS Home.

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1.04 Activity

While signed in as Lynn, add the Product Report object (located in the Shared Data ⇒ Basics folder) as a favorite.

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1.3 Viewing Visual Analytics Reports

Business Scenario

Product Report

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Orion Star Sports & Outdoors

Sales

64 suppliers

3,151 products

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Product Report

This report examines our suppliers and products and can be used by executives, marketing managers, and sales representatives to better understand products in our organization.

Click the details icon found in each tile to see detailed instant actions and links for each part.

Supplier Analysis

Product Analysis

Profit and Quantity by Product Category

Top 10 Cities by Orders

Profit

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Orion Star Sports & Outdoors

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Note: When you design a report, keep in mind that it might look slightly different in the Report Viewer or on a mobile device. For example, the layout of the tiles in the treemap depends on the size of the display area, so the same treemap might look different in the various applications.

Note: Only users who have the appropriate capabilities can edit the report. You can print, email a link to a report, or generate a link to a report or object from the SAS Report Viewer or SAS Report Builder. In addition, an application administrator can distribute a report from SAS Visual Analytics.

1.05 Question

All users have the ability to edit reports from SAS Report Viewer.

- True
- False



Using SAS Report Viewer

This demonstration illustrates using SAS Report Viewer to display a report in the web browser.

- From the browser window, select **SAS Home Page** from the bookmarks bar or from the link on the page.
 - Enter **Rob** in the **User ID** field.
 - Enter **Student1** in the **Password** field.
 - Click **Sign In**.
- SAS Home is displayed by default.
- View and interact with the Product Report.
 - Double-click **Product Report** on the Favorites tile to view the report.

The Product Report appears in SAS Report Viewer.

Supplier Analysis

View details about the suppliers for Orion Star Sports and Outdoors, including details about locations, the products manufactured, and the quantity sold and profit generated by each of our suppliers.

Supplier Name	Number of Products	Profit (millions)
Stop Sports	421	\$752
A Team Sports	70	\$275
America Sport	5	\$5
American Fashion Clothing	18	\$327
Bauer Twinkling S.A.	4	\$9
Bon Gammerts	7	(\$11)
British Sports Ltd	42	\$645

Product Analysis

View details about the products sold by Orion Star Sports and Outdoors, including information about product categories and groups, the top 10 cities by orders and profits, and historical details.

Central Dashboard:

- Supplier Locations:** A world map showing supplier locations.
- Quantity vs Profit:** A stacked bar chart showing quantity and profit over time.
- Profit and Quantity by Product Category:** A treemap chart showing the distribution of products by category.
- Profit by Product Group:** A horizontal bar chart showing profit by product group.
- Top 10 Cities by Orders:** A bar chart showing the top 10 cities by number of orders.
- Profit vs Number of Orders:** A line chart showing profit and the number of orders over time.

The initial section of the report is an overview section that describes the report and the pages within the report.

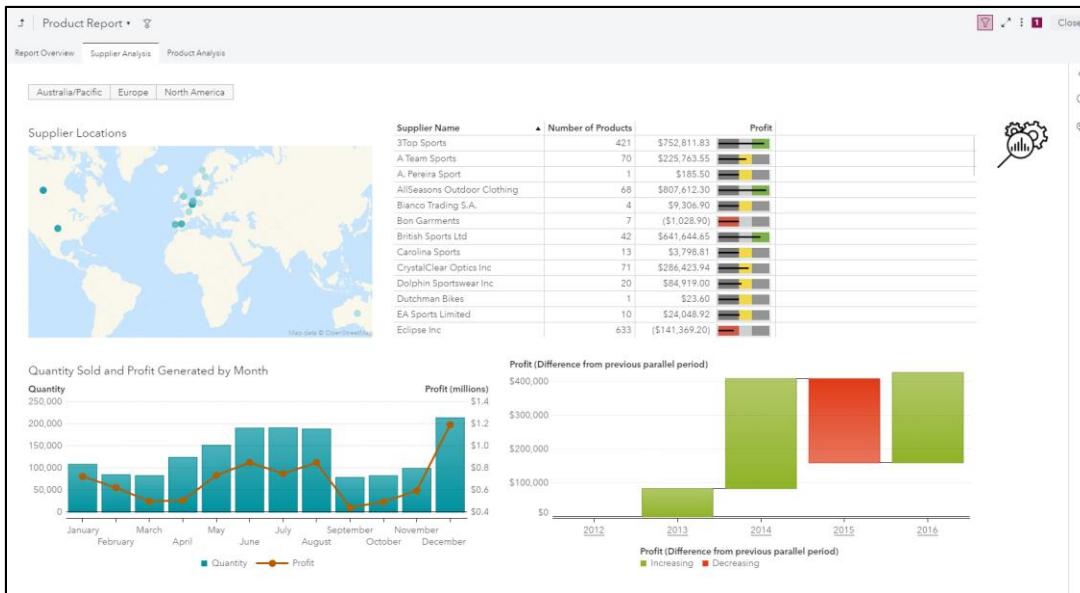
The right pane contains the following icons:

Information	The Information pane displays details about the report or the selected object. For selected objects, any display rules or interactive filters (or both) are also displayed.
Comments	<p>The Comments pane displays any comments that have been added to the report or selected object.</p> <p>Note: You must have the Add and View Comments capability to add or view comments. To edit or delete comments, you must have the Comments: Administrator capability.</p>

- b. Click the image next to the Supplier Analysis information or click the **Supplier Analysis** tab at the top of the report to view the page.

Note: A page link action is established between the images on the Report Overview page and the Supplier Analysis and Product Analysis pages, respectively.

The Supplier Analysis page should resemble the following:



The report uses a button bar as a page prompt to filter data by continent.



The Supplier Analysis page contains several report objects and filters.

- A geo map shows countries where suppliers for Orion Star are located. The locations are colored by the average number of products produced by suppliers in that country. Darker colors indicate a higher average number of products. Placing your cursor over a country in the geo map displays a data tip with the number of suppliers in that country and the average products produced by supplier.
 - A list table displays the names of suppliers, the number of products produced, and the total profit generated by each supplier. A gauge display rule indicates whether the profit values are below average (red), average (yellow), or above average (green).
 - A dual axis bar-line chart shows the total quantity sold and the total profit generated by month.
 - A waterfall chart displays the change in profit from the previous parallel period. This chart uses a hierarchy, so you can view information by year and by month.
- c. Click  (**Click here for more information about this page**) in the upper right corner of the report.

Note: The  icon is an image object with a link to a hidden page. This icon is used throughout the course to link to information about the page.

A hidden page is displayed as a pop-up window. This hidden page includes information about the page, including details about the report objects, actions, and links.

The Supplier Analysis section provides a summary of the suppliers for Orion Star. A geo map displays the countries where suppliers are located; the coordinates are colored by the average number of products produced by suppliers in those locations and a data tip value shows the number of suppliers. A table displays the list of suppliers along with the number of products produced and the total profit generated from each supplier. A dual axis bar-line chart shows the total quantity sold and the total profit generated by month. A waterfall chart displays the change in profit from the previous parallel period; this chart uses a hierarchy so you can view information by year and by month.

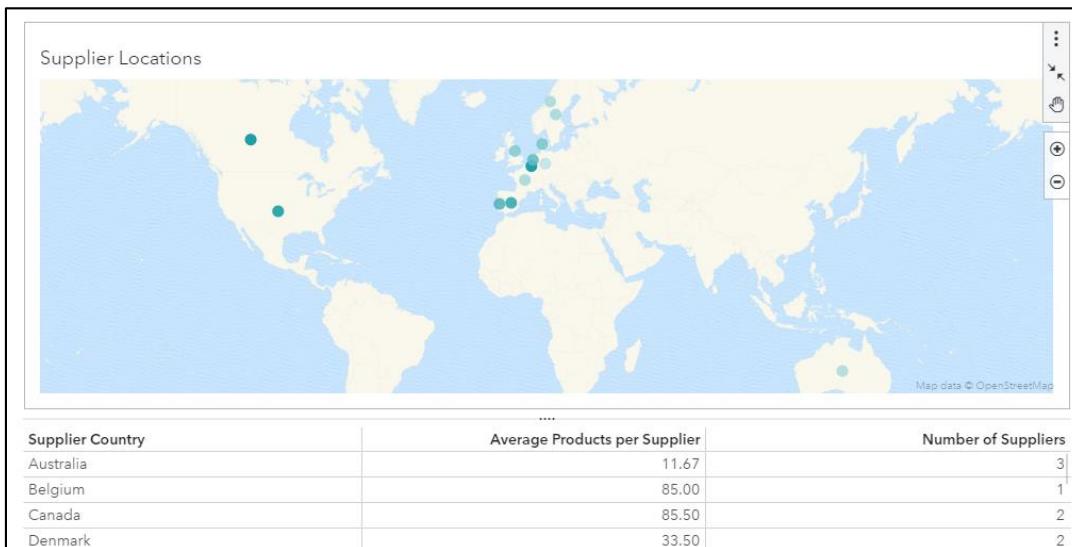
Actions:
The button bar in the page prompt area enables you to focus on a specific location. Select a continent to filter the geo map, the table, the dual axis bar-line chart, and the waterfall chart.

Select a country in the geo map to filter the list table to display information about the suppliers located in that country, to filter the dual axis bar-line chart to display information about quantity and profit for that country, and to filter the waterfall chart to display information about the change in profit from the previous parallel period for that country.

Links:
Double-click a country in the geo map to view the Wikipedia page for that country.
Double-click a supplier in the list table to view details about products manufactured by that supplier.
Double-click a month in the dual axis bar-line chart to view details about products produced in that month.

Close

- d. Click **Close** to close the hidden page.
6. View information about objects, and work with interactions and links.
 - a. Move the cursor to the upper right corner of the geo map and click  (**Maximize object**).



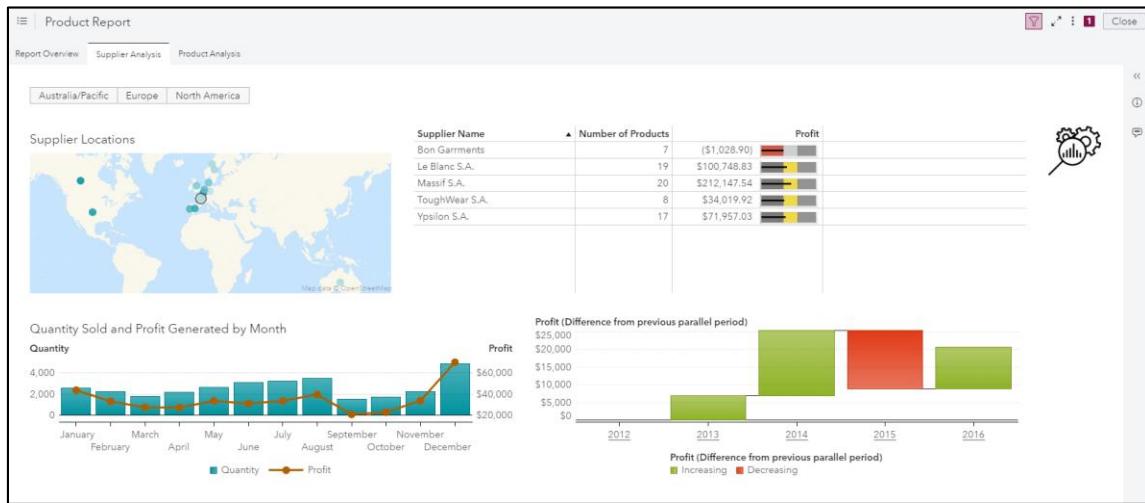
A table of detail data appears below the geo map, showing the average products produced per supplier and the number of suppliers in each country.

On average, each supplier in France produces about 14 products. When compared to other countries in Europe, we can see that although France has a larger number of suppliers, their production is not as diverse.

- b. Move the cursor to the upper right corner of the geo map and click  (**Restore**).

c. Select **France** in the Geo map.

With **France** selected, the other objects in the section are updated to show information about suppliers in France.



d. Select the list table.

e. Select the **Profit** column and drag it to the left of **Number of Products**.

Supplier Name	▲	Profit	Number of Products
Bon Garments		(\$1,028.90)	7
Le Blanc S.A.		\$100,748.83	19
Massif S.A.		\$212,147.54	20
ToughWear S.A.		\$34,019.92	8
Ypsilon S.A.		\$71,957.03	17

f. In the right pane, click (Information).

Information

Supplier Details

Name: Supplier Details

Display rules:

Table Level

Profit

to the right of text, with Profit as x

(\$600,000.00) ≤ x < \$0.00	
\$0.00 ≤ x < \$400,000.00	
\$400,000.00 ≤ x ≤ \$900,000.00	

The Information pane provides details about the display rules used in the list table, along with any interactive filters.

- g. Click **(Information)** on the right to hide the Information pane.
- h. In the list table, double-click **Bon Garments**.

A hidden page displays information about products produced by that supplier.

Enter a string to search by product name:
Enter Search Parameter...

Number of Products by Product Line	Supplier Name	Product Group	Product Name	Quantity	Profit	Number of Orders
Clothes & Shoes	Bon Garments	Stockings & Socks	Double Layer Ankle Socks	300	\$420.00	188
Sports	Bon Garments	Stockings & Socks	Fitness Slouch Socks	207	\$393.30	128
	Bon Garments	Stockings & Socks	Forrest Backpacking Socks	348	\$596.30	224
	Bon Garments	Stockings & Socks	Grizzly Hiking	344	\$516.00	232
	Bon Garments	Assorted Sports articles	Holmes Super Break Bag	370	(\$3,922.00)	215
	Bon Garments	Stockings & Socks	Maxrun 'Liner Socks	180	\$252.00	114
	Bon Garments	Stockings & Socks	Sports Training Socks	477	\$715.50	299
				Sum: 2,226	Sum: (\$1,028.90)	Total: 1,397

Because the list table and the objects in the hidden page are based on the same data source, an automatic filter is applied.

Bon Garments produces seven products in two product lines: Clothes & Shoes and Sports. The list table displays details about each product along with total quantity sold, total profit generated, and total number of orders for each product.

- Click the row for the **Holmes Super Break Bag**.

Enter a string to search by product name:
Enter Search Parameter...

Number of Products by Product Line

Supplier Name	Product Group	Product Name	Quantity	Profit	Number of Orders
Bon Garments	Stockings & Socks	Double Layer Ankle Socks	300	\$420.00	188
Bon Garments	Stockings & Socks	Fitness Slouch Socks	207	\$393.30	128
Bon Garments	Stockings & Socks	Forrest Backpacking Socks	348	\$596.30	224
Bon Garments	Stockings & Socks	Grizzly Hiking	344	\$516.00	232
Bon Garments	Assorted Sports articles	Holmes Super Break Bag	370	(\$3,922.00)	215
Bon Garments	Stockings & Socks	Maxrun Liner Socks	180	\$252.00	114
Bon Garments	Stockings & Socks	Sports Training Socks	477	\$715.50	299
			Sum: 2,226	Sum: (\$1,028.90)	Total: 1,397

A linked selection action is established between the treemap and the list table. Selecting a row in the list table highlights the associated tile in the treemap, and selecting a tile in the treemap highlights the associated rows in the list table.

A majority of products produced by this supplier are profitable, except for the Holmes Super Break Bag, which generates large losses. Because this is the only product in the Sports product line produced by this supplier, this might indicate high costs to break into this segment. It might be a good business decision for this supplier to specialize in the Stockings & Socks group where they make average profits.

- Click **Close** to close the hidden page.
- In the list table, double-click **Massif S.A.**.

A hidden page displays information about products produced by that supplier.

Enter a string to search by product name:
Enter Search Parameter...

Number of Products by Product Line

Supplier Name	Product Group	Product Name	Quantity	Profit	Number of Orders
Massif S.A.	Winter Sports	Alpine Ski Bag 2-pair Black/Yellow	315	\$1,314.27	188
Massif S.A.	Winter Sports	Alpine Ski Bag Black/Yellow	126	\$594.93	77
Massif S.A.	Winter Sports	Massif Bandit L Ski Axial	1,472	\$49,900.80	902
Massif S.A.	Winter Sports	Massif Bandit Ski Parcel Axial	1,054	\$37,195.25	659
Massif S.A.	Winter Sports	Massif Cut X Super 9.9 Ski Parcel	1,736	\$35,371.00	1,032
Massif S.A.	Winter Sports	Massif Cut Z 9.6l Ski Parcel-Fdx95	268	\$1,471.40	171
Massif S.A.	Winter Sports	Massif Cut Z 9.6l Ski Parcel Fdx95	264	\$1,181.40	176
			Sum: 9,996	Sum: \$212,147.54	Total: 6,103

- I. Enter **Jacket** in the **Enter a string to search by product name** field and press Enter.

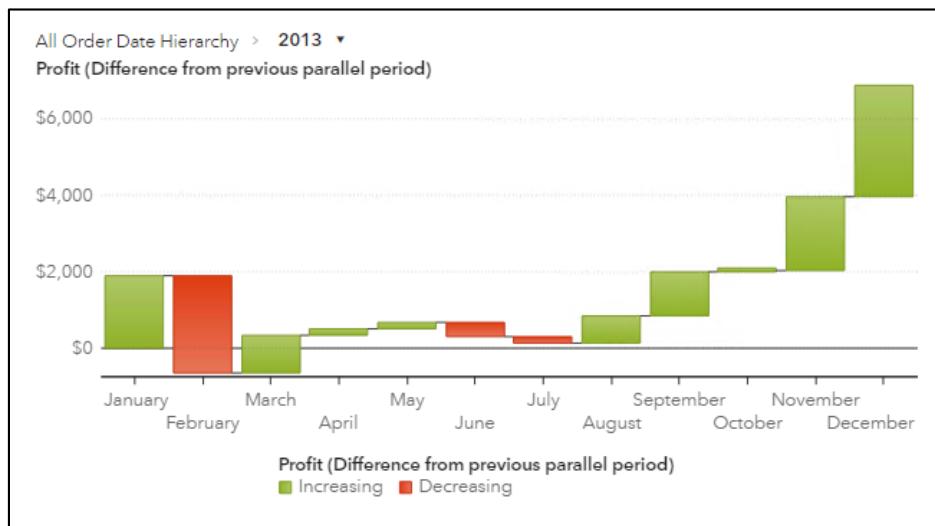
The list table is updated to show information about products that contain the string *Jacket*.

Supplier Name	Product Group	Product Name	Quantity	Profit	Number of Orders
Massif S.A.	Ski Dress	Massif Men's Monitor Bomber Jacket	304	\$9,838.14	168
Massif S.A.	Knitwear	Massif Men's Polar Fleece Jacket	533	\$2,636.00	328
Massif S.A.	Ski Dress	Massif Men's Pro Jacket	207	\$15,021.70	124
Massif S.A.	Ski Dress	Massif Men's Shell Jacket	195	\$13,175.70	130
				Sum: \$40,671.54	Total: 750

Note: Parameters are used to search the list table. The parameter is updated with the input value, and the list table is filtered for product names that contain that value.

- m. Click **Close** to close the hidden page.
- n. On the waterfall chart, double-click the bar for **2013**.

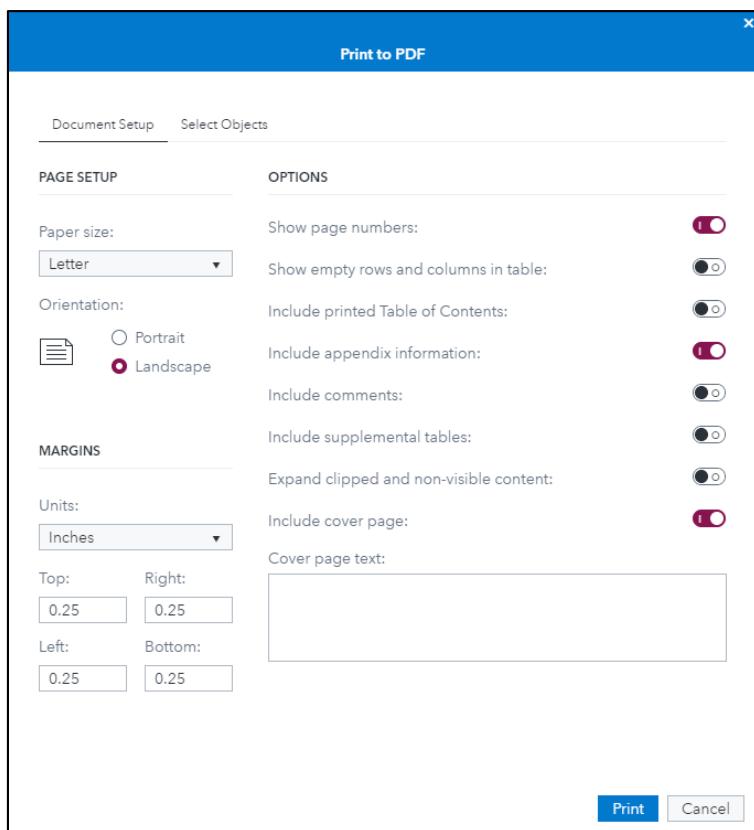
The waterfall chart displays information about changes in profit from the same month in 2012.



7. Investigate printing options.

- a. In the top right corner of the report, click  (**More options**) and select **Print**.

The Print to PDF window appears.



You can specify options for the PDF document, including whether a table of contents and page numbers are displayed. You also have the option of choosing which objects appear in the PDF.

- b. Click **Cancel**.
 8. Click **Close** in the upper right corner to close the report.
- Note:** It is a best practice to close a report when you are finished viewing it to conserve resources.
9. Click **(Show applications menu)** and select **Home** in the upper left corner to return to SAS Home.
 10. Select **Rob** \Rightarrow **Sign out** in the upper right corner.

End of Demonstration



Practice

1. Viewing a Report in the Report Viewer

- a. Open the browser and sign in to SAS Home using Rob's credentials.
- b. Open and interact with the Product Report in the Report Viewer.
- c. View the Product Analysis page.
 - 1) View information about the page and answer the following question:

What links are available for the Product Analysis page?

Answer: _____

- 2) View report objects and use actions between the graphs to answer the following questions:

Which product category has the fewest number of orders? The lowest total profit?

Answer: _____

Which product groups are included in the Indoor Sports category?

Answer: _____

How many products are in the Fitness product group?

Answer: _____

Do any fitness products generate a loss?

Answer: _____

What are the top two cities by orders for fitness products? By profit?

Answer: _____

- 3) Save an image of the dual axis time series plot filtered by *Indoor Sports* and *Fitness*.
- d. Close the report and sign out.

End of Practices

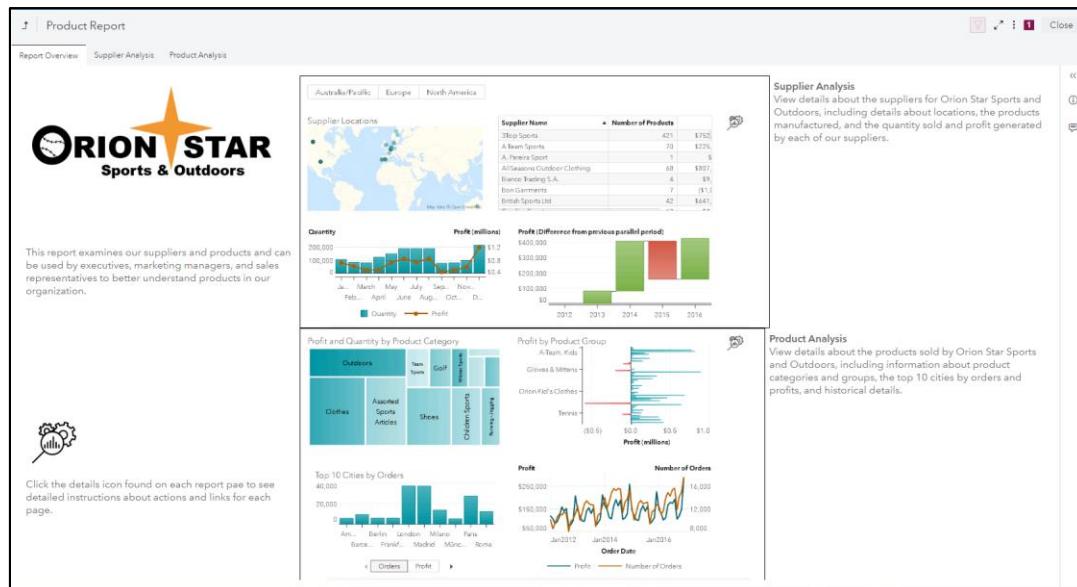
1.4 Solutions

Solutions to Practices

1. Viewing a Report in the Report Viewer

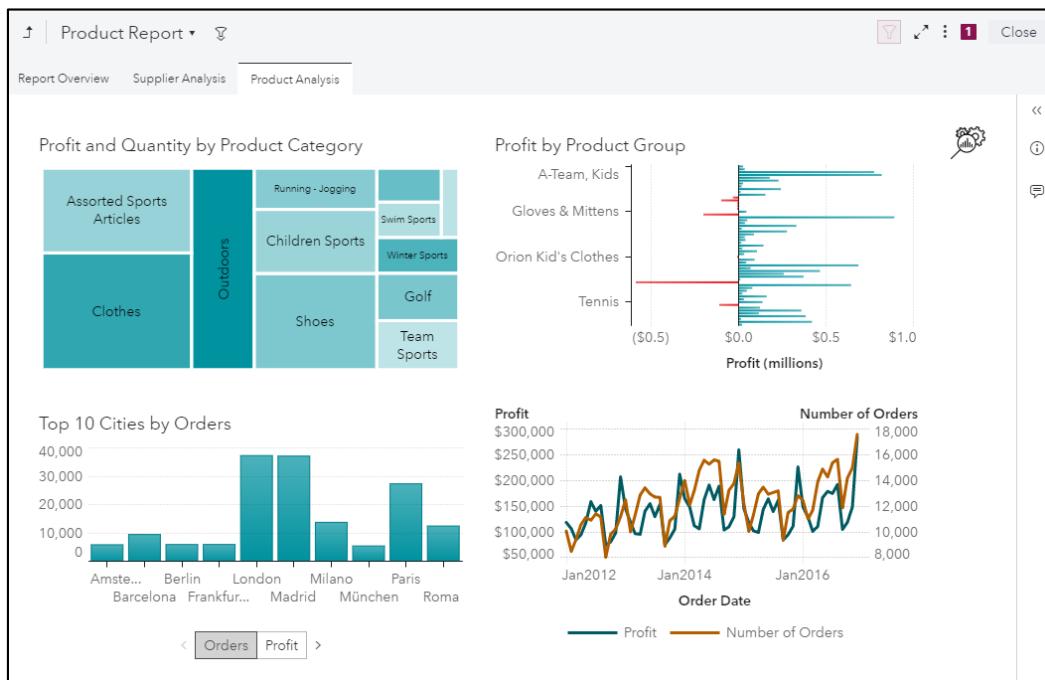
- Open the browser and sign in to SAS Home using Rob's credentials.
 - From the browser window, select **SAS Home Page** from the bookmarks bar.
 - Enter **Rob** in the **User ID** field.
 - Enter **Student1** in the **Password** field.
 - Click **Sign In**. SAS Home is displayed by default.
- Open and interact with the Product Report in the Report Viewer.
 - Select **Browse** from SAS Home.
 - Navigate to the **Shared Data\Basics** folder.
 - Double-click **Product Report**.

The Product Report opens in the Report Viewer.



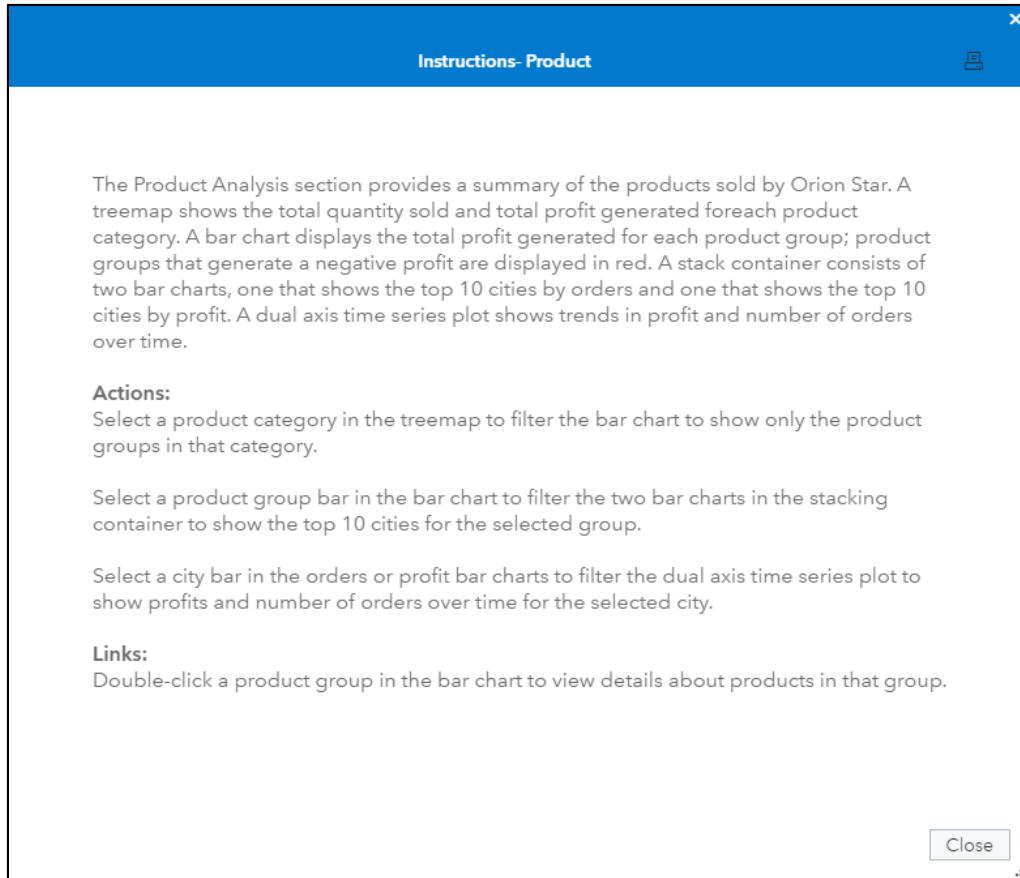
c. View the Product Analysis page.

To view the page, click the image next to the Product Analysis information or click the **Product Analysis** tab at the top of the report.



- 1) Click  (Click here for more information about this page) in the upper right corner of the report.

A hidden page displays information about the page, including information about the report objects, actions, and links.



The Product Analysis section provides a summary of the products sold by Orion Star. A treemap shows the total quantity sold and total profit generated for each product category. A bar chart displays the total profit generated for each product group; product groups that generate a negative profit are displayed in red. A stack container consists of two bar charts, one that shows the top 10 cities by orders and one that shows the top 10 cities by profit. A dual axis time series plot shows trends in profit and number of orders over time.

Actions:
Select a product category in the treemap to filter the bar chart to show only the product groups in that category.

Select a product group bar in the bar chart to filter the two bar charts in the stacking container to show the top 10 cities for the selected group.

Select a city bar in the orders or profit bar charts to filter the dual axis time series plot to show profits and number of orders over time for the selected city.

Links:
Double-click a product group in the bar chart to view details about products in that group.

What links are available for the Product Analysis page?

Answer: Double-clicking a product group in the bar chart displays details about products in that group.

- Scroll down in the hidden page to view the Links section.

Links:
Double-click a product group in the bar chart to view details about products in that group.

- Click Close to close the hidden page.

- 2) View report objects and use actions between graphs to answer the following questions:

Which product category has the fewest number of orders? The lowest total profit?

Answer: Indoor Sports has the fewest number of orders (11,755). Team Sports has the lowest total profit (\$133,185.52).

- In the upper right corner of the treemap, click  (Maximize object).
- Scroll through the detail data to find the category with the lowest number of orders.

Product Category	Quantity	Profit	Number of Orders
Assorted Sports Articles	241,308	\$461,488.46	116,267
Children Sports	149,142	\$429,751.38	71,045
Clothes	332,355	\$1,289,492.35	157,356
Golf	73,892	\$693,525.86	32,270
Indoor Sports	23,245	\$160,689.61	11,755
Outdoors	239,583	\$1,687,084.95	107,616
Overall Count	41,493	\$2,924,040.47	200,820

- Scroll through the detail data to find the category with the lowest profit.

Product Category	Quantity	Profit	Number of Orders
Outdoors	239,583	\$1,687,084.95	107,616
Racket Sports	41,683	\$836,949.47	20,589
Running - Jogging	96,235	\$593,334.04	43,378
Shoes	224,065	\$662,446.58	106,510
Swim Sports	43,323	\$244,196.15	20,796
Team Sports	76,736	\$133,185.52	34,197
Winter Sports	55,750	\$1,027,229.44	26,174

- In the upper right corner of the treemap, click  (Restore).

Which product groups are included in the Indoor Sports category?

Answer: Fitness, Gymnastic Clothing, and Top Trim

- Click the tile for Indoor Sports in the treemap.
- The Profit by Product Group bar chart is updated to show product groups in the Indoor Sports product category.



How many products are in the Fitness product group?

Answer: 45 products

Place your cursor over the Fitness bar in the Profit by Product Group bar chart to view the data tip.



Do any fitness products generate a loss?

Answer: Yes, the following fitness products generate a loss: Letour Mag Plus Bike-Buy Now Paper, Letour Spinner Bike, Letour 757 Home Exerciser, and Lift Weights 15 Kg Dumbbell.

- Double-click the Fitness bar in the bar chart.
- In the list table, scroll to the right to view the Profit column.
- Click the Profit column to sort the list table in ascending order by Profit.

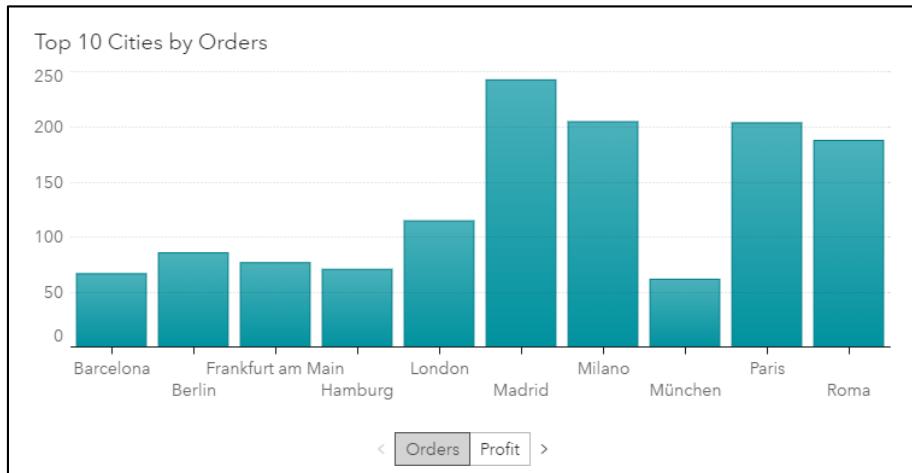
Product Group	Product Name	Quantity	Profit ▲	Number of Orders
Fitness	Letour Mag Plus Bike-Buy Now Paper	445	(\$31,748.60)	318
Fitness	Letour Spinner Bike	111	(\$1,745.10)	75
Fitness	Letour 757 Home Exerciser	44	(\$1,331.50)	31
Fitness	Lift Weights 15 Kg Dumbbell	363	(\$541.26)	223
Fitness	Weight 1.5 Kg	49	\$4.90	29
Fitness	Weight 0.5 Kg	144	\$28.80	90

- Click Close to close the hidden page.

What are the top two cities by orders for fitness products? By profit?

Answer: Madrid (243) and Milano (205) are the top two cities by orders. London (\$523.38) and Houston (\$278.20) are the top two cities by profit.

- Verify that the Fitness bar is selected in the Profit by Product Group bar chart.
- Verify that Orders is selected in the stack container in the bottom left of the page.



- Click Profit in the stack container in the bottom left of the page.



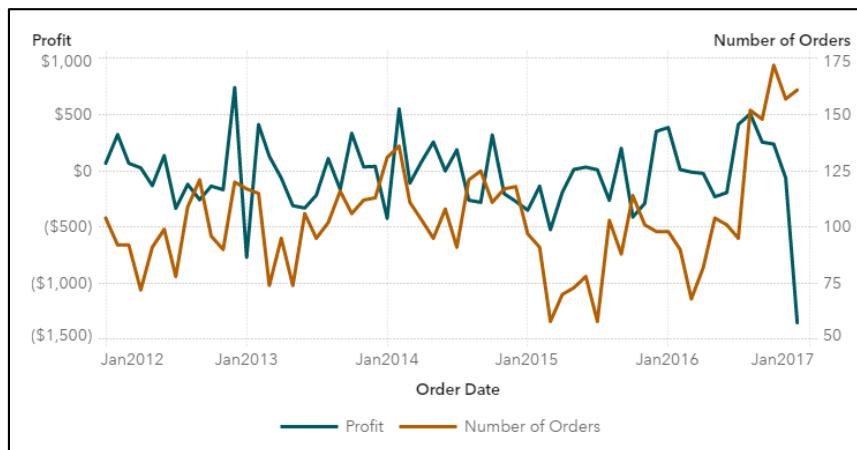
3) Save an image of the dual axis time series plot filtered by *Indoor Sports* and *Fitness*.

- In the upper right corner of the dual axis time series plot, click (More) and select **Save image**.

An image file with the name Snapshot is created using the current view of the dual axis time series plot.

- Click and select **Show in folder** in the bottom of the browser to view it.
- Double-click **Snapshot of Profit and Orders by Time.png** to view the image.

Note: The date and time values will also be included in the filename.



- Close the image.
- Close the report and sign out.
 - Click **Close** in the upper right corner to close the report.
 - Select **Rob** **Sign out** in the upper right corner.

End of Solutions

Solutions to Activities and Questions

1.02 Multiple Choice Question – Correct Answer

Which of the following statements is true?

- a. All users have the ability to create reports.
- b.** Administrators control access to reports.
- c. Only administrators can create reports.

Administrators manage role-based capabilities, which control the application features that each group of users can access.

Security also enables the administrator to control which data sources, plans, and reports each group of users can access.

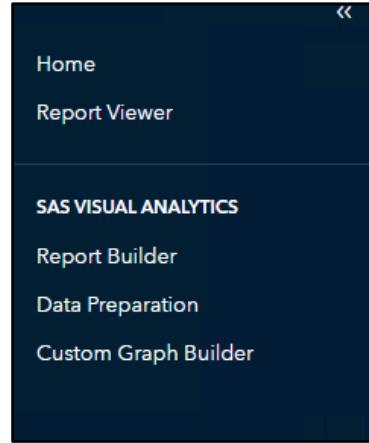
20

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1.03 Activity – Correct Answer

What applications can Lynn access?



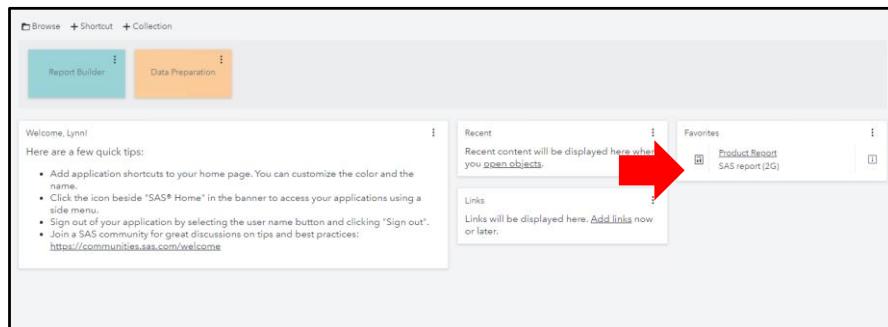
26

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1.04 Activity – Solution

- In the upper right corner of the Favorites tile, click  (More) and select Edit.
- Click  (Add).
- Navigate to the Shared Data/Basics folder.
- Select the Product Report and click Open.
- Click Save.



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1.05 Question – Correct Answer

All users have the ability to edit reports from SAS Report Viewer.

- True
 False

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Practice Review

1.1 Viewing a Report in the Report Viewer – Solution

Open and interact with the Product Report in the Report Viewer.
View the Product Analysis page.

What links are available for the Product Analysis page?



Links:

Double-click a product group in the bar chart to view details about products in that group.

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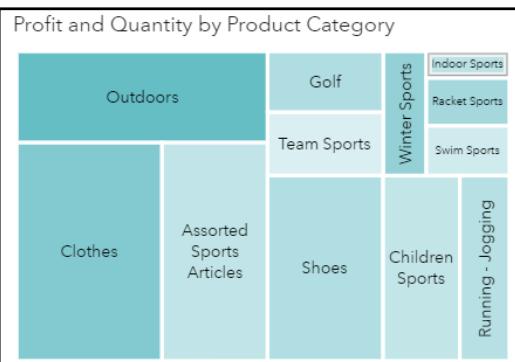


1.1 Viewing a Report in the Report Viewer – Solution

Which product category has the fewest number of orders? The lowest total profit?

Indoor Sports has the fewest number of orders (11,755).

Team Sports has the lowest total profit (\$133,185.52).



Product Category	Quantity	Profit	Number of Orders
Assorted Sports Articles	241,308	\$461,488.46	116,267
Children Sports	149,142	\$429,751.38	71,045
Clothes	332,355	\$1,289,492.35	157,356
Golf	73,892	\$693,525.86	32,270
Indoor Sports	23,245	\$160,689.61	11,755
Outdoors	239,583	\$1,687,084.95	107,616
Total	811,483	\$6,926,040.47	370,580

Product Category	Quantity	Profit	Number of Orders
Outdoors	239,583	\$1,687,084.95	107,616
Racket Sports	41,683	\$836,949.47	20,589
Running - Jogging	96,235	\$593,334.04	43,378
Shoes	224,065	\$662,446.58	106,510
Swim Sports	43,323	\$244,196.15	20,796
Team Sports	76,736	\$133,185.52	34,197
Total	556,761	\$1,047,769.44	246,174

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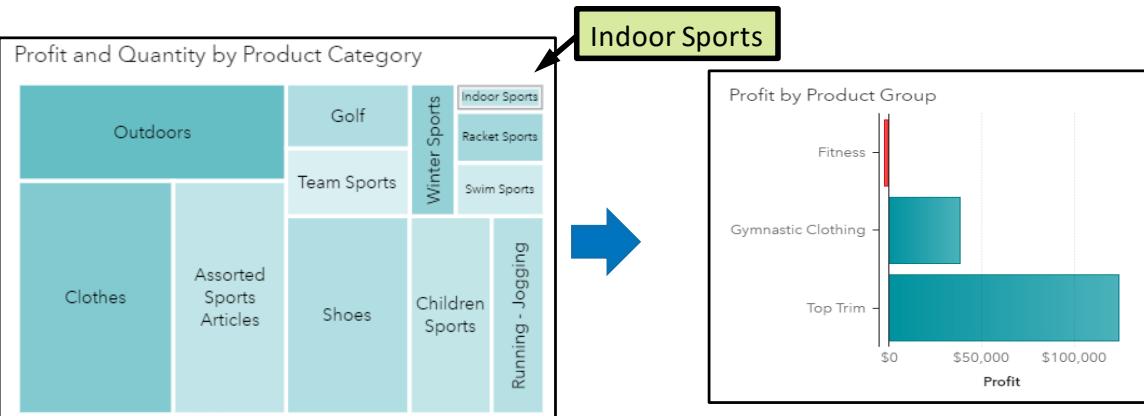
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1.1 Viewing a Report in the Report Viewer – Solution

Which product groups are included in the Indoor Sports category?

Fitness, Gymnastic Clothing, and Top Trim



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1.1 Viewing a Report in the Report Viewer – Solution

How many products are in the Fitness product group? **45 products**



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1.1 Viewing a Report in the Report Viewer – Solution

Do any fitness products generate a loss?

Yes, the following fitness products generate a loss: Letour Mag Plus Bike-Buy Now Paper, Letour Spinner Bike, Letour 757 Home Exerciser, and Lift Weights 15 Kg Dumbbell.

Product Group	Product Name	Quantity	Profit	Orders
Fitness	Letour Mag Plus Bike-Buy Now Paper	445	(\$31,748.60)	318
Fitness	Letour Spinner Bike	111	(\$1,745.10)	75
Fitness	Letour 757 Home Exerciser	44	(\$1,331.50)	31
Fitness	Lift Weights 15 Kg Dumbbell	363	(\$541.26)	223
Fitness	Weight 1.5 Kg	49	\$4.90	29
Fitness	Weight 0.5 Kg	144	\$28.80	90

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1.1 Viewing a Report in the Report Viewer – Solution

What are the top two cities by orders for fitness products? By profit?

Madrid (243) and Milano (205) are the top two cities by orders.



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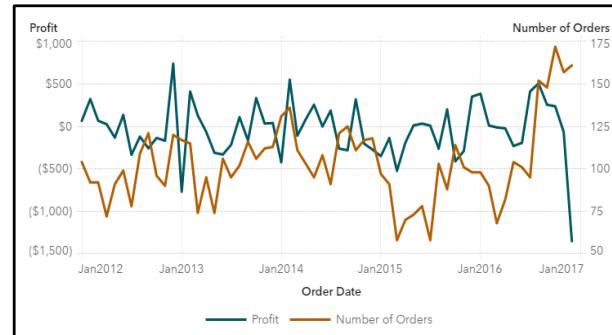


London (\$523.38) and Houston (\$278.20) are the top two cities by profit.



1.1 Viewing a Report in the Report Viewer – Solution

Save an image of the dual axis time series plot filtered by **Indoor Sports and Fitness**.



Lesson 2 Preparing Data Using SAS® Visual Data Builder

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Demonstration: Accessing and Investigating Data	2-10
Practice	2-22
2.2 Using SAS Visual Data Builder.....	2-23
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Practice	2-35
2.3 Solutions.....	2-36
Solutions to Practices	2-36
Solutions to Activities and Questions	2-44
Practice Review	2-46

2.1 Investigating Data in SAS Visual Analytics

Business Scenario: Data

The diagram illustrates four main tasks in SAS Visual Analytics:

- Load tables to LASR:** Shows a database icon and a server icon with an arrow between them.
- Investigate data:** Shows a document icon with a gear and a bar chart icon with a question mark.
- Modify data properties:** Shows a numeric field icon (123), a categorical field icon (ABC), and currency symbols (£, \$, €).
- Create data items:** Shows a calculator icon and a formula icon (I , 2 , $x = \frac{y}{z}$).

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Business Scenario: Customers

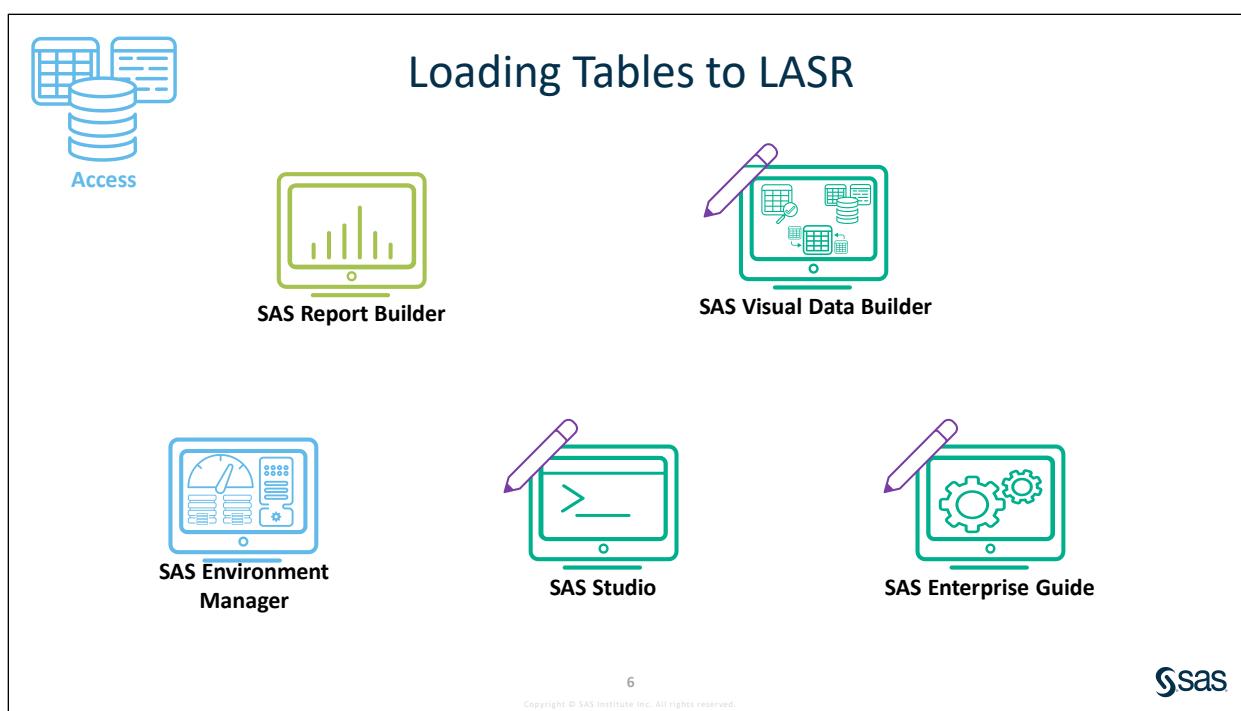
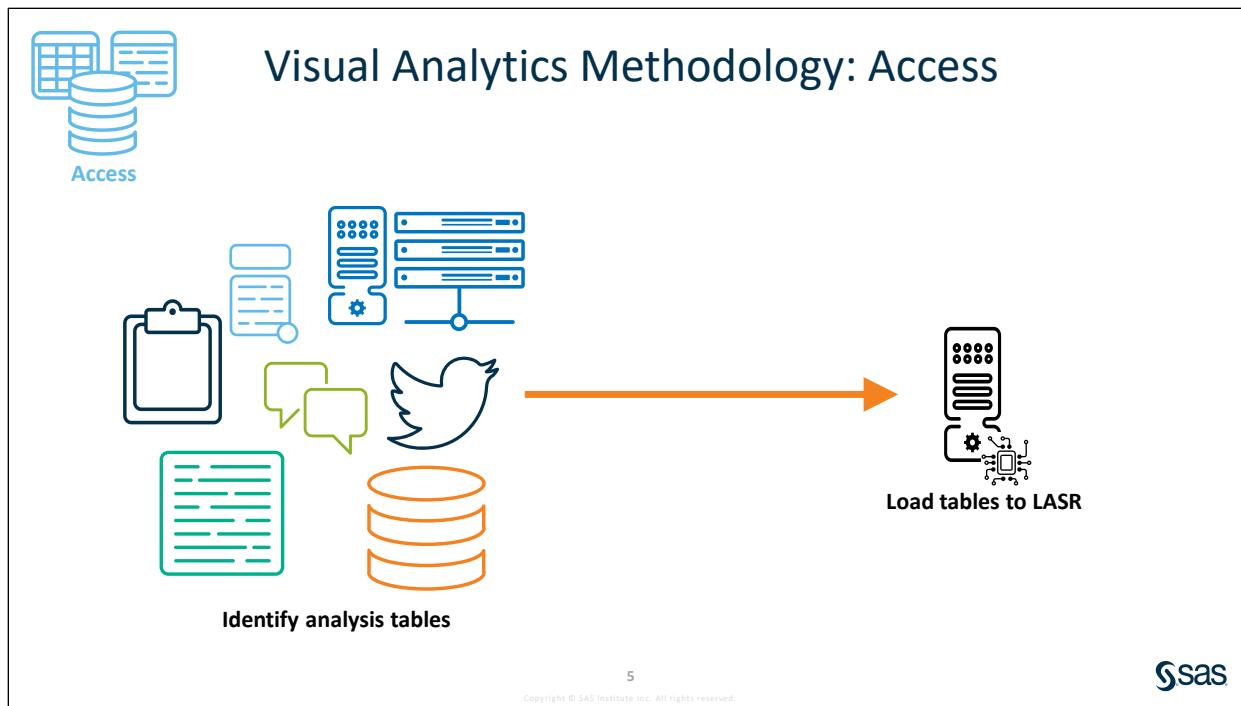
The diagram illustrates four main tasks in SAS Visual Analytics:

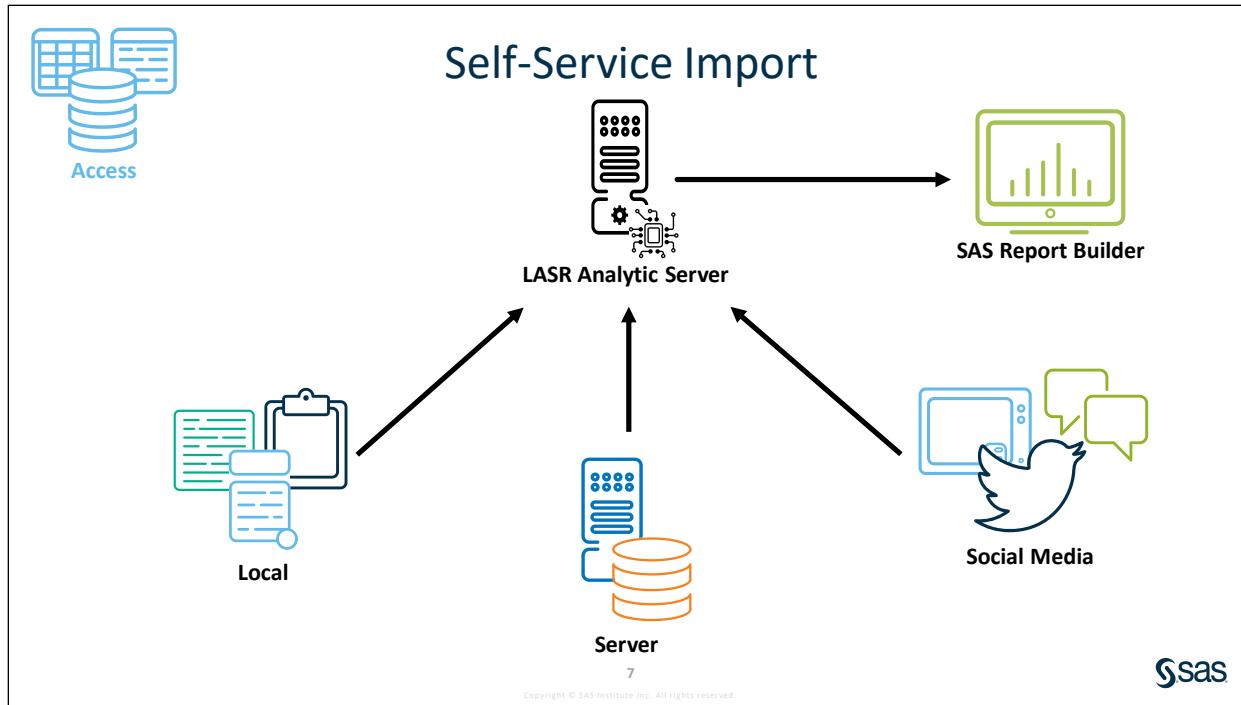
- Marketing:** Shows a target icon and a stack of coins icon with a dollar sign.
- Profits:** Shows a stack of coins icon with a dollar sign.
- Shipping:** Shows a package icon with arrows pointing up and down.
- Delivery times:** Shows a calendar icon with a clock icon.

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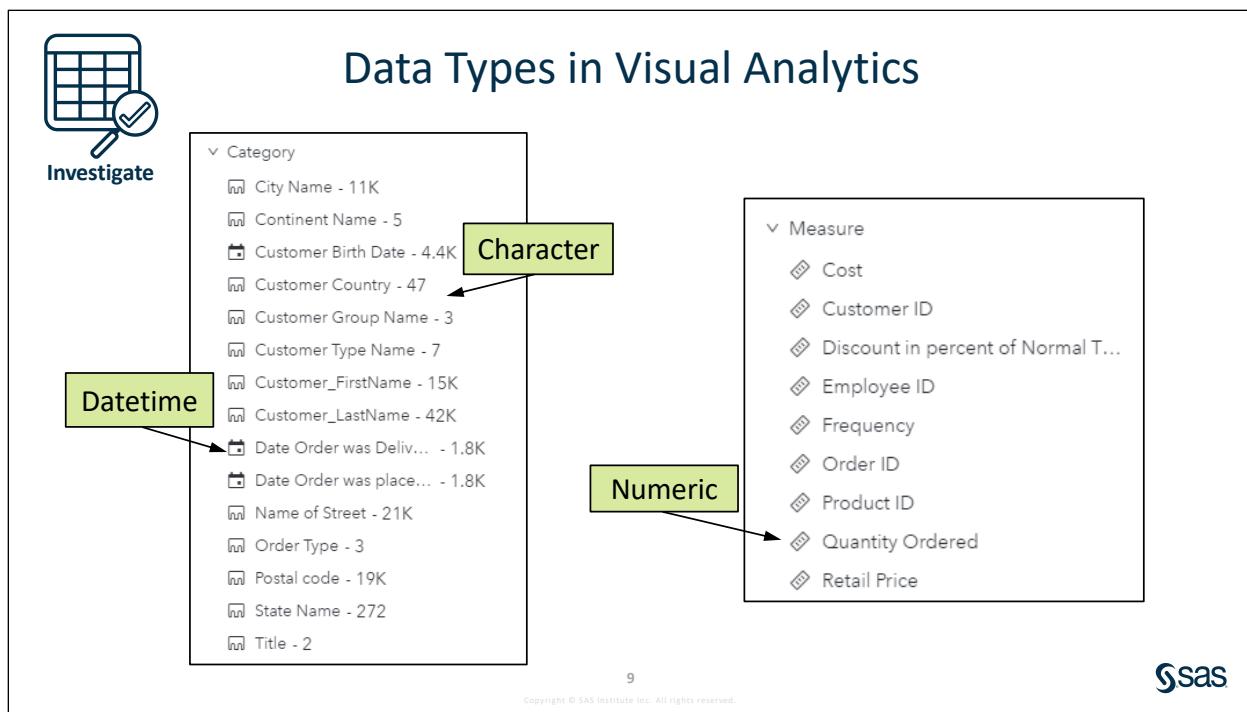
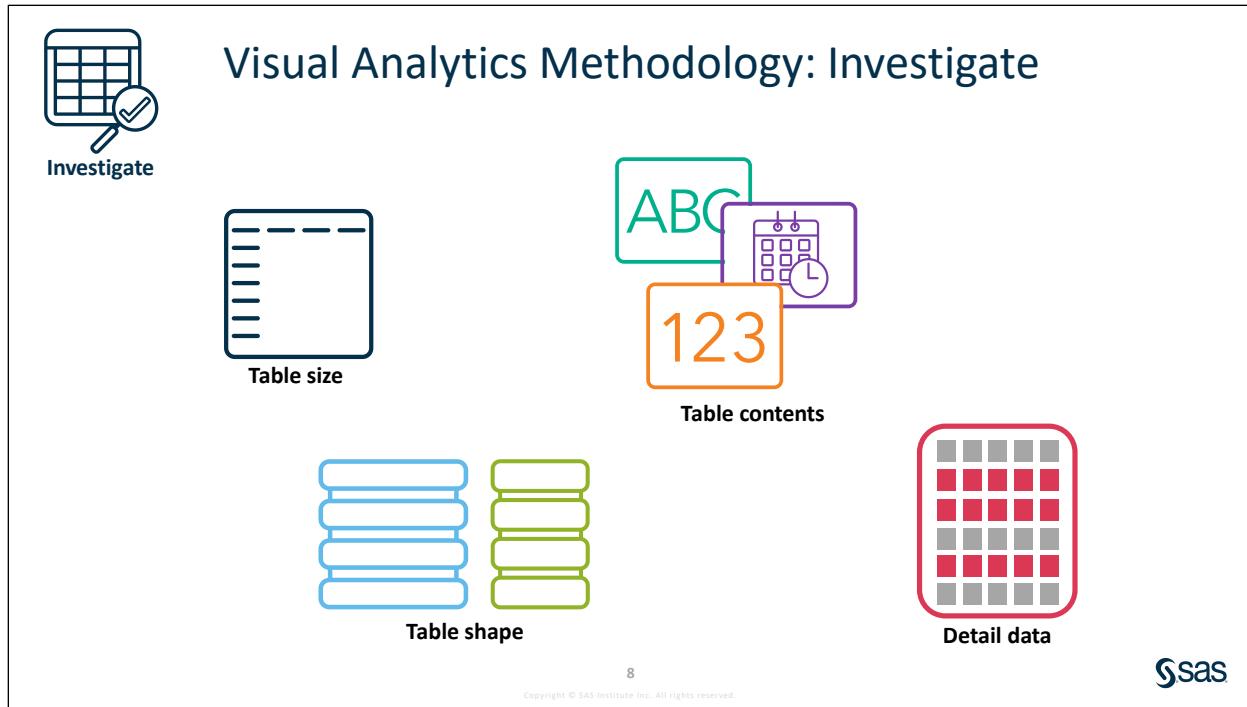
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The following types of data can be imported into CAS using self-service import:

Local	You can import data from a Microsoft Excel spreadsheet (XLS or XLSX), a text file (CSV or TXT), or a SAS data set (SASHDAT or SAS7BDAT) or data from the clipboard.
Server	After providing connection information, you can import a table to the LASR Analytic Server from a database (Teradata, Oracle, Hadoop, PostgreSQL, Impala).
Social Media	<p>After authenticating with Twitter, Facebook, Google Analytics, and providing search criteria, you can import data to the LASR Analytic Server.</p> <p>Note: Your access to, and use of, social media data through a social media provider's public APIs is subject to the social media provider's applicable license terms, terms of use, and other usage terms and policies.</p>



In SAS Report Builder, character and datetime data items are treated as categories, data items whose distinct values can be used to group and aggregate measures. In the Data pane, distinct counts are displayed for each category data item. Numeric data items are treated as measures, data items whose values can be used in computations.

Objects: Tables

Customer Name ▼	Quantity Ordered
Zyryi, Mr. Christoher	5
Zwilling, Mr. Timothy	58
Zwikker, Ms. M.E.	34
Zwikker, Mr. Jan	96
Zwikker, Mr. F.W.A.	11
Zwietering, Ms. T.W.A	17
Zwier, Mr. Frank	17

Use a *list table* to view summary or detail data about your data source.

Order Type ▲	Catalog Sale	Internet Sale	Retail Sale
Continent Name ▲	Quantity Ordered	Quantity Ordered	Quantity Ordered
Africa	548	793	.
Asia	845	1,073	.
Europe	142,511	120,384	836,473
North America	63,480	55,688	280,652
Oceania	14,811	12,551	67,508

Use a *crosstab* to view summary information for multiple categories.

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List table	<p>By default, the list table contains aggregated data with one row for each distinct combination of category values. If the Detail data option has been selected, then every row of the data source is displayed.</p> <p>Note: By default, the list table is sorted in ascending order by the first column and the first 5,000 sorted rows are displayed.</p> <p>Note: To change the sorting, click the heading for the column on which you want to sort. An arrow appears in the column heading to indicate the sorting. If the arrow points up, then the sort is ascending. If the arrow points down, then the sort is descending.</p> <p>Note: To sort on multiple columns, hold down the Ctrl key and click the columns to sort by, in order.</p> <p>Note: If detailed data is displayed in the list table, it cannot be the source of an action or link.</p>
Crosstab	<p>Each cell of the crosstab contains the aggregated measure values for a specific intersection of category values. You should consider placing lower cardinality (fewer distinct values) categories in the Columns role and higher cardinality (more distinct values) categories in the Rows role.</p>

Objects: Automatic Chart

Use an *automatic chart* to get a quick view of your data.

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Data Items	Chart Type
One measure	Histogram
One category and any number of measures	Bar chart
One date or datetime category and any number of measures	Time series plot
One date or datetime category and one or more categories	List table
One geography and up to two measures	Geo map
One geography and three or more measures	Bar chart
One hierarchy and any number of measures	Bar chart
One hierarchy, one or more categories, and any number of other data items	Crosstab
Two or more hierarchies and any number of other data items	Crosstab
Two or more categories and any number of measures	List table
Two or three measures	Scatter plot or heat map*
Four or more measures	Scatter plot matrix or correlation matrix*

* The actual chart type depends on the cardinality of the data.

2.01 Activity

- Sign in to SAS Visual Analytics using Eric's credentials.
- Create a new report using Report Builder.
- Select the **Products_clean** table to analyze.

What objects are suggested for analyzing the **Products_clean** table?

Which one is your favorite?

Add one or two suggested objects to the canvas.

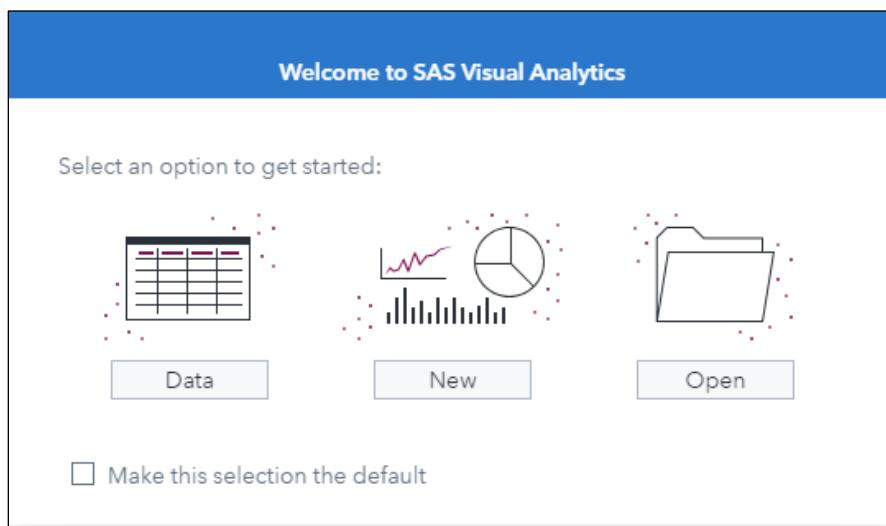


Accessing and Investigating Data

This demonstration illustrates how to access data in Visual Analytics through self-service import and how to investigate data for the business scenario.

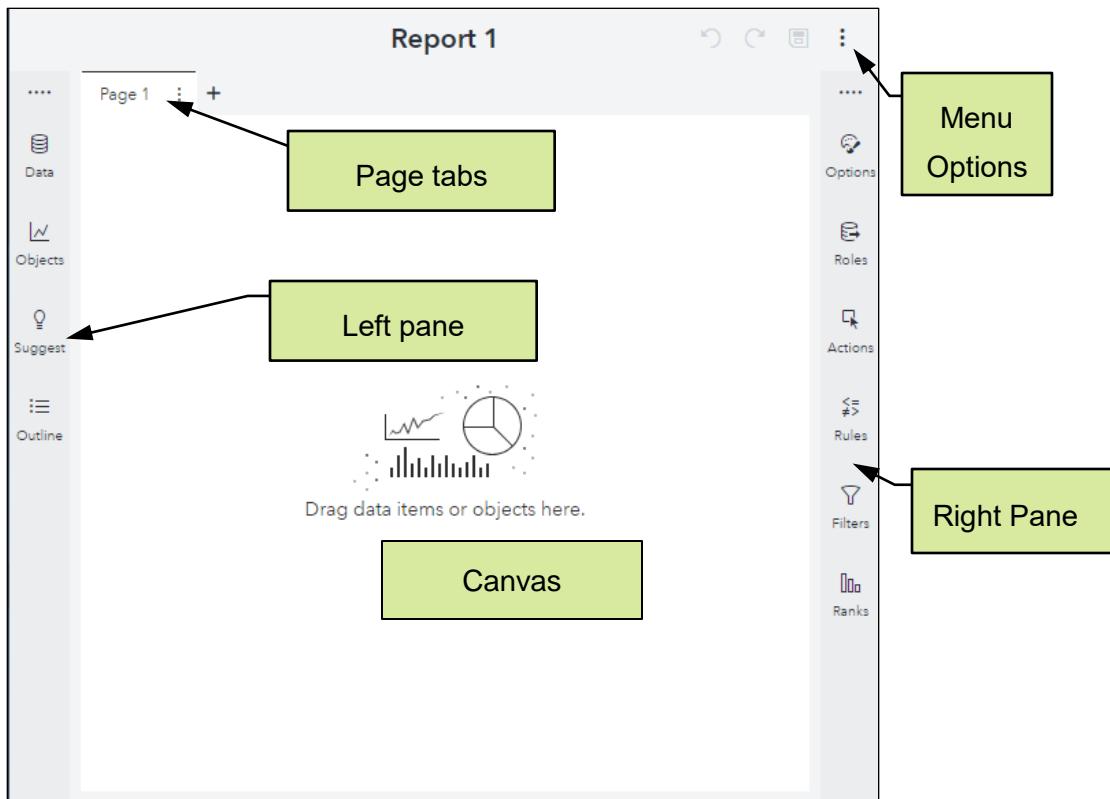
1. From the browser window, select **SAS Home Page** from the bookmarks bar.
2. Enter **Lynn** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Select **Report Builder** in the Action Button area.

The Welcome to SAS Visual Analytics window appears.



6. Click **New**.

Report Builder appears.



The Left pane contains the following icons:

Data	The Data pane enables you to work with data sources, create new data items (hierarchy, calculated item, aggregated measure), add a data source filter, and view and modify properties for data items.
Objects	The Objects pane provides a list of tables, graphs, gauges, controls, containers, and other objects that can be included in the report.
Suggest	The Suggest pane provides you with suggested objects that would work best with the data that you have selected.
Outline	The Outline pane enables you to view and work with pages and objects in your report.

The Right pane contains the following icons:

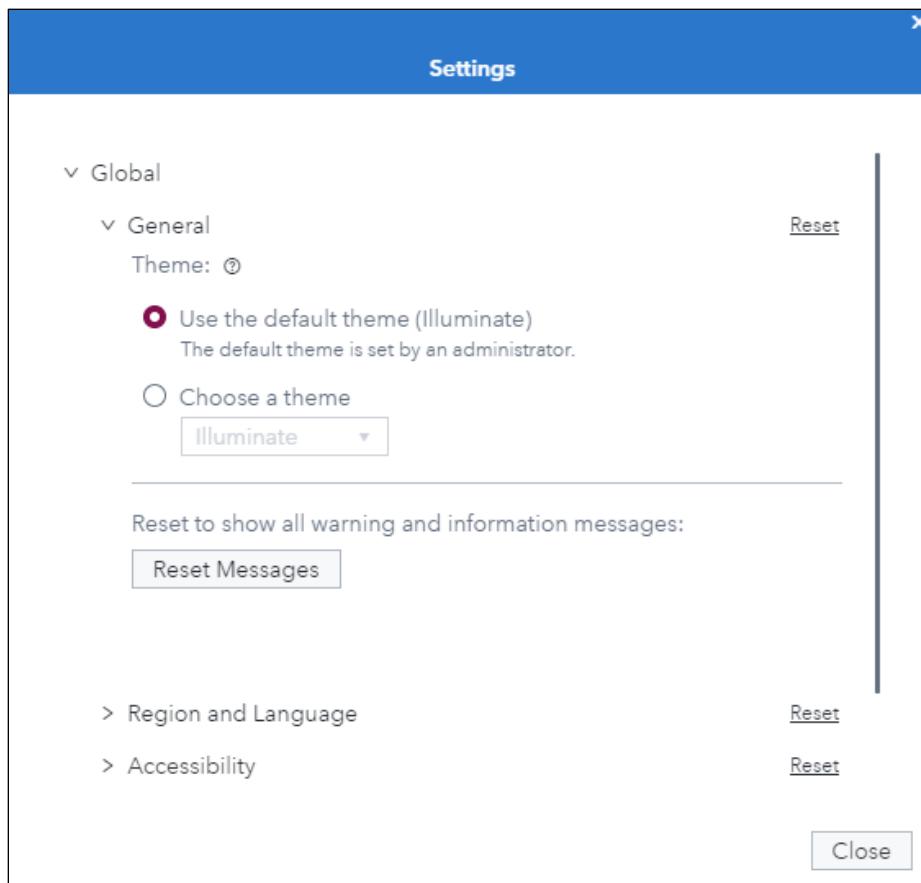
Options	The Options pane lists the options and styles available for the currently selected report, page, or report object.
Roles	The Roles pane enables you to add or modify role assignments for the currently selected report object.
Actions	The Actions pane provides an easy way to set up a single filter, a linked selection, or a page, report, or URL link.

Rules	The Rules pane enables you to view, add, or modify display rules (expression, color-mapped values, and gauge) to the currently selected object.
Filters	The Filters pane enables you to view, add, or modify filters for the selected report object.
Ranks	The Ranks pane enables you to view, add, or modify rankings for the selected report object.

7. Check the general settings for Report Builder.

- a. Select **Lynn** \Rightarrow **Settings**.

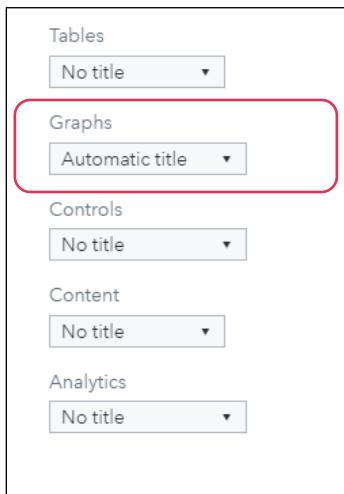
The Settings window appears.



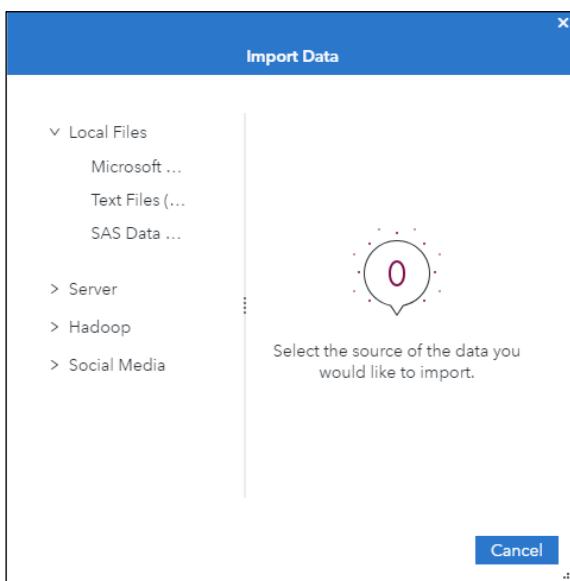
- b. Select **General** under SAS Visual Analytics.
- c. Scroll down to **When adding a new object to a report, use the following default object title settings**.
- d. Click $\textcircled{?}$ (**More information about this option**).

The automatic title option might not apply to some objects, such as key value.

These options enable you to add automatic titles to specific objects in your report. Notice that automatic titles will be added to all Graph objects.



- e. Click **Close** to close the Settings window.
- 8. Import a SAS data set into SAS LASR Analytic Server.
 - a. If needed, select **Data** in the left pane.
 - b. Click **Select to add data**.
 - c. In the Open Data Source window, click **Import**.



- d. Select **Local File** \Rightarrow **SAS Data Set**.
- e. Click **Browse** to choose a file to import.
- f. Navigate to **D:\basics\data**.
Select the **customers.sas7bdat** table and click **Open**.
- g. Select the **customers.sas7bdat** table and click **Open**.
- h. Expand the **Advanced** pane.

OUTPUTTABLE

Name: *	customers
Description:	Imported on June 5, 2019 10:24:53 AM from "customers.sas7bdat" by "Lynn"

▼ Advanced

Location:	/Shared Data/SAS Visual Analytics/Public/LASR	<input type="button" value=""/>
Library:	/Shared Data/SAS Visual Analytics/Public/Visual Analytics Public LASR	<input type="button" value=""/>
<input checked="" type="checkbox"/> Show SAS LASR Analytic Server libraries only		
<input type="checkbox"/> Compress data (for the imported table)		

Note: We are using the Public LASR Server to facilitate training. By default, all imported files are accessible by everyone if they are imported to the Public LASR Server. A more secure LASR Server would be used for production environments.

- i. Change the output table **Name** to **customers_investigate**.
- j. Expand the **Advanced** field.

Import Data

SAS Data File

customers.sas7bdat	<input type="button" value=""/>	<input type="button" value="Preview"/>	<input type="button" value="Import"/>
--------------------	---------------------------------	--	---------------------------------------

OUTPUT TABLE

Name: *	customers_investigate
Description:	Imported on June 3, 2019 02:17:46 PM from "customers.sas7bdat" by "Lynn"

▼ Advanced

Location:	/Shared Data/SAS Visual Analytics/Public/LASR	<input type="button" value=""/>
Library:	/Shared Data/SAS Visual Analytics/Public/Visual Analytics Public LASR	<input type="button" value=""/>
<input checked="" type="checkbox"/> Show SAS LASR Analytic Server libraries only		

- k. Click **Import**.

The table is imported to the Public LASR Analytic server and is available to use with Visual Analytics. When the import is complete, the Data pane is displayed and lists the data items from the **CUSTOMERS_INVESTIGATE** table.

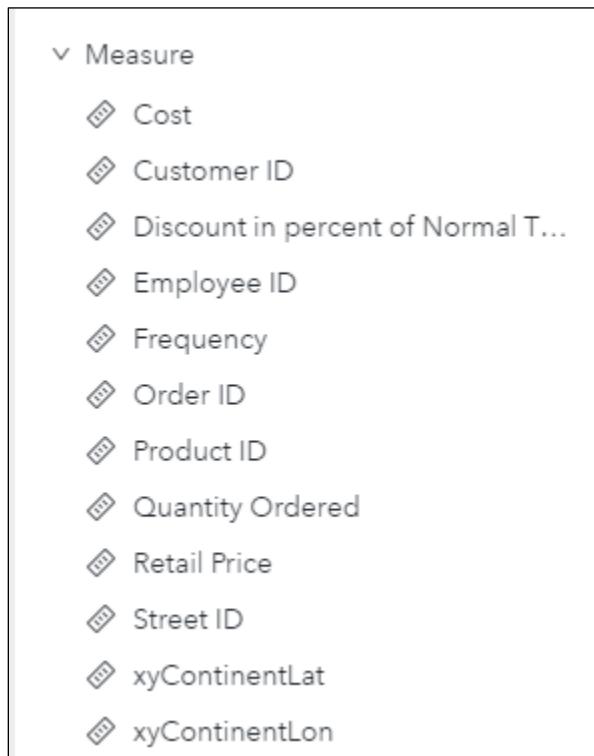
The screenshot shows the SAS Visual Analytics Data pane titled "Report 1". The left sidebar has sections for "Data" (selected), "Objects", "Outline", and "Measure". Under "Data", a dropdown menu shows "CUSTOMERS_INVESTIGATE" and a search bar with "Filter". Below these are buttons for "+ New data item" and "Suggest". A tree view under "Suggest" shows a "Category" node expanded, listing items like "City Name - 11K", "Continent Name - 5", "Customer Birth Date - 4.4K", etc. To the right of the tree is a placeholder area with a chart icon and the text "Drag data items or objects here." On the far right, there are buttons for "Options", "Roles", "Actions", "Rules", "Filters", and "Ranks".

9. View the list of data items in the Category group.

- ✓ Category
 - ❑ City Name - 11K
 - ❑ Continent Name - 5
 - ❑ Customer Birth Date - 4.4K
 - ❑ Customer Country - 47
 - ❑ Customer Group Name - 3
 - ❑ Customer Type Name - 7
 - ❑ Customer_FirstName - 15K
 - ❑ Customer_LastName - 42K
 - ❑ Date Order was Deliv... - 1.8K
 - ❑ Date Order was place... - 1.8K
 - ❑ Name of Street - 21K
 - ❑ Order Type - 3
 - ❑ Postal code - 19K
 - ❑ State Name - 272
 - ❑ Title - 2

Character variables and numeric variables with a date format appear as categories in Visual Analytics. Distinct counts appear next to each category.

10. Scroll down in the Data pane to view the list of data items in the Measure group.



Numeric variables appear as measures in Visual Analytics. By default, all measures have an aggregation of Sum.

11. Use the list table object to view the imported table.

- a. In the left pane, click the **Objects** icon.
- b. Drag the **List Table** object, from the Tables group, to the canvas.
- c. In the right pane, click the **Roles** icon.
- d. For the **Columns** role, click **Add**.
- e. Select all data items **except Frequency** and **Frequency Percent**.

Note: To make multiple selections, click the first column, hold down the Shift key, and click the last column.

- f. Click **OK**.

The list table should resemble the following:

City Name	Continent Name	Customer Birth Date	Customer Country	Customer Group Name	Customer Type Name
	Europe	08May1953	United Kingdom	Orion Club Gold members	Orion Club Gold members me
	Europe	10Mar1983	Ireland	Orion Club Gold members	Orion Club Gold members low
	Europe	12Jan1958	Austria	Orion Club members	Orion Club members high acti
	Europe	12Jan1958	Austria	Orion Club members	Orion Club members high acti
	Europe	08May1953	United Kingdom	Orion Club Gold members	Orion Club Gold members me
	Europe	10Mar1983	Ireland	Orion Club Gold members	Orion Club Gold members low
	Europe	08May1953	United Kingdom	Orion Club Gold members	Orion Club Gold members me

- g. Scroll through the columns to view the data.

The Marketing team has asked for customer data to analyze the following:

- profits by age group
- profits by gender

The Shipping team has requested information about delivery times.

Some data items (**Profit**, **Age Group**, **Gender**, and **Days to Delivery**) are not in the table but are needed for the analysis. The following existing data items can be used to create this information:

New data item	Contributing data items
Profit	Cost, Quantity Ordered, Retail Price
Age Group	Customer Birth Date
Gender	Title (Mr. Ms.)
Days to Delivery	Delivery Date, Order Date

12. Click  (New page) in the upper left corner next to **Page 1**.

13. Use the crosstab object to view distinct values for order type.

- In the left pane, click the **Objects** icon.
- Drag the **Crosstab** object, from the Tables group, to the canvas.
- If necessary, click the **Roles** icon in the right pane.
- For the **Rows** role, select **Add \Rightarrow Order Type**.
- Click **OK**.

The crosstab should resemble the following:

Order Type	Frequency
Catalog Sale	127,129
Internet Sale	108,570
Retail Sale	715,970

Order Type contains the method in which the order was placed: catalog, internet, or retail.

14. Use the automatic chart to view quantity ordered by customer.

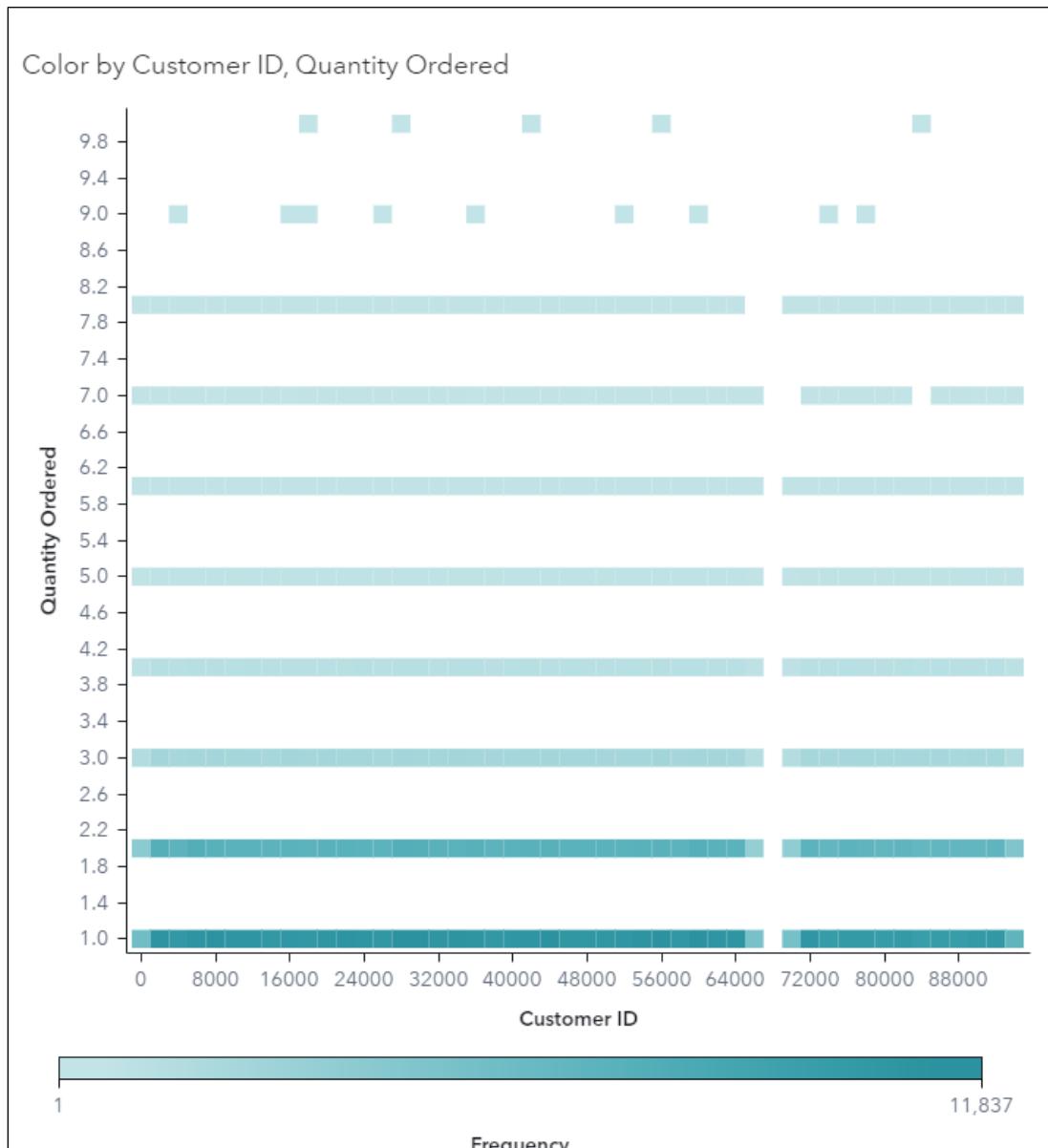
- In the left pane, click the **Data** icon.
- Select the following data items, in the Measures group (in the order specified):

Customer ID

Quantity Ordered

- Drag the selected items to the right of the crosstab.

The automatic chart should resemble the following:



In Visual Analytics, all ID data items are classified as measures by default. An automatic chart of **Customer ID** and **Quantity Ordered** (two measures) yields a heat map that displays the relationship between the data items.

15. View descriptive information for the measure data items.

- In the left pane, click the **Data** icon.
- Click  (**Actions**) and select **View measure details**.

The Measure Details window displays descriptive statistics for each measure.

Measure Details				
Name	Minimum	Maximum	Average	Sum
Cost	0.40	1,583.60	77.76	73,997,879.26
Customer ID	1.00	94,254.00	45,440.60	43,244,412,915.00
Discount in percent of Normal Total Retail Price	0.30	0.60	0.38	3,503.90
Employee ID	120,121.00	99,999,999.00	24,857,697.64	23,656,300,254,058.00
Order ID	1,230,000,033.00	1,244,337,638.00	1,236,943,348.18	1,177,160,639,221,085.00

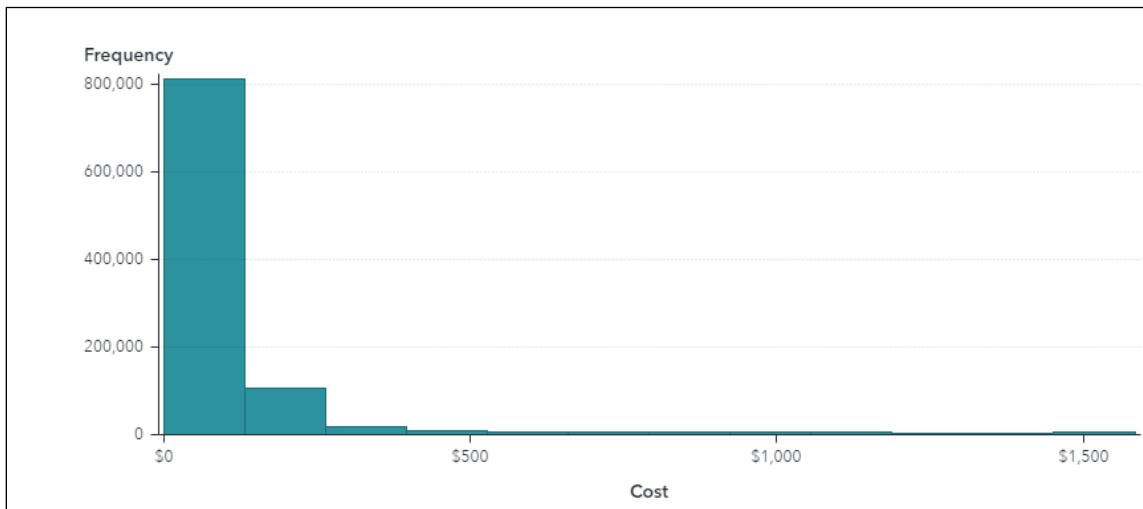
Note: **Customer ID**, **Employee ID**, **Order ID**, and **Product ID** are numeric values and are classified as measures by default. They should be classified as categories because they should not be used in calculations. The results of summing or averaging these data items returns meaningless information.

- With **Cost** selected, view the More information area.

More information	
Standard Deviation:	85.28
Standard Error:	0.09
Variance:	7,272.08
Distinct Count:	1,883
Number Missing:	0
Total Observations:	951,669
Skewness:	3.7038
Kurtosis:	28.7836
Coefficient of Variation:	109.6721
Uncorrected Sum of Squares:	12,674,377,403.50
Corrected Sum of Squares:	6,920,605,729.76
T-statistic (for Average=0):	889.5021
P-value (for T-statistic):	<0.0001

Note: The number of rows (total observations) in the **CUSTOMERS** table appears in this list along with additional descriptive statistics for **Cost**.

- d. View the graph on the right.



Note: The histogram displays the distribution of the **Cost** values.

- e. Click **Close** to close the Measure Details window.
16. In the upper right corner, click (Menu) and select **Save as**.
 17. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 18. Enter **VA1- Demo2.1** in the **Name** field.
 19. Click **Save**.
 20. Select **Lynn** \Rightarrow **Sign out** in the upper right corner.

End of Demonstration





Practice

1. Accessing and Investigating Data

- a. Open the browser and sign in to Visual Analytics using Lynn's credentials.
- b. Access Report Builder.
- c. Open the **VA1- Practice2.1** report in the **Shared Data/Basics/Practices (HR)** folder.
- d. View the Data pane and answer the following questions:

How many unique values does **Company** have? **Job Title**?

Answer: _____

What is the type (or classification) of **Employee ID**?

Answer: _____

- e. View the list table of all data items on Page 1 and answer the following questions:

What is the case of **Employee Country**?

Answer: _____

Which data item can be used to determine whether an employee is active (currently employed) or retired (formerly employed)?

Answer: _____

- f. View the crosstab of **Department** and **Job Title** on Page 2 and answer the following question:

Which department contains the missing job title?

Answer: _____

- g. Create an auto chart of **Company** (on the right side of the crosstab) and answer the following questions:

What is the largest company? The smallest?

Answer: _____

- h. View the measure details (from the Data pane) and answer the following questions:

What is the minimum total profit generated by an employee? The maximum? The average? The total profit generated by all employees?

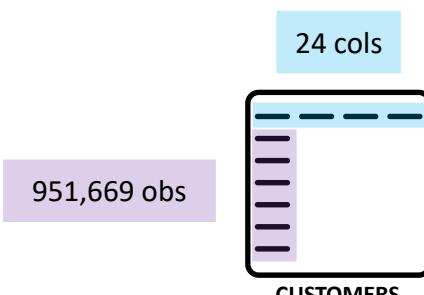
Answer: _____

- i. Save the report.
- j. Sign out of Report Builder.

End of Practices

2.2 Using SAS Visual Data Builder

Business Scenario: Customers



24 cols

951,669 obs

CUSTOMERS

One row per product ordered



Rename



Delete



Convert

24

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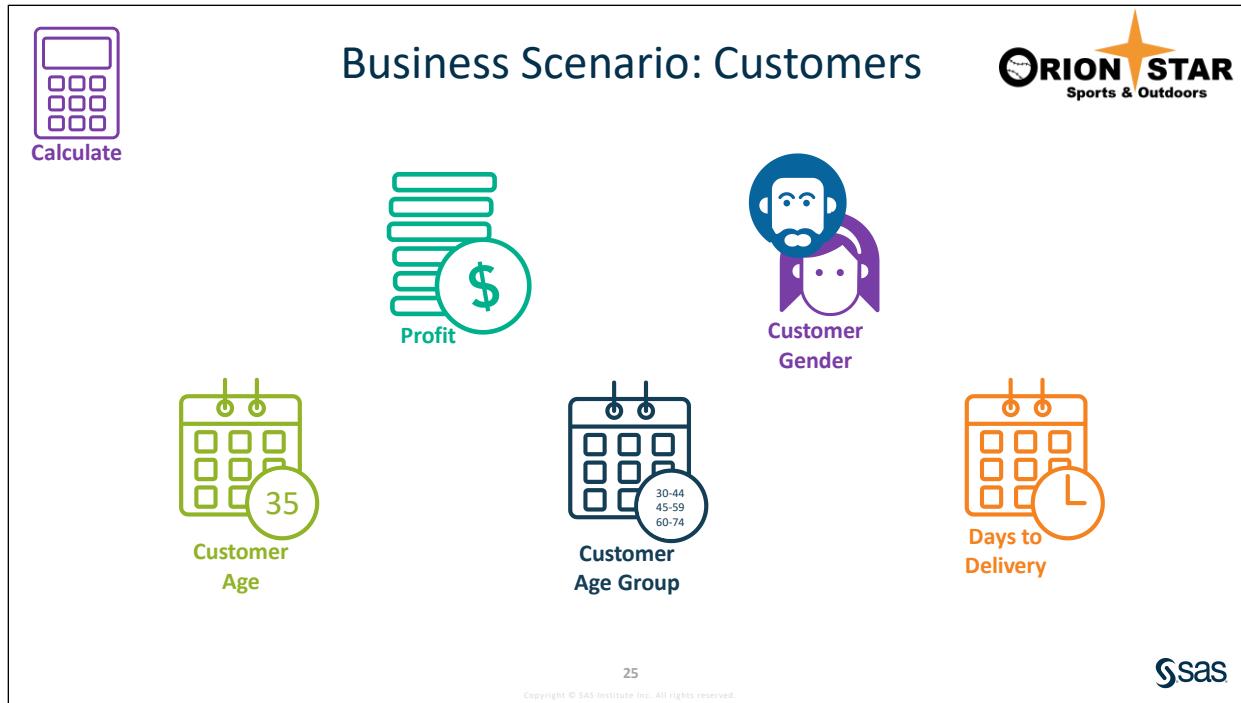
A description of the categories in the **CUSTOMERS** table is displayed below:

Name	Description	Distinct Counts
City Name	City where customer resides	10,507
Continent Name	Continent where customer resides	5
Customer Birth Date	Date on which customer was born	4,368
Customer Country	Country where customer resides	47
Customer Group Name	Loyalty member group	3
Customer Name	Name of customer	67,806
Customer Type Name	Loyalty member level	7
Customer ID	Unique identifier for customer	68,300
Date Order was Delivered	Date on which order was delivered to customer	1,840
Date Order was placed by Customer	Date on which order was placed by customer	1,825
Order Type	Method in which the order was placed	3
Order ID	Unique identifier for customer	747,953
Postal code	Postal code where customer resides	19,340
State Name	State or province where customer resides	272

Note: By default, all datetime variables have a format of Date with Month Name.

A description of measures in the **CUSTOMERS** table is displayed below:

Name	Description	Minimum	Maximum	Average	Number Missing
Cost	Cost per unit	0.40	1,583.60	77.76	0
Discount in percent of Normal Total Retail Price	Discount (% of normal total retail price)	0.30	0.60	0.38	942,517
Quantity Ordered	Quantity ordered	1.00	10.00	1.68	0
Retail Price	Total revenue	0.63	9,385.80	139.96	0



25

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Note: The following data items are not needed for the analysis and will be removed: **Street Name**, **Street ID**, **Employee ID**, **Product ID**, **xyContinentLat**, and **xyContinentLon**.

Note: **Profit** and **Days to Delivery** are calculated in SAS Visual Data Builder. **Customer Age** is calculated in Visual Analytics using the Now operator, so the age updates every time the report is opened. Both **Customer Age Group** and **Customer Gender** can be calculated in SAS Visual Data Builder using a custom expression. These data items can also be calculated in Report Builder, which you see in a later lesson.

Profit is calculated as **Retail Price (Total Revenue) – Cost (Unit Cost) * Quantity Ordered**.

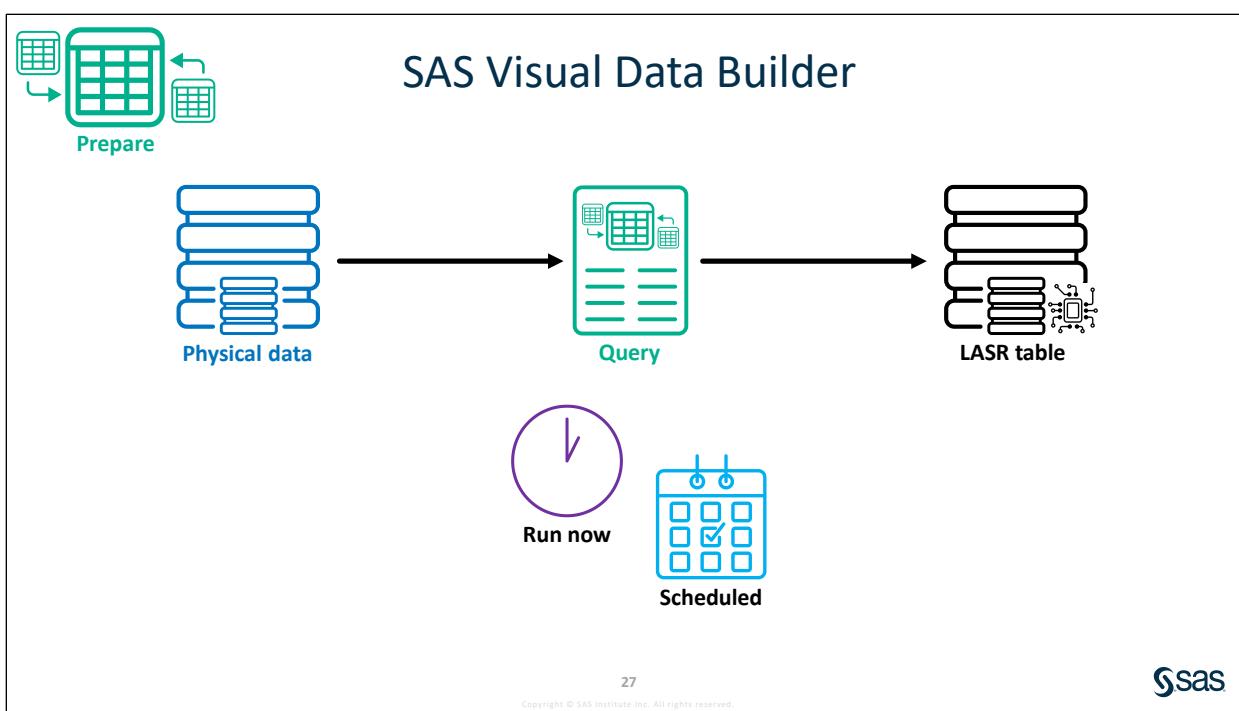
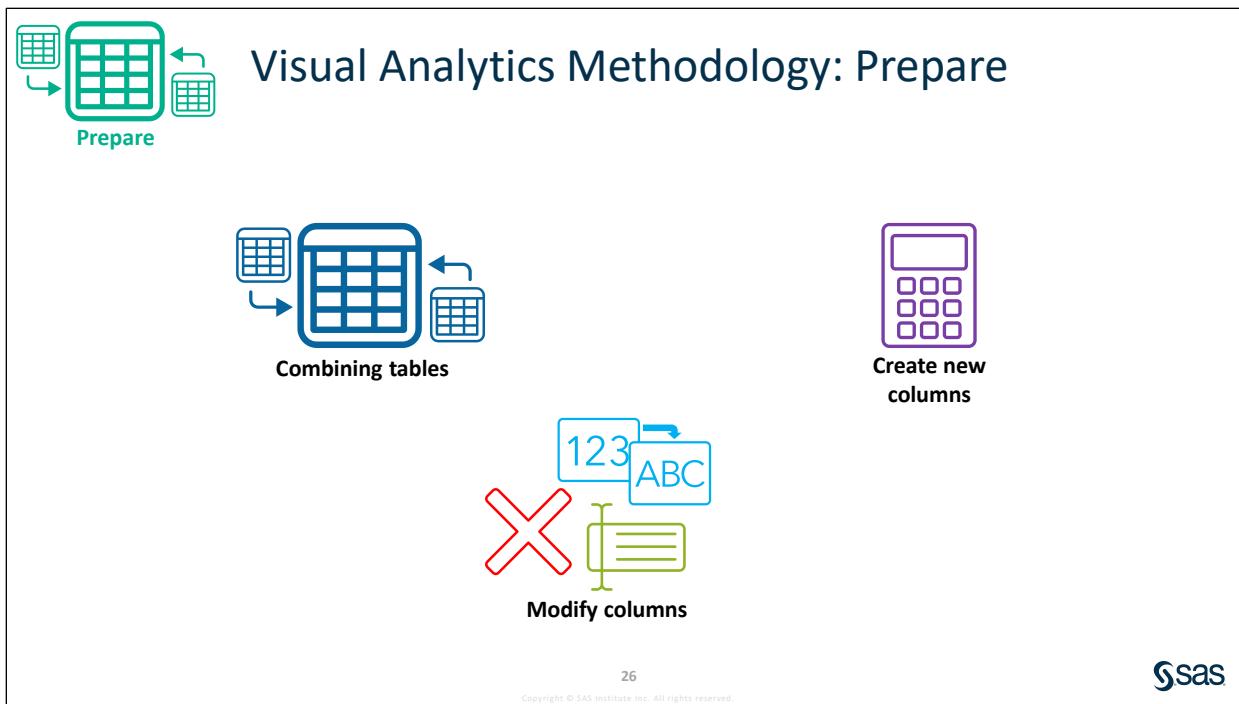
Days to Delivery is calculated as **Date Order was Delivered – Date Order** (that is, the date on which the order was placed by the customer).

Customer Age is calculated as **(Today's Date - Customer Birth Date)/365.25**.

Customer Age Group will use **Customer Age** to create ranges of ages.

Customer Gender is **Male** if **Title** is *Mr.* and **Female** if **Title** is *Ms./Mrs.*

Note: The actual calculations are more complex and are discussed in more detail in later sections.



2.02 Activity

Given the values for **Quantity**, **Total Revenue**, and **Unit Cost**, how would you calculate **Profit**?

Quantity	Total Revenue	Unit Cost
1	\$191.00	\$160.90
4	\$499.20	\$107.20
1	\$173.00	\$145.50
1	\$56.90	\$51.90
4	\$740.40	\$155.40

28

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2.03 Activity

Given the values for **Order_Date** and **Delivery_Date**, how would you calculate **Days to Delivery**?

Order_Date	Delivery_Date
27Jun2016	01Jul2016
31Mar2012	04Apr2012
26Feb2014	27Feb2014
08Nov2016	12Nov2016
17May2013	18May2013

30

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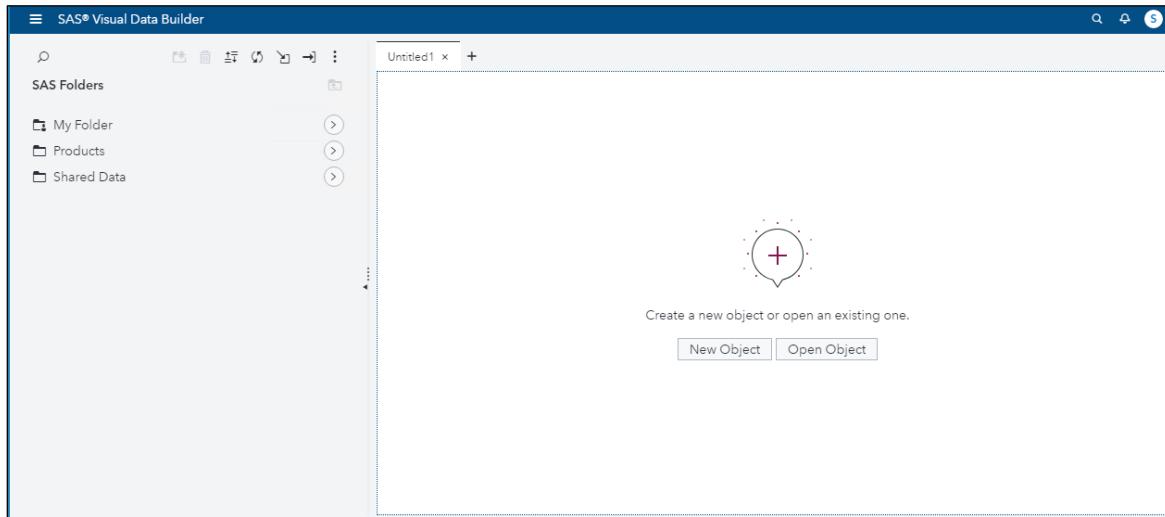


Preparing Data

This demonstration illustrates how to view a query in SAS Visual Data Builder.

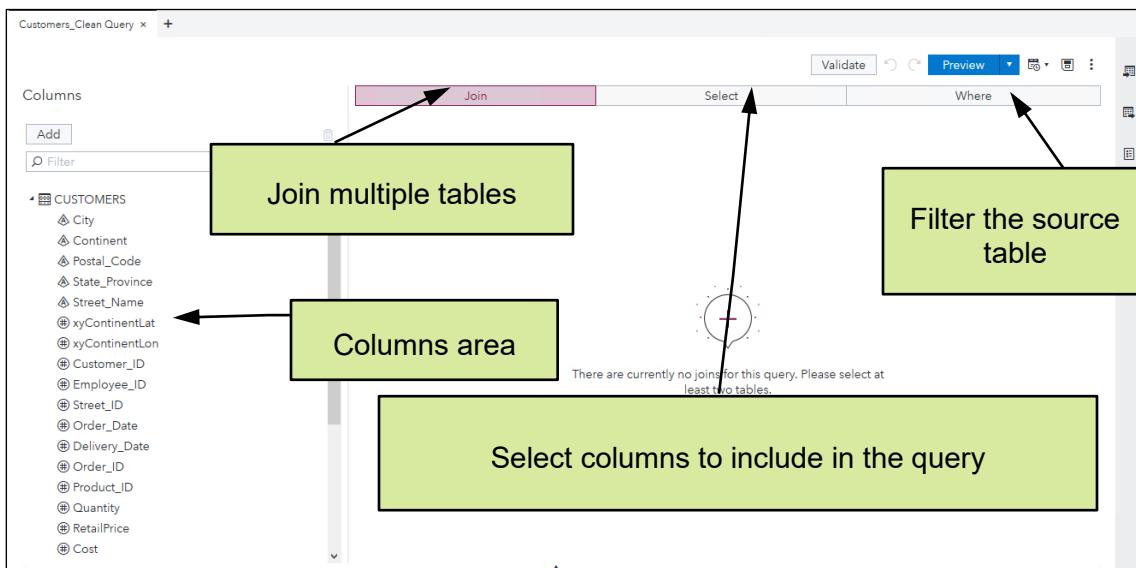
1. From the browser window, select **SAS Home Page** from the bookmarks bar.
2. Enter **Lynn** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Select in **Data Preparation** in the Action Button area.

SAS Visual Data Builder appears. You can create a new object or open an existing one.



6. Click **Open Object**.
 - a. In the Open window, navigate to the **Shared Data/Basics/Demos(Marketing)** folder.
 - b. Double-click **VA1-Demo2.2** to open the query.

The query is displayed.



7. Click **Select**.

The columns from the table are displayed.

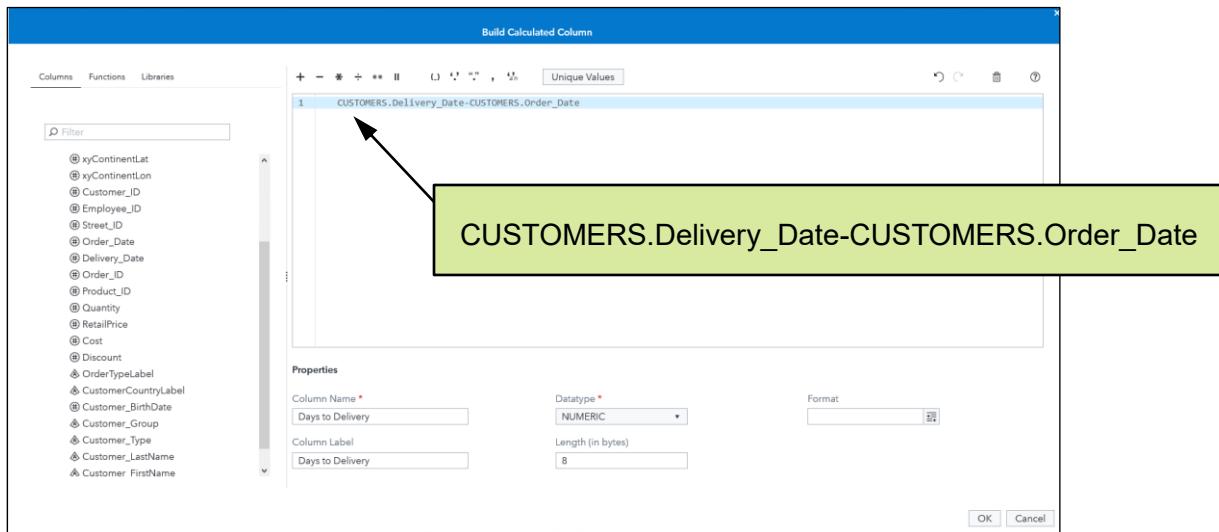
Join		Select	Where		
Columns	Filter Groups				
Column Name	Expression	Type	Length	Format	L
City	CUSTOMERS.City	CHARACTER	45		
Profit	CUSTOMERS.RetailPrice	NUMERIC	8	DOLLAR12.2	
Days to Delivery	CUSTOMERS.Delivery_D	NUMERIC	8		
Continent	CUSTOMERS.Continent	CHARACTER	45		
Postal_Code	CUSTOMERS.Postal_Co	CHARACTER	15		
State_Province	CUSTOMERS.State_Prov	CHARACTER	38		
Customer_ID	CUSTOMERS.Customer	NUMERIC		12.	
Order_Date	CUSTOMERS.Order_Da	DATE		DATE9.	
Order_ID	CUSTOMERS.Order_ID	NUMERIC		12.	
Quantity	CUSTOMERS.Quantity	NUMERIC		COMMA12	

Note: Data items that were not needed were removed from the query.

8. Locate the **Days to Delivery** column.

9. In the **Expression** column, select  (**Expression**) to see the calculation.

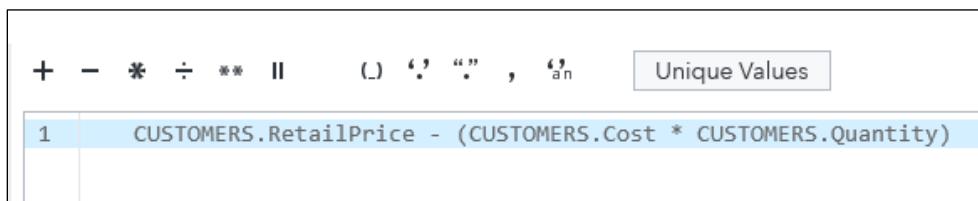
The Build Calculated Column window is displayed.



10. Click **Cancel**.

11. Locate the **Profit** column.

12. In the **Expression** column, select  (**Expression**) to see the calculation.

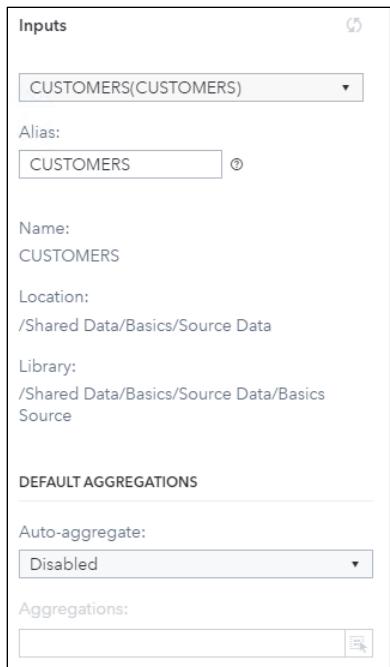


13. Click **Cancel**.

14. Scroll through the code at the bottom of the query to see the generated.

```
LIBNAME srcdat BASE "D:\VA 7.5 data";
option DBIDIRECTEXEC;
/* Drop existing table */
%vdb_dt(TEMP_447);
proc sql noprnt outobs=max nowarn;
  create view TEMP_447 AS SELECT
    CUSTOMERS.City length=45 label='City Name' AS City,
    CUSTOMERS.RetailPrice - (CUSTOMERS.Cost * CUSTOMERS.Quantity) length=8 format=DOLLAR12.2 label='Profit' AS Profit,
    CUSTOMERS.Delivery_Date - CUSTOMERS.Order_Date length=8 label='Days to Delivery' AS 'Days to Delivery'n,
    CUSTOMERS.Continent length=45 label='Continent Name' AS Continent,
    CUSTOMERS.Postal_Code length=15 label='Postal code' AS Postal_Code,
    CUSTOMERS.State_Province length=38 label='State Name' AS State_Province,
    CUSTOMERS.Customer_ID length=8 format=12, label='Customer ID' AS Customer_ID,
    CUSTOMERS.Order_Date length=8 format=DATE9. label='Date Order was placed by Customer' AS Order_Date,
    CUSTOMERS.Order_ID length=8 format=12, label='Order ID' AS Order_ID,
    CUSTOMERS.Quantity length=8 format=COMMMA12, label='Quantity Ordered' AS Quantity,
    CUSTOMERS.RetailPrice length=8 format=DOLLAR13.2 label='Retail Price' AS RetailPrice,
    CUSTOMERS.Cost length=8 format=DOLLAR13.2 AS Cost,
    CUSTOMERS.Discount length=8 format=PERCENT label='Discount in percent of Normal Total Retail Price' AS Discount
```

15. In the right pane, click  (**Inputs**) to view details about the input table.



16. Click  (**Outputs**) to view the query output information.

17. Click **Clear** to clear the output table properties.

Note: It is best practice to clear the existing values before specifying output table properties.

18. Enter **customers_clean** in the **Table** field.

19. Click  (**Choose output location**) in the **Location** field.

20. Navigate to **Shared Data** \Rightarrow **Basics** \Rightarrow **LASR Data**.

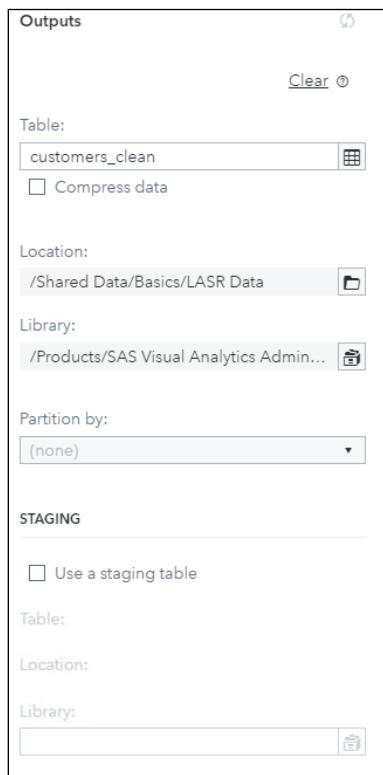
21. Click **OK**.

22. Click  (**Choose an output table library**).

23. If necessary, navigate to **Products** \Rightarrow **SAS Visual Analytics Administrator** \Rightarrow **Visual Analytics LASR**.

24. Click **Open**.

The output pane should resemble the following:



25. Save the query.

- In the upper right corner of the plan, click (Actions) and select **Save As**.
- Select **Yes** when prompted.
- Navigate to the **Shared Data/Basic/Demos (Marketing)** folder.
- Verify that **VA1-Demo2.2** is entered in the **Name** field.
- Click **Save**.
- Click **Yes** to replace it.

26. Select **Lynn** **Sign out** in the upper right corner.

End of Demonstration

Practice Scenario: Employees

ORION STAR Sports & Outdoors

24 cols

648 obs

EMPLOYEES

One row per employee

Rename

Delete

Convert

Filter

Change case

aa → AA

Sas

33

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Practice Scenario: Employees

ORION STAR Sports & Outdoors

Calculate

Employee Gender

Anniversary Month

Employee Tenure

Employee Type

Sas

34

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Note: The following data items are not needed for the analysis and will be removed: **Employee Birth Date, Section, Total Customers, Total Products Ordered, Total Quantity Ordered, Levels of Management, Manager at 2. level, Manager at 3. level, Manager at 4. level, Manager at 5. level, and Manager at 6. level.**

Note: **Anniversary Month** is calculated in SAS Visual Data Builder. **Employee Tenure** is calculated in Visual Analytics using the Now operator, so the years of service updates every time the report is opened. **Employee Type** can be calculated in SAS Visual Data Builder using a custom expression. These data items can also be calculated in Report Builder, which you see in a later chapter.

Anniversary Month is calculated as the name of the month in which the employee was hired.

Employee Tenure is calculated as $(\text{Employee Termination Date} - \text{Employee Hire Date})/365.25$ for retired employees and as $(\text{Today's Date} - \text{Employee Hire Date})/365.25$ for active employees.

Employee Type is *Retired* if the termination date is not missing and *Active* if the termination date is missing.

Note: The actual calculations are more complex and are discussed in more detail in later sections.



Practice

2. Preparing Data

- a. Open the browser and sign in to SAS Visual Analytics using Lynn's credentials.
- b. Open and run the **VA1- Practice2.2** plan in the **Shared Data/Basics/Practices (HR)** folder.
- c. View the input properties from the data query.

What is the name of the input table?

Answer: _____

- d. View the output properties from the data query.

What is the name of the output table?

Answer: _____

- e. Locate the **Employee_Country** column in the query.

What expression is used to update the column in the query?

Answer: _____

- f. What filter was applied to the table?

Answer: _____

- g. Save the query.

- h. Sign out of Visual Data Builder.

End of Practices

2.3 Solutions

Solutions to Practices

1. Accessing and Investigating Data

- a. Open the browser and sign in to Visual Analytics using Lynn's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Lynn** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home displayed by default.
- b. To access Report Builder, click  (**Show applications menu**) and select **Report Builder**. The Welcome to SAS Visual Analytics window appears.
- c. Open the **VA1- Practice2.1** report in the **Shared Data/Basics/Practices (HR)** folder.
 - 1) Click **Open**.
 - 2) In the Open window, navigate to the **Shared Data/Basics/Practices (HR)** folder.
 - 3) Double-click the **VA1- Practice2.1** report to open it.
- d. View the Data pane and answer the questions.
 - 1) Click the **Data** icon in the left pane.
 - 2) Answer the following questions:

How many unique values does **Company** have? **Job Title**?

Answer: **Company** has 12 distinct values. **Job Title** has 9 distinct values.

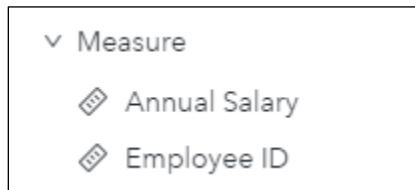
View the list of Category data items on the Data pane.

▼ Category
└ Company - 12
└ Department - 3
└ Employee Birth Date - 604
└ Employee Country - 11
└ Employee Hire Date - 240
└ Employee Termination ... - 62
└ EmployeeName - 648
└ Group - 15
└ Job Title - 9
└ Section - 3
└ Title - 3

What is the type (or classification) of **Employee ID**?

Answer: Employee ID is identified as a measure data item.

View the list of Measure data items on the Data pane.



- e. View the list table of all data items on Page 1 and answer the questions.

- 1) If necessary, click the **Page 1** tab at the top of the canvas.

The list table should resemble the following:

Company	Department	Employee Birth Date	Employee Country	Employee Hire Date
Logistics	Stock & Shipping	.	.	.
Orion Australia	Sales	06Jun1953	au	01Jan1978
Orion Australia	Sales	22Apr1990	au	01Oct2010
Orion Australia	Sales	20Jul1948	au	01Jan1978
Orion Australia	Sales	18Aug1990	au	01Sep2010
Orion Australia	Sales	09Nov1990	au	01Nov2010
Orion Australia	Sales	21Feb1990	au	01Dec2010
Orion Australia	Sales	21Nov1978	au	01Jan1997
Orion Australia	Sales	07May1983	au	01Jan2002
Orion Australia	Sales	27Jul1958	au	01Jul1982

- 2) Scroll through the columns and answer the following questions:

What is the case of **Employee Country**?

Answer: Employee Country is lowercase.

Employee Country
au

Which data item can be used to determine whether an employee is active (currently employed) or retired (formerly employed)?

Answer: If Employee Termination Date is missing, the employee is active (currently employed). If Employee Termination Date is not missing, the employee is retired (formerly employed).

Employee Termination Date
.
30Jun2010
.
.
.
.
.
.
31Jan2010

- f. View the crosstab of **Department** and **Job Title** on Page 2 and answer the question.
- 1) Click the **Page 2** tab at the top of the canvas.
 - 2) View the crosstab and answer the question.

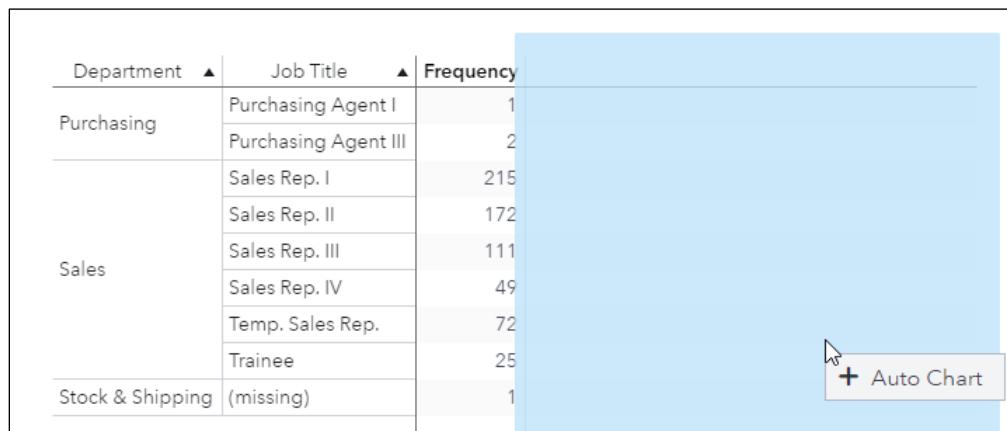
Which department contains the missing job title?

Answer: Stock & Shipping

Department	Job Title	Frequency
Purchasing	Purchasing Agent I	1
	Purchasing Agent III	2
Sales	Sales Rep. I	215
	Sales Rep. II	172
	Sales Rep. III	111
	Sales Rep. IV	49
	Temp. Sales Rep.	72
	Trainee	25
Stock & Shipping	(missing)	1

- g. Create an auto chart of **Company** (on the right side of the crosstab) and answer the questions.

- 1) In the left pane, click the **Data** icon.
- 2) Drag **Company** from the Data pane to the right side of the canvas.

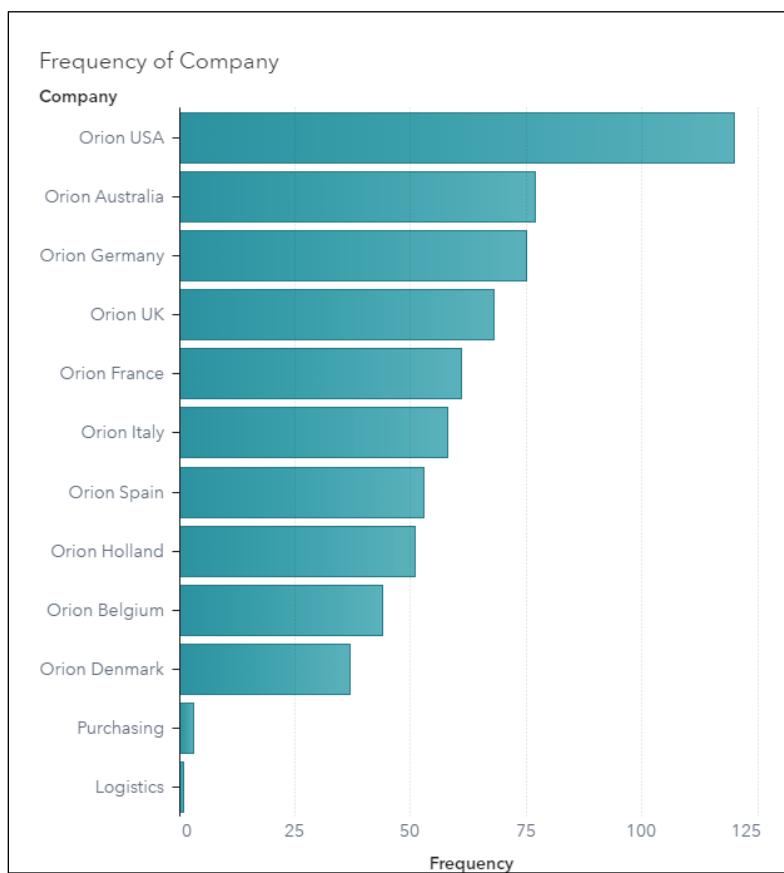


Department	Job Title	Frequency
Purchasing	Purchasing Agent I	1
	Purchasing Agent III	2
Sales	Sales Rep. I	215
	Sales Rep. II	172
	Sales Rep. III	111
	Sales Rep. IV	49
	Temp. Sales Rep.	72
	Trainee	25
	Stock & Shipping	(missing)
		1

What is the largest company? The smallest?

Answer: Orion USA is the largest company with the most employees (120). Logistics is the smallest company with the fewest employees (1).

- Place your cursor over the bars to see the frequency.



- h. View the measure details (from the Data pane) and answer the questions.

- 1) In the left pane, click the **Data** icon.
- 2) Click  (**Actions**) and select **View measure details**.

The Measure Details table shows the minimum, maximum, average, and sum for each measure.

Measure Details				
Name	Minimum	Maximum	Average	Sum
Annual Salary	20,835.00	40,755.00	27,595.90	17,854,545.00
Employee ID	120,121.00	99,999,999.00	274,748.73	178,037,176.00
Levels of Management	0.00	5.00	4.17	2,705.00
Manager at 1. level	120,102.00	121,145.00	120,642.77	78,055,869.00
Manager at 2. level	120,101.00	121,142.00	120,639.28	78,053,611.00

What is the minimum total profit generated by an employee? The maximum? The average? The total profit generated by all employees?

Answer: The minimum total profit generated by an employee is 11.10.
 The maximum total profit generated by an employee is 19,146,779.62.
 The average total profit generated by employees is 109,148.07.
 The total profit generated by all employees is 70,727,947.65.

Name	↓	Minimum	Maximum	Average	Sum
Total Profit		11.10	19,146,779.62	109,148.07	70,727,947.65

- 3) Click **Close**.

- i. Save the report by clicking  (**Menu**) and selecting **Save** in the upper right corner.
- j. To sign out of SAS Report Builder, select **Lynn** ⇒ **Sign out** in the upper right corner.

2. Preparing Data

- a. Open the browser and sign in to Visual Analytics using Lynn's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Lynn** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open and run the **VA1- Practice2.2** plan in the **Shared Data/Basics/Practices (HR)** folder.
 - 1) Click  (**Show applications menu**) and select **Data Preparation**.
 - 2) Click **Open Object**.
 - 3) Navigate to the **Shared Data/Basics/Practices (HR)** folder.
 - 4) Double-click **VA1- Practice2.2** to open the plan.

- c. View the input properties from the query.

In the right pane, click  (Inputs).

Inputs

EMPLOYEES(EMPLOYEES) ▾

Alias:
EMPLOYEES

Name:
EMPLOYEES

Location:
/Shared Data/Basics/Source Data

Library:
/Shared Data/Basics/Source Data/Basics
Source

DEFAULT AGGREGATIONS

Auto-aggregate:
Disabled

Aggregations:

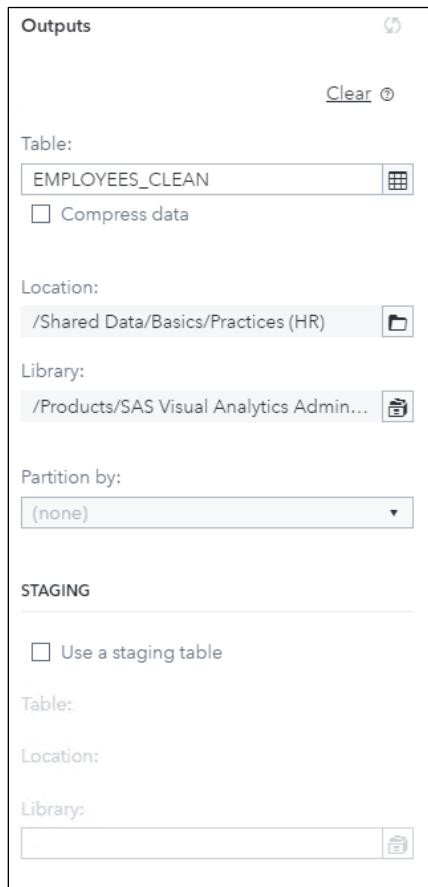
[Empty list box]

What is the name of the input table?

Answer: EMPLOYEES

- d. View the output properties from the data query.

In the right pane, click  (Outputs).



Outputs

Table: EMPLOYEES_CLEAN

Location: /Shared Data/Basics/Practices (HR)

Library: /Products/SAS Visual Analytics Admin...

Partition by: (none)

STAGING

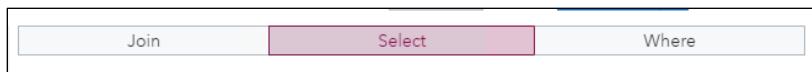
Use a staging table

What is the name of the output table?

Answer: EMPLOYEES_CLEAN

- e. Locate the Employee_Country column in the query.

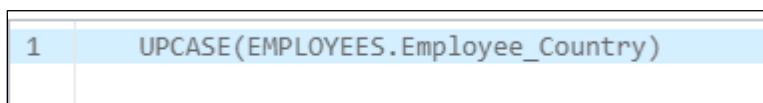
- 1) Click **Select** in the Query.



- 2) Locate **Employee_Country**.

- 3) Select  (**Expression**).

What expression is used to update the column in the query?



1	UPCASE(EMPLOYEES.Employee_Country)
---	------------------------------------

Answer: _UPCASE(EMPLOYEES.Employee_Country)

- f. What filter was applied to the table?

Click **Where** in the query.

Join	Select	Where
<input type="button" value="Edit Expression"/>		
1		EMPLOYEES.Department IN ("Sales" "Purchasing")

Answer: EMPLOYEES.Department IN (“Sales” “Purchasing”)

- g. Click  (**Save**).

- h. To sign out of Visual Data Builder, select **Lynn** ⇒ **Sign out** in the upper right corner.

End of Solutions

Solutions to Activities and Questions

2.01 Activity – Correct Answer

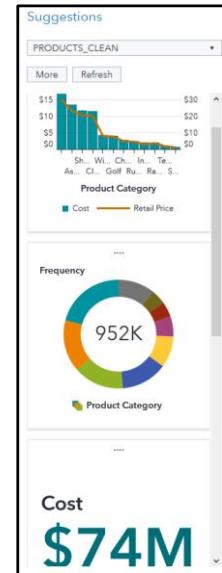
- Sign in to SAS Visual Analytics using Eric's credentials.
- Create a new report using Report Builder.
- Select the **Products_clean** table to analyze.

What objects are suggested for analyzing the **Products_clean** table?

Which one is your favorite?

Add one or two suggested objects to the canvas.

Answers can vary.



sas

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2.02 Activity – Correct Answer

Given the values for **Quantity**, **Total Revenue**, and **Unit Cost**, how would you calculate **Profit**?

Quantity	Total Revenue	Unit Cost
1	\$191.00	\$160.90
4	\$499.20	\$107.20
1	\$173.00	\$145.50
1	\$56.90	\$51.90
4	\$740.40	\$155.40

Profit = Total Revenue-(Unit Cost*Quantity)

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sas

2.03 Activity – Correct Answer

Given the values for **Order_Date** and **Delivery_Date**, how would you calculate **Days to Delivery**?

Days to Delivery = Delivery_Date – Order_Date

In SAS, dates are stored as the number of days since January 1, 1960.

Order_Date	Delivery_Date
27Jun2016	01Jul2016
31Mar2012	04Apr2012
26Feb2014	27Feb2014
08Nov2016	12Nov2016
17May2013	18May2013

Practice Review

2.1 Accessing and Investigating Data – Solution

View the Data pane and answer the following questions:

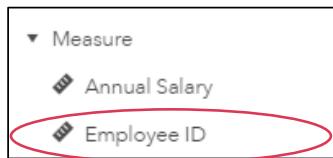
How many unique values does **Company** have? **Job Title**?

Company has 12 distinct values.

Job Title has 9 distinct values.

What is the type (or classification) of **Employee ID**?

Measure



Category	
Company - 12	
Department - 3	
Employee Birth Date - 604	
Employee Country - 11	
Employee Hire Date - 240	
Employee Termination ... - 62	
EmployeeName - 648	
Group - 15	
Job Title - 9	
Section - 3	
Title - 3	



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2.1 Accessing and Investigating Data – Solution

View the list table and answer the following questions:

What is the case of **Employee Country**?

Lowercase

Employee Country
au



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2.1 Accessing and Investigating Data – Solution

View the list table and answer the following questions:

Which data item can be used to determine whether an employee is active (currently employed) or retired (formerly employed)?

If Employee Termination Date is missing, the employee is active (currently employed).

If Employee Termination Date is not missing, the employee is retired (formerly employed).

Employee Termination Date
.
30Jun2010
.
.
.
.
31Jan2010

Active

Retired



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2.1 Accessing and Investigating Data – Solution

View the crosstab of **Department** and **Job Title** and answer the following question:

Which department contains the missing job title?

Stock & Shipping

Filter the table to include only employees in the Purchasing and Sales departments.

Department	Job Title	Frequency
Purchasing	Purchasing Agent I	1
	Purchasing Agent III	2
Sales	Sales Rep. I	215
	Sales Rep. II	172
	Sales Rep. III	111
	Sales Rep. IV	49
	Temp. Sales Rep.	72
	Trainee	25
	Stock & Shipping (missing)	1

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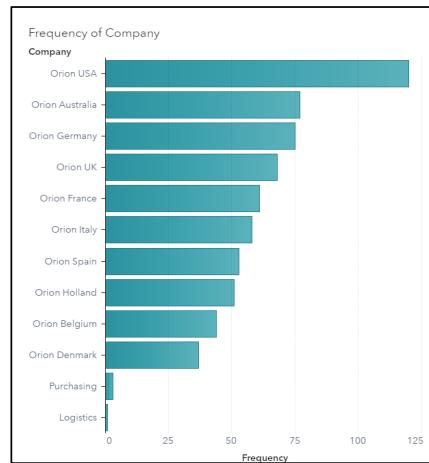
2.1 Accessing and Investigating Data – Solution

Create an autochart of **Company** and answer the following questions:

What is the largest company? The smallest?

Orion USA is the largest company with the most employees (120).

Logistics is the smallest company with the fewest employees (1).



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2.1 Accessing and Investigating Data – Solution

View the measure details (from the Data pane) and answer the following questions:

What is the minimum total profit generated by an employee? The maximum? The average? The total profit generated by all employees?

Minimum- 11.10

Name	↓	Minimum	Maximum	Average	Sum
Total Profit		11.10	19,146,779.62	109,148.07	70,727,947.65

Maximum- 19,146,779.62

Average- 109,148.07

Total (sum)- 70,727,947.65

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2.2 Preparing Data: Part 1 – Solution

View the input properties from the query and answer the following question:

What is the name of the input table?

EMPLOYEES

Inputs

Name:
EMPLOYEES

Alias:
EMPLOYEES

Location:
/Shared Data/Basics/Source Data

Library:
/Shared Data/Basics/Source Data/Basics Source

DEFAULT AGGREGATIONS

Auto-aggregate:
Disabled

Aggregations:

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2.2 Preparing Data: Part 1 – Solution

View the output properties from the query and answer the following question:

What is the name of the output table?

EMPLOYEES_CLEAN

Outputs

Table:
EMPLOYEES_CLEAN

Location:
/Shared Data/Basics/Practices (HR)

Library:
/Products/SAS Visual Analytics Admin...

Partition by:
(none)

STAGING

Use a staging table

Table:
EMPLOYEES_CLEAN

Location:
/Shared Data/Basics/Practices (HR)

Library:
/Products/SAS Visual Analytics Admin...

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2.2 Preparing Data: Part 1 – Solution

Locate the **Employee_Country** in the query. What expression is used to update the column in the query?

UPCASE(EMPLOYEES.Employee_Country)

1	UPCASE(EMPLOYEES.Employee_Country)
---	------------------------------------

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2.2 Preparing Data: Part 1 – Solution

What filter was applied to the table?

EMPLOYEES.Department IN ("Sales" "Purchasing")

Join	Select	Where
1	EMPLOYEES.Department IN ("Sales" "Purchasing")	

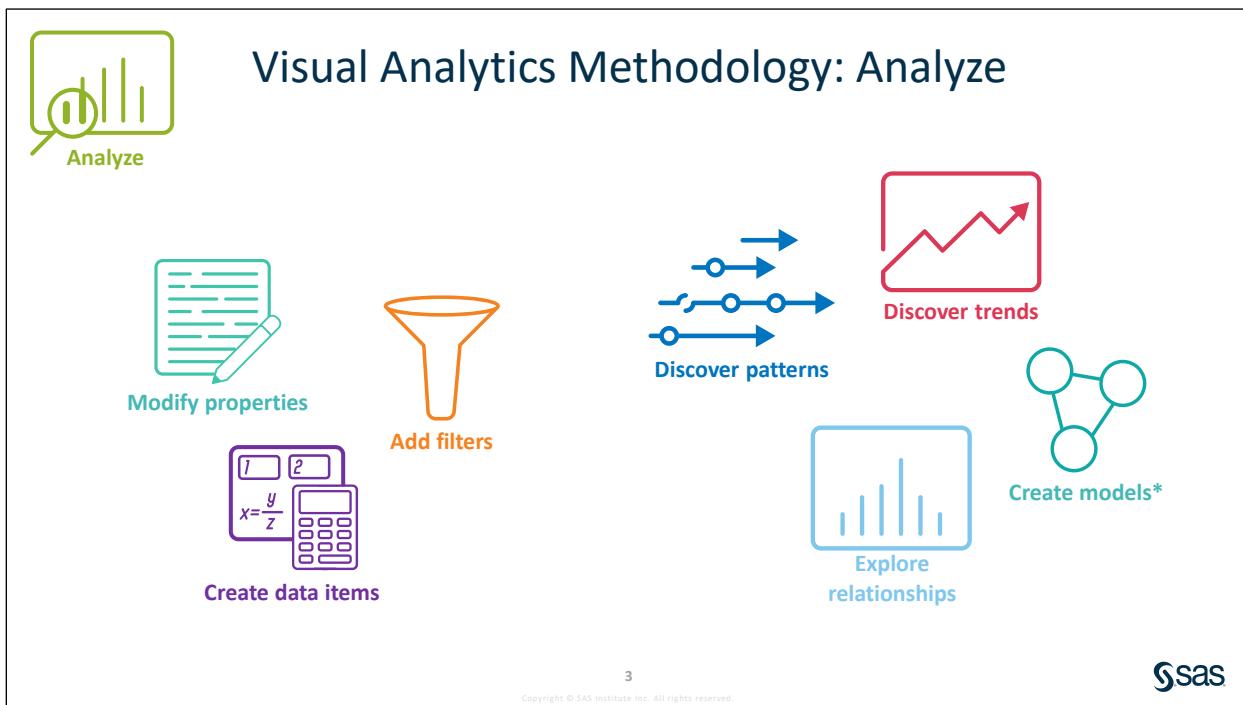
39

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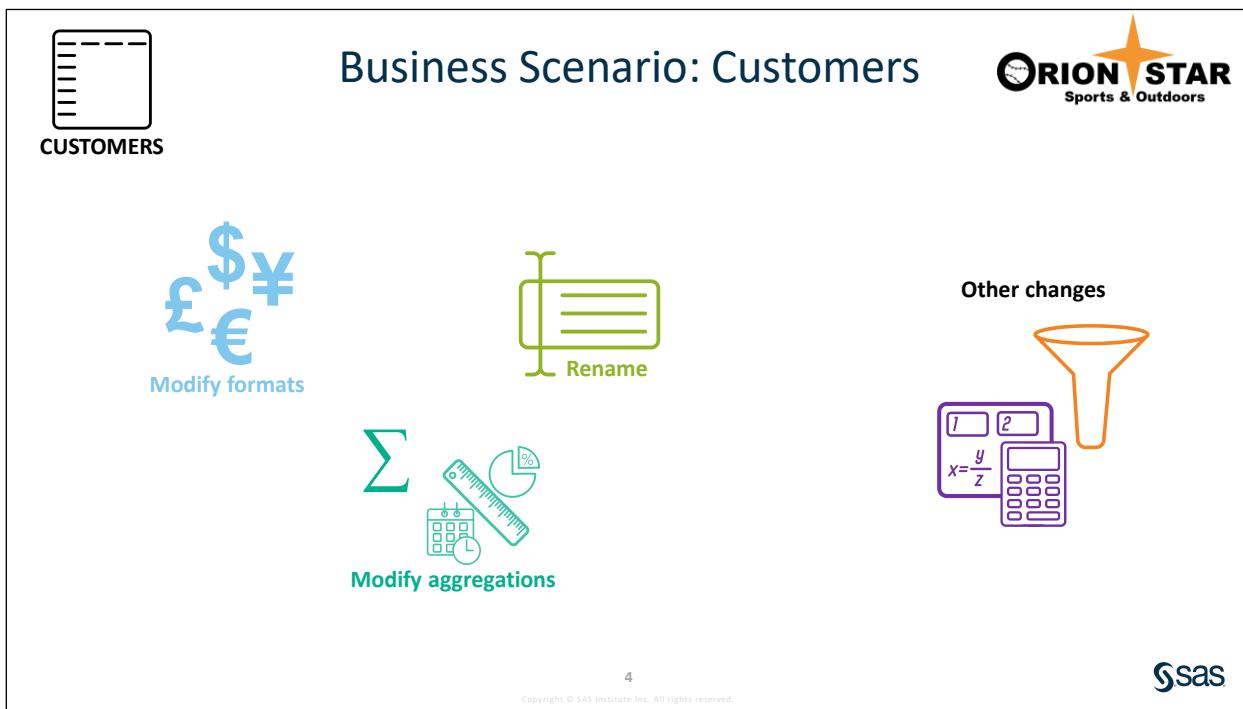
Lesson 3 Analyzing Data Using SAS® Visual Analytics

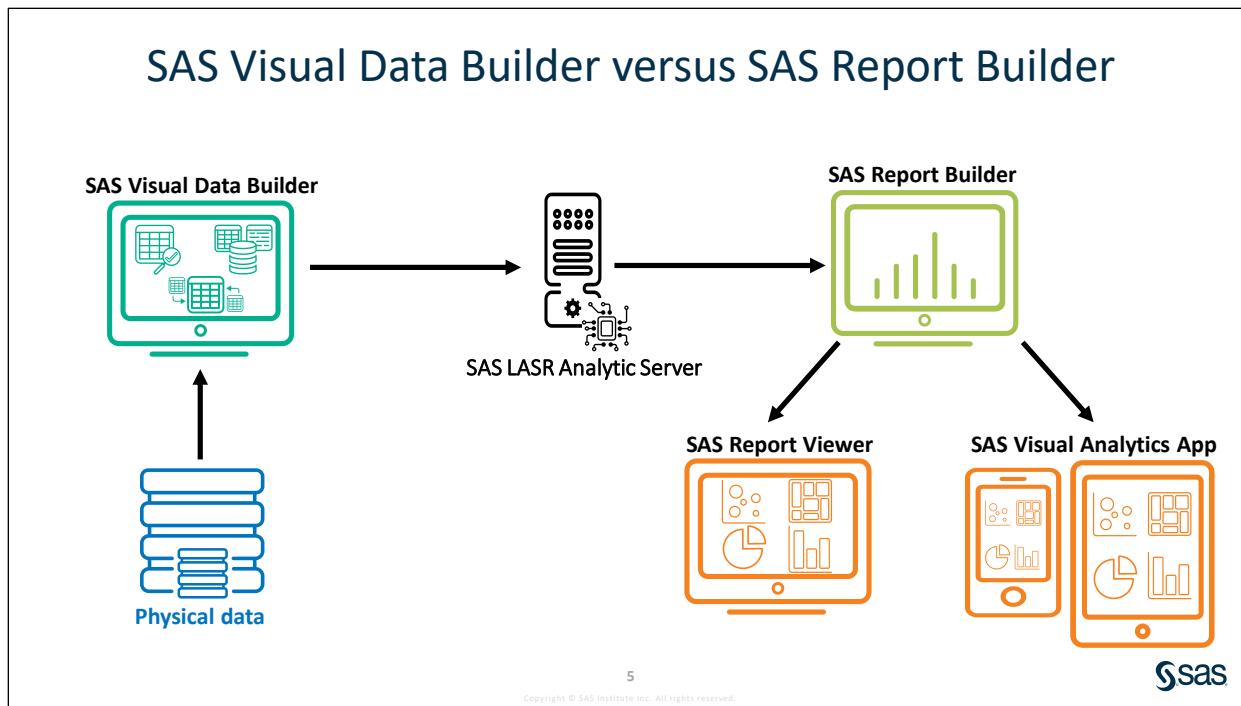
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3.1 Working with Data Items



* Creating, testing, and comparing models can be accomplished with SAS Visual Statistics and SAS Visual Data Mining and Machine Learning.





In the Report Builder Data pane, an icon next to each data item indicates the classification of data item. The following types of data items are available:

Category		A data item whose distinct values are used to group and aggregate measures.
Date and Time		A category data item whose distinct values are used to group and aggregate measures. There are three types of date categories: date, datetime, and time.
Custom Category		A data item that can be created based on either a category or numeric data item. A custom category is always a category data item with alphanumeric values.
Calculated (category)		A data item that is calculated from existing data items using an expression and returns an alphanumeric value.
Calculated (datetime)		A data item that is calculated from existing data items using an expression and returns a datetime value. Calculated dates and times are treated as categories with distinct values being governed by the chosen date or time format.
Geography		A category data item whose values are mapped to geographical locations or regions. These data items can be used to show data on a geographic map.
Hierarchy		A data item with a predefined arrangement of category data items, typically whose values are arranged with more general information at the top and more specific information at the bottom. The first level of the hierarchy is known as the <i>root</i> level.
Geographic Hierarchy		A hierarchy whose members are all geographic data items.

Interaction Effect		A user-created data role that can be used when there is a nonadditive relationship between two variables (the effect of one variable on a model changes as another variable changes). SAS Visual Statistics must be licensed for you to create and use an interaction effect.
Measure		A data item whose values can be used in computations. These values are numeric. By default, almost all measures have an aggregation of Sum, but the aggregation can be modified.
Calculated (measure)		A data item that is calculated from existing data items using an expression and returns a numeric value. Numeric data items are treated as measures (with an aggregation of Sum), or they can be changed to category data items.
Frequency		A measure data item whose value represents the number of observations in the selected data source. This data item is automatically added to the Data pane under the Measure group. You cannot change the classification for this data item. This data item is automatically assigned to some report objects when no measure is assigned.
Frequency Percent		A measure data item whose value represents the percentage of observations in the selected data source. This data item is automatically added to the Data pane under the Aggregated Measure group. You cannot change the classification for this data item.
Aggregated Measure or Time Period Calculation		A data item that represents special predefined operations, like distinct count, percentage of totals, percentage of subtotals, or frequency percent. Users can also create their own aggregated measure calculations. Aggregated measures cannot be used in all report objects, filters, controls, spark lines, or time series graphs. Some aggregated measures cannot be used in a detail rank. Percentage of subtotal items can be used only in a crosstab.



Working with Data Items

This demonstration illustrates how to modify data item properties (name, format, aggregation) in Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Select **Report Builder** in the Action Button area.
6. In the Welcome window, click **Data**.
7. In the Open Data Source window, click **CUSTOMERS_CLEAN**.

The screenshot shows the 'Open Data Source' window. At the top, there are buttons for 'All' and 'Recent', and a 'Filter' search bar. Below this, a section titled 'All data sources:' lists three items: 'CATEGORIES', 'COURSES', and 'CUSTOMERS_CLEAN'. The 'CUSTOMERS_CLEAN' item is highlighted with a blue selection bar at the bottom of the list.

8. Click **OK**.

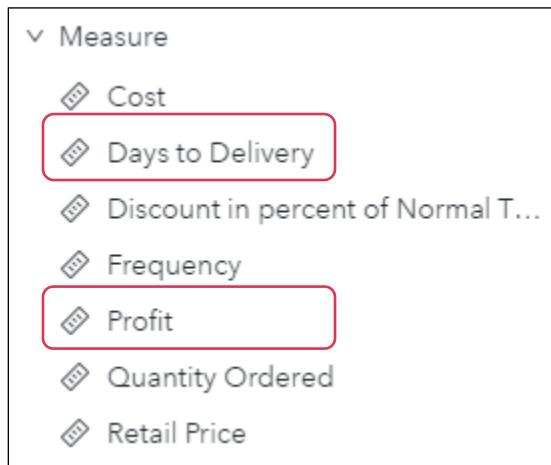
The Data pane is displayed, and it contains a list of data items from the **CUSTOMERS_CLEAN** table.

The screenshot shows the SAS Data pane with the title "Data" at the top. Below the title is a dropdown menu set to "CUSTOMERS_CLEAN". There is also a "Filter" search bar. The main area lists data items categorized into "Category" and "Measure".

- + New data item
- ∨ Category
 - nl City Name - 11K
 - nl Continent Name - 5
 - cal Customer Birth Date - 4.4K
 - nl Customer Country - 47
 - nl Customer Group Name - 3
 - nl Customer ID - 68K
 - nl Customer Type Name - 7
 - nl Customer_FirstName - 16K
 - nl Customer_LastName - 42K
 - cal Date Order was Deliv... - 1.8K
 - cal Date Order was place... - 1.8K
 - nl Order ID - 748K
 - nl Order Type - 3
 - nl Postal code - 19K
 - nl State Name - 272
 - nl Title - 2
- ∨ Measure
 - di Cost
 - di Days to Delivery
 - di Discount in percent of Normal T...
 - di Frequency
 - di Profit
 - di Quantity Ordered
 - di Retail Price

9. Verify that the new columns created in SAS Visual Data Builder (**Days to Delivery** and **Profit**) appear in the Measure group.

Note: Numeric (double) data items appear as measures in Report Builder.



10. Modify properties for a data item, **Date Order was Delivered**.

- In the Category group, right-click **Date Order was Delivered**.
- Select **Format** \Rightarrow **More formats**.
- Select **MMYY YYYY**.
- Click **OK**.
- Click (Edit properties) next to **Date Order was Delivered**.
- Enter **Delivery Date** in the **Name** field and press **Enter**.

11. Modify properties for a data item, **Profit**.

- In the Measure group, click (Edit properties) next to **Profit**.
- Click (Edit) for the **Format** field.
- If needed, change **Width** to **12**.
- If needed, change **Decimals** to **2**.
- Click **OK**.
- Click (Edit Properties) to collapse the data item.

12. Modify properties for a data item, **Discount in percent of Normal Total Retail Price**.

- In the Measure group, click (Edit properties) next to **Discount in percent of Normal Total Retail Price**.
- Select **Average** for the **Aggregation** field.
- Enter **Discount** in the **Name** field and click (Edit properties) to collapse the data item.

13. Modify the aggregation for a data item, **Days to Delivery**.

- In the Measure group, click  (Edit properties) next to **Days to Delivery**.
- Select **Average** for the **Aggregation** field.
- Enter **Average Days to Delivery** in the **Name** field and click  (Edit properties) to collapse the data item.

14. Rename data items.

- In the Category group, click  (Edit properties) next to **Date Order was placed by Customer**.
- Enter **Order Date** in the **Name** field and click  (Edit properties) to collapse the data item.
- In the Measure group, click  (Edit properties) next to **Cost**.
- Enter **Unit Cost** in the **Name** field and click  (Edit properties) to collapse the data item.
- In the Measure group, click  (Edit properties) next to **Quantity Ordered**.
- Enter **Quantity** in the **Name** field and click  (Edit properties) to collapse the data item.
- In the Measure group, click  (Edit properties) next to **Retail Price**.
- Enter **Total Revenue** in the **Name** field and click  (Edit properties) to collapse the data item.
- If necessary, click **Clear Selection** at the bottom of the data pane to release any selected data items.

15. Save the report.

- In the upper right corner, click  (Menu) and select **Save as**.
- Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
- Enter **VA1-Demo3.1** in the **Name** field.
- Click **Save**.

16. Select **Eric**  **Sign out** in the upper right corner.

End of Demonstration



EMPLOYEES

Practice Scenario: Employees





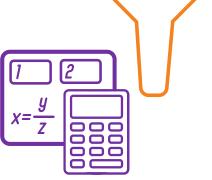
View table



Rename



Modify formats



Other changes



Modify classifications



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Practice

1. Working with Data Items

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice3.1** report from the **Shared Data/Basics/Practices (HR)** folder.
- View the data items in the Data pane and answer the following questions:

What is the classification of **Employee ID? Manager at 1. level?**

Answer: _____

What does the **Frequency** data item represent?

Answer: _____

- Change the classification for **Manager at 1. level** to **Category**.
- Change the format for **Annual Salary** to **Dollar13.2**.
- Rename the following data items:

Old name	New name
Employee ID	ID
EmployeeName	Name
Manager at 1. level	Manager ID
Frequency	Number of Employees

Note: Click  (**Actions**) and select **Refresh data source** at the top of the Data pane to collapse the data item properties.

- Save the report.
- Sign out of Report Builder.

End of Practices

3.2 Exploring Data with Charts and Graphs

Business Scenario: Customers

Marketing

Focus group

Range of profits

Order Type

Continent

Orion Star Sports & Outdoors

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Objects: Graphs (Descriptive)

Histogram Data:

Quantity Bin	Frequency
0-1	500,000
1-2	300,000
2-3	100,000
3-4	10,000
4-5	5,000
5-6	0
6-7	0
7-8	0
8-9	0
9-10	0
10+11	0

Box Plot Data:

Order Type	Min	Q1	Median	Q3	Max
Catalog Sale	0	2	3	5	30
Internet Sale	0	2	3	5	30
Retail Sale	0	2	3	5	30

Use a *histogram* to view the distribution of a single measure.

Use a *box plot* to view information about the variability of the data and extreme values.

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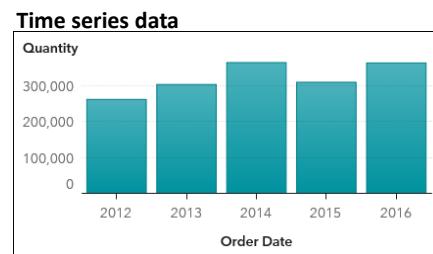
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Histogram	The histogram contains a series of bars that represent the number of observations (or percentage of all observations) for a measure that fit in a specified value range (or bin). The shape of the distribution can be affected by the number of bins specified for the histogram.
Note:	If you use the default number of bins, then the minimum and maximum values on the histogram might not match your actual data values. However, if you specify the number of histogram bins, then the minimum and maximum values on the histogram match your actual data values exactly.
Box plot	The size and location of the box indicate the range of values between the 25 th and 75 th percentile (or the interquartile range). The diamond marker inside the box indicates the mean value, and the line inside the box indicates the median value. You can modify options to display outliers in the plot. Outliers are data points whose distance from the interquartile range are more than 1.5 times the size of the interquartile range. The whiskers (lines protruding from the box) can indicate either minimum and maximum values of the plot or the range of values outside of the interquartile range but close enough not to be considered outliers. If there are many outliers, the range of outlier values is represented by a bar colored to represent the number of values inside the outlier range (as seen above).

Objects: Graphs (Descriptive)

Use a *bar chart* to compare summarized data for the following:



Bar chart

A bar chart displays data aggregated by the distinct values of a category. By default, the bars are sorted by descending order of the value of the first measure. For ranked bars, the data is sorted based on the values of the rank. Stacked bar charts enable you to compare totals for each category, as well as totals for all categories. However, comparing segments is difficult, and when there are many segments in the chart, it is difficult to read. To see relative differences (parts of a whole) in a bar chart, select **Normalize groups to 100%** for the **Group scale** option.

Note: Nominal values are categories whose data has no particular order.

3.01 Multiple Choice Question

Which graph would help you determine whether a measure is normally distributed?

- a. distribution plot
- b. box plot
- c. histogram
- d. normality plot



Exploring Data: Part 1

This demonstration illustrates how to use the automatic chart to explore data and modify roles and options for charts and graphs in Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.
 2. Enter **Eric** in the **User ID** field.
 3. Enter **Student1** in the **Password** field.
 4. Click **Sign In**.
 5. Select **Report Builder** in the Action Button area.
- The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo3.2a** to open the report.
 7. Turn off automatic graph titles.
 - a. In the upper right corner, select **Eric** \Rightarrow **Settings**.
 - b. Select **General** under **SAS Visual Analytics** on the left side of the window.
 - c. Scroll down to **When adding a new object to a report, use the following default object title settings:**
 - d. For Graphs, change **Automatic title** to **No title**.

When adding a new object to a report, use the following default object title settings:

Tables

Graphs (This section is highlighted with a red border)

Controls

Content

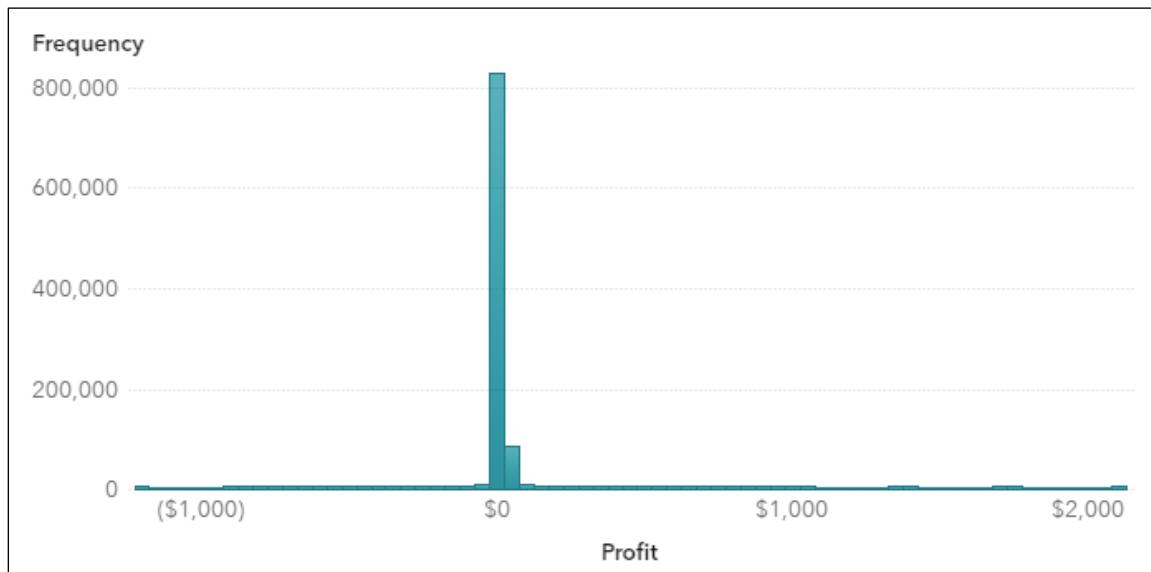
Analytics

- e. Click **Close**.

8. Create an automatic chart.

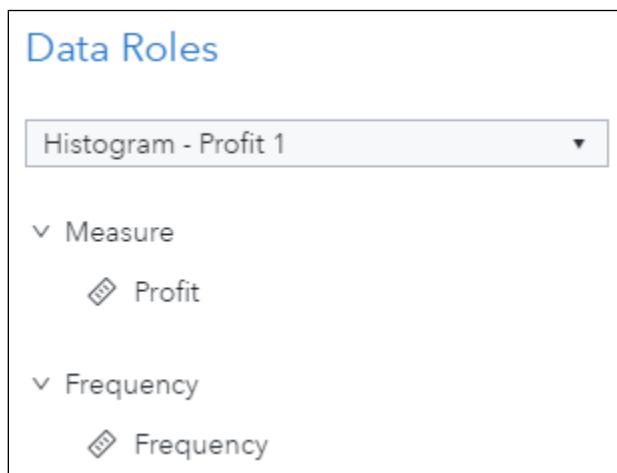
- a. In the left pane, click the **Data** icon.
- b. Drag **Profit** from the Data pane to the canvas.

The automatic chart functionality determines the best way to display the selected data.



A histogram is used to display the distribution of profits

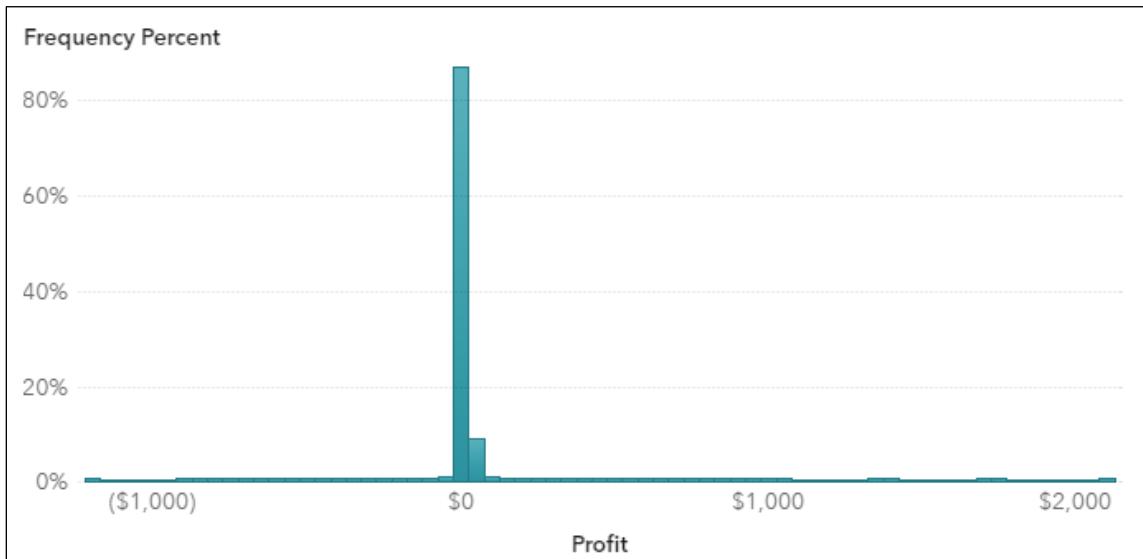
If necessary, click the **Roles** icon in the right pane.



A histogram accepts two roles, Measure and Frequency.

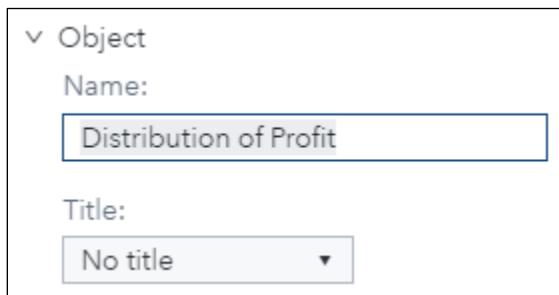
- c. For the **Frequency** role, select **Frequency** ⇒ **Frequency Percent**.

The histogram is updated to use frequency percent for the Y axis.

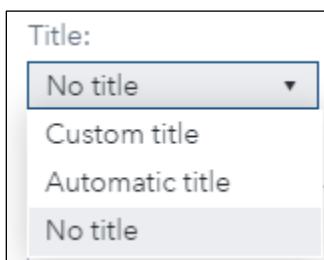


- d. In the right pane, click the **Options** icon.

- 1) Expand the **Object** group.
- 2) Enter **Distribution of Profit** in the **Name** field.
- 3) Verify that **No Title** is selected in the **Title** field.

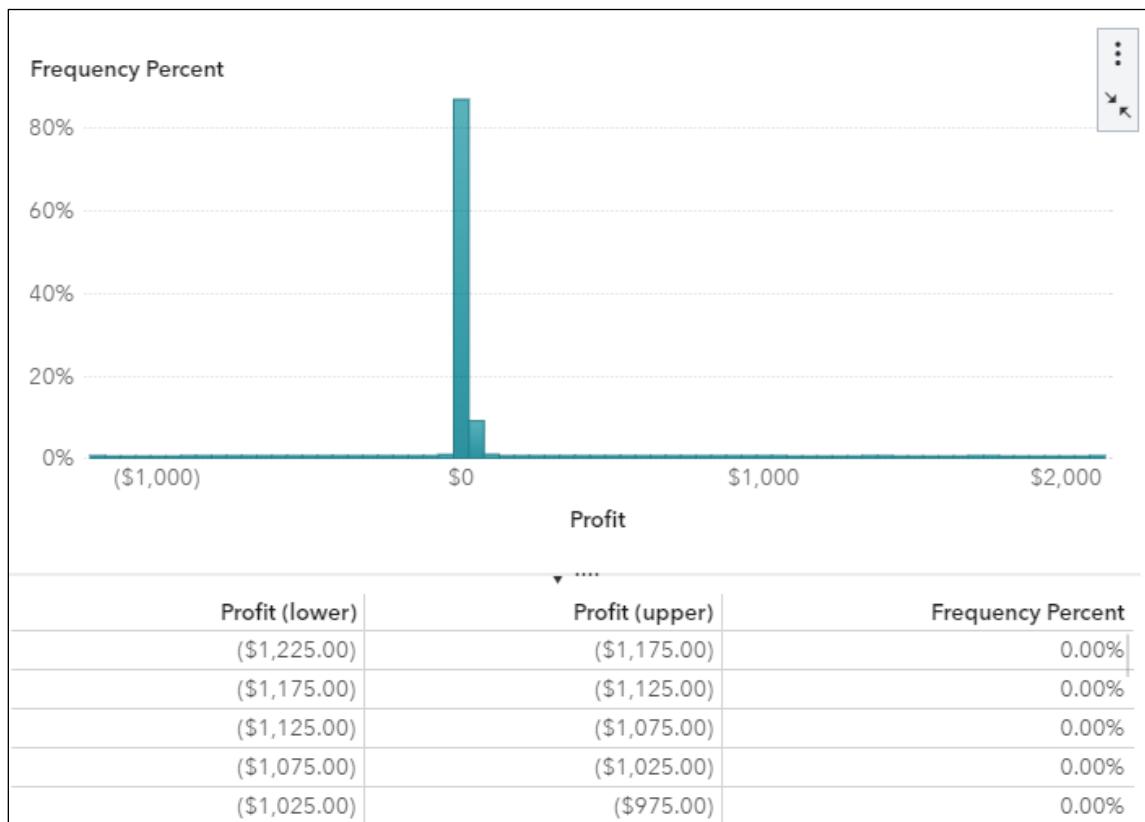


Note: The **Automatic title** setting was turned off for Graph objects earlier in this demo. You can turn it on for this Graph by selecting **Automatic title**, or you can create a custom title by selecting **Custom title**.



- e. In the upper right corner of the histogram, click (**Maximize**) to view additional details.

A table of data values is displayed at the bottom of the chart.



- f. Click the highest bar in the graph.
- g. Scroll through the table to find the highlighted row.

Profit (lower)	Profit (upper)	Frequency Percent
(\$75.00)	(\$25.00)	1.08%
(\$25.00)	\$25.00	86.87%
\$25.00	\$75.00	9.18%
\$75.00	\$125.00	1.13%

Most of the products ordered are low profit or profit loss items, in the -\$25 to \$25 range. Why is this problem occurring? Are these products ordered from a similar product area, geographical area, or order type? Could the costs be too high in these areas? What can we do to reduce costs?

- h. In the upper right corner, click  (**Restore**).
9. Create a crosstab.
 - a. In the left pane, click the **Objects** icon.
 - b. Drag the **Crosstab** object, from the Tables group, to the bottom of the canvas.
 - c. In the right pane, click the **Roles** icon.
 - d. For the **Rows** role, select **Add** \Rightarrow **Order Type** and click **OK**.
 - e. For the **Measures** role, select **Frequency** \Rightarrow **Profit**.

The Roles pane should resemble the following:

Data Roles

Crosstab - Order Type 1

- ▼ Columns
 - + Add
- ▼ Rows
 - Order Type
 - + Add
- ▼ Measures
 - Profit
 - + Add

Note: The Measures role is required for the crosstab object.

The crosstab should resemble the following:

Order Type ▲	Profit
Catalog Sale	\$1,153,380.79
Internet Sale	\$981,170.49
Retail Sale	\$6,124,855.53

Profits are much lower in the internet and catalog channels. A company-wide policy mandates that we need to try to improve profits for orders through these channels.

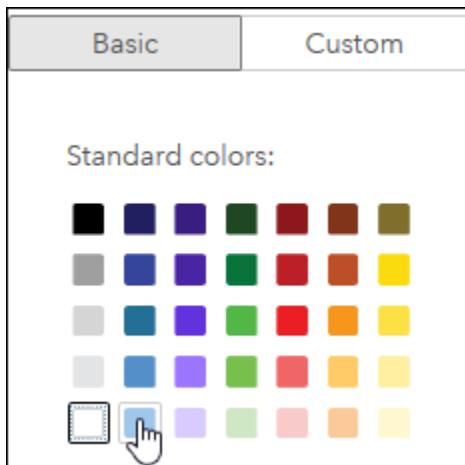
- f. On the Roles tab, for the **Columns** role, select **Add** ⇒ **Continent Name** and click **OK**.

The updated crosstab should resemble the following:

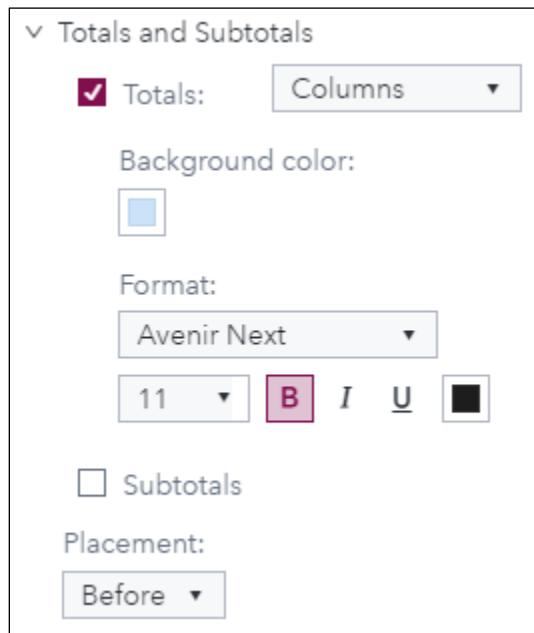
Continent Name ▲	Africa	Asia	Europe	North America	Oceania
Order Type ▲	Profit	Profit	Profit	Profit	Profit
Catalog Sale	\$730.57	\$7,564.99	\$670,252.82	\$423,428.89	\$51,403.52
Internet Sale	(\$858.24)	\$7,938.71	\$559,663.83	\$370,621.44	\$43,804.75
Retail Sale	.	.	\$4,429,533.94	\$1,327,595.23	\$367,726.36

- g. In the right pane, click the **Options** icon.
- h. Expand the **Totals and Subtotals** section.
- i. Select the **Totals** check box.

By default, totals are added to rows and columns.
- j. Click **▼** and select **Columns**.
- k. Click  (Select a color) for the **Background color** field.
- l. Select **Pale blue**.



- m. For the **Format** field, click **B** (Bold), if necessary.



The updated crosstab should resemble the following:

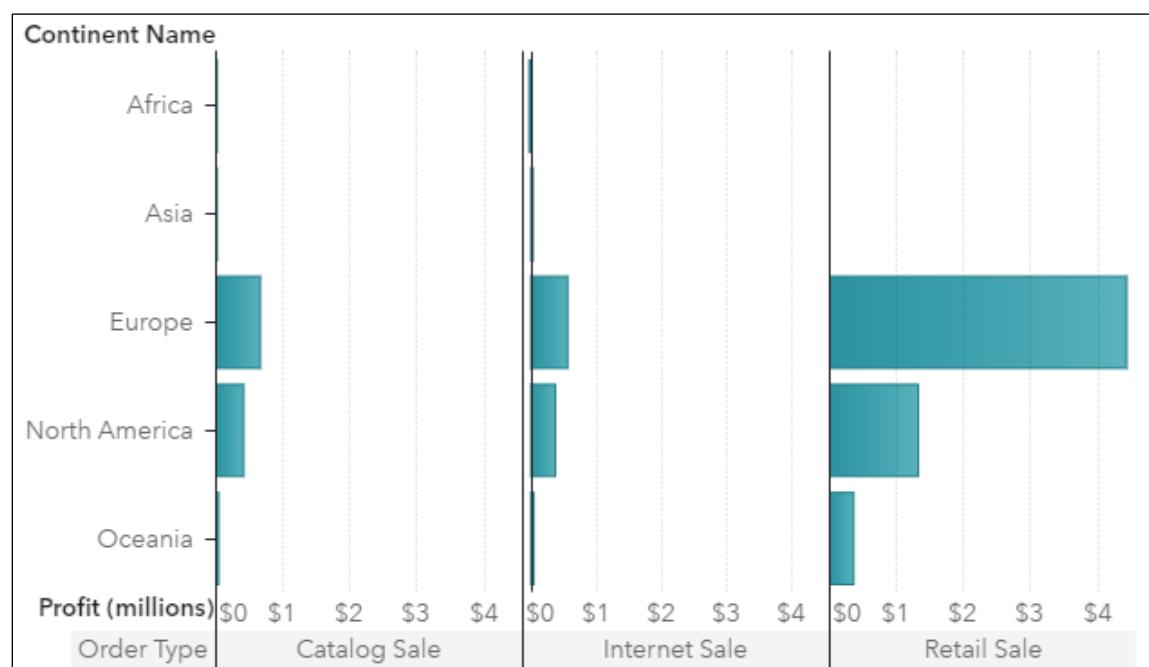
Continent Name ▲	Africa	Asia	Europe	North America	Oceania
Order Type ▲	Profit	Profit	Profit	Profit	Profit
Total	(\$127.68)	\$15,503.70	\$5,659,450.59	\$2,121,645.57	\$462,934.63
Catalog Sale	\$730.57	\$7,564.99	\$670,252.82	\$423,428.89	\$51,403.52
Internet Sale	(\$858.24)	\$7,938.71	\$559,663.83	\$370,621.44	\$43,804.75
Retail Sale	.	.	\$4,429,533.94	\$1,327,595.24	\$367,726.36

Profits are much lower in North America than in Europe. Because our corporate office is in North America, we would expect higher profits. Also notice the loss in Africa for internet sales. Why is this loss occurring? Is this due to start-up operations (for example, building distribution facilities in Africa)? Are the losses consistent over time or has this changed over time?

10. Change the crosstab to a bar chart.

- In the upper right corner of the crosstab, click  (More) and select **Change Crosstab to** **⇒ Bar Chart**.

The bar chart should resemble the following:



- b. In the right pane, click the **Roles** icon.

The screenshot shows the 'Data Roles' pane in SAS Visual Analytics. At the top, a dropdown menu is set to 'Bar - Continent Name 1'. Below it, the pane is organized into several sections:

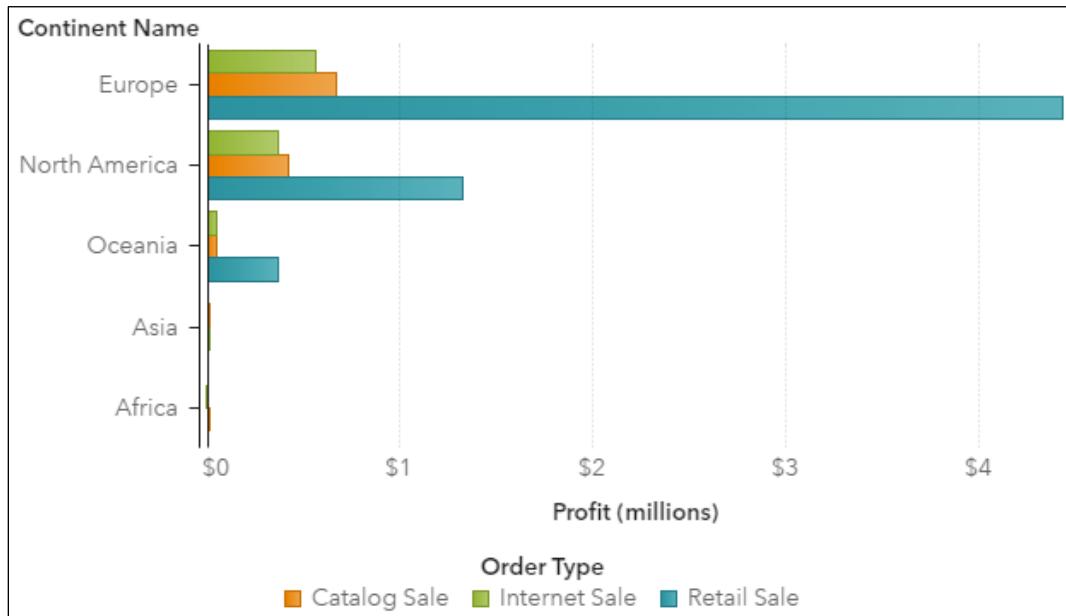
- Category:** Contains an item 'Continent Name'.
- Measure:** Contains an item 'Profit' and a '+ Add' button.
- Group:** Contains a 'Group' item.
- Lattice columns:** Contains an item 'Order Type' and a '+ Add' button.
- Lattice rows:** Contains a 'Group' item.
- Data tip values:** Contains items 'Continent Name', 'Order Type', 'Profit', and a '+ Add' button.
- Animation:** Contains a 'Group' item.
- Hidden:** Contains a 'Group' item.

The bar chart has many more roles available.

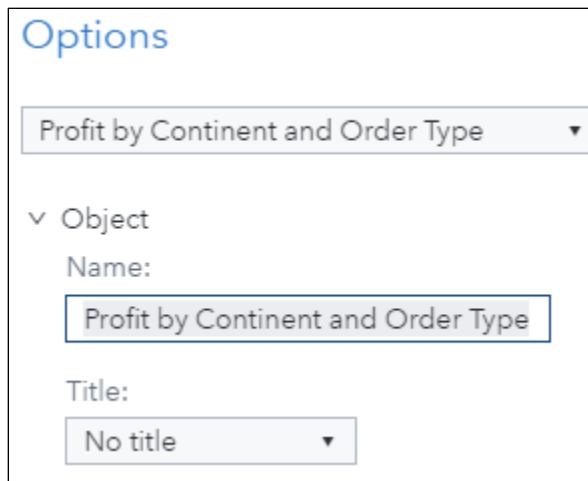
- Category data items can be added to the Group role to show additional bars for each category, or to the Lattice columns and Lattice rows roles to add additional bar charts for each distinct category.
- Category and Measure data items can be added to the Data tip values role to show additional information when you hover over a bar.
- Datetime data items can be added to the Animation role to animate the bar chart.
- Category or date data items can be added to the Hidden role for mapping data sources, adding color-mapped value display rules, or adding external links.

- c. Drag **Order Type**, from the Lattice columns role, to the **Group** role.

The bar chart should resemble the following:



- d. In the right pane, click the **Options** icon.
e. Expand the **Object** group.
f. Enter **Profit by Continent and Order Type** in the Name field.



- g. In the Bar group, for the **Grouping style** field, click (**Stacked**).
h. Select **Data labels**.
i. Select **9** for the **Text style** field.

The Options pane should resemble the following:

▼ Bar

Direction:

Fixed baseline

Spacing:

15%

15%

Transparency:

0%

0%

Combine excluded into "All Other"

Grouping style:

Group scale:

Display actual values ▾

Measure layout:

Automatic ▾

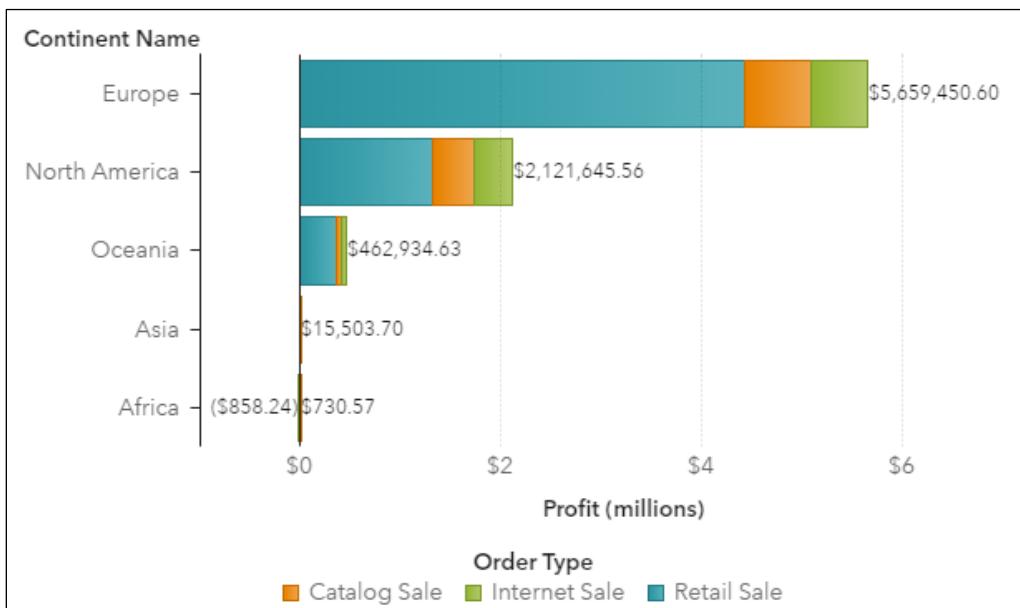
Data labels

Text style:

9 ▾ **B** *I*

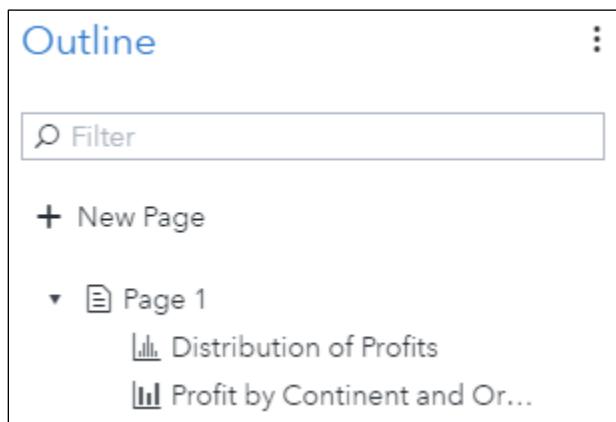
Segment labels

The updated bar chart should resemble the following:



Profits in North America are less than half of total profits in Europe. We need to understand why this discrepancy exists and try to improve profits in non-European countries.

11. In the left pane, click the **Outline** icon.



The Outline pane displays a list of all pages and objects in the report.

12. In the upper right corner, click (**Menu**) and select **Save**.
13. Select **Eric** **Sign out** in the upper right corner.

End of Demonstration

Practice Scenario: Employees

The diagram illustrates a practice scenario for employees across six categories:

- Human Resources:** Represented by two stylized human figures with speech bubbles.
- Promotions:** Represented by two hands shaking.
- Range of salaries:** Represented by a bar chart with a dollar sign icon.
- Department:** Represented by a group of stylized human figures with a target icon above them, a blue circle with a dollar sign, and a red shipping box with double arrows.
- Job Title:** Represented by a person icon inside a square frame.

Logos for **ORION STAR Sports & Outdoors** and **Sas** are also present.

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Practice

2. Exploring Data: Part 1

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice3.2a** report from the **Shared Data/Basics/Practices (HR)** folder.
- Create an automatic chart using the following data items:

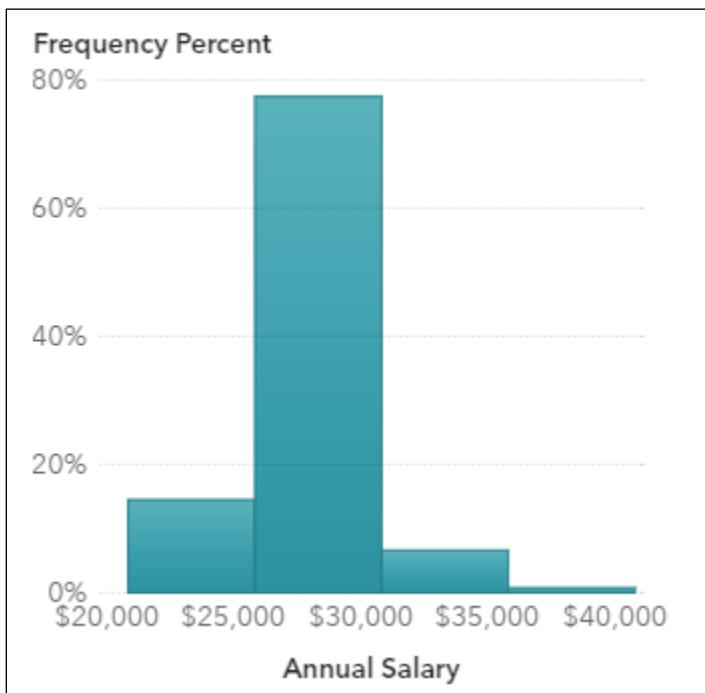
Annual Salary

Frequency Percent

- Modify the following options for the automatic chart:

Name	Distribution of Salary
Bin range	Measure values
Set a fixed bin count	<selected>
Bin count	4

The automatic chart should resemble the following:



- Maximize the histogram to answer the following question:

Into which range do most salaries fall?

Answer: _____

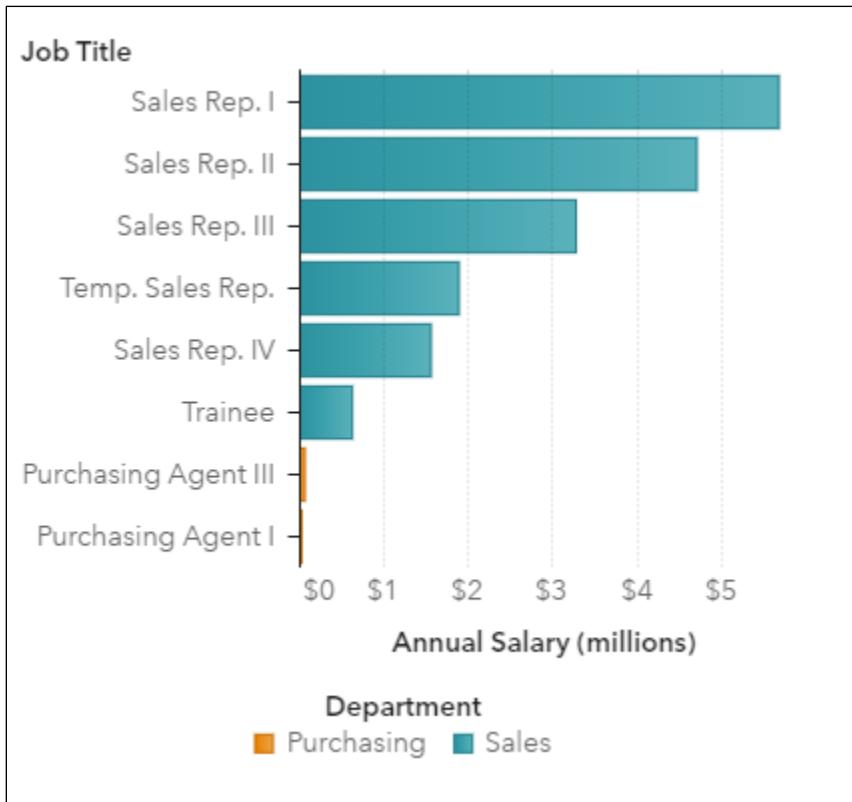
Hint: After answering the question, click  (**Restore**) in the upper right corner.

- f. Add a bar chart on the right of the automatic chart by assigning the following data items to the specified roles:

Category	Job Title
Measure	Annual Salary
Group	Department

- g. Specify **Total Salary by Job and Department** as the name of the bar chart.

The bar chart should resemble the following:



- h. Answer the following questions:

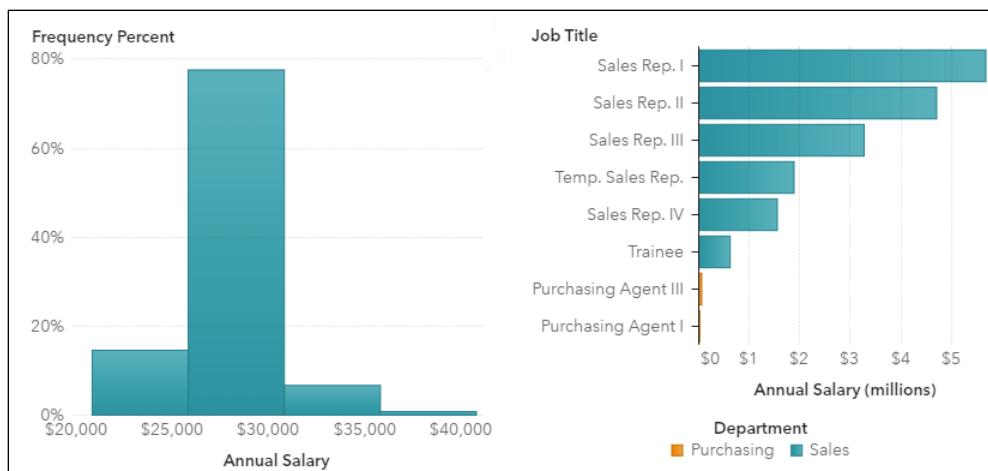
In which department are most of our salary costs spent? For which job title?

Answer: _____

Why do you think salary costs are so much higher for this group?

Answer: _____

The final report should resemble the following:



- i. Save the report.
- j. Sign out of Report Builder.

End of Practices





Exploring Data: Part 2

This demonstration illustrates how to use box plots to explore data in Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
14. Select **Report Builder** in the Action Button area.

The Welcome to SAS Visual Analytics window appears.

5. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1-Demo3.2b** to open the report.
6. In the upper left corner of the report, click the **Page 2** tab.
7. Create a box plot.
 - a. In the left pane, click the **Objects** icon.
 - b. Drag the **Box Plot** object, from the **Graphs** group, to the left side of the canvas.



- c. In the right pane, click the **Roles** icon.
- d. For the **Category** role, select **Add \Rightarrow Order Type**.

- e. For the **Measures** role, select **Add** \Rightarrow **Profit** and click **OK**.

The Roles pane should resemble the following:

Data Roles

Box - Order Type 1

- ✓ Category
 - └ Order Type
- ✓ Measures
 - Profit
 - + Add
- ✓ Lattice columns
 - + Add
- ✓ Lattice rows
 - + Add

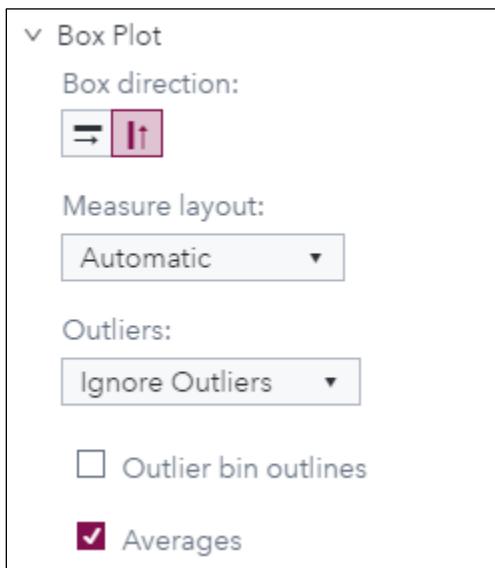
The box plot should resemble the following:



- f. In the right pane, click the **Options** icon.

- g. If necessary, expand the **Object** section.

- h. Enter **Profit by Order Type** in the **Name** field.
- i. In the Box Plot group, select **Ignore Outliers** for the **Outliers** field.
- j. Select the check box for **Averages**.



The box plot should resemble the following:



- k. In the upper right corner of the box plot, click  (Maximize) to view additional details.

The table of data values displays descriptive statistics for **Profit** for each order type.

Order Type	Minimum	Lower Whisker	First Quartile	Average	Median	Third Quartile
Catalog Sale	(\$826.26)	(\$18.63)	\$0.20	\$9.07	\$4.80	\$12.80
Internet Sale	(\$1,222.48)	(\$18.63)	\$0.20	\$9.04	\$4.70	\$12.80
Retail Sale	(\$1,222.48)	(\$17.13)	\$0.10	\$8.55	\$4.25	\$11.60

Even though total profits are highest for the retail sales channel, averages across all channels are very similar, but are a bit higher for catalog and internet sales. This reinforces our company-wide policy to try to increase profits in these channels. Total profits might be higher in retail because there are more customers or more orders for that channel.

- l. In the upper right corner, click  (Restore).
- m. In the upper right corner of the Profit by Continent box plot, click  (Maximize) to view additional details.

The table of data values displays descriptive statistics for **Profit** for each continent.

Continent Name	Minimum	Lower Whisker	First Quartile	Average	Median	Third Quartile
Africa	(\$374.42)	(\$11.70)	\$0.30	(\$0.17)	\$4.80	\$12.60
Asia	(\$258.84)	(\$34.62)	\$1.00	\$13.97	\$6.80	\$25.20
Europe	(\$1,222.48)	(\$17.82)	(\$0.10)	\$8.66	\$4.40	\$11.80
North America	(\$1,222.48)	(\$18.63)	\$0.10	\$9.00	\$4.50	\$12.60
Oceania	(\$646.40)	(\$14.80)	\$0.20	\$7.66	\$3.90	\$10.20

Even though total profits are highest for Europe, averages are higher in North America and Asia. Because our corporate office is in North America, we will start by focusing on increasing profits in North America. Total profits might be higher in Europe because there are more customers or more orders for that continent. Also, note the negative average profits in Africa. Why is this occurring? What can we do to increase profits for that continent?

- n. In the upper right corner, click  (Restore).
8. In the upper right corner, click  (Menu) and select **Save**.
9. Select **Eric**  **Sign out** in the upper right corner.

End of Demonstration

Practice Scenario: Employees

The dashboard illustrates a practice scenario for employees at Orion Star Sports & Outdoors. It features four main sections: Human Resources, Salaries, Sales Rep I, and Sales Rep II. Human Resources shows two people talking. Salaries displays a box plot of salaries with a dollar sign icon. Sales Rep I is represented by an orange icon with a single dollar sign. Sales Rep II is represented by a blue icon with two dollar signs. Sales Rep III is represented by a black icon with three dollar signs. A purple bar chart indicates a salary range of \$20K - \$30K. The SAS logo is in the bottom right corner.

Human Resources

Salaries

Sales Rep I

Sales Rep II

Sales Rep III

\$20K - \$30K

ORION STAR
Sports & Outdoors

sas



Practice

3. Exploring Data: Part 2

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice3.2b** report from the **Shared Data/Basics/Practices (HR)** folder.
- On Page 2, create a box plot by assigning the following data items to the specified roles:

Category	Job Title
Measures	Annual Salary

- Modify the following options for the box plot:

Name	Salary Analysis by Job Title
Outliers	Show Outliers
Show averages	<selected>

The box plot should resemble the following:



- Maximize the box plot to answer the following questions:

Which job title has the highest average salary? The lowest?

Answer: _____

Orion Star has had a great sales year and would like to promote some employees. With which job title would you recommend starting the promotion analysis? Why?

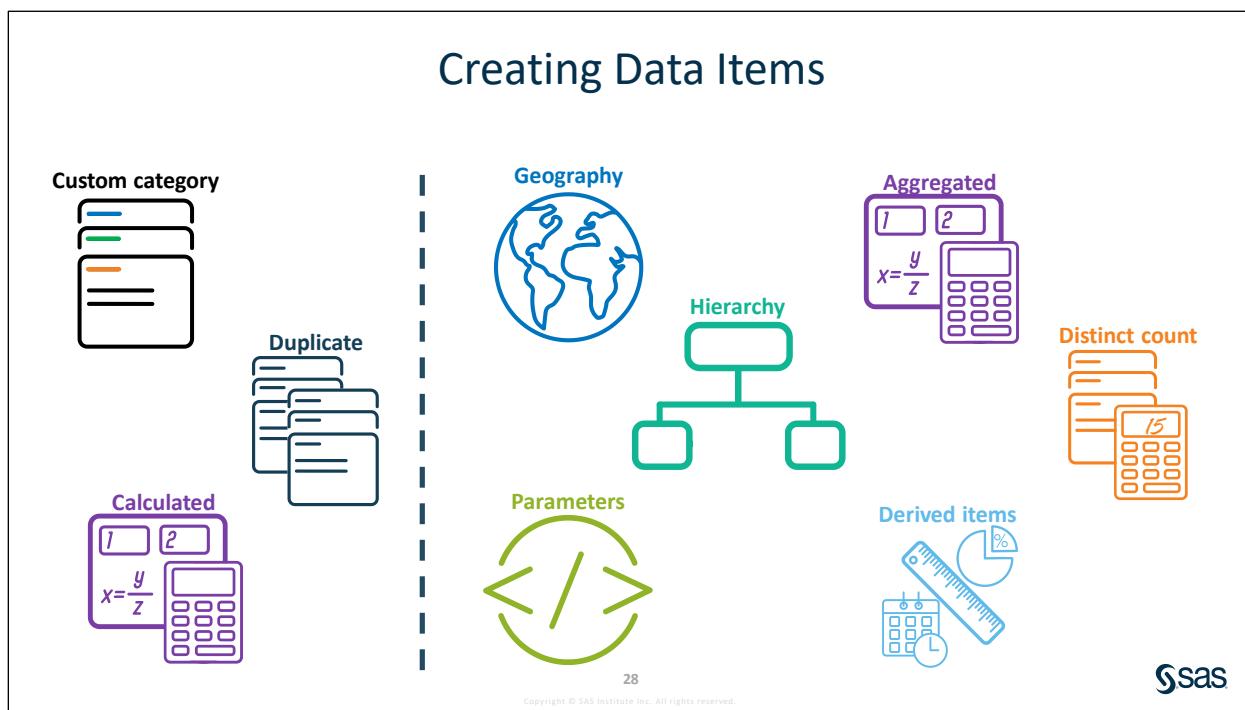
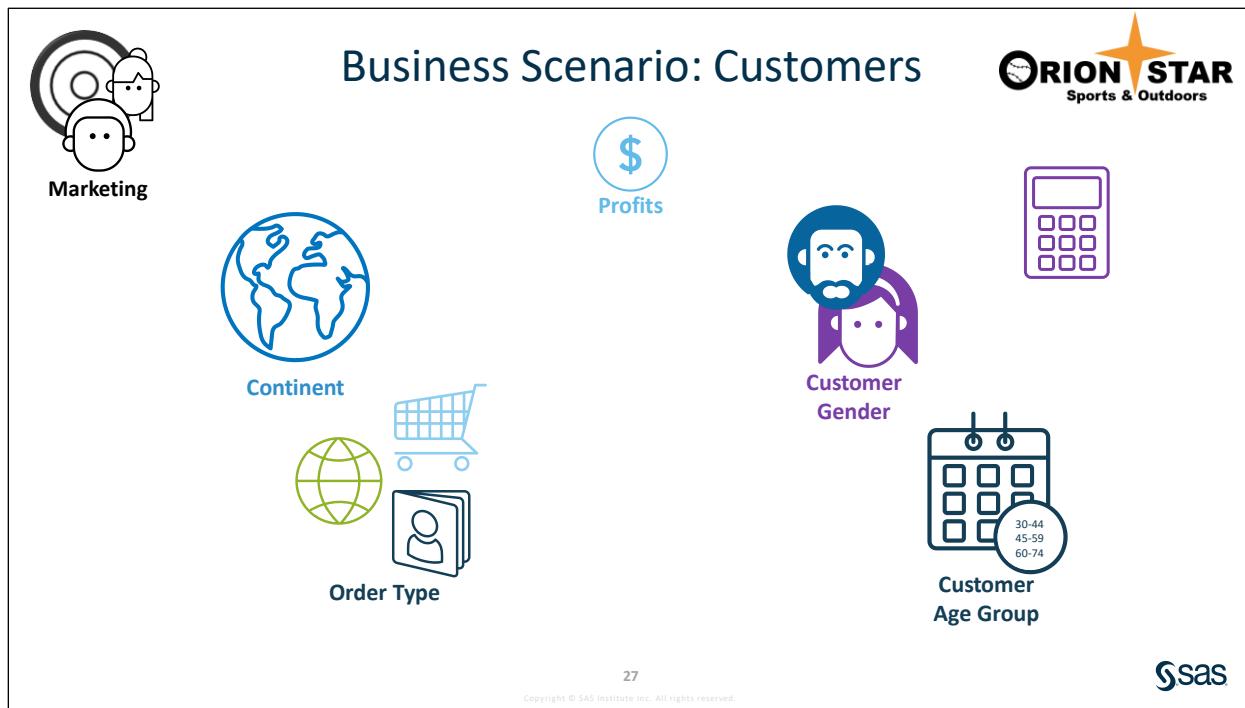
Answer: _____

Hint: After answering the question, click (**Restore**) in the upper right corner.

- Save the report.
- Sign out of Report Builder.

End of Practices

3.3 Creating Data Items and Applying Filters



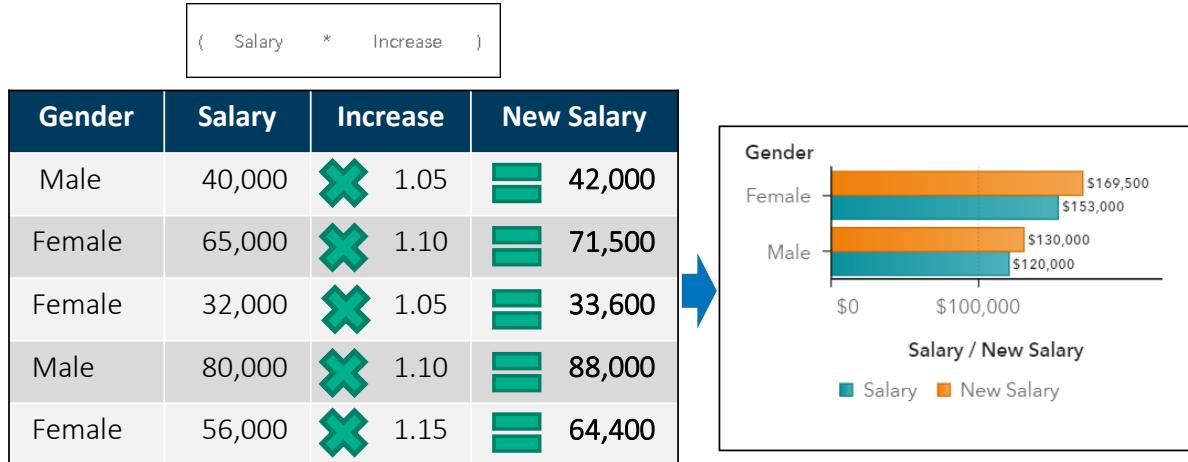
Duplicate	Both measures and categories can be duplicated (copied) in Visual Analytics. Duplicating measures enables you to compare the data using different aggregations in a table or graph or change the classification to a category for grouping other values in tables or graphs. Duplicating datetime values enables you to apply different formats to the values for use in tables or graphs. Duplicating calculated items enables you to make variations to a calculation. For more information about duplicating data items, see “Working with Data Items in a Report” in the <i>SAS® Visual Analytics 7.5: Working with Report Data</i> documentation.
Distinct count	A distinct count counts the number of distinct values of a category data item as an aggregated measure. This means that the calculation changes depending on the other data items available in the graph. For example, you can see the number of orders placed for each gender or the number of orders placed for each country by creating a distinct count from Order ID . For more information about creating distinct counts, see “Working with Data Items in a Report” in the <i>SAS Visual Analytics 7.5: Working with Report Data</i> documentation. Note: If the category contains missing values, the distinct count is increased by one. A configuration setting can modify this behavior.
Calculated	The following types of calculated items can be created: Calculated item- Calculated items are created by performing mathematical calculations on numeric values, or by performing operations on datetime data items or categories. All calculations are performed on unaggregated data. That is, the expression is evaluated for each row in the data source. Aggregated measure- Aggregated measures enable you to calculate new data items using aggregated values. This means that the calculation changes depending on the other data items available in the graph. For example, you can see the profit margin for each region or by each store. For more information about creating calculated data items, see “Working with Calculated Items in a Report” in the <i>SAS Visual Analytics 7.5: Working with Report Data</i> documentation. For more information about operators, see “Reference: Operators for Data Expressions” in the <i>SAS Visual Analytics 7.5: Working with Report Data</i> documentation.
Geography	A geography data item is a category whose values are mapped to geographical locations or regions. Geography data items can be used with geo maps and other report objects. Geography data items can be created using predefined roles (for example, country names), by associating latitude and longitude coordinates with the values (custom), or by associating shape files with map regions. Shape files need to be imported into SAS for custom polygonal shapes. For more information about adding custom polygons, see “Geographic Maps” in the <i>SAS Visual Analytics 7.5: Administration Guide</i> . For more information about creating geography data items, see “Working with Geography Data Items” in the <i>SAS Visual Analytics 7.5: Working with Report Data</i> documentation.

Hierarchy	A hierarchy is a defined arrangement of category data items based on a parent-child relationship. In many cases, the levels of the hierarchy are arranged with the more general information at the top (for example, year) and the more specific information at the bottom (for example, month). Hierarchies enable you to add drill-down functionality to graphs and tables. Hierarchies that consist of all geographic data items are considered geographic hierarchies and can be used in geo maps. Note: You can create a date hierarchy from a date data item. The date hierarchy, by default, will have levels for year, quarter, month, and day. A date hierarchy created from a datetime data item will have levels, by default, for year, quarter, month, day, hour, minute, and second. For more information about hierarchies, see “Working with Hierarchies in a Report” in the <i>SAS® Visual Analytics 7.5: Working with Report Data</i> documentation.														
Custom category	A custom category creates labels for groups of values of category or measure data items. When you create a custom category from a measure data item, you can use ranges or distinct values to group the data. For more information about custom categories, see “Working with Custom Categories in a Report” in the <i>SAS® Visual Analytics 7.5: Working with Report Data</i> documentation.														
Derived items	<p>Derived data items are aggregated measures that display values for the measure and the formula type on which the derived item is based. The following types of derived items can be created from category data items:</p> <table border="1"> <tr> <td>Distinct count</td><td>Displays the number of distinct values for the selected category. For more information, see the distinct count row above.</td></tr> <tr> <td>Count</td><td>Displays the number of nonmissing values for the selected category.</td></tr> <tr> <td>Number missing</td><td>Displays the number of missing values for the selected category.</td></tr> </table> <p>The following types of derived data items can be created from measure data items:</p> <table border="1"> <tr> <td>Difference from previous period</td><td>Displays the difference between the value for the current time period and the value for the previous time period.</td></tr> <tr> <td>Difference from previous parallel period</td><td>Displays the difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.</td></tr> <tr> <td>Percent difference from previous period</td><td>Displays the percentage difference between the value for the current time period and the value for the previous time period.</td></tr> <tr> <td>Percent difference from</td><td>Displays the percentage difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.</td></tr> </table>	Distinct count	Displays the number of distinct values for the selected category. For more information, see the distinct count row above.	Count	Displays the number of nonmissing values for the selected category.	Number missing	Displays the number of missing values for the selected category.	Difference from previous period	Displays the difference between the value for the current time period and the value for the previous time period.	Difference from previous parallel period	Displays the difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.	Percent difference from previous period	Displays the percentage difference between the value for the current time period and the value for the previous time period.	Percent difference from	Displays the percentage difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.
Distinct count	Displays the number of distinct values for the selected category. For more information, see the distinct count row above.														
Count	Displays the number of nonmissing values for the selected category.														
Number missing	Displays the number of missing values for the selected category.														
Difference from previous period	Displays the difference between the value for the current time period and the value for the previous time period.														
Difference from previous parallel period	Displays the difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.														
Percent difference from previous period	Displays the percentage difference between the value for the current time period and the value for the previous time period.														
Percent difference from	Displays the percentage difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.														

	previous parallel period	
	Percent of subtotals	<p>Displays the percentage of the subtotal value for the measure on which it is based. You can create a percentage of subtotal only when the source data item has an aggregation of Sum or Count.</p> <p>Note: The Percent of subtotals derived item is available only for use in crosstabs.</p> <p>Note: The Percent of subtotals derived item is relative to the subset of data that is selected by your filters and ranks.</p>
	Percent of total – sum	<p>Displays the percentage of the total value for the measure on which it is based. You can create a percentage of total only when the source data item has an aggregation of Sum or Count.</p> <p>Note: The Percent of total – sum derived item is relative to the subset of data that is selected by your filters and ranks.</p>
	Period to date	Displays the aggregated value for the current time period and all of the previous time periods within a larger time interval.
	Year to date	Displays the aggregated value for the current time period and all of the previous time periods within the year. The year-to-date calculation subsets the data for each year using today's date (where today is evaluated each time you view the report).
	Year to date growth	Displays the percentage difference between the year-to-date value for the current time period and the year-to-date value for the same time period of the previous year. The year-to-date calculation subsets the data for each year using today's date (where today is evaluated each time you view the report).
	Year over year growth	Displays the percentage difference between the current time period and an equivalent time period from the previous year. The year-over-year calculation subsets the data for each year using today's date (where today is evaluated each time you view the report).
	<p>For more information about derived items, see “Working with Data Items in a Report” in the <i>SAS® Visual Analytics 7.5: Working with Report Data</i> documentation.</p>	
Parameters	<p>A parameter is a variable whose value can be changed and that can be referenced by other report objects. Parameters can be used in control objects in Visual Analytics. When the value of the control changes, the parameter is updated with that value, and any report objects that reference that parameter are updated as well. Parameters can be used in calculations, display rules, filters, ranks, URLs, and text objects. For more information about parameters, see “Working with Parameters in Reports” in the <i>SAS® Visual Analytics 7.5: Working with Report Data</i> documentation.</p>	
Note:	<p>Creating calculated items and aggregated measures is discussed in more detail in the <i>SAS® Visual Analytics 2 for SAS® 9: Advanced</i> course.</p>	
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Calculated Item: Example

Calculated items are created by performing operations on unaggregated data.



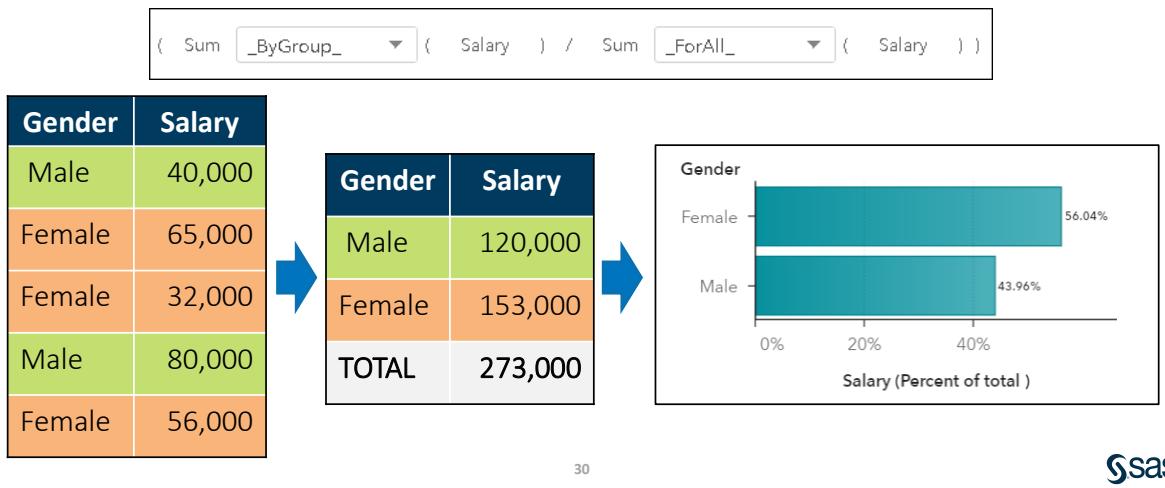
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Aggregated Measure: Example

Aggregated measures are created by aggregating and then performing the operation.



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Note: Distinct counts and derived data items are special types of aggregated measure.

3.02 Activity

Match each new data item with the type of calculation.

Gross Profit Margin (Total Profit/Total Revenue)

Date (from month, day, year)

Hemisphere (from continents)

A. calculated item

GDP Growth (year-over-year)

B. aggregated measure

Number of Employees (distinct count)

State Abbreviations (uppercase)

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Custom Category: Example

Custom categories create labels for groups of category or measure data items.

Custom category

Value Groups

- ▼ Northern
 - Africa
 - Europe
 - Oceania
- ▼ Southern
 - Asia
 - North America

Calculated item

```
IF Continent Name In (multiple selected)
  RETURN "Northern"
ELSE "Southern"
```

(Asia, Europe, North America)

This calculated item and custom category produce equivalent results.

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3.03 Activity

Given the values of **Customer Birth Date** and today's date, how would you calculate **Customer Age**?

Customer Birth Date
01Jan1938
12Feb1940
15Jan1950
20Dec1965
11Jun1975
08Aug1980
01Mar1955



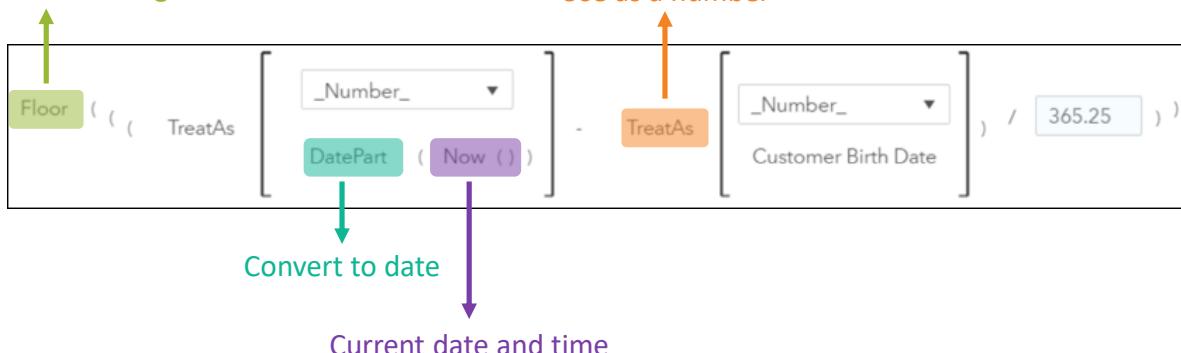
34

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Calculated Columns: Customer Age

Round down to nearest integer

Use as a number



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Note: SAS Visual Analytics treats datetime values as character data. To use numeric operators with datetime values, the **TreatAs** operator is required.



Creating Data Items

This demonstration illustrates how to create new data items (distinct counts, custom categories) in Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Select **Report Builder** in the Action Button area.

The Welcome to SAS Visual Analytics window appears.

6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo3.3a** to open the report.
7. In the upper left corner of the report, click the **Page 3** tab.
8. View new calculated items (**Number of Orders**, **Customer Age**, and **Customer Age Group**).
 - a. In the left pane, click the **Data** icon.
 - b. View **Number of Orders** (new derived data item) in the Aggregated Measure group.

Aggregated Measure

- Frequency Percent
- Number of Orders**

Note: You can view the calculation by right-clicking the calculated item and selecting **Edit**.

Distinct _ByGroup_ (Order ID)

- c. View **Customer Age** (new calculated data item) in the Measure group.

Measure

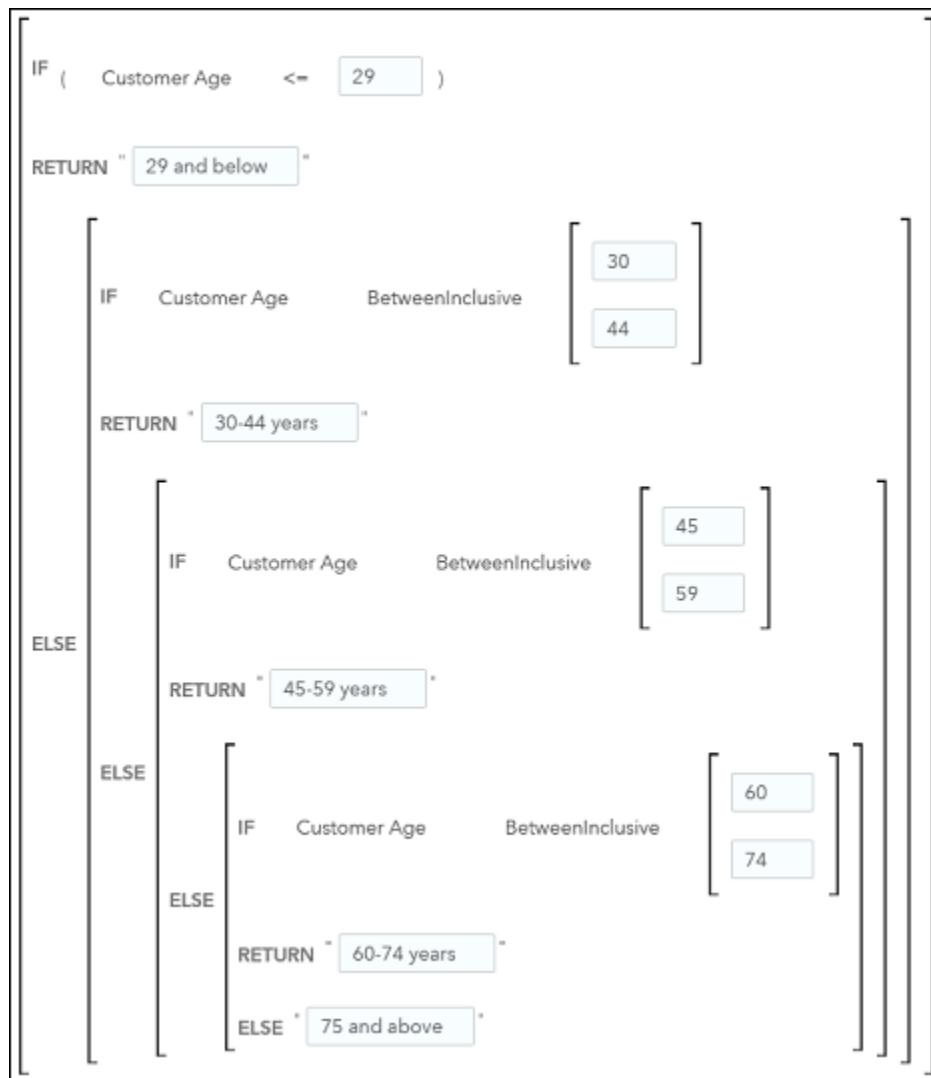
- Customer Age**
- Days to Delivery
- Discount

Note: You can view the calculation by right-clicking the calculated item and selecting **Edit**.

Floor ((TreatAs [_Number_] DatePart (Now ())) - TreatAs [_Number_] Customer Birth Date) / 365.25)

- d. Right-click **Customer Age Group** and select **Edit**.

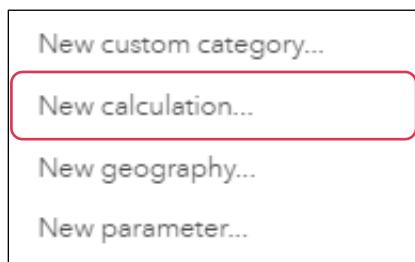
The expression should resemble the following:



- e. Click **Cancel** to close the Edit Calculated Item window.

9. Create new distinct count data items.

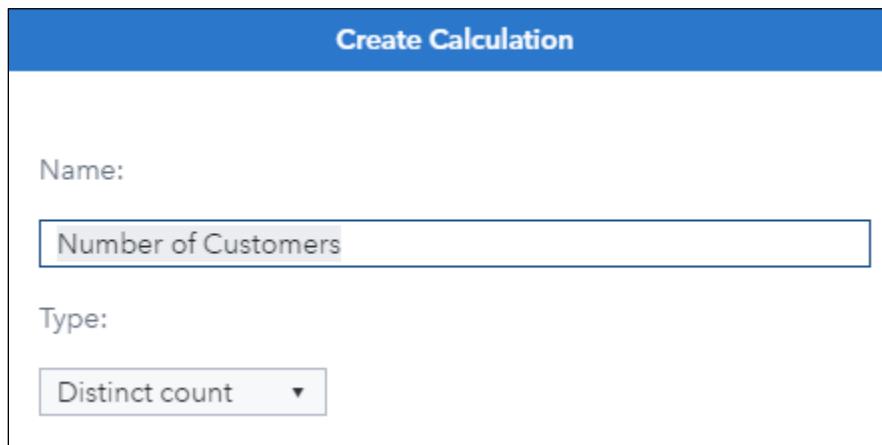
- If necessary, click the **Data** icon in the left pane.
- Right-click **Customer ID** in the Category group and select **New calculation**.



- Enter **Number of Customers** in the **Name** field.

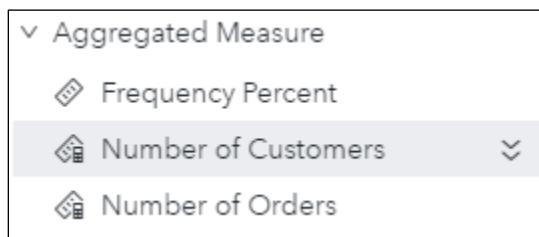
- d. Verify that **Distinct count** is selected for the **Type** field.

The Create Calculation window should resemble the following:



- e. Click **OK**.

The new data item, **Number of Customers**, is added to the Aggregated Measure group.



10. Create an automatic chart.

- a. In the Data pane, select the following data items:

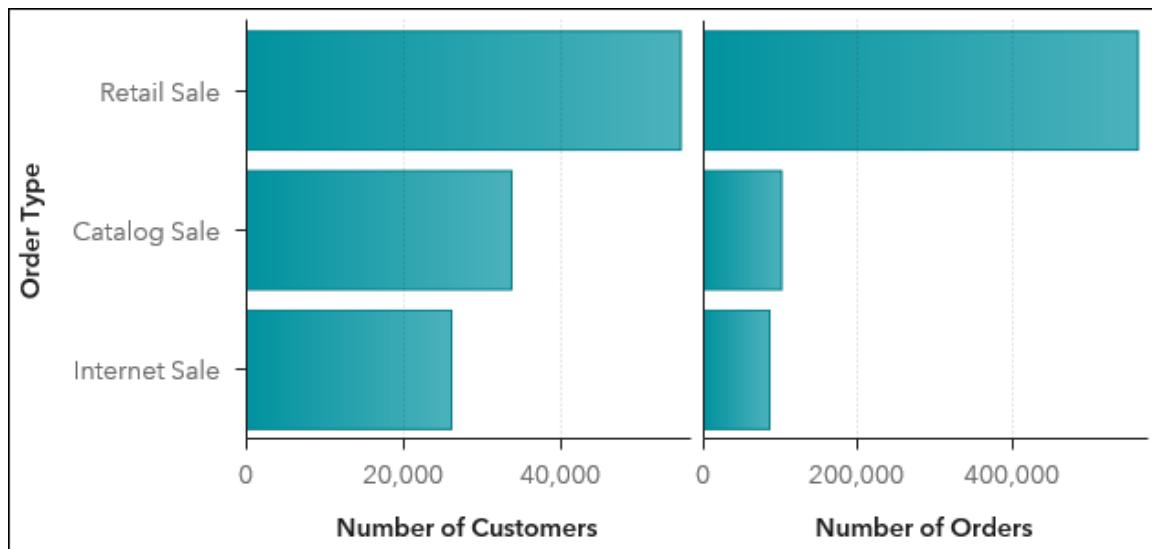
Number of Orders

Order Type

Note: **Number of Customers** should already be selected.

- b. Drag the columns to the left side of the canvas.

The automatic chart functionality determines the best way to display the selected data.



Total profit is lower in the internet and catalog channels because there are fewer customers that place orders through those channels. There are also significantly lower orders placed through those channels.

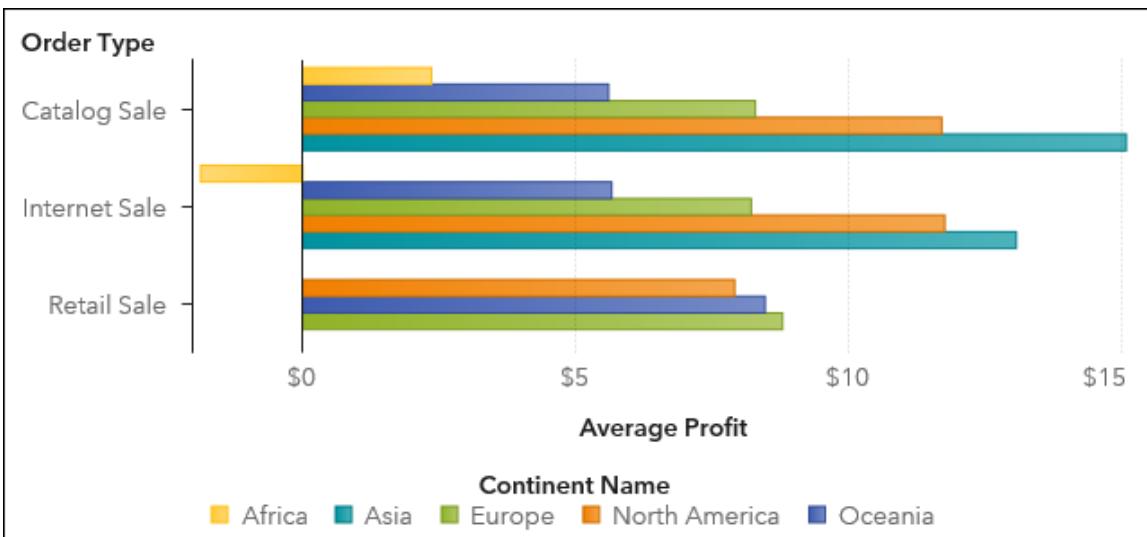
- c. In the right pane, click the **Options** icon.
 - d. If necessary, expand the **Object** section.
 - e. Enter **Customers and Orders by Order Type** in the **Name** field.
11. Duplicate a data item and modify data item properties.
- a. In the left pane, click the **Data** icon.
 - b. In the Measure group, right-click **Profit** and select **Duplicate**.
 - c. Click  (**Edit properties**) next to the new data item, **Profit (1)**.
 - d. Select **Average** for the **Aggregation** field.
 - e. Enter **Average Profit** in the **Name** field and press **Enter**.
12. Modify the Profit by Order Type and Continent bar chart.
- a. In the canvas, click the **Profit by Order Type and Continent** bar chart to make it active.
 - b. In the right pane, click the **Roles** icon.
 - c. In the left pane, click the **Data** icon.
 - d. Make sure that **Average Profit** is selected.

- e. Drag **Average Profit** on top of **Profit** to replace the measure in the Roles pane.

The Data Roles pane displays the following structure:

- Profit by Order Type and Continent
- Category
 - Order Type
- Measure
 - Profit
 - Average Profit
- Group

The bar chart should resemble the following:



Ideally, we would want to increase orders placed for existing customers that produce the highest average profit. In this example, that would be Asian customers who order through the catalog. However, because corporate headquarters is in North America, management has decided that the initial marketing strategy should focus on increasing sales among North American customers who order through the catalog and internet. If this marketing strategy is successful, it will be implemented in other locations.

- f. In the Options pane, update the object name to **Average Profit by Order Type and Continent**.
13. Create a new custom category, **Customer Gender**.
- In the Data pane, select **New data item** \Rightarrow **Custom category**.
 - In the New Custom Category window, enter **Customer Gender** in the **Name** field.
 - Select **Title** in the **Based on** field.
 - Select **Value Group 1** to edit the group name.

- 1) Type **Male** and press **Enter**.
- 2) Click **Mr.** in the left pane and drag to the **Drag values here** area on the right.

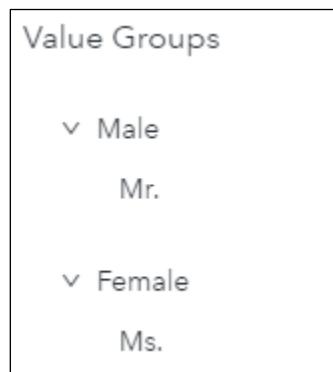
The screenshot shows the SAS interface with two main panes. On the left is the 'Values of Title' pane, which contains a search bar labeled 'Filter' and two checkboxes: 'Mr.' and 'Ms.'. On the right is the 'Value Groups' pane, which is currently expanded to show a single group named 'Male'. Inside this group, the value 'Mr.' is highlighted and has a blue border, indicating it is selected or being moved. A tooltip 'Drag values here' is positioned above the 'Mr.' value. The overall interface is clean with a light gray background and white text.

- 3) Drag **Ms.** to the **Click or drag values here to add a value group** area to create another value group.

This screenshot continues from the previous one. The 'Value Groups' pane now shows the 'Male' group expanded, containing the value 'Mr.'. Below it, there is a new section with a blue header bar containing the text '+ Click or drag values here to add a value group'. The value 'Ms.' is now placed in this section, indicating it has been added to the system. The overall layout remains consistent with the first screenshot, maintaining the same color scheme and structure.

- 1) Select **Value Group 1**.
- 2) Type **Female** and press **Enter**.

The Value Groups should resemble the following:



- f. In the Remaining Values area, verify that **Other** is specified in the **Group as** field.

Remaining Values:

Show as is Show as missing Group as: Other

- g. Click **OK** to create the new custom category.

Note: As an alternative, you can also create a calculated data item with the following expression:

```

IF ( Title = "Mr. ")
  RETURN "Male"
ELSE
  IF ( Title = "Ms. ")
    RETURN "Female"
  ELSE
    RETURN "Other"
  ENDIF
ENDIF
  
```

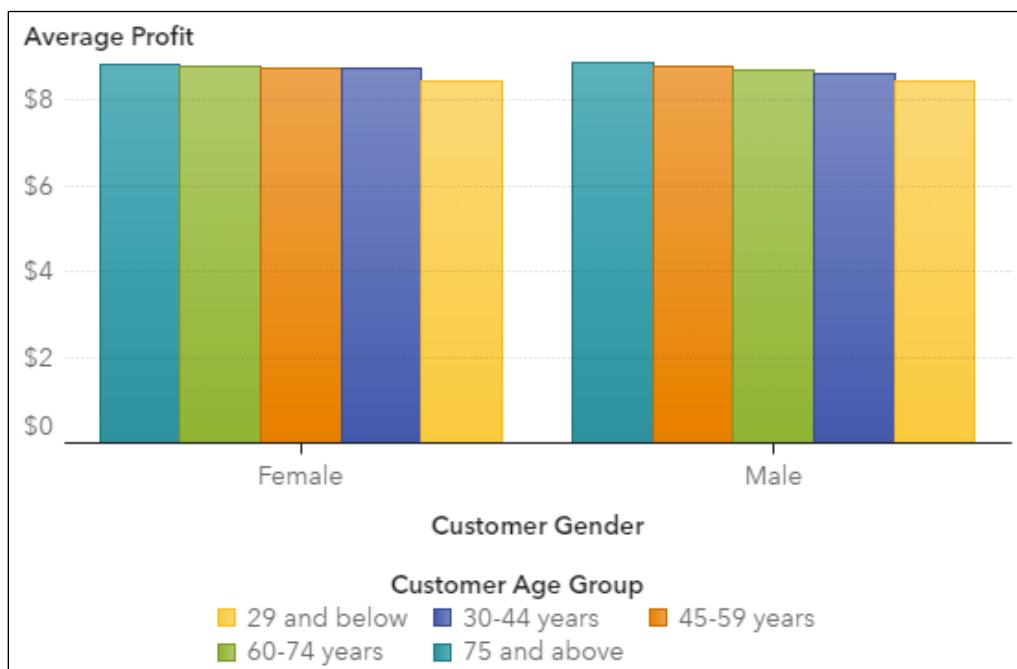
The new data item, **Customer Gender**, should appear in the Category group.

Category

- City Name - 11K
- Continent Name - 5
- Customer Age Group - 5
- Customer Birth Date - 4.4K
- Customer Country - 47
- Customer Gender - 2

14. Duplicate the Average Profit by Order Type and Continent bar chart.
 - a. In the canvas area, in the upper right corner of the Average Profit by Order Type and Continent bar chart, click (More) and select **Duplicate** to copy the bar chart.
 - b. Click above the new bar chart and drag to the drop zone to the bottom of the Average Profit by Order Type and Continent bar chart.
 - c. In the right pane, click the **Roles** icon.
 - d. For the **Category** role, select **Order Type** \Rightarrow **Customer Gender**.
 - e. For the **Group** role, select **Continent Name** \Rightarrow **Customer Age Group**.
 - f. In the right pane, click the **Options** icon.
 - g. If necessary, expand the **Object** section.
 - h. Enter **Average Profit by Gender and Age Group** in the **Name** field.
 - i. In the Bar section, click (Vertical) for the **Direction** field.

The bar chart should resemble the following:



Average profits are similar across genders and age groups but are slightly higher for females and males in the 75 and above age group.

15. In the upper right corner, click  (Menu) and select **Save**.
16. Select **Eric**  **Sign out** in the upper right corner.

End of Demonstration

The diagram illustrates a practice scenario for employees. It features several icons and labels:

- Human Resources:** Represented by two people with speech bubbles.
- Salaries:** Represented by a blue dollar bill icon.
- Sales Rep I:** Represented by an orange icon showing a person with a dollar sign.
- Years of Service:** Represented by a blue calendar icon with the number 20.
- Retired:** Represented by a green newspaper icon.
- Active:** Represented by a teal open book icon with a pen.
- Calculator:** Represented by a purple calculator icon.
- Orion Star Sports & Outdoors:** A logo in the top right corner.

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3.04 Activity

Given the values of **Employee Hire Date** and **Employee Termination Date**, how would you calculate **Years of Service**?

Employee Hire Date	Employee Termination Date
01Dec2004	28Feb2007
02Jan2005	.
25Jan2005	.
01Feb2005	.
01Mar2005	28Feb2010
01Apr2005	31Jan2010
01Apr2005	.





Practice

4. Creating Data Items

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice3.3a** report from the **Shared Data/Basics/Practices (HR)** folder.
- Create a new data item, **Employee Status**, by assigning the following labels to the values:

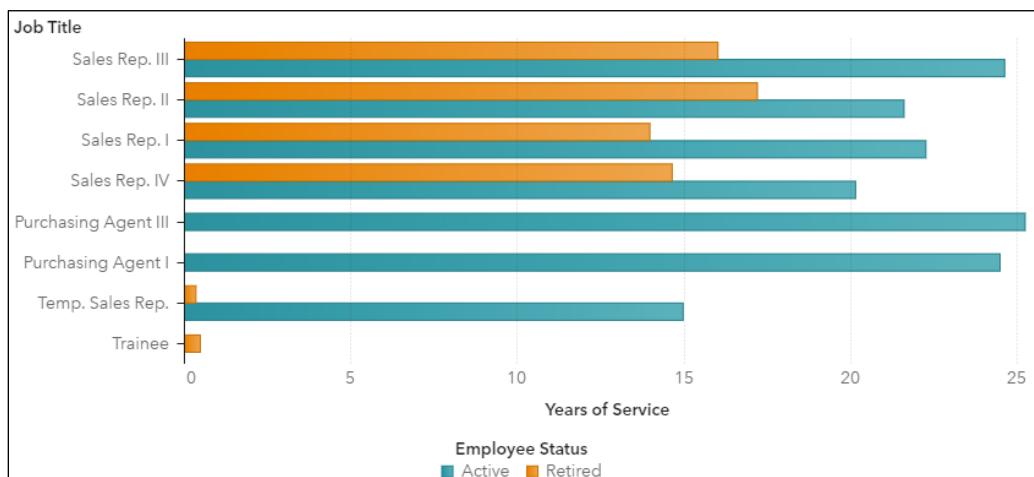
Employee Status (label)	Employee Termination Date (value)
Active	.
Retired	<all remaining values>

- On Page 3, create a bar chart by assigning the following data items to the specified roles:

Category	Job Title
Measure	Years of Service
Group	Employee Status

- Specify **Years of Service by Job Title and Status** as the name of the bar chart.
- Change the aggregation for **Years of Service** to **Average**.

The bar chart should resemble the following:



- Answer the following question:

Management has decided that one possible criterion for promotion is years of service. Considering this, with which job title would you recommend starting the promotion analysis?

Answer: _____

- Save the report.
- Sign out of Report Builder.

End of Practices

Business Scenario: Customers

The diagram illustrates various business components and their icons:

- Marketing**: Represented by a target icon.
- North America**: Represented by the Statue of Liberty icon.
- Catalog**: Represented by a stack of books icon.
- Internet**: Represented by a globe icon.
- Profits**: Represented by a dollar sign icon.
- Create geography data items**: Represented by two globe icons.
- Add a filter**: Represented by an orange funnel icon.
- Create a hierarchy**: Represented by a tree-like structure icon.

Sas

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Filtering Data

The diagram shows four types of filters:

- Detail report filters**: Represented by a stack of five blue cylinders labeled "Data source".
- Summary report filters**: Represented by a blue funnel with a plus sign inside.
- Post-aggregate**: Represented by a blue funnel with a plus sign inside.
- Basic**: Represented by a red funnel icon.
- Advanced**: Represented by three green funnels of increasing size.

Report Designer

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The following types of filters can be created and modified only by the report designer:

Data source filter	Subsets the data for the entire report and is applied to every report object that uses that data source. The data source filter acts as a pre-filter, by filtering the data before it is brought into Report Builder. This can be seen by the updated cardinality values in the Data pane after the filter has been applied.
Basic report filter	Subsets the data for individual report objects by using a single data item and an equality condition.
Advanced report filter	Subsets the data for individual report objects by using any number of data items and operators in the same expression.
Post-aggregate report filter	Subsets the data for individual report objects by using aggregated values, not summarized values. Post-aggregate report filters are available only for measure data items.

For more information about filters that can be created and modified by the report designer, see “Working with Report Filters” in the *SAS® Visual Analytics 7.5* documentation.

Filters that can be modified by report viewers are discussed in more detail in a later section.

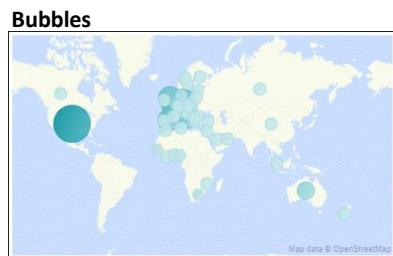
Filters are applied in the following order:

- Data source filter (or filters)
- Basic or advanced report filter/ post-aggregate report filter
- Prompts and actions

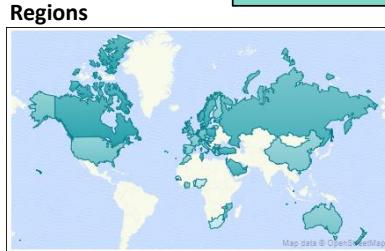
Note: More advanced filtering techniques are discussed in the *SAS® Visual Analytics 2 for SAS®9: Advanced course*.

Objects: Graphs (Geography)

Use a *geo map* when location is a critical component of the analysis.



Use a *geo region map* or *geo coordinate map* only when there is an even distribution of values within each region.



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Geo map

A geo map overlays data on a geographic map. Data can be displayed as bubbles, coordinates, or colored regions. In order to display data on a geo map, at least one category data item must have values that are mapped to geographical locations or regions.

- **Coordinates** - A coordinates geo map (also known as a *dot distribution map* or a *dot density map*) helps with detecting spatial patterns and understanding the distribution of data over a geographical region, which can help reveal patterns using clustered points.
- **Regions** - A regions geo map (also known as a *choropleth map*) uses colors to show variations by location. However, larger regions appear more emphasized than smaller ones, which can affect perceptions of colors.
- **Bubbles** - A bubble geo map displays bubbles over a geographical region. The bubble size helps with comparing proportions over regions without the size of the region causing distortions, but the size of the bubble can overlap with other bubbles and regions making the chart difficult to read.

For more information about creating geography data items, see “Working with Geography Data Items” in the SAS® Visual Analytics 7.5 documentation.

Geography Data Items

Predefined roles

Egypt India Australia
Italy United States

Latitude and Longitude coordinates

Latitude and Longitude coordinates

Polygon data

Polygon data

Calculator icon

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3.05 Multiple Answer Question

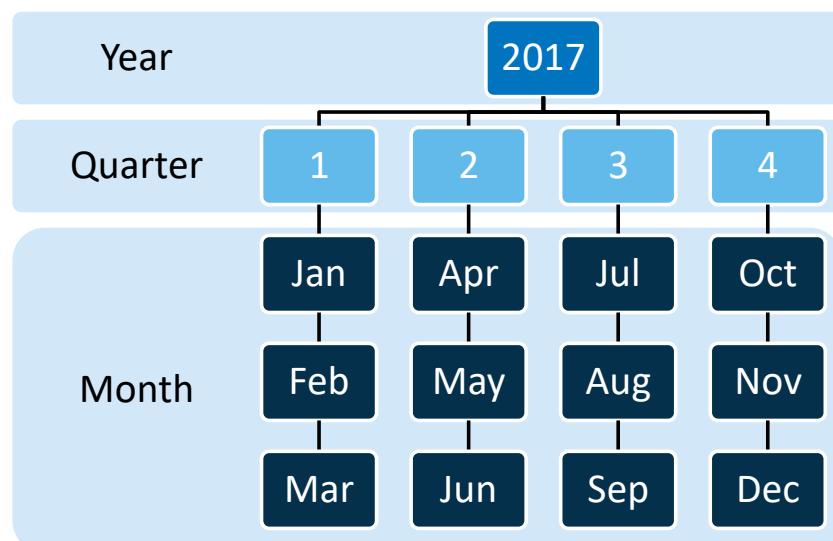
Which object can use a data item that has a classification type of geography?

- a. crosstab
- b. geo map
- c. table
- d. bar chart

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What Is a Hierarchy?



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A *hierarchy* is a defined arrangement of categorical data items based on parent-child relationships.



Applying Filters

This demonstration illustrates how to create new data items (geographic data items, hierarchies) and apply filters in Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.
 2. Enter **Eric** in the **User ID** field.
 3. Enter **Student1** in the **Password** field.
 4. Click **Sign In**.
 5. Select **Report Builder** in the Action Button area.
- The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo3.3b** to open the report.
 7. In the upper left corner of the report, click the **Page 4** tab.
 8. Create new data items.
 - a. In the left pane, click the **Data** icon.
 - b. Click  (Edit properties) next to **State Name**.
 - c. Select **Geography** for the **Classification** field.
 - 1) Verify that **Predefined geographic names and codes** is selected for the **Geography data type** field.
 - 2) Select **US State Names** for the **Geography** field.

Edit Geography Item

Name:
State Name

Based on:

Geography data type:

Name or code context:

OK **Cancel**

- 3) Click **OK**.

A new group, **Geography**, is added to the Data pane.

The screenshot shows a collapsed group named "Geography". Inside the group, there is one item listed: "State Name - 272".

- d. In the Data pane, click (**Edit properties**) next to **Postal code**.
- e. Select **Geography** for the **Classification** field.
 - 1) Verify that **Predefined geographic names and codes** is selected for the **Geography data type** field.
 - 2) Select **US Zip Codes** for the **Geography** field.
 - 3) Click **OK**.

The Geography group should resemble the following:

The screenshot shows a collapsed group named "Geography". Inside the group, there are two items listed: "Postal code - 19K" and "State Name - 272".

- f. In the Data pane, select **New data item** \Rightarrow **Hierarchy**.
 - 1) In the New Hierarchy window, enter **US Hierarchy** in the **Name** field.
 - 2) Double-click the following data items in the Available items list, in the specified order, to move them to the Selected items list:

State Name

Postal code

The screenshot shows the "New Hierarchy" dialog box. The "Name:" field contains "US Hierarchy". The "Available items (17):" list includes "City Name - 11K" and "Continent Name - 5". The "Selected items (2):" list includes "State Name - 272" and "Postal code - 19K".

- 3) Click **OK**.

A new group, **Hierarchy**, is added to the Data pane.

The screenshot shows a collapsed group named "Hierarchy". Inside the group, there is one item listed: "US Hierarchy".

9. Add a data source filter.

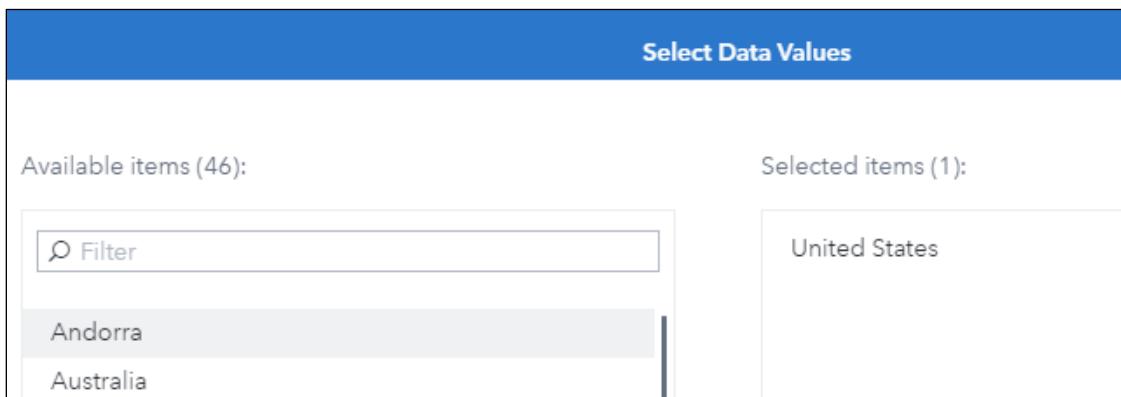
- In the Data pane, click  (Actions) and select **Apply data source filter**.

Note: Because the new geography data items cover only the United States, a data source filter is added to include only the data for customers in the United States.

- On the left, verify that **Data Items** is selected.
- Expand the **Character** group.
- Select **Customer Country**.
- In the Conditions area, double-click **Customer Country In (x)** to add it to the expression area.

Customer Country	In	(none selected)
------------------	----	-----------------

- In the expression area, click **(none selected)**.
- In the Select Data Values window, double-click **United States** to move it from the Available items list to the Selected items list.



- Click **OK**.

The expression should resemble the following:

Customer Country	In	United States
------------------	----	---------------

The bottom of the Apply Data Source Filter window should resemble the following:

Returned observations: 232,258	Total observations: 951,669
--------------------------------	-----------------------------

Note: 232,258 observations have a value of *United States* for **Customer Country**.

- Click **OK** to apply the data source filter.

The Data pane should resemble the following:

The screenshot shows the Data pane with a tree structure under the 'Category' node. The nodes listed are: City Name - 4.5K, Continent Name - 1, Customer Age Group - 5, Customer Birth Date - 4.3K, Customer Country - 1, Customer Gender - 2, and Customer Group Name - 3. Each node has a small icon next to it.

- ▼ Category
 - City Name - 4.5K
 - Continent Name - 1
 - Customer Age Group - 5
 - Customer Birth Date - 4.3K
 - Customer Country - 1
 - Customer Gender - 2
 - Customer Group Name - 3

The data source filter updates the cardinality values that appear in the Data pane and is applied to every report object that uses this data source.

10. Create a geo map.

- a. In the left pane, click the **Objects** icon.
- b. Drag the **Geo Map** object, from the Graphs group, to the canvas.
- c. In the right pane, click the **Roles** icon.
- d. For the **Category** role, select **Add ⇨ US Hierarchy**.
- e. Verify that **Frequency** is specified for the **Size** role.
- f. For the **Color** role, select **Add ⇨ Profit**.

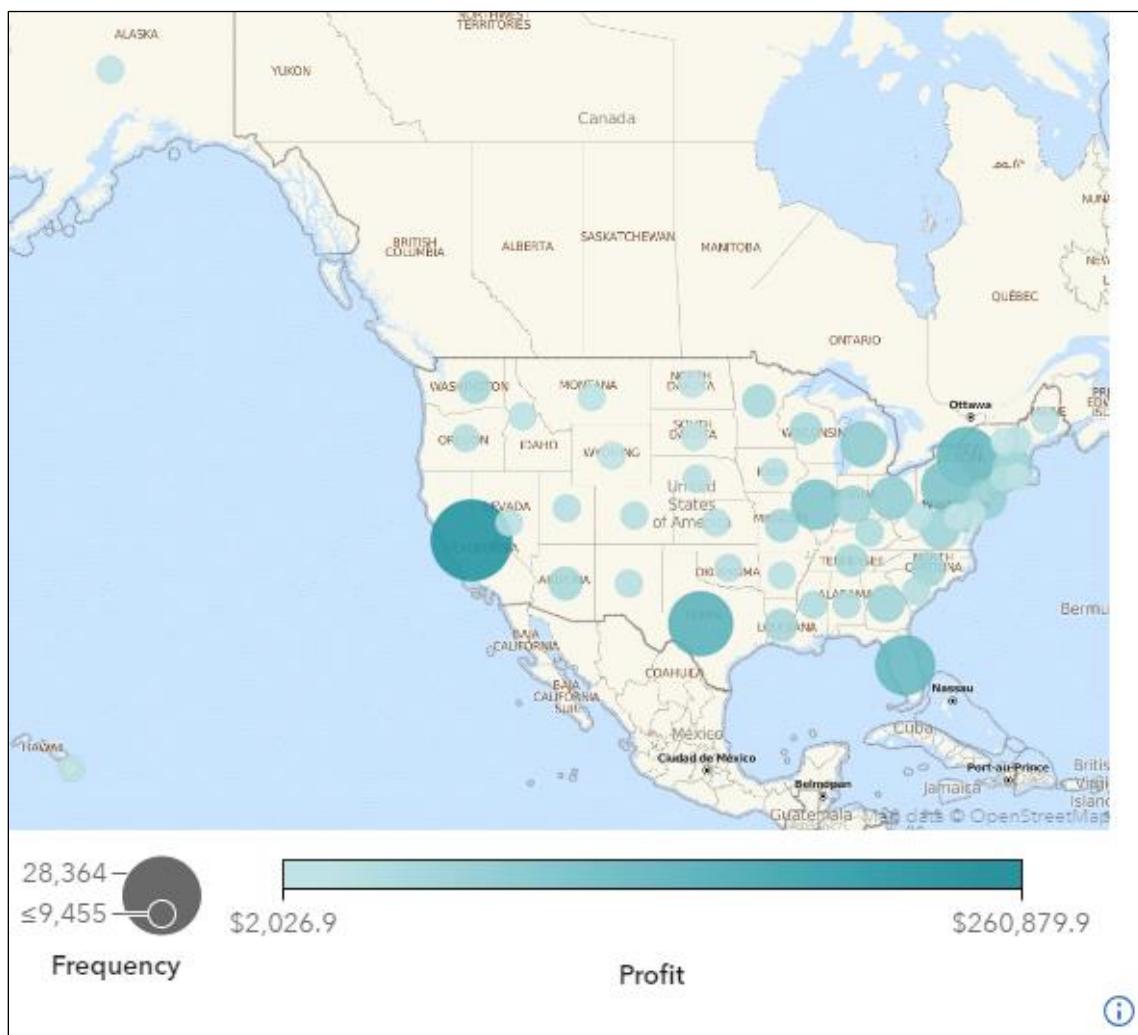
The Roles pane should resemble the following:

The screenshot shows the 'Data Roles' pane with a dropdown menu set to 'Geo Map 1'. The pane lists several roles with their corresponding data items:

- Category: US Hierarchy
- Size: Frequency
- Color: Profit
- Data tip values:
 - US Hierarchy
 - Frequency
 - Profit
- Add
- Animation

The geo map requires a geography data item for the Category role. A measure data item can be added to the Color role to color the geographic regions based on the measure.

The geo map should resemble the following:



- g. Place your cursor over in the lower right corner of the geo map to view the warning.

No matches were found for supplied geography data items: PR
Some features may not be displayed on the map because of missing location information in the data.

Note: PR is not found in the US State Names predefined geographic role. You can filter this value out if you do not want to see the warning.

- h. In the right pane, click the **Options** icon.
- i. If necessary, expand the **Object** group.
- j. Enter **Profit by Location** in the **Name** field.
- k. In the Map group, select **Coordinates** for the **Type** field.
- l. Select **Diamond** for the **Initial marker shape** field.
- m. Enter **30** for the **Marker size** field.

The Options pane should resemble the following:

▼ Map

Type:
Coordinates ▾

Transparency:
13%


Initial marker shape:
Diamond ▾

Marker size:
30%

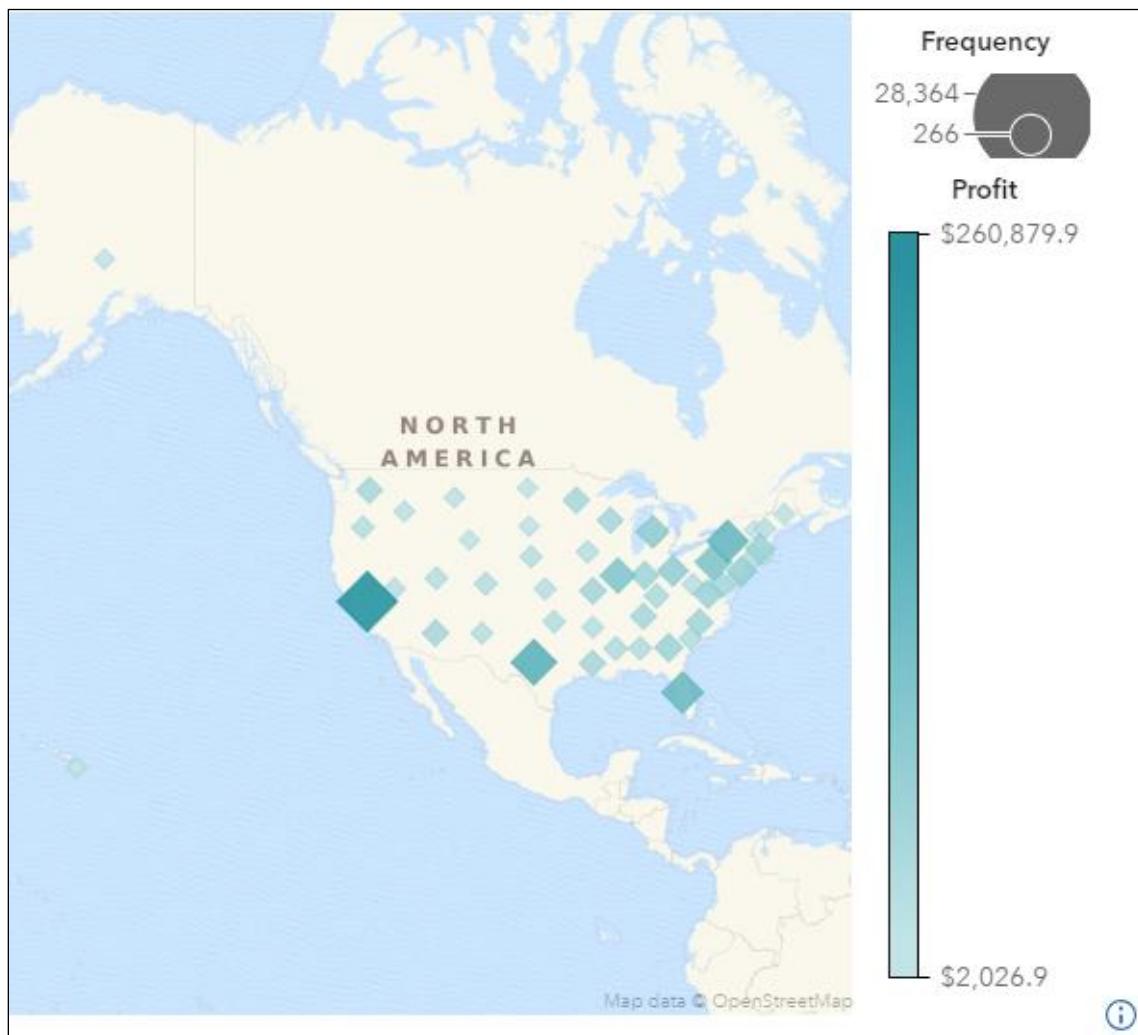

- n. Expand the **Legend** group.
- o. Choose the middle on the right side for the **Placement** field.

▼ Legend

Visibility:
On ▾

Placement:

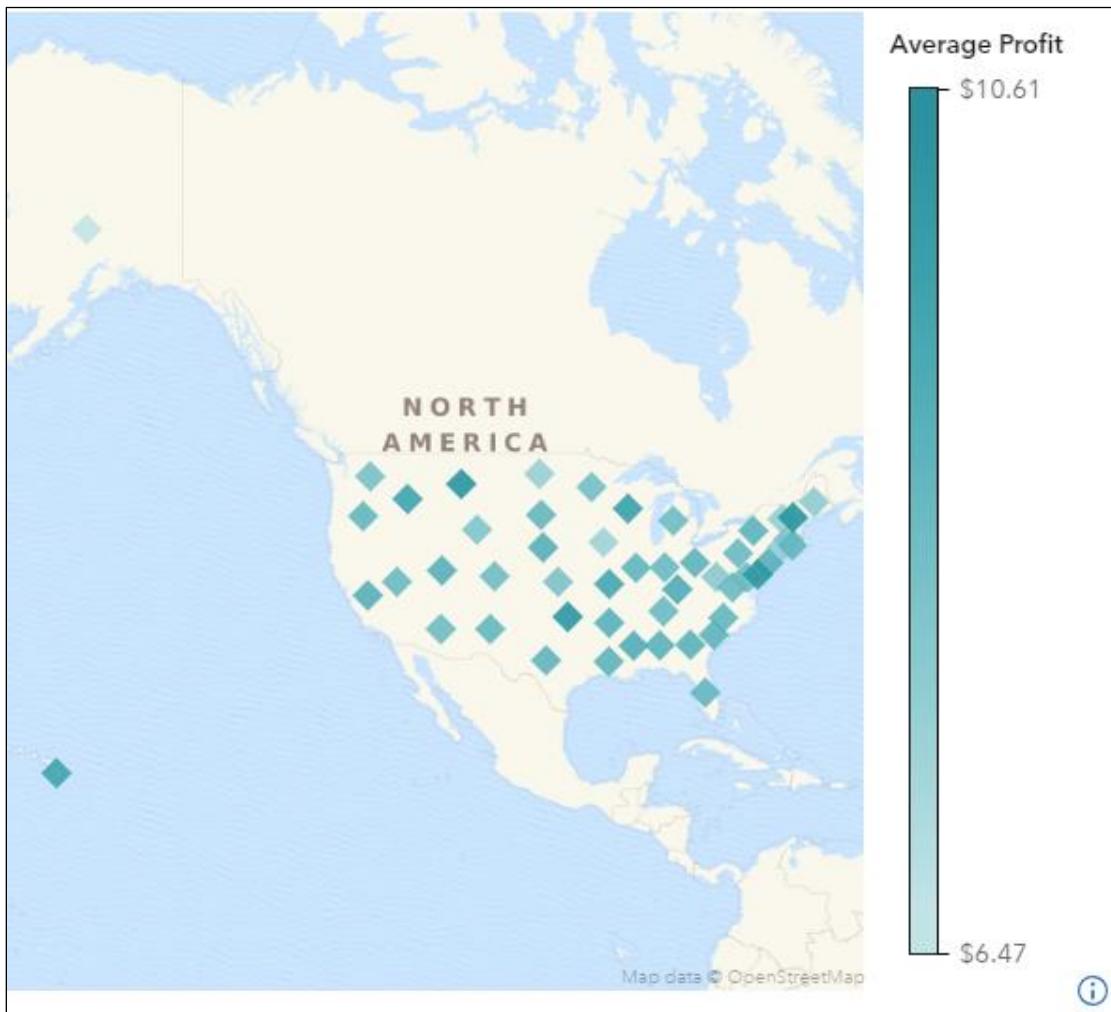

The updated geo map should resemble the following:



Highest total profits seem to be in larger states (California, Texas, and Florida), most likely because there are more customers and more orders placed in those states. Looking at average profits by location can give greater insight into orders placed in the United States.

- p. Right-click the **Geo Map** object and select **Remove** \Rightarrow **Frequency**
- q. Right-click the **Geo Map** object and select **Replace** \Rightarrow **Profit**.
- r. Select **Average Profit**.

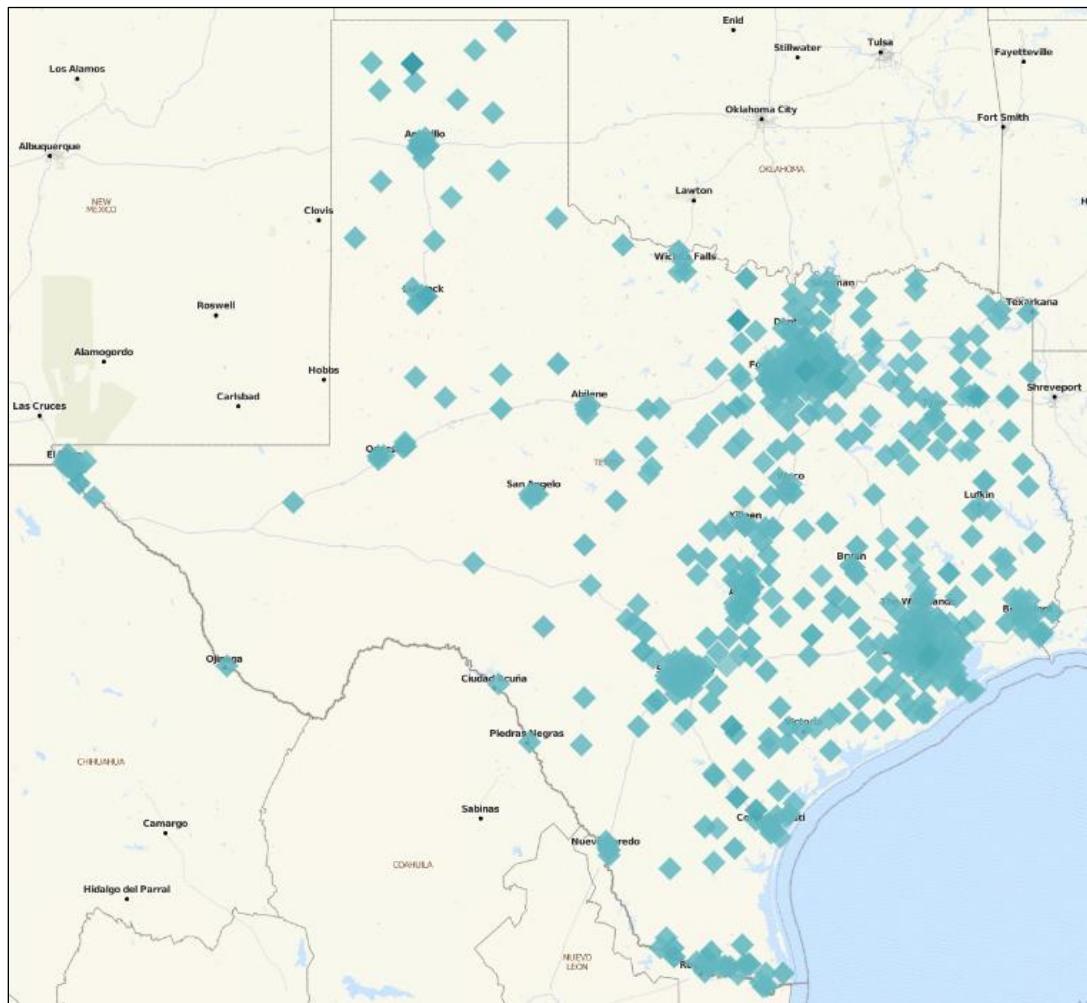
The updated geo map should resemble the following:



When looking at averages, there does not seem to be any clusters of higher average profits in any one location in the United States. High average profits seem to be evenly distributed across the United States.

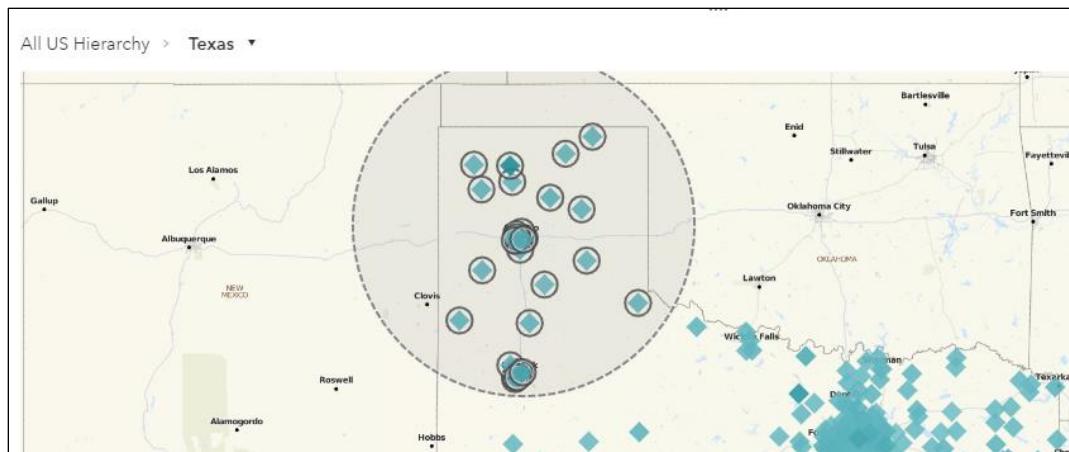
- s. Double-click the marker for **Texas**.

The geo map displays markers for all postal codes in Texas where products were ordered.

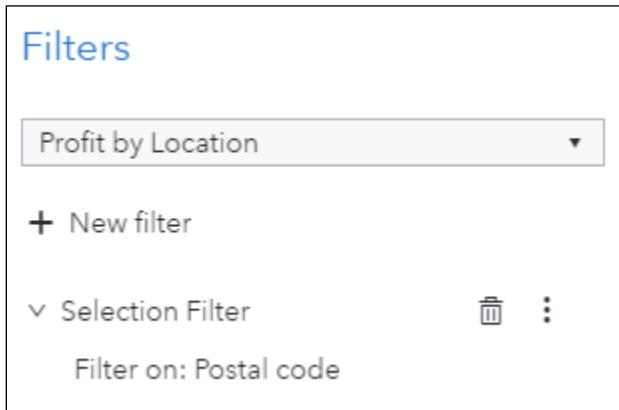


- t. Right-click in the map, select **Pan** \Rightarrow **Circular selection**.
- u. Click **Amarillo, TX**.
- v. Hold the left mouse button and drag to create a circular selection.

The Geographic Selection window should resemble the following:



- w. Right-click inside the selection circle and select **New filter from selection** ⇒ **Include only selection**.
- x. Select the **Filters** icon in the right pane to show the applied filter.



11. In the upper right corner, click (Menu) and select **Save**.

12. Select **Eric** ⇒ **Sign out** in the upper right corner.

End of Demonstration

Practice Scenario: Employees

Human Resources

Profit Generated

Active

Sales

Add a filter

Create geography data item

ORION STAR
Sports & Outdoors

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Practice

5. Applying Filters

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - b. Open the **VA1- Practice3.3b** report from the **Shared Data/Basics/Practices (HR)** folder.
 - c. Add a data source filter to filter for active employees in the Sales Department.
- Note:** Use the AND operator (in the Boolean group) to filter for multiple conditions. After the data source filter is applied, 429 observations should be returned.
- d. Change the classification for **Employee Country** to **Geography** ⇒ **Country or Region ISO 2-Letter Codes**.
 - e. On Page 4, create a geo map by assigning the following data items to the specified roles:

Category	Employee Country
Size	Total Profit
Color	Number of Employees

The geo map should resemble the following:



- f. Maximize the geo map to answer the following questions:

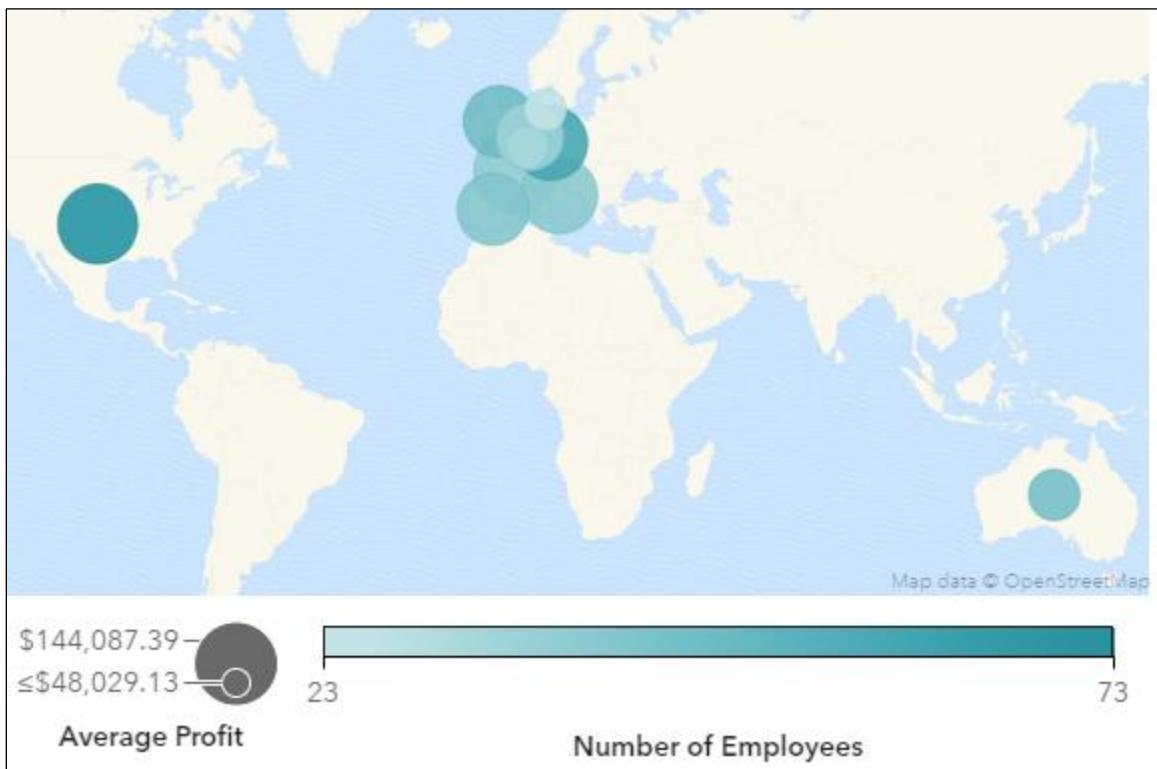
Management has decided that one possible criterion for promotion is profit generated. Which two countries generate the highest profit? Why do they have such high profits?

Answer: _____

Hint: After answering the questions, click  (Restore) in the upper right corner.

- g. In the geo map, specify **Average Profit** for the Size role.
 h. Specify **Average Profit and Number of Employees by Country** as the name of the geo map.

The updated geo map should resemble the following:



- i. Maximize the geo map to answer the following question:

With which country would you recommend starting promotions if profit generated is one possible criterion for promotion?

Answer: _____

Hint: After answering the question, click  (Restore) in the upper right corner.

- j. Save the report.
 k. Sign out of Report Builder.

End of Practices

3.4 Performing Data Analysis

Business Scenario: Customers

ORION STAR Sports & Outdoors

58 Marketing

Shipping

Customer Age Group

Customer Gender

Order Type

Delivery times

Number of orders

Profits

Orion Star Sports & Outdoors

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Objects: Graphs (Analysis)

Number of Orders

Profit (millions)	Number of Orders
\$0.0	~10,000
\$0.1	~15,000
\$0.2	~20,000
\$0.3	~80,000
\$0.4	~100,000
\$0.5	~40,000
\$0.6	~30,000
\$0.7	~20,000
\$0.8	~15,000
\$0.9	~10,000
\$1.0	~20,000
\$1.2	~150,000
\$1.5	~120,000

Product Category

Category	Sub-Categories
Clothes	
Outdoors	
Racket Sports	
Winter Sports	
Running - Jogging	
Shoes	
Golf	
Swim Sports	
Children Sports	
Assorted Sports Articles	

Use a *bubble plot* to display three dimensions of data (horizontal location, vertical location, size of bubble) for some group of category values.

Use a *treemap* to display lots of information in a small amount of space. Use size and color to draw attention to specific areas of interest.

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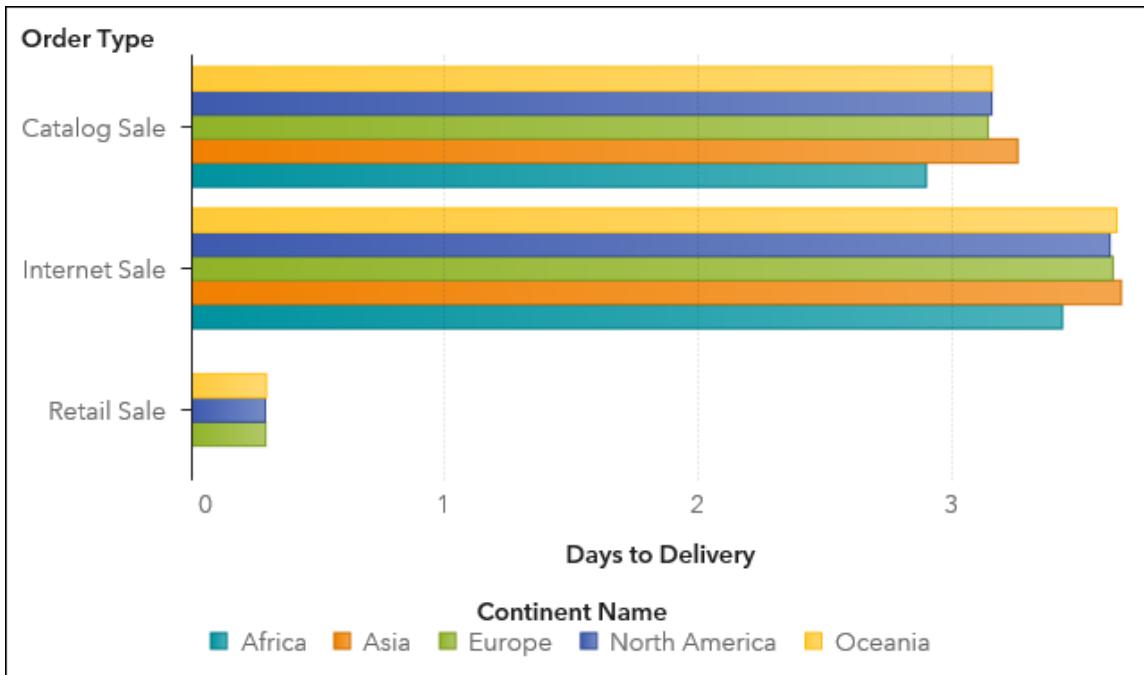
Bubble plot	A bubble plot displays the values of at least three measures by using plot markers (bubbles) of varying sizes in a scatter plot. The values of two measures determine the location of the bubble in the plot, and the value of the third measure determines the size of the bubble. Bubble plots can be animated to show changes in data over time. Note: A bubble's size is scaled relative to the minimum and maximum values of the size variable.
Treemap	A treemap displays a hierarchy or category as a set of rectangular tiles. The value of a category or hierarchy node is represented by tiles, and measures can be added to both size and color the tiles. Typically, the size and color are used to draw attention to areas of interest (for example, top contributors). The measures used to size and color the tiles should mean something when compared. Do not use the same measure for both the size and color as this violates the law of redundancy. The measure used to size the tiles cannot be below zero and must have an aggregation of sum. Note: The layout of the tiles in the treemap is dependent on the size of the display area because it uses a space-filling algorithm to lay the tiles out. This means that the same treemap might appear slightly different in Report Builder than it does in the Report Viewer or in the Visual Analytics app.



Analyzing Data

This demonstration illustrates how to analyze data with graphs in Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Select **Report Builder** in the Action Button area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1-Demo3.4a** to open the report.
7. In the upper left corner of the report, click the **Page 4** tab.
8. View the Days to Delivery by Order Type and Continent bar chart.



In general, catalog sales take slightly less time to be delivered than internet sales. We might need to look at our internet process to try to minimize the difference. For most continents, the average days to delivery are the same, except that Africa has lower delivery times than other continents. This could be because there are no retail stores in Africa, but that does not explain why Asia has higher delivery times. We might need to look at our distribution facilities in Africa and Asia to determine the discrepancy.

9. Create a bubble plot.

- a. In the left pane, click the **Objects** icon.
- b. Drag the **Bubble Plot** object, from the Graphs group, to the right side of the canvas.
- c. In the right pane, click the **Roles** icon.
- d. For the **Group** role, select **Add** \Rightarrow **Customer Hierarchy**.
- e. For the **X axis** role, select **Add** \Rightarrow **Days to Delivery**.
- f. For the **Y axis** role, select **Add** \Rightarrow **Number of Orders**.
- g. For the Size role, select **Add** \Rightarrow **Average Profit**.

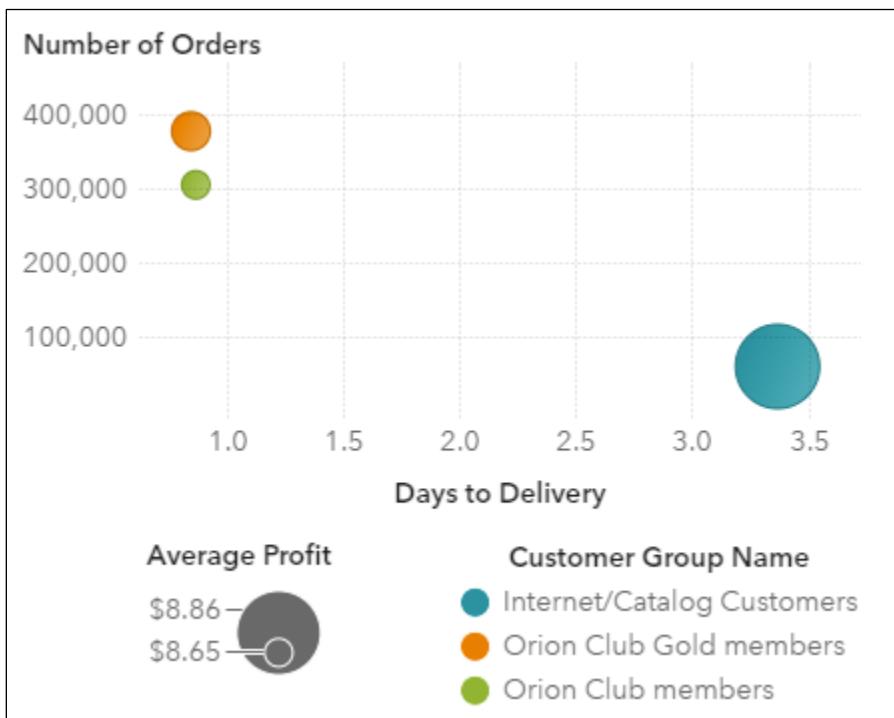
The Roles pane should resemble the following:

The screenshot shows the 'Data Roles' pane with the following configuration:

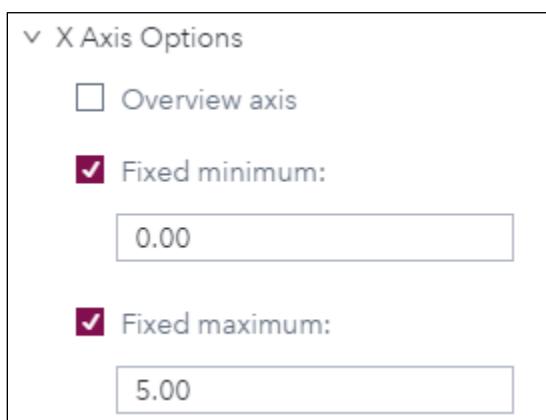
- Bubble - Days to Delivery 1** (selected)
- X axis**: Days to Delivery
- Y axis**: Number of Orders
- Size**: Average Profit
- Group**: Customer Hierarchy

Measure data items are added to the X axis and Y axis roles to determine the placement of the bubble. A measure data item is added to the Size role to determine the size of the bubble.

The bubble plot should resemble the following:

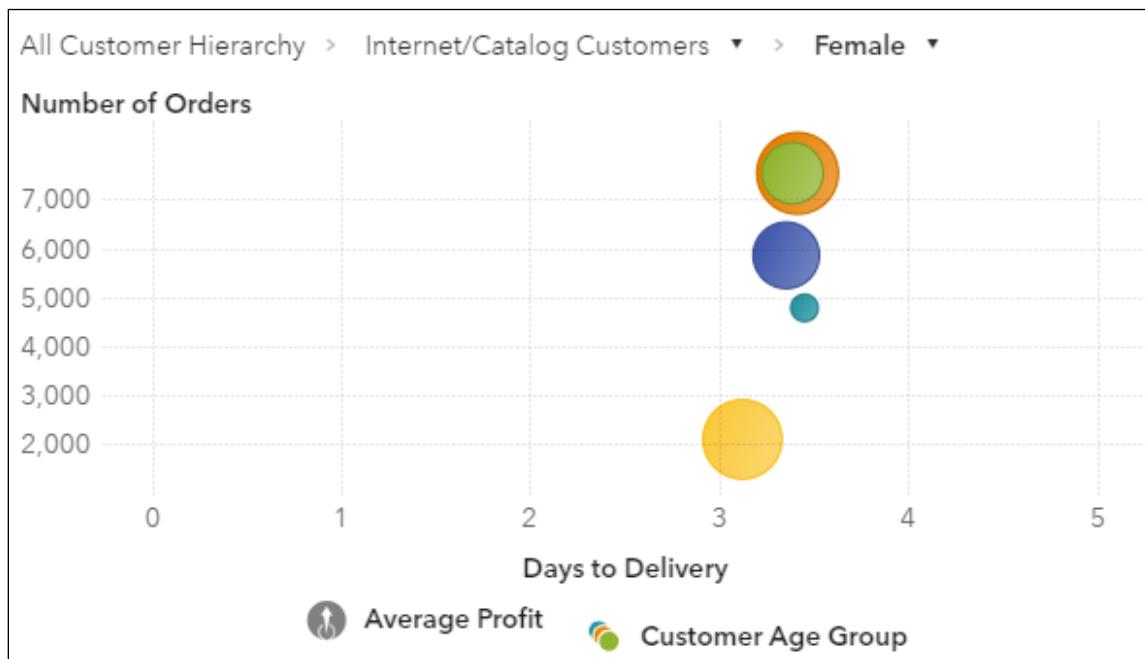


- h. In the right pane, click the **Options** icon.
- i. Expand the **X Axis Options** group.
- 1) Select **Fixed minimum**.
- 2) Enter **0** in the **Fixed minimum** field.
- 3) Select **Fixed maximum**.
- 4) Enter **5** in the **Fixed maximum** field.



- j. In the bubble plot, double-click the **Internet/Catalog Customers** bubble.
- k. Double-click the **Female** bubble.

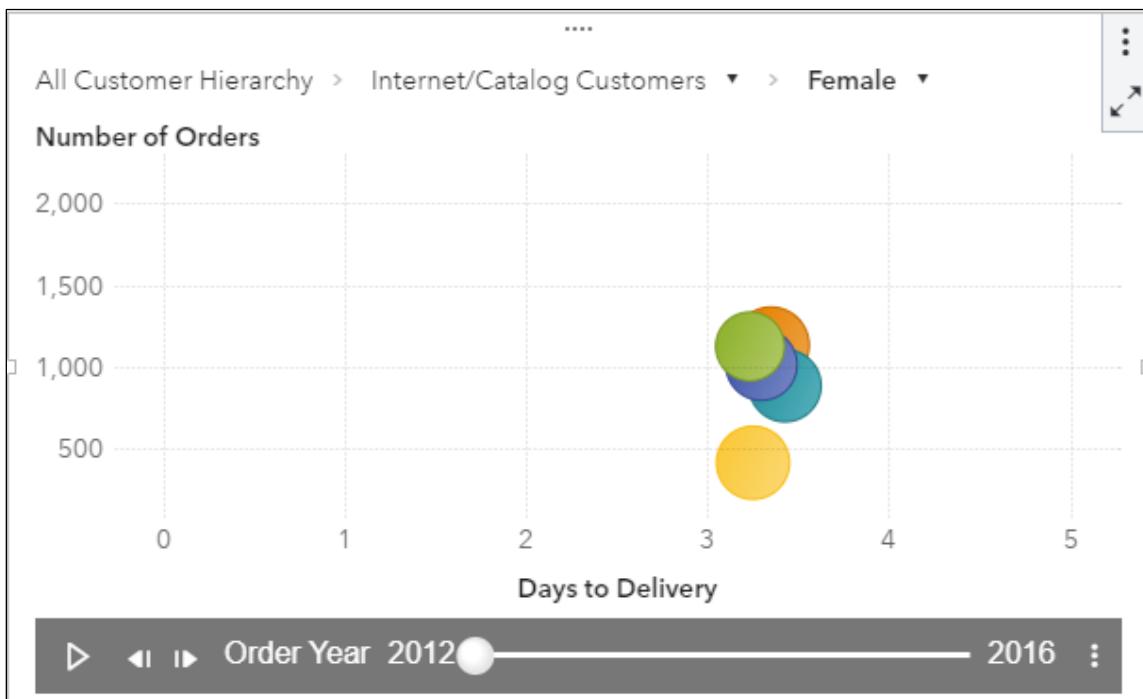
The bubble plot should resemble the following:



Next, we can analyze customers to determine which groups our marketing strategy can focus on. For internet/catalog orders among female customers, it seems the older age groups (60-74 years and 75 and above) place the fewest orders, but the oldest age group (75 and above) has the highest average profit. We should create marketing materials specifically for these groups to try to increase the number of orders.

10. Animate the bubble plot.
 - a. In the right pane, click the **Roles** icon.
 - b. For the **Animation** role, select **Add \Rightarrow Order Year**.

The updated bubble plot should resemble the following:



- Click in the lower left corner to play the animation.

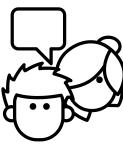
For female customers who have placed internet/catalog orders, the days to delivery remain nearly constant over the years. However, the number of orders has a marked increase in 2014 for customers in the 30–44 age group and a slight drop in 2015 and then seems to remain constant. For the older age groups (60–74 years and 75 and above), the number of orders remains constant but average profit decreases over time.

- In the upper right corner, click (Menu) and select **Save**.
- Select **Eric** **Sign out** in the upper right corner.

End of Demonstration

Practice Scenario: Employees

Human Resources



Create a hierarchy

Company

Job Title

Employee Gender

Loyalty

Performance

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ORION STAR
Sports & Outdoors

sas

The diagram illustrates a practice scenario for employees. It starts with a 'Human Resources' icon showing two people talking. Below it is a rounded rectangle containing icons for a person, a calendar labeled '27 Loyalty', and coins labeled 'Performance'. A large blue arrow points from this rounded rectangle to the right, labeled 'Create a hierarchy'. Along this arrow are three categories: 'Company' (with a building icon), 'Job Title' (with a resume icon), and 'Employee Gender' (with a male and female head icon). The SAS logo is in the bottom right corner.



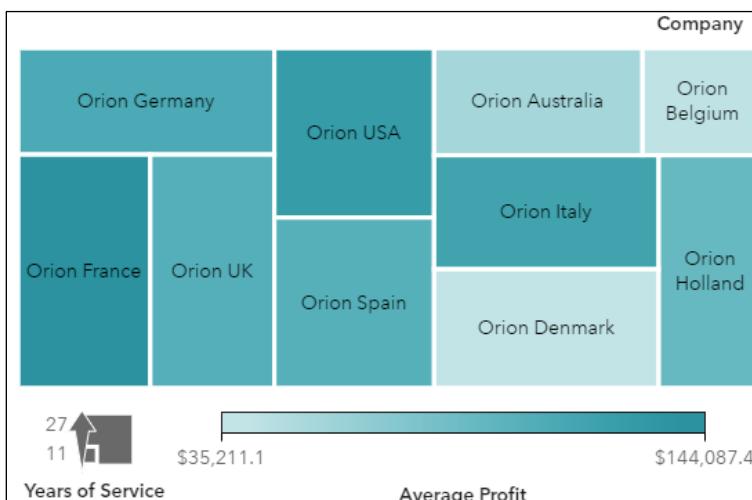
Practice

6. Analyzing Data

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice3.4a** report from the **Shared Data/Basics/Practices (HR)** folder.
- On Page 5, create a treemap by assigning the following data items to the specified roles:

Title	Company
Size	Years of Service
Color	Average Profit
Data tip values	add Number of Employees

The treemap should resemble the following:



- Create a new hierarchy (**Employee Hierarchy**) that contains the following categories: **Company, Job Title, Employee Gender**
 - In the treemap, specify **Employee Hierarchy** for the Tile role and navigate through the hierarchy to answer the following questions:
Which two companies have the highest average profit generated (one possible criterion for promotion)?
- Answer:** _____
- For these two companies, which job titles would you recommend for promotion (based on average years of service and average profit generated)?
- Answer:** _____
- Save the report.
 - Sign out of Report Builder.

End of Practices

Business Scenario: Customers



Marketing



Delivery times



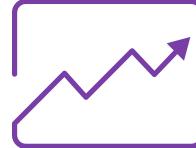
Total revenue



Discounts



Unit costs



Predict profit and number of orders

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sas

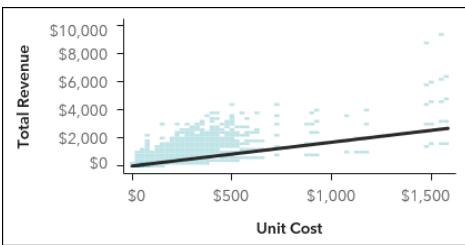
Objects: Graphs (Relationship)



Use a *correlation matrix* to evaluate the linear relationship between measures.



Use a *scatter plot* to evaluate the relationship between two measures.



Use a *heat map* to evaluate the relationship between two high-cardinality measures, between two categories, or between a category and a measure.

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Scatter plot	A scatter plot displays the values of two measures using markers. When more than two measures are added to the graph, a scatter plot matrix is displayed, which shows a series of scatter plots for every possible pairing of the measures applied to the graph. Scatter plots can be used to visualize trends between measures and to pinpoint any possible outliers. Note: Scatter plots do not use aggregated data. Because of this, you get an error message if you attempt to create a scatter plot using more than 40,000 rows of data. For more information about data limits, see "High-Cardinality Thresholds for Objects" in the <i>SAS® Visual Analytics 7.5 documentation</i> .
Heat map	A heat map displays the distribution of values for two data items by using a table with colored cells. When more than two data items are added to the graph, a heat map matrix is displayed, which shows a series of heat maps for every possible pairing of the data items applied to the graph. Heat maps can be used to visualize trends between high-cardinality measures and to pinpoint any possible outliers. If multiple measures are added to a heat map, the relationship between the measures can be visualized by adding a fit line.
Correlation matrix	A correlation matrix displays the degree of correlation between multiple measures as a matrix of rectangular cells, where each cell represents the intersection of two measures and the color of the cell indicates the degree of correlation between those two measures. The correlation values are calculated by using Pearson's correlation coefficient and are identified as weak (if the absolute value of the correlation is 0.3 or lower), moderate (if the absolute value of the correlation is greater than 0.3 and less than or equal to 0.6), or strong (if the absolute value of the correlation is greater than 0.6). Positive correlation values indicate that as one measure increases, the other measure increases as well, whereas negative correlation values indicate that as one measure increases, the other measure decreases.

3.06 Activity

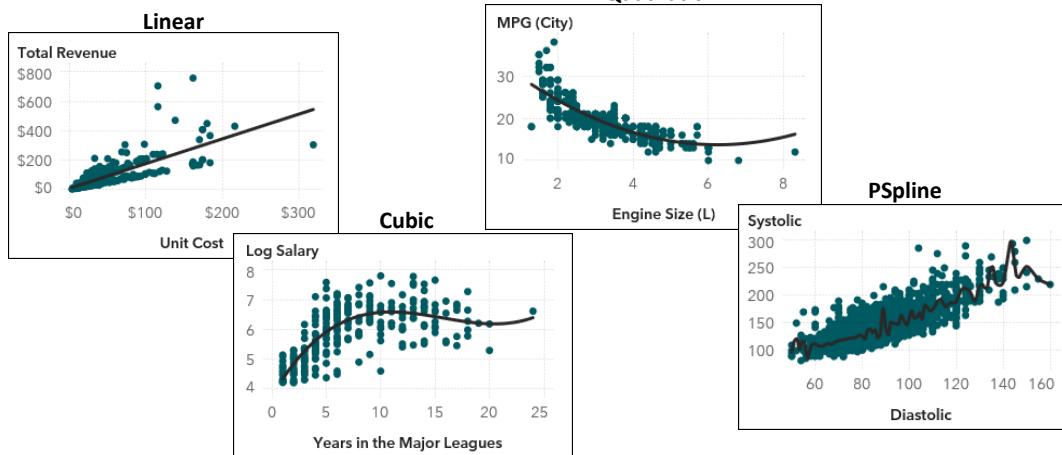
Each report object has a threshold for how much data it can visually display. Many report objects will not display high-cardinality data items with lots of unique values.

What are some examples of high-cardinality data items?

What are some examples of low-cardinality data items?

Fit Lines

Fit lines can be added to scatter plots and heat maps to plot the relationship between variables.



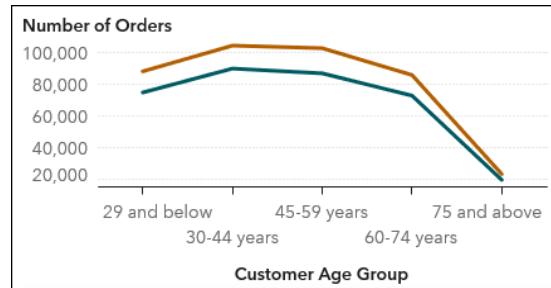
The following types of fit lines are available:

Best Fit	Selects the most appropriate model (linear, quadratic, or cubic) for your data. This method uses backward variable selection to select the highest-order model that is significant.
Linear	Creates a linear fit line (a straight line that best represents the relationship between measures) using a linear regression algorithm. For this method, correlation information is automatically added to the plot.
Quadratic	Creates a quadratic fit line (a line with a single curve that best represents the relationship between measures). This method produces a line with the shape of a parabola.
Cubic	Creates a cubic fit line (a line with two curves that best represents the relationship between measures). This method often produces a line with an S shape.
PSpline	Creates a penalized B-spline, which is a smoothing spline that closely fits the data. This method can display a complex line with many changes in its curvature.

Objects: Graphs (Time Plots)



Use a *time series plot* to show trends of measures over time.



Use a *line chart* to show trends over some ordinal variable (time, age group).

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Line chart

A line chart displays data by using a line that connects data values across some interval, such as time or a series of ordinal ranges. Stacked line charts enable you to compare totals for each category, as well as totals for all categories. However, comparing segments is difficult, and it is often hard to tell the difference between segments. To create a stacked line chart, select **Stack Filled** for the **Grouping style** option.

Time series plot

A time series plot displays data over time by using a line that connects the data values.

Objects: Analytics (Forecasting)

OrderTotal (millions)

Historical values

Hindcast

Predicted values

Confidence interval

OrderTotal (Model)

OrderTotal (Actual)

About this forecast

Use a *forecasting* object to show estimates of future values based on historical trends in the data.

A forecasting object uses the statistical trends in your data to predict future values. The forecast displays a line with predicted values and a colored band that represents the confidence interval. By default, the next six periods are forecasted, and the 95% confidence interval is displayed. Historical values for the forecasting model are displayed as markers only (without a line). Historical predicted values (hindcast) are displayed as part of the forecast line. SAS Report Builder automatically tests the following forecasting models against your data and selects the best model:

- ARIMA
- Damped-trend exponential smoothing
- Linear exponential smoothing
- Seasonal exponential smoothing
- Simple exponential smoothing
- Winters method (additive)
- Winters method (multiplicative)

Note: Forecasting accounts for cyclical patterns by using standard intervals of time (for example, 60 minutes in an hour, 24 hours in a day, and so on). If your data uses nonstandard values (for example, 48 thirty-minute cycles per day), then cyclical patterns are not considered in the forecast.

Note: If SAS Visual Statistics is licensed at your site, you can create models instead of relying on the model automatically selected for forecasting.



Adding Data Analysis

This demonstration illustrates how to add data analysis to graphs in Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Select **Report builder** in the Action Button area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo3.4b** to open the report.
7. In the upper left corner of the report, click the **Page 5** tab.
8. Create a correlation matrix.
 - a. In the left pane, click the **Objects** icon.
 - b. Drag the **Correlation Matrix** object, from the Graphs group, to the top of the canvas.
 - c. In the right pane, click the **Roles** icon.
 - d. For the **Measures** role, click **Add**.
 - e. In the Add Data Items window, select the following measures:
Days to Delivery
Discount
Total Revenue
Unit Cost
 - f. Click **OK**.

The Roles pane should resemble the following:

Data Roles

Correlation - Days to Delivery 1

Show correlations:

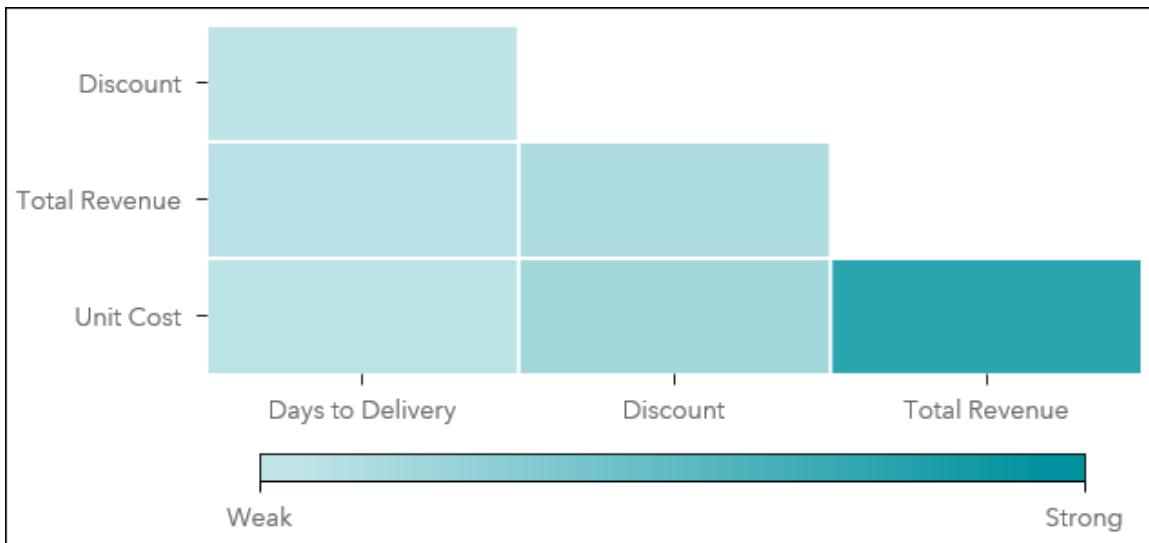
Within one set of measures

✓ Measures

- ❖ Days to Delivery
- ❖ Discount
- ❖ Total Revenue
- ❖ Unit Cost
- + Add

Only measure data items can be used for the correlation matrix.

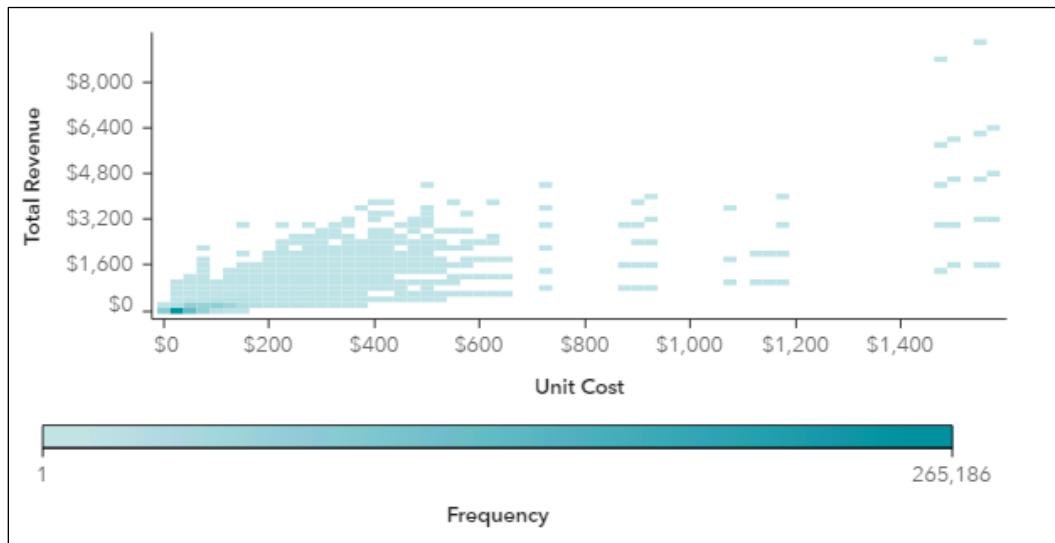
The correlation matrix should resemble the following:



There is a strong relationship between **Unit Cost** and **Total Revenue**. Placing your cursor over the cell shows a correlation of 0.7790, meaning that as **Unit Cost** increases, so does **Total Revenue**. We should examine these two measures more closely to better understand the relationship.

9. Create a heat map.
 - a. In the left pane, click the **Data** icon.
 - b. Select **Unit Cost** and **Total Revenue**.
 - c. Drag the selected data items to the right of the correlation matrix.

The automatic chart functionality determines the best way to display the selected data.

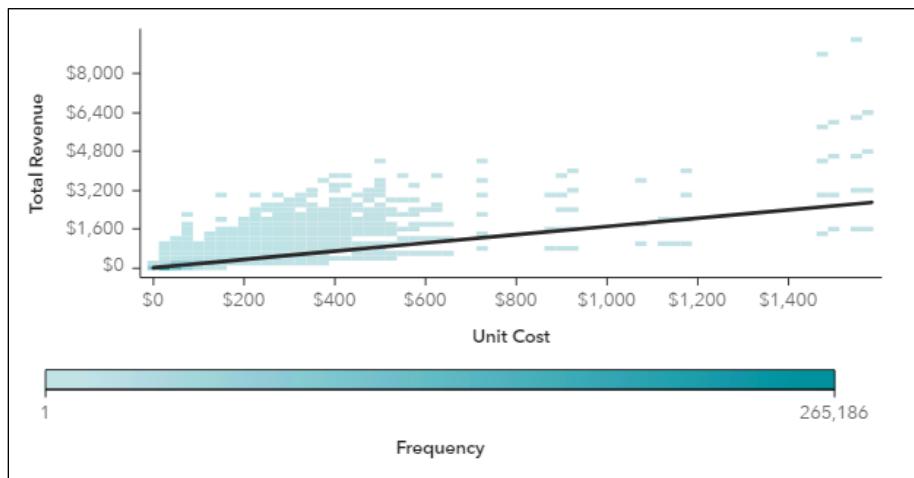


Because unit cost and total revenue are both high cardinality data items, a heat map is used to display the relationship between the measures. For low cardinality data items, a scatter plot would be used.

- d. In the right pane, click the **Options** icon.
- e. In the Fit Line group, select **Linear** for the **Type** field.



The heat map should resemble the following:



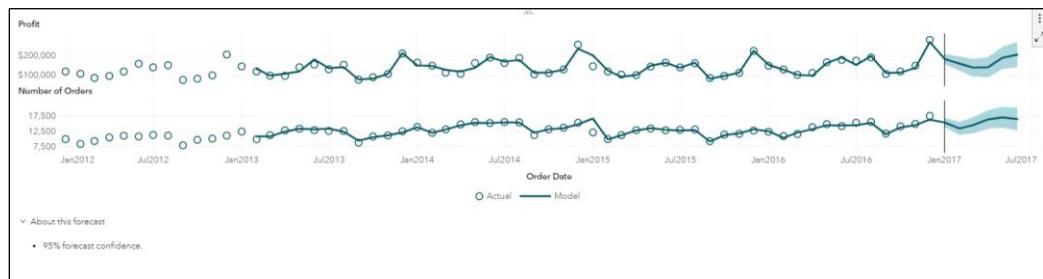
- f. In the upper right corner of the heat map, click (**Maximize**) to view additional details.
- g. Click **Unit Cost, Total Revenue analysis** in the table of data values below the chart.

Unit Cost, Total Revenue		Unit Cost, Total Revenue analysis
Property	Value	
Model type	Linear	
Model description	The linear fit is the straight line that best represents the relationship be...	
R-square value	0.6068	
Correlation	A correlation of 0.78 suggests there is a strong linear relationship betw...	
Correlation help	A positive correlation value means that as one variable increases, the se...	
Slope	1.6966	
Function	$f(x)=8.0391 + 1.6966x$	
Average x	77.76	
Average y	139.96	
Standard deviation x	85.2765	
Standard deviation y	185.7319	
Observations	951,669	

The linear fit line between unit cost and total revenue indicates that a dollar increase in costs increases revenues by \$1.69.

- h. In the upper right corner, click  (Restore).
10. Modify the time series plot.
- a. Click the time series plot to make it active.
 - b. Click  (More) and select **Change Time Series Plot to ⇨ Forecasting**.
 - c. In the right pane, click the **Options** icon.
 - d. Increase the size of the Forecast object to see the forecasted values.

The forecast plot should resemble the following:



We can see that profit and the number of orders are closely related: when the number of orders rise, so do profits. The forecast shows that this trend is expected to continue in the near future.

- e. In the upper right corner of the forecast plot, click  (Maximize) to view additional details.
- f. Scroll to the bottom of the table of data values below the chart.

Results		Dependent Variables Results						
Order Date	Profit	Profit (Actual)	Lower Confidence Interval	Upper Confidence Interval	Number of Orders	Number of Orders (Actual)	Lower Confidence Interval	Upper Confidence Interval
Nov2016	\$137,377.61	\$149,117.28	.	.	14,639	15,005	.	.
Dec2016	\$273,803.86	\$284,648.43	.	.	16,409	17,621	.	.
Jan2017	\$184,241.94	.	\$157,588.93	\$210,894.95	15,466	.	13,945	16,987
Feb2017	\$160,011.07	.	\$122,318.02	\$197,704.12	13,551	.	11,400	15,703
Mar2017	\$139,309.78	.	\$93,145.41	\$185,474.15	14,609	.	11,974	17,244

The forecast values for profit and number of orders, along with values for the lower and upper confidence intervals, are displayed.

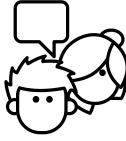
- g. Click **Dependent Variables Results** in the table of data values below the chart.

Results		Dependent Variables Results
Dependent Variable	Algorithm	
Profit	ARIMA: Profit ~ P = (12) D = (1,12) NOINT	
Number of Orders	ARIMA: Number of Orders ~ P = (12) D = (1,12) NOINT	

Visual Analytics has determined that the ARIMA algorithm best forecasts profit and number of orders. This algorithm cannot be changed.

- h. In the upper left corner, click  (Restore).
 11. In the upper right corner, click  (Menu) and select **Save**.
 12. Select **Eric** ⇒ **Sign out** in the upper right corner.

End of Demonstration



Human Resources

Practice Scenario: Employees





Salary



Profits



Job title differences



Orders



Years of Service



27



\$



74
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Practice

7. Adding Data Analysis

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice3.4b** report from the **Shared Data/Basics/Practices (HR)** folder.
- On Page 6, create a correlation matrix by assigning the following data items to the specified roles:

Measures	Annual Salary
	Total Orders
	Total Profit
	Years of Service

The correlation matrix should resemble the following:



- Answer the following question:

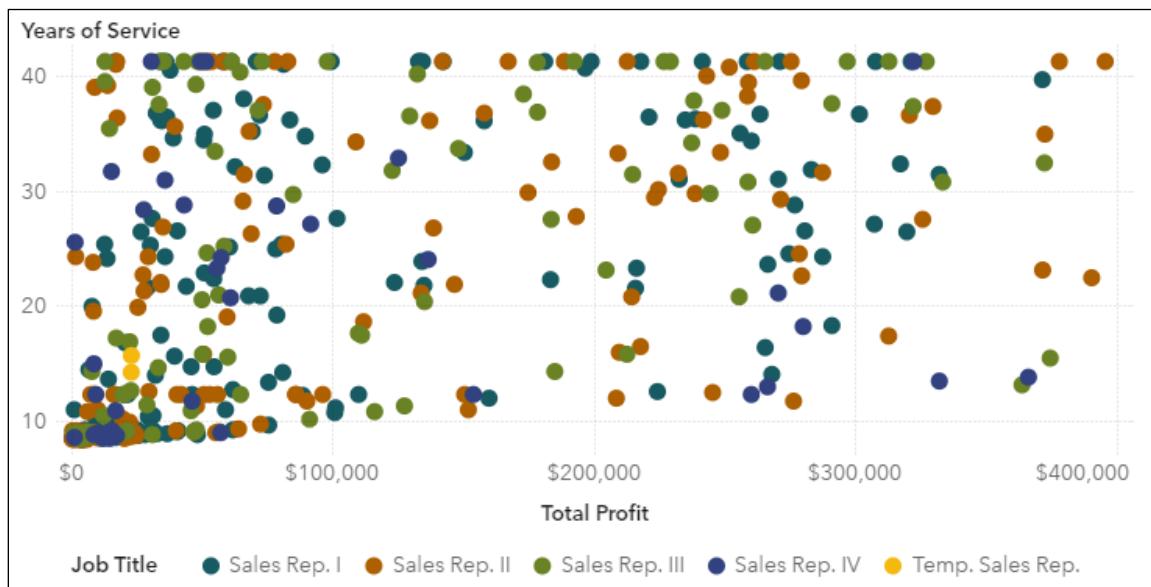
During a management meeting, it was mentioned that total orders might be a better criterion for promotion than profit generated. Do you agree?

Answer: _____

- Create a scatter plot, on the right of the correlation matrix, by assigning the following data items to the specified roles:

Measures	Total Profit
	Years of Service
Color	Job Title

The scatter plot should resemble the following:

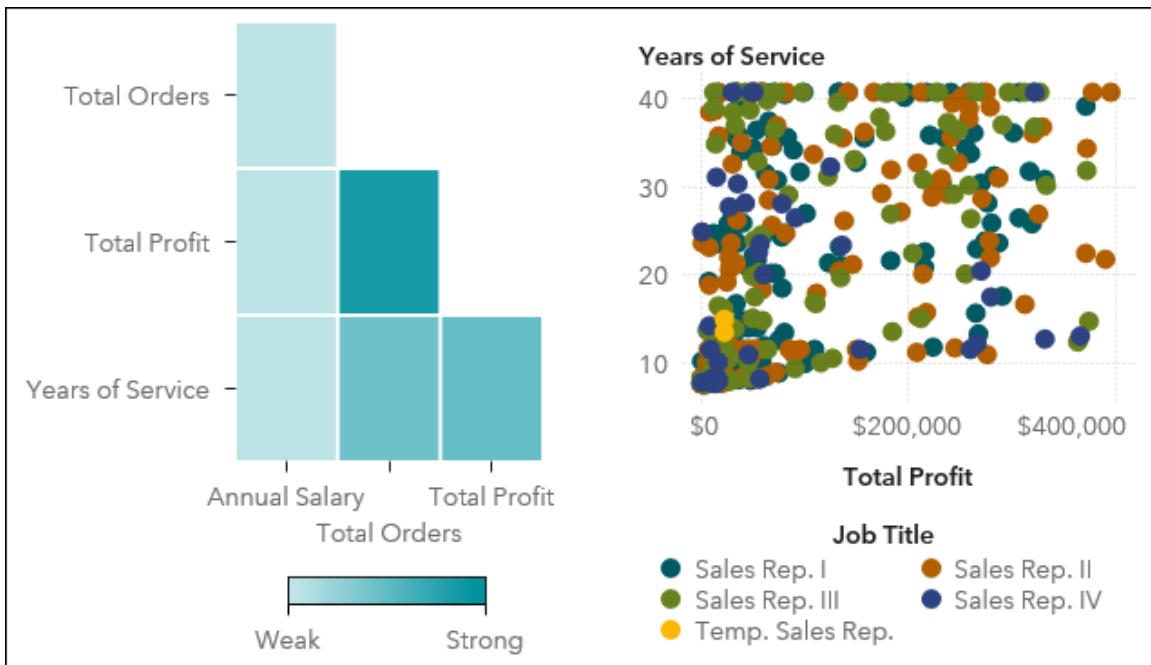


- f. Answer the following question:

Using years of service and profit generated as promotion criteria, do you notice any differences between job titles?

Answer: _____

Page 6 should resemble the following:



- g. Save the report.
h. Sign out of Report Builder.

End of Practices

3.5 Solutions

Solutions to Practices

1. Working with Data Items

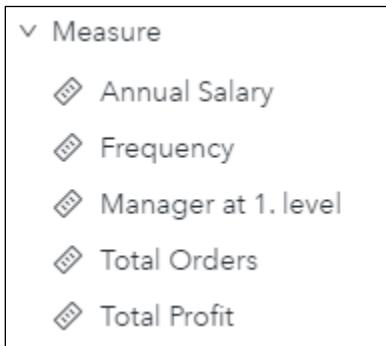
- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open the **VA1- Practice3.1** report from the **Shared Data/Basics/Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area.
The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) In the Open window, navigate to the **Shared Data/Basics/Practices (HR)** folder.
 - 4) Double-click **VA1- Practice3.1** to open the report.
- c. View the items in the Data pane. If necessary, click the **Data** icon in the left pane.

What is the classification of **Employee ID? Manager at 1. level?**

Answer: Employee ID has a classification of category.



Manager at 1. level has a classification of measure.



What does the **Frequency** data item represent?

Answer: Because there is one row per employee in the **EMPLOYEES_CLEAN** data source, **Frequency** represents the number of employees.

- d. Change the classification for **Manager at 1. level** to **Category**.
 - 1) In the Measure group, click  (Edit properties) next to **Manager at 1. level**.
 - 2) Select **Category** for the **Classification** field. **Manager at 1. level** should now appear in the Category group.
- e. Change the format for **Annual Salary** to **Dollar13.2**.
 - 1) In the Measure group, click  (Edit properties) next to **Annual Salary**.
 - 2) Click  (Edit) for the **Format** field.
 - a) In the Format window, verify that **13** is specified for the **Width** field.
 - b) Enter **2** for the **Decimals** field.
 - c) Click **OK**.
- f. Rename data items.
 - 1) In the Category group, click  (Edit properties) next to **Employee ID**.
 - 2) Enter **ID** in the **Name** field and press **Enter**.
 - 3) In the Category group, click  (Edit properties) next to **Employee Name**.
 - 4) Enter **Name** in the **Name** field and press **Enter**.
 - 5) In the Category group, click  (Edit properties) next to **Manager at 1. level**.
 - 6) Enter **Manager ID** in the **Name** field and press **Enter**.
 - 7) In the Measure group, click  (Edit properties) next to **Frequency**.
 - 8) Enter **Number of Employees** in the **Name** field and press **Enter**.
 - 9) Click  (Actions) and select **Refresh data source** at the top of the Data pane to collapse the data item properties.
- g. To save the report, click  (Menu) in the upper right corner and select **Save**.
- h. To sign out of SAS Report Builder, select **Eric** \Rightarrow **Sign out** in the upper right corner.

2. Exploring Data: Part 1

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.

- b. Open the **VA1- Practice3.2a** report from the **Shared Data/Basics/Practices (HR)** folder.

- 1) Select **Report Builder** in the Action Button area.

The Welcome to SAS Visual Analytics window appears.

- 2) Click **Open**.

- 3) Navigate to the **Shared Data/Basics/Practices (HR)** folder.

- 4) Double-click **VA1- Practice3.2a** to open the report.

- c. Create an automatic chart.

- 1) In the right pane, click the **Data** icon.

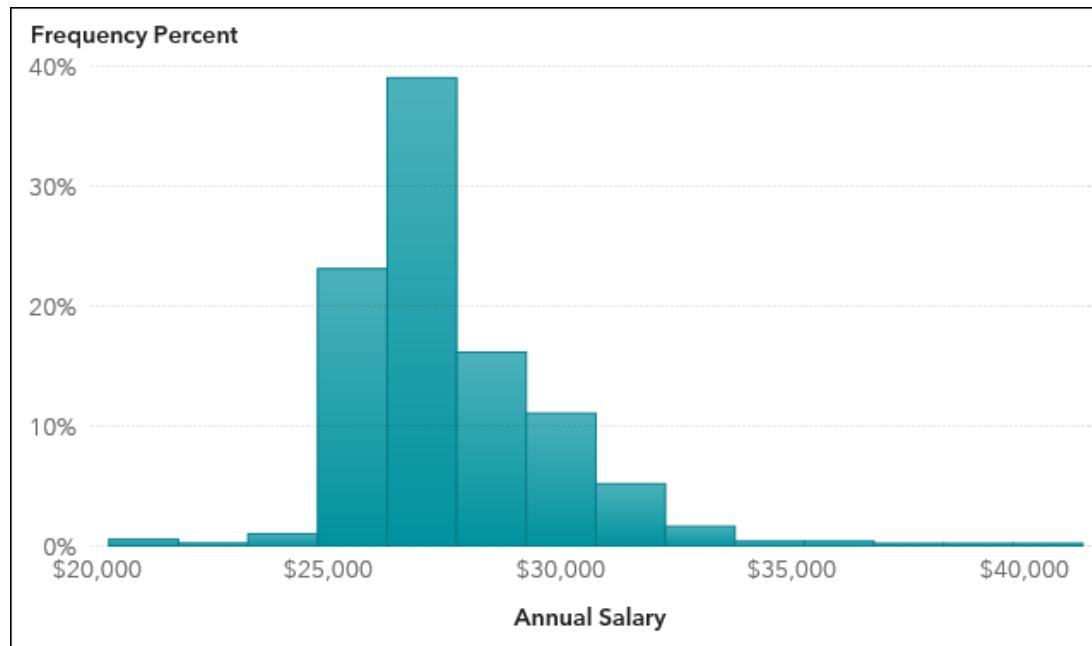
- 2) Click the following data items to select them:

Annual Salary

Frequency Percent

- 3) Drag the data items to the canvas.

The automatic chart functionality determines the best way to display the selected data.



- d. Modify the options for the automatic chart.

- 1) In the right pane, click the **Options** icon.

- 2) If necessary, expand the **Object** group.

- 3) Enter **Distribution of Salary** in the **Name** field.

- 4) In the Histogram group, select **Measure values** for the **Bin range** field.

- 5) Select **Set a fixed bin count**.

- 6) Enter **4** in the **Bin count** field and press Enter.

▼ Histogram

Direction:

Transparency:

0%

Bin range:

Measure values ▾

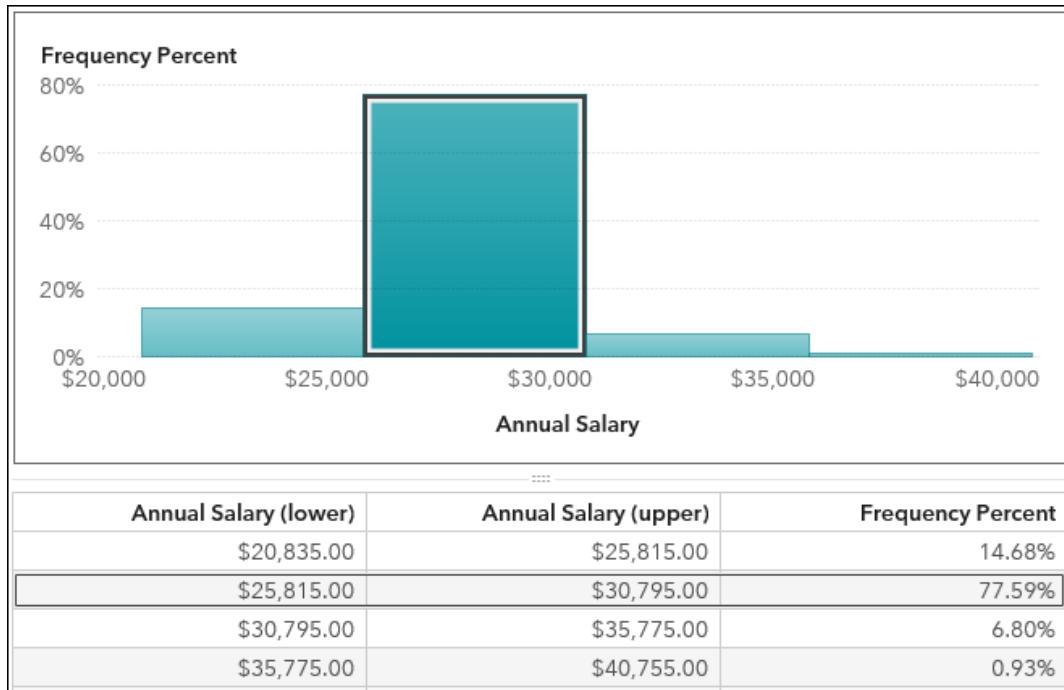
Set a fixed bin count

Bin count (2-100): *

4

- e. Maximize the histogram and answer the question.

- 1) In the upper right corner of the chart, click (**Maximize**) to view additional details. A table of data values is displayed at the bottom of the chart.
- 2) Click the highest bar in the graph.

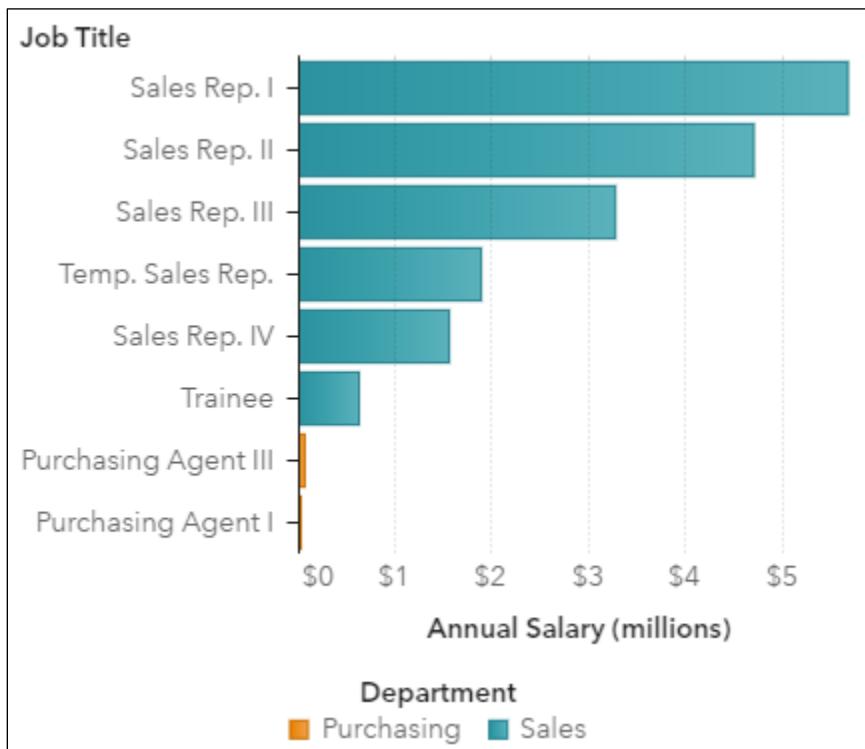


Into which range do most salaries fall?

Answer: More than 75% of salaries fall within the \$25K to \$30K range.

- 3) In the upper left corner, click  (Restore).
- f. Create a bar chart on the right of the automatic chart.
- 1) In the left pane, click the **Objects** icon.
 - 2) Drag the **Bar Chart** object, from the **Graphs** group, to the right side of the canvas.
 - 3) In the right pane, click the **Roles** icon.
 - 4) For the **Category** role, select **Add** \Rightarrow **Job Title**.
 - 5) For the **Measure** role, select **Number of Employees** \Rightarrow **Annual Salary**.
 - 6) For the **Group** role, select **Add** \Rightarrow **Department**.

The bar chart should resemble the following:



- g. Modify the name of the bar chart.
- 1) In the right pane, click the **Options** icon.
 - 2) If necessary, expand the **Object** group.
 - 3) Enter **Total Salary by Job and Department** in the **Name** field.

- h. Answer the questions.

In which department are most of our salary costs spent? For which job title?

Answer: Most of our salary costs are spent in the Sales Department, with a majority going toward the Sales Rep. I job title.

Why do you think salary costs are so much higher for this group?

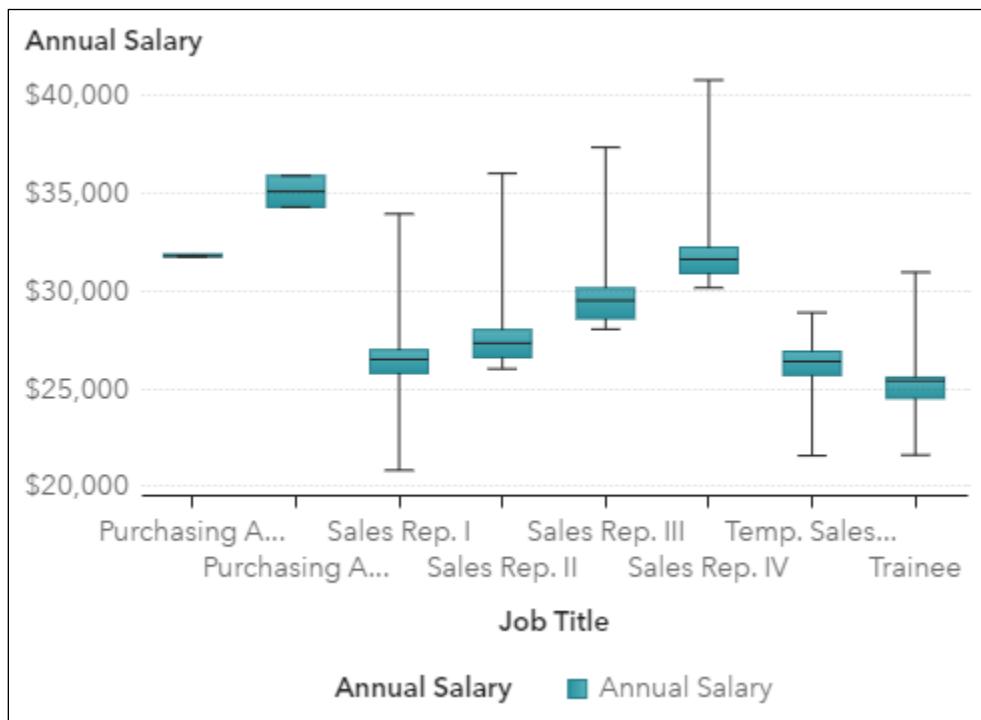
Answer: Salary costs are higher for this group either because this job title pays more or there are more employees with this job title. Because the Sales Rep I. job title is the lowest level of all sales reps, you can assume that there are more employees with this job title.

- i. To save the report, click  (Menu) in the upper right corner and select **Save**.
- j. To sign out of SAS Report Builder, select **Eric** ⇒ **Sign out** in the upper right corner.

3. Exploring Data: Part 2

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open the **VA1- Practice3.2b** report from the **Shared Data/Basics/Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area.
The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Practices (HR)** folder.
 - 4) Double-click **VA1- Practice3.2b** to open the report.
- c. On Page 2, create a box plot.
 - 1) In the upper left corner of the report, click the **Page 2** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Box Plot** object from the Graphs group to the canvas.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the **Category** role, select **Add** ⇒ **Job Title**.
 - 6) For the **Measures** role, select **Add** ⇒ **Annual Salary** and click **OK**.

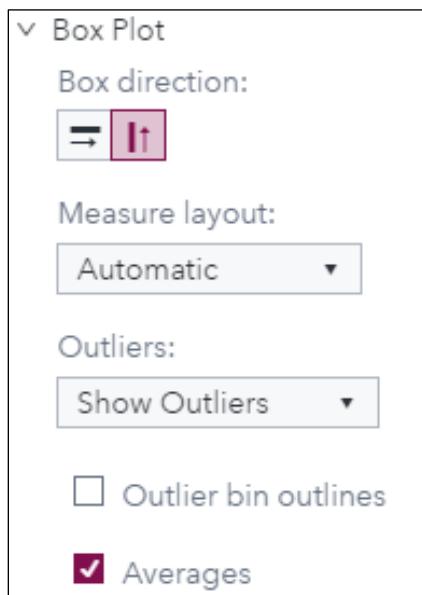
The box plot should resemble the following:



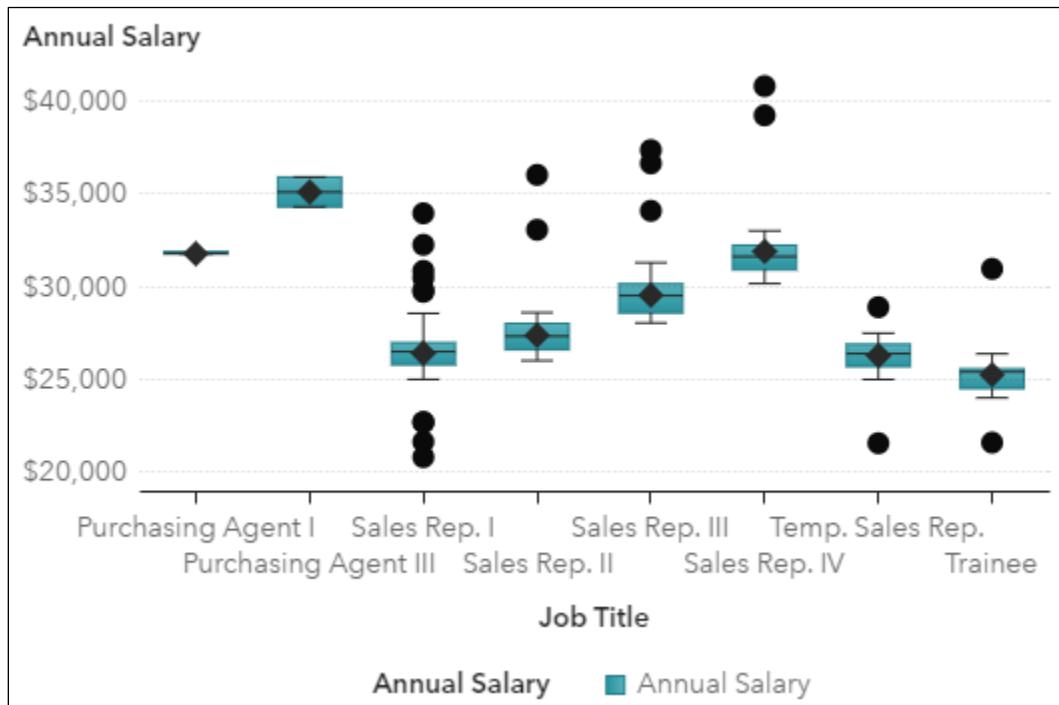
d. Modify the options for the box plot.

- 1) In the right pane, click the **Options** icon.
- 2) If necessary, expand the **Object** section.
- 3) Enter **Salary Analysis by Job Title** in the **Name** field.
- 4) In the Box Plot group, select **Show Outliers** for the **Outliers** field.
- 5) Select **Averages**.

The Options pane should resemble the following:



The box plot should resemble the following:



e. Maximize the box plot and answer the questions.

- 1) In the upper right corner of the chart, click (**Maximize**) to view additional details.
- 2) In the detail data, click **Average** to sort by that column in ascending order.

Job Title	Minimum	Lower Whisker	First Quartile	Average ▲	Median
Trainee	\$21,615.00	\$24,015.00	\$24,515.00	\$25,260.80	\$25,405.00
Temp. Sales Rep.	\$21,580.00	\$25,005.00	\$25,695.00	\$26,287.57	\$26,387.50
Sales Rep. I	\$20,835.00	\$25,010.00	\$25,795.00	\$26,417.79	\$26,495.00
Sales Rep. II	\$26,015.00	\$26,015.00	\$26,600.00	\$27,373.58	\$27,325.00
Sales Rep. III	\$28,040.00	\$28,040.00	\$28,580.00	\$29,533.29	\$29,505.00
Purchasing Agent I	\$31,760.00	\$31,760.00	\$31,760.00	\$31,760.00	\$31,760.00
Sales Rep. IV	\$30,150.00	\$30,150.00	\$30,890.00	\$31,880.51	\$31,605.00
Purchasing Agent III	\$34,270.00	\$34,270.00	\$34,270.00	\$35,070.00	\$35,070.00

Which job title has the highest average salary? The lowest?

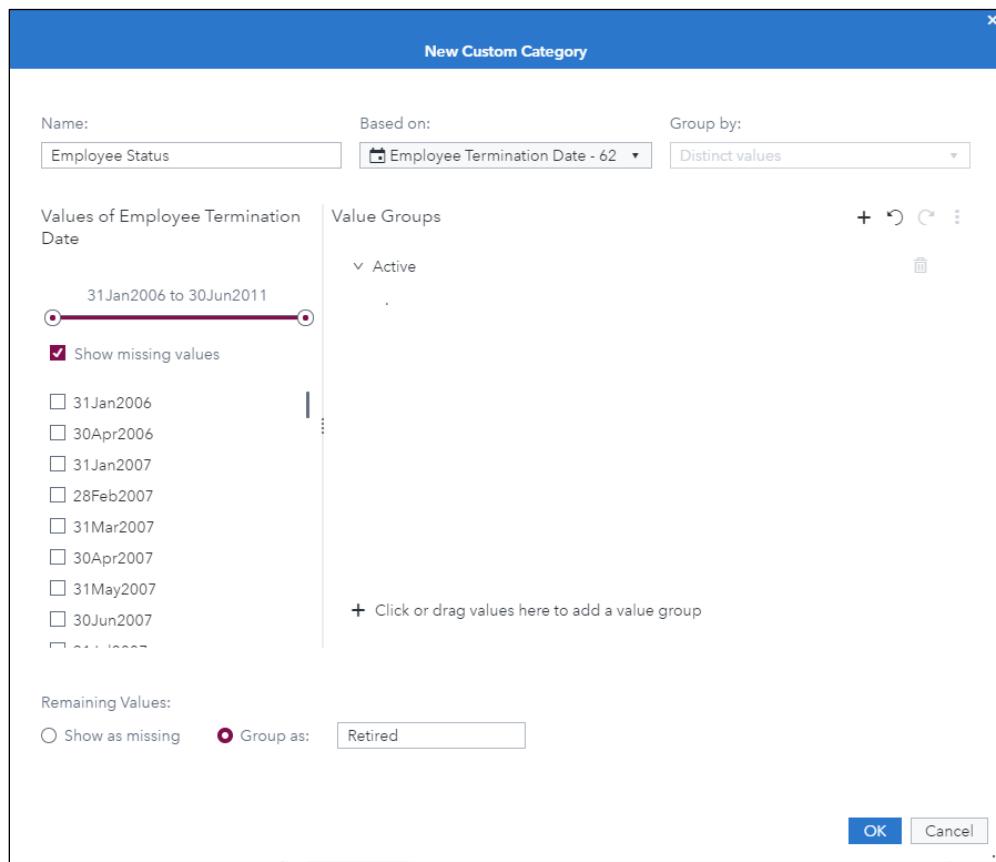
Answer: Purchasing Agent III has the highest average salary (\$35,070.00). Trainee has the lowest average salary (\$25,260.80).

Orion Star has had a great sales year and would like to promote some employees. With which job title would you recommend starting the promotion analysis? Why?

Answer: I would recommend starting with Sales Rep. I. That job title most likely has the largest number of employees, and it has more outliers than other job titles, which could indicate that those who are at that job title and have a higher salary need to be promoted.

- 3) In the upper right corner, click  (**Restore**).
 - f. To save the report, click  (**Menu**) in the upper right corner and select **Save**.
 - g. To sign out of SAS Report Builder, select **Eric** ⇒ **Sign out** in the upper right corner.
- 4. Creating Data Items**
 - a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
 - b. Open the **VA1- Practice3.3a** report from the **Shared Data/Basics/Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area.
The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Practices (HR)** folder.
 - 4) Double-click **VA1- Practice3.3a** to open the report.
 - c. Create a new data item, **Employee Status**.
 - 1) In the left pane, click the **Data** icon.
 - 2) In the Data pane, select **New data item** ⇒ **Custom category**.
 - a) In the New Custom Category window, enter **Employee Status** in the **Name** field.
 - b) Select **Employee Termination Date** in the **Based on** field.
 - c) Select **Value Group 1**.
 - d) Type **Active** and press Enter.
 - e) Drag **.** (missing value) from the left pane to the **Drag values here** area on the right.

- f) In the Remaining Values area, enter **Retired** in the **Group as** field.



- g) Click **OK** to create the new custom category.

The new calculated item, **Employee Status**, appears in the Category group.

▼ Category

- Anniversary Month - 12
- Company - 11
- Department - 2
- Employee Country - 10
- Employee Gender - 2
- Employee Hire Date - 239
- Employee Status - 2

Note: As an alternative, you can also create a calculated data item with the following expression:

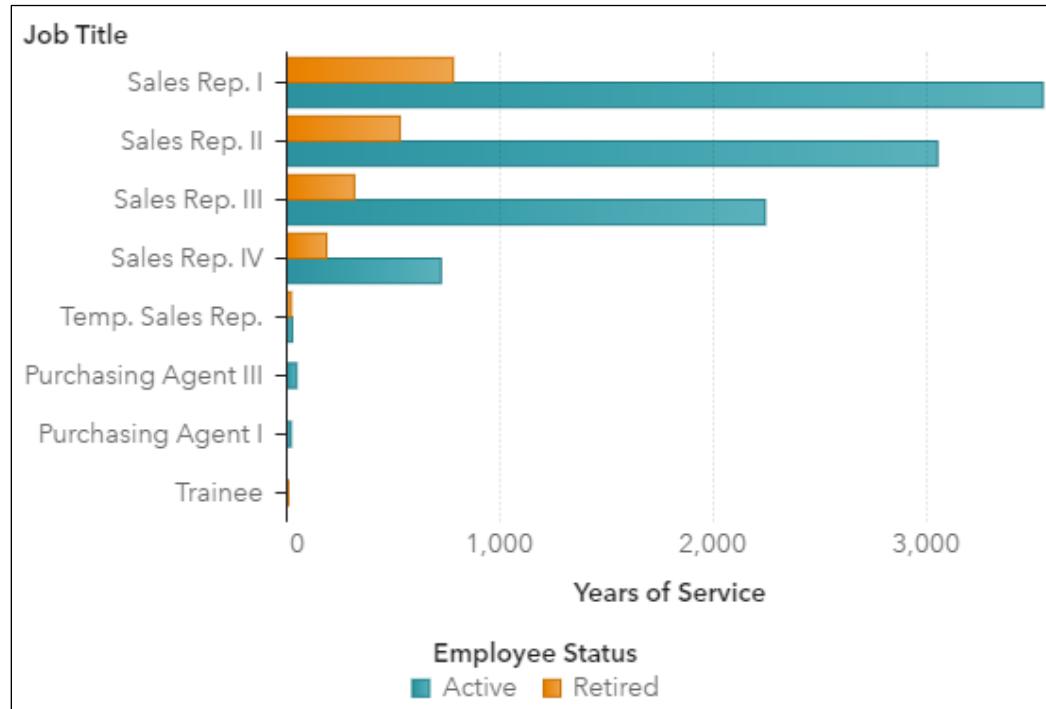
```

IF Employee Termination Date IS Missing
  RETURN "Active"
ELSE "Retired"
  
```

- d. On Page 3, create a bar chart.

 - 1) In the upper left corner of the report, click the **Page 3** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Bar Chart** object, from the Graphs group, to the canvas.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the **Category** role, select **Add** \Rightarrow **Job Title**.
 - 6) For the **Measure** role, select **Number of Employees** \Rightarrow **Years of Service**.
 - 7) For the **Group** role, select **Add** \Rightarrow **Employee Status**.

The bar chart should resemble the following:

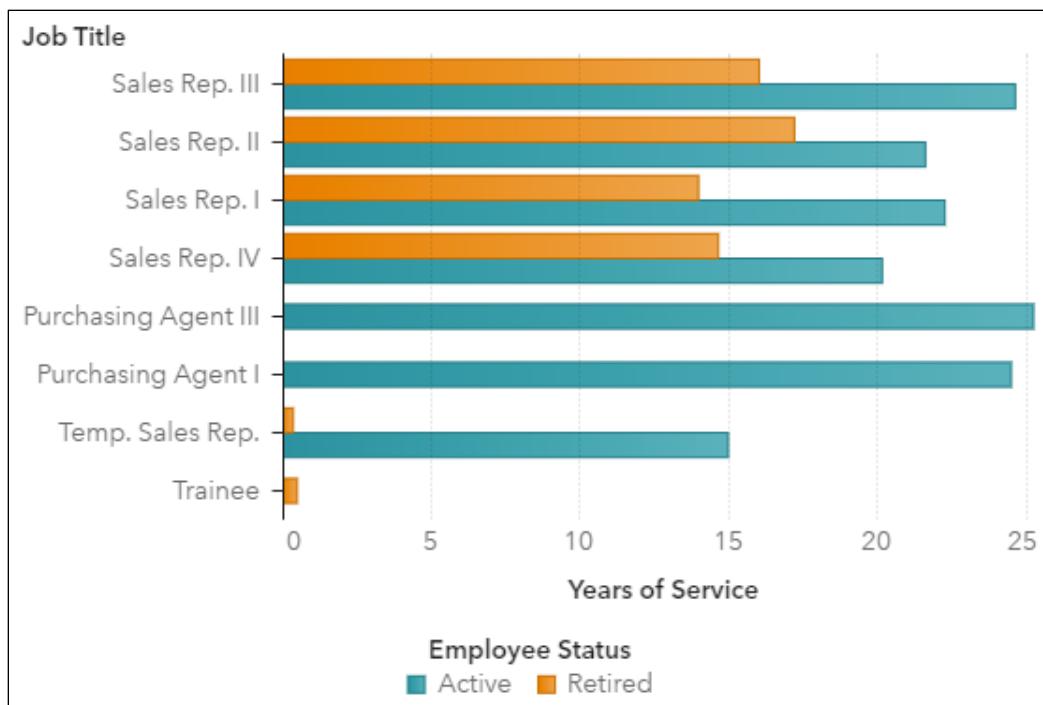


- e. Specify **Years of Service by Job Title and Status** as the name of the bar chart.

 - 1) In the right pane, click the **Options** icon.
 - 2) If necessary, expand the **Object** section.

- 3) Enter **Years of Service by Job Title and Status** in the **Name** field.
- f. Change the aggregation for **Years of Service** to **Average**.
- 1) In the right pane, click the **Data** icon.
 - 2) Click  (Edit properties) next to the new data item, **Years of Service**.
 - 3) Select **Average** for the **Aggregation** field.

The updated bar chart should resemble the following:



- g. Answer the following question:

Management has decided that one possible criterion for promotion is years of service. Considering this, with which job title would you recommend starting the promotion analysis?

Answer: I would recommend starting with Sales Rep. I, because for active employees that job title has a slightly higher average for years of service when compared to Sales Rep. II. Within Sales Rep. I employees, I would most likely look at employees with more years of service as a starting point to reward employees for their loyalty to the company.

- h. To save the report, click  (Menu) in the upper right corner and select **Save**.
- i. To sign out of SAS Report Builder, select **Eric** \Rightarrow **Sign out** in the upper right corner.

5. Applying Filters

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.

- b. Open the **VA1- Practice3.3b** report from the **Shared Data/Basics/Practices (HR)** folder.

- 1) Select **Report Builder** in the Action Button area.

The Welcome to SAS Visual Analytics window appears.

- 2) Click **Open**.

- 3) Navigate to the **Shared Data/Basics/Practices (HR)** folder.

- 4) Double-click **VA1- Practice3.3b** to open the report.

- c. Add a data source filter to filter for active employees in the Sales Department.

- 1) In the left pane, click the **Data** icon.

- 2) In the Data pane, click  **(Actions)** and select **Apply data source filter**.

- a) Click **Operators** on the left.

- b) Expand **Boolean**.

- c) Double-click **AND** to add it to the expression.

- d) On the left, click **Data Items**.

- e) Expand **Character**.

- f) Select **Employee Status**.

- g) In the Conditions area, double-click **Employee Status = 'x'** to add it to the first condition in the expression area.

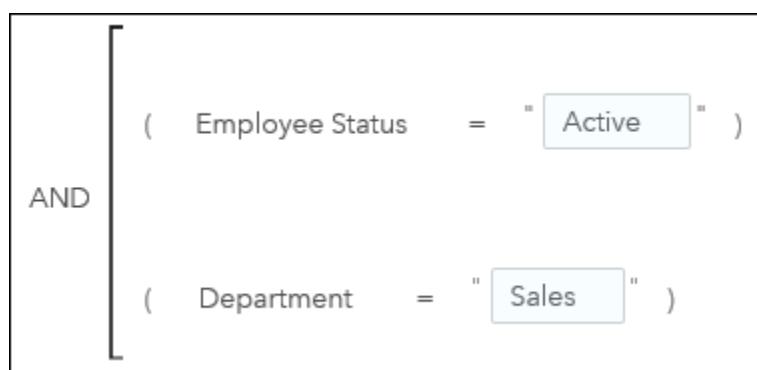
- h) Enter **Active** as the string for the first condition.

- i) In the Character group, select **Department**.

- j) In the Conditions area, double-click **Department = 'x'** to add it to the second condition in the expression area.

- k) Enter **Sales** as the string for the second condition.

The expression should resemble the following:



The bottom of the Apply Data Source Filter window should resemble the following:

Returned observations: 429	Total observations: 647
----------------------------	-------------------------

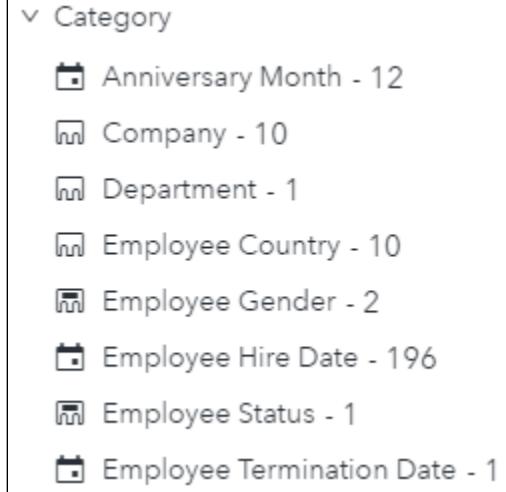
i) In the upper right corner, click  (Preview result).

m) Scroll down the list.

Data Source Filter		Employee Status	Department
True		Active	Sales
False		Retired	Sales
False		Retired	Sales
False		Retired	Sales

- n) Click **Close** to close the preview.
- 3) Click **OK** to apply the data source filter.

The Data pane should resemble the following:

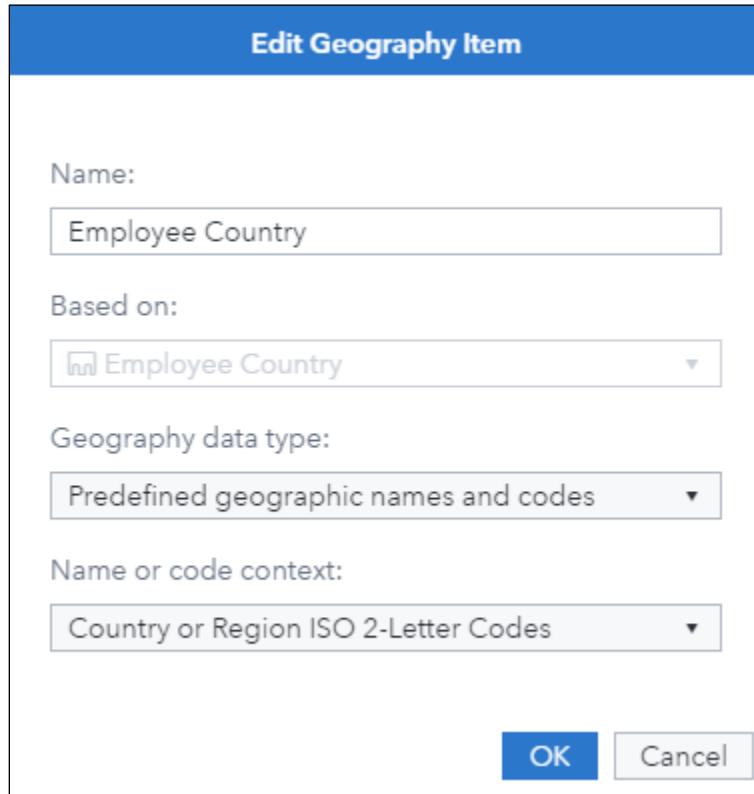


Category

-  Anniversary Month - 12
-  Company - 10
-  Department - 1
-  Employee Country - 10
-  Employee Gender - 2
-  Employee Hire Date - 196
-  Employee Status - 1
-  Employee Termination Date - 1

- d. Change the classification for **Employee Country** to **Geography** ⇒ **Country or Region ISO 2-Letter Codes**.
- 1) In the left pane, click the **Data** icon.
 - 2) Click  (Edit properties) next to **Employee Country**.

- 3) Select **Geography** for the **Classification** field.
 - a) Verify that **Predefined geographic names and codes** is selected for the **Geography data type** field.
 - b) Select **Country or Region ISO 2-Letter Codes** for the **Geography** field.



- 4) Click **OK**.
A new group, **Geography**, is added to the Data pane.

The screenshot shows the Data pane with a single group named 'Geography'. This group is currently expanded, showing a single item named 'Employee Country - 10'.

- e. On Page 4, create a geo map.
 - 1) In the upper left corner of the report, click the **Page 4** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Geo Map** object, from the Graphs group, to the canvas.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the **Category** role, select **Add** \Rightarrow **Employee Country**.
 - 6) For the **Size** role, select **Number of Employees** \Rightarrow **Total Profit**.
 - 7) For the **Color** role, select **Add** \Rightarrow **Number of Employees**.

f. Maximize the geo map and answer the questions.

- 1) In the upper right corner of the chart, click  (Maximize) to view additional details.
- 2) In the detail data, click **Total Profit** twice to sort by that column in descending order.



- 3) Answer the questions.

Management has decided that one possible criterion for promotion is profit generated. Which two countries generate the highest profit? Why do they have such high profits?

Answer: United States (\$9,490,871.30) and Germany (\$6,705,983.90) generate the highest total profit. These countries have more employees than other countries, which could explain the higher profits.

- 4) In the upper right corner, click  (Restore).

g. Modify the Size role for the geo map.

- 1) Verify that the geo map is selected.
- 2) In the right pane, click the **Roles** icon.
- 3) For the **Size** role, select **Total Profit ⇔ Average Profit**.

- h. Specify **Average Profit and Number of Employees by Country** as the name of the bar chart.

- 1) In the right pane, click the **Options** icon.
 - 2) If necessary, expand the **Object** section.
 - 3) Enter **Average Profit and Number of Employees by Country** in the **Name** field.
- i. Maximize the geo map and answer the question.
- 1) In the upper right corner of the chart, click  (**Maximize**) to view additional details.
 - 2) In the detail data, click **Average Profit** twice to sort by that column in descending order.



- 3) Answer the question.

With which country would you recommend starting the promotions if profit generated is one possible criterion for promotion?

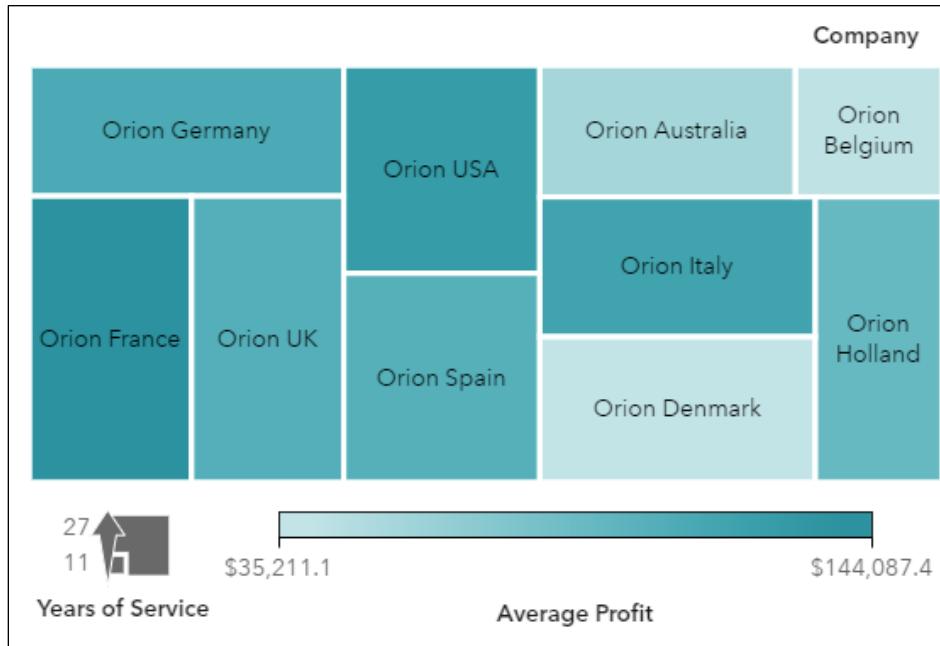
Answer: I would recommend starting with United States, because although France has the highest average profit (\$144,087.39), they also have about half the number of employees as the United States. Because the US has a high number of employees and a high average profit, promotions in that country would have the largest impact.

- 4) In the upper right corner, click  (**Restore**).
- j. To save the report, click  (**Menu**) in the upper right corner and select **Save**.
- k. To sign out of SAS Report Builder, select **Eric** ⇒ **Sign out** in the upper right corner.

6. Analyzing Data

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open the **VA1- Practice3.4a** report from the **Shared Data/Basics/Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area.
The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Practices (HR)** folder.
 - 4) Double-click **VA1- Practice3.4a** to open the report.
- c. On Page 5, create a treemap.
 - 1) In the upper left corner of the report, click the **Page 5** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Treemap** object, from the **Graphs** group, to the canvas.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the **Tile** role, select **Add** \Rightarrow **Company**.
 - 6) For the **Size** role, select **Number of Employees** \Rightarrow **Years of Service**.
 - 7) For the **Color** role, select **Add** \Rightarrow **Average Profit**.
 - 8) For the **Data tip values** role, select **Add** \Rightarrow **Number of Employees** and click **OK**.

The treemap should resemble the following:



d. Create a new hierarchy (**Employee Hierarchy**).

- 1) In the left pane, click the **Data** icon.
- 2) In the Data pane, select **New data item** \Rightarrow **Hierarchy**.
 - a) In the New Hierarchy window, enter **Employee Hierarchy** in the **Name** field.
 - b) Double-click the following data items, in the specified order, in the Available items list to move them to the Selected items list:
Company, Job Title, Employee Gender
 - c) Click **OK** to create the hierarchy.

The Hierarchy group in the Data pane should resemble the following:



e. Modify the Tile role in the treemap and answer the questions.

- 1) If necessary, select the treemap.
- 2) In the right pane, click the **Roles** icon.
- 3) For the **Tile** role, select **Company** \Rightarrow **Employee Hierarchy**.
- 4) Answer the questions.

Which two companies have the highest average profit generated (one possible criterion for promotion)?

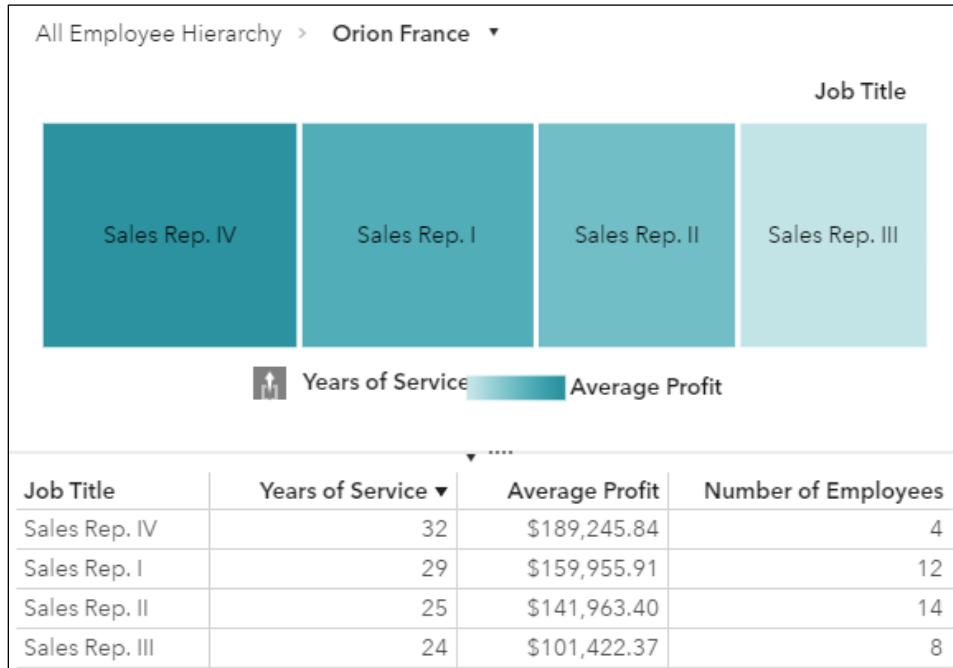
Answer: Orion France and Orion USA have the highest average profit generated.

Company	Years of Service	Average Profit \blacktriangledown
Orion France	27	\$144,087.39
Orion USA	23	\$130,011.94

- In the upper right corner of the treemap, click (Maximize) to view additional details.
- In the table below the treemap, click Average Profit twice to sort in descending order.
 - In the upper right corner, click (Restore).
 - In the treemap, double-click Orion France.
 - In the upper right corner of the treemap, click (Maximize) to view additional details.
 - In the table below the treemap, click Years of Service twice to sort in descending order.
 - In the upper right corner, click (Restore).

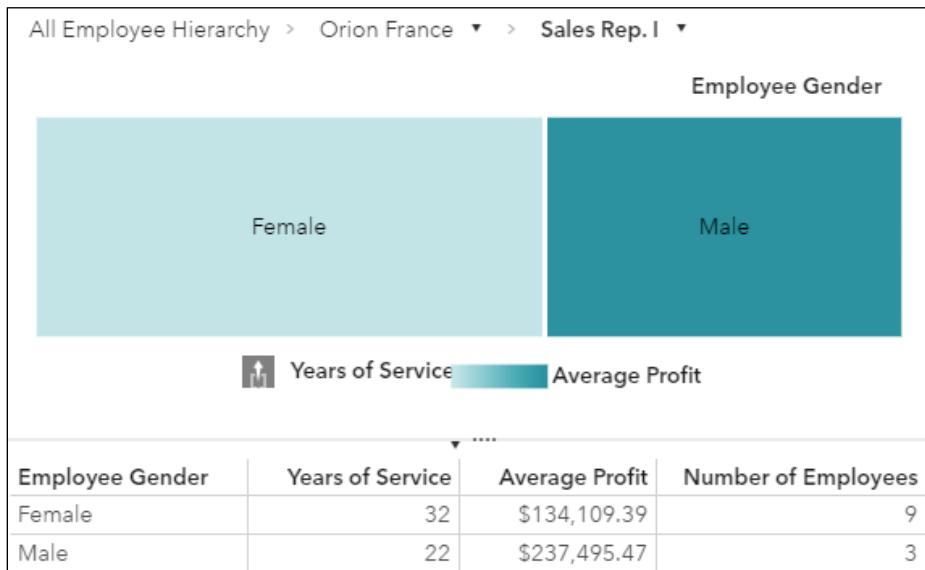
For these two companies, which job titles would you recommend for promotion (based on average years of service and average profit generated)?

Answer: For Orion France, although Sales Rep IV have the highest years of service and highest average profit, there is no promotion level for them. Sales Rep. I employees have the next highest average years of service and the highest profit per employee.



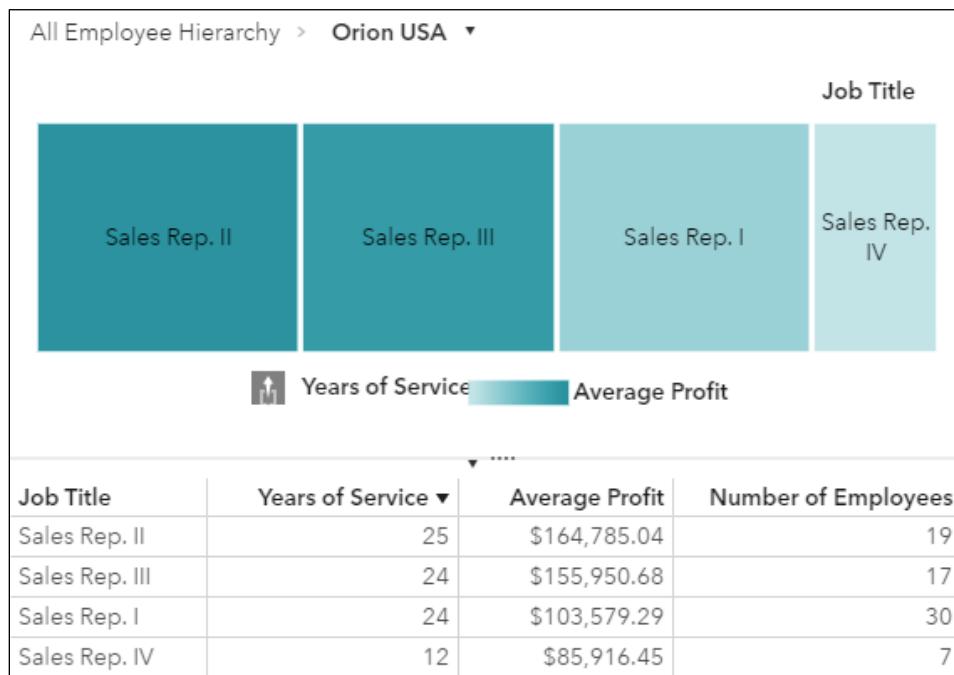
- In the treemap, double-click Sales Rep. I.
- In the upper right corner of the treemap, click (Maximize) to view additional details.

For Sales Rep. I, males have higher profit per employee but fewer years of service and fewer employees.



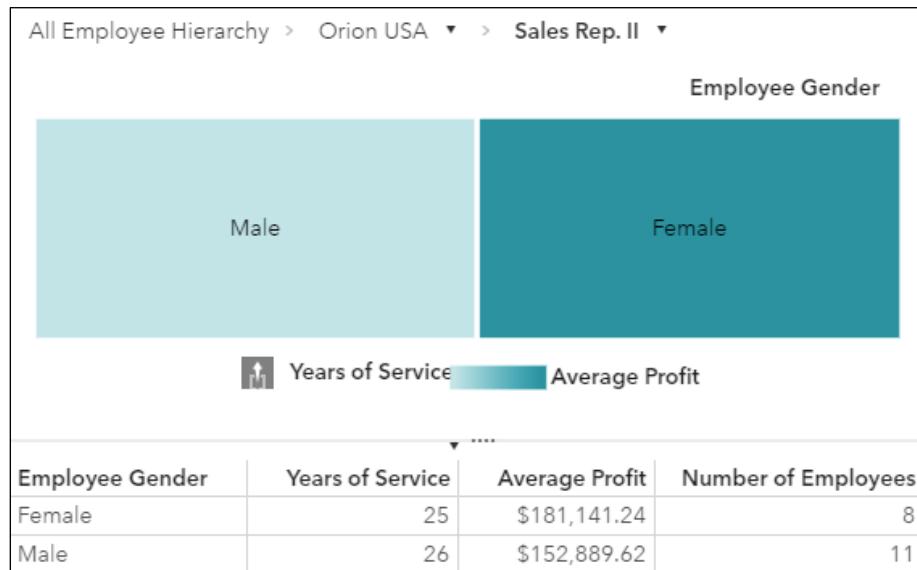
- In the upper right corner, click (Restore).

For Orion USA, Sales Rep. II employees have the highest years of service and the highest average profit per employee.



- In the treemap, click All Employee Hierarchy to return to the top level of the hierarchy.
- Double-click Orion USA.
- In the upper right corner of the treemap, click (Maximize) to view additional details.
- In the table below the treemap, click Years of Service twice to sort in descending order.
- In the upper right corner, click (Restore).

For Sales Rep. II, females have higher profit per employee but fewer years of service and fewer employees.



- In the treemap, double-click **Sales Rep. II**.
 - In the upper right corner of the treemap, click (Maximize) to view additional details.
 - In the table below the treemap, click **Years of Service** twice to sort in descending order.
 - In the upper right corner, click (Restore).
- f. To save the report, click (Menu) in the upper right corner and select **Save**.
 - g. To sign out of SAS Report Builder, select **Eric** \Rightarrow **Sign out** in the upper right corner.

7. Adding Data Analysis

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open the **VA1- Practice3.4b** report from the **Shared Data/Basics/Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area.
The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Practices (HR)** folder.
 - 4) Double-click **VA1- Practice3.4b** to open the report.
- c. On Page 6, create a correlation matrix.
 - 1) In the upper left corner of the report, click the **Page 6** tab.

- 2) In the left pane, click the **Objects** icon.
- 3) Drag the **Correlation Matrix** object, from the Graphs group, to the canvas.
- 4) In the right pane, click the **Roles** icon.
- 5) For the **Measures** role, click **Add**.
- 6) In the Add Data Items window, select the following measures:
Annual Salary
Total Orders
Total Profit
Years of Service
- 7) Click **OK**.

The correlation matrix should resemble the following:



- d. Answer the question.

During a management meeting, it was mentioned that total orders might be a better criterion for promotion than profit generated. Do you agree?

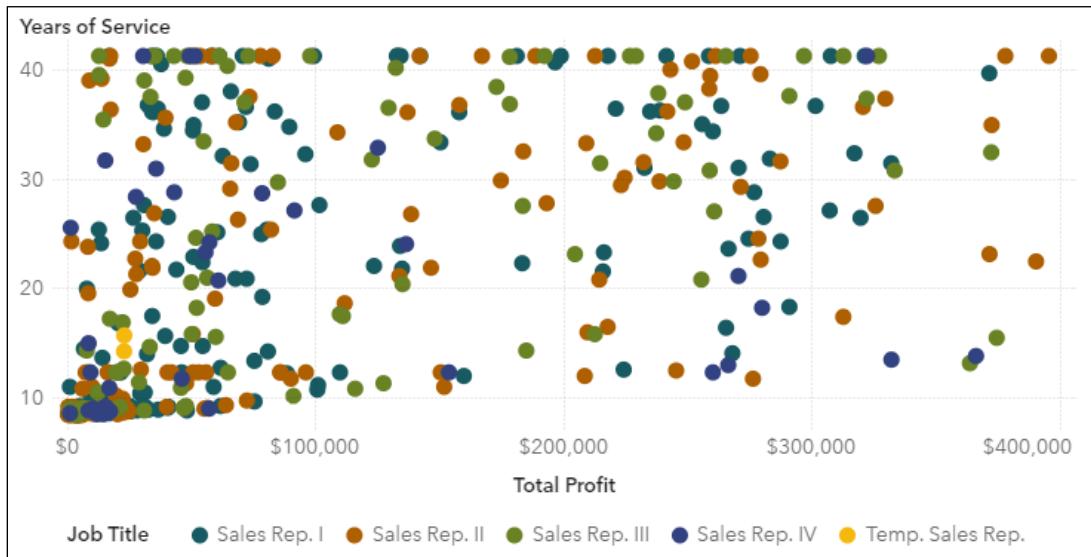
Answer: Looking at the correlation matrix, Total Profit and Total Orders are highly correlated (0.8783), so either measure would be appropriate for promotion criteria.

- e. Create a scatter plot.

- 1) In the left pane, click the **Objects** icon.
- 2) Drag the **Scatter Plot** object, from the Graphs group, to the right side of the canvas.
- 3) In the right pane, click the **Roles** icon.
- 4) For the **Measures** role, click **Add**.
- 5) In the Add Data Items window, select **Total Profit** and **Years of Service** and click **OK**.

- 6) For the **Color** role, select **Add \Rightarrow Job Title**.

The scatter plot should resemble the following:



- f. Answer the question.

Using years of service and profit generated as promotion criteria, do you notice any differences between job titles?

Answer: Based on the promotion criteria of years of service and profit generated, we want to focus on the employees in the upper right quadrant of the scatter plot. In that area, there seems to be an equal representation of Sales Rep. I, Sales Rep. II, and Sales Rep. III.

- g. To save the report, click  (Menu) in the upper right corner and select **Save**.
 h. To sign out of SAS Report Builder, select **Eric \Rightarrow Sign out** in the upper right corner.

End of Solutions

Solutions to Activities and Questions

3.01 Multiple Choice Question – Correct Answer

Which graph would help you determine whether a measure is normally distributed?

- a. distribution plot
- b. box plot
- c. histogram
- d. normality plot

3.02 Activity – Correct Answer

Match each new data item with the type of calculation.

B Gross Profit Margin (Total Profit/Total Revenue)

A Date (from month, day, year)

A. calculated item

A Hemisphere (from continents)

B. aggregated measure

B Number of Employees (distinct count)

A State Abbreviations (uppercase)

3.03 Activity

Given the values of **Customer Birth Date** and today's date, how would you calculate **Customer Age**?

In SAS, dates are stored as the number of days since January 1, 1960:

$$\text{Customer Age} = (\text{Today} - \text{Customer Birth Date})/365.25$$

Customer Birth Date
01Jan1938
12Feb1940
15Jan1950
20Dec1965
11Jun1975
08Aug1980
01Mar1955



35

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3.04 Activity – Correct Answer

Given the values of **Employee Hire Date** and **Employee Termination Date**, how would you calculate Years of Service?

Active employees:

$$\text{YOS} = (\text{Today} - \text{Employee Hire Date})/365.25$$

Retired employees:

$$\text{YOS} = (\text{Employee Termination Date} - \text{Employee Hire Date})/365.25$$

Use the IF... ELSE operator to perform different calculations based on a condition.

Employee Hire Date	Employee Termination Date
01Dec2004	28Feb2007
02Jan2005	.
25Jan2005	.
01Feb2005	.
01Mar2005	28Feb2010
01Apr2005	31Jan2010
01Apr2005	.



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3.05 Multiple Answer Question – Correct Answer

Which object can use a data item that has a classification type of geography?

- a. crosstab
- b. geo map
- c. table
- d. bar chart

All these graphs can use a data item that has a classification type of geography. The geo map requires it.

3.06 Activity – Correct Answer

Each report object has a threshold for how much data it can visually display. Many report objects will not display high-cardinality data items with lots of unique values.

What are some examples of high-cardinality data items?

Examples: Employee ID, Street Address, Customer Name, Birth Date

What are some examples of low-cardinality data items?

Examples: Country Name, Age Group, Job Title, Store Type

Practice Review

3.1 Working with Data Items – Solution

What is the classification of Employee_ID? Manager at 1. level?

Employee_ID has a classification of category.

Manager at 1. level has a classification of measure.

What does the Frequency data item represent?

Frequency represents the number of employees.

Category	Measure
Anniversary Month - 12	Annual Salary
Company - 11	Frequency
Department - 2	Manager at 1. level
Employee Country - 10	Total Orders
Employee Hire Date - 239	Total Profit
Employee ID - 647	
Employee Termination Date - 62	
EmployeeName - 647	
Group - 14	
Job Title - 8	
Title - 2	

9


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3.2 Exploring Data: Part 1 – Solution



Into which range do a majority of salaries fall?

More than 75% of salaries fall within the \$25K to \$30K range.

19


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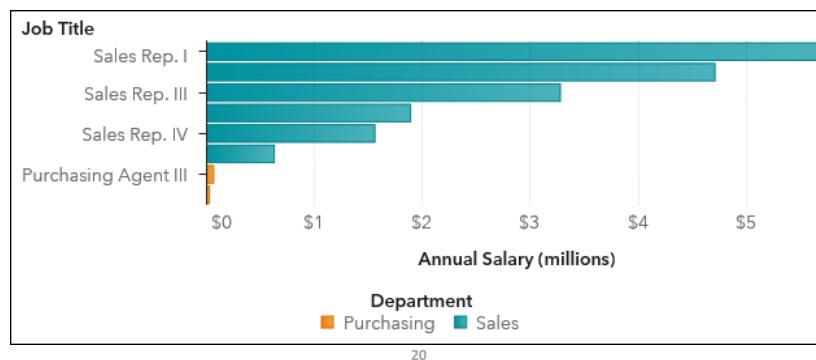
3.2 Exploring Data: Part 1 – Solution

In which department are a majority of our salary costs spent? **Sales**

For which job title? **Sales Rep. I**

Why do you think salary costs are so much higher for this group?

Most likely because there are more employees with this job title.



3.3 Exploring Data: Part 2 – Solution

Which job title has the highest average salary? **Purchasing Agent III**

The lowest?

Trainee

Job Title	Minimum	Lower Whisker	First Quartile	Average ▲	Median
Trainee	\$21,615.00	\$24,015.00	\$24,515.00	\$25,260.80	\$25,405.00
Temp. Sales Rep.	\$21,580.00	\$25,005.00	\$25,695.00	\$26,287.57	\$26,387.50
Sales Rep. I	\$20,835.00	\$25,010.00	\$25,795.00	\$26,417.79	\$26,495.00
Sales Rep. II	\$26,015.00	\$26,015.00	\$26,600.00	\$27,373.58	\$27,325.00
Sales Rep. III	\$28,040.00	\$28,040.00	\$28,580.00	\$29,533.29	\$29,505.00
Purchasing Agent I	\$31,760.00	\$31,760.00	\$31,760.00	\$31,760.00	\$31,760.00
Sales Rep. IV	\$30,150.00	\$30,150.00	\$30,890.00	\$31,880.51	\$31,605.00
Purchasing Agent III	\$34,270.00	\$34,270.00	\$34,270.00	\$35,070.00	\$35,070.00

Orion Star has had a great sales year and would like to promote some employees. With which job title would you recommend starting the promotion analysis? Why?

Sales Rep. I, because that job title most likely has the largest number of employees and because it has more outliers than other job titles.



3.4 Creating Data Items – Solution

Values of Employee Termination Date

31Jan2006 to 30Jun2011

Show missing values

- 31Jan2006
- 30Apr2006
- 31Jan2007
- 28Feb2007
- 31Mar2007
- 30Apr2007
- 31May2007
- 30Jun2007
- 31Jul2007

Value Groups

Active

Employee Status – Calculated Item

```

IF      Employee           Missing
Termination Date

RETURN " Active "

ELSE " Retired "

```

+ Click or drag values here to add a value group

Remaining Values:

Show as missing Group as: Retired

42

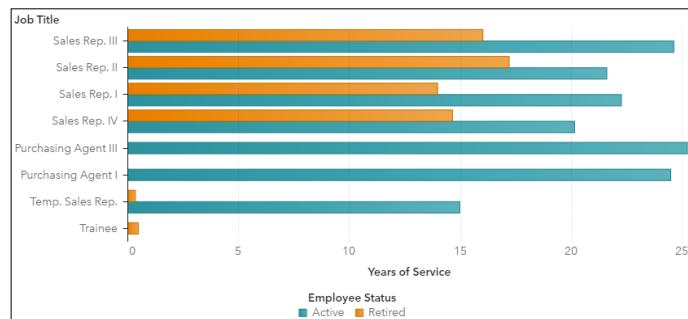


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3.4 Creating Data Items – Solution

Management has decided that one possible criterion for promotion is years of service. Considering this, with which job title would you recommend starting the promotion analysis?

Sales Rep. I, because for active employees that job title has a slightly higher average for years of service when compared to Sales Rep. II.



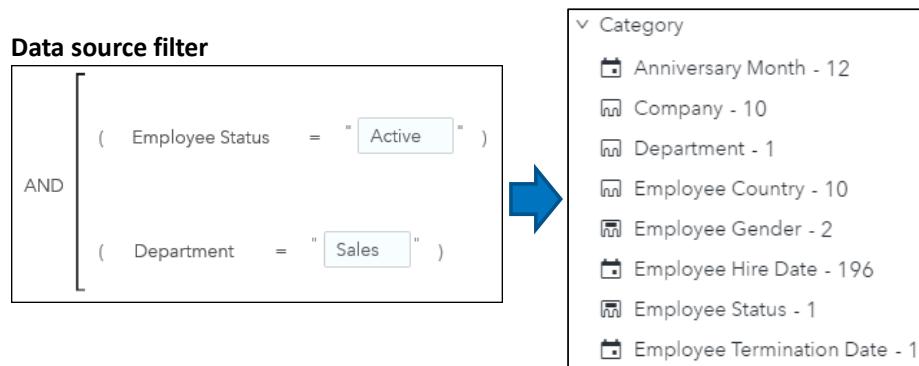
43



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3.5 Applying Filters – Solution

Add a data source filter to filter for active employees in the Sales Department.



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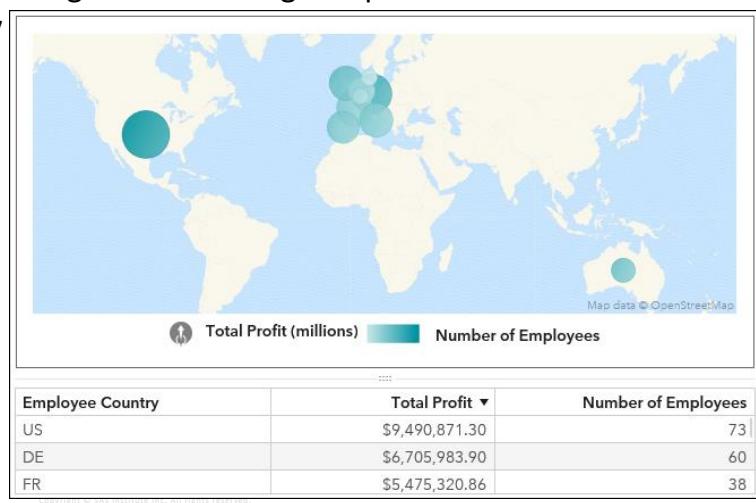
3.5 Applying Filters – Solution

Management has decided that one possible criterion for promotion is profit generated. Which two countries generate the highest profit?

United States and Germany

Why do they have such high profits?

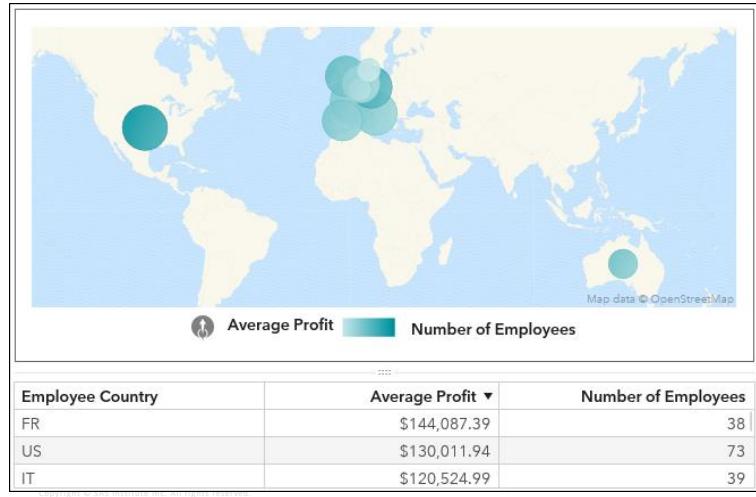
These countries have more employees, which could explain the higher profits.



3.5 Applying Filters – Solution

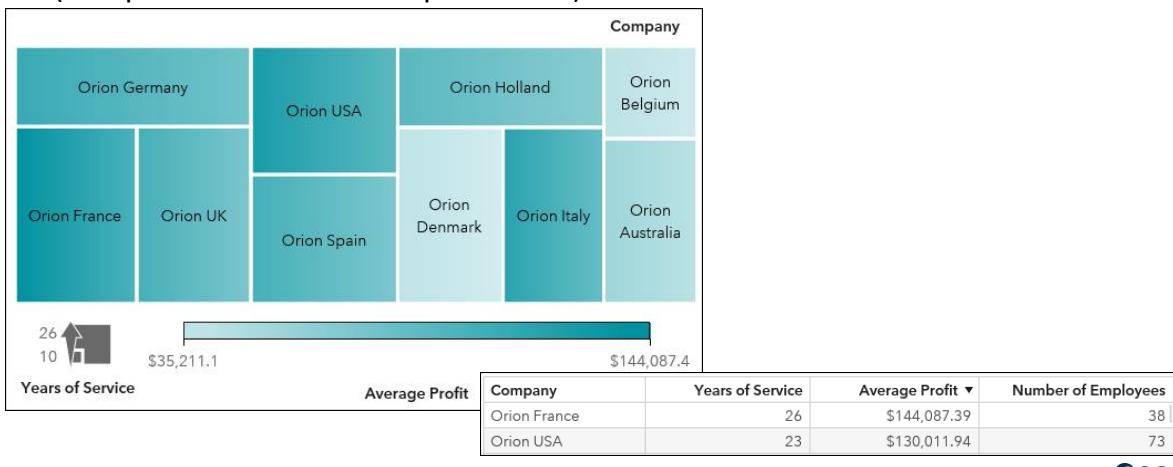
With which country would you recommend starting the promotions if profit generated is one possible criterion for promotion?

United States, because although France has the highest average profit, they also have about half the number of employees.



3.6 Analyzing Data – Solution

Which two companies have the highest average profit generated (one possible criterion for promotion)? **Orion France and Orion USA**



3.6 Analyzing Data – Solution

For those two companies, which job titles would you recommend for promotion (based on average years of service and average profit generated)?

For Orion France, Sales Rep. I employees have the second highest average years of service and the highest profit per employee among the jobs with the most number of employees.



3.6 Analyzing Data – Solution

For those two companies, which job titles would you recommend for promotion (based on average years of service and average profit generated)?

For Orion USA, Sales Rep. II jobs have the highest years of service and the highest average profit per employee.



3.7 Adding Data Analysis – Solution



During a management meeting, it was mentioned that total orders might be a better criterion for promotion than profit generated. Do you agree?

Total Profit and Total Orders are highly correlated (0.8783), so either measure would be appropriate for promotion criterion.

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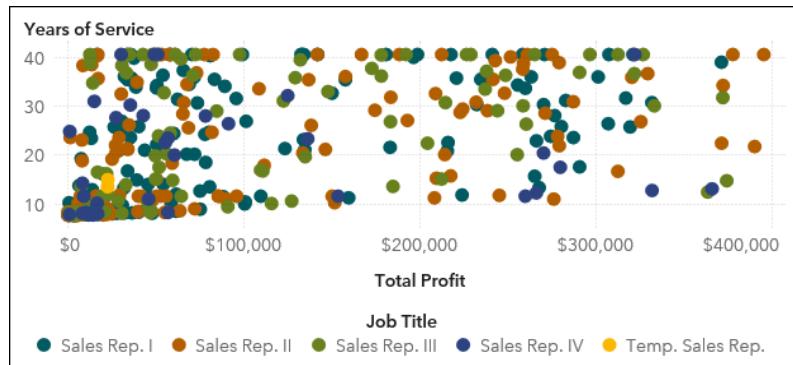
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3.7 Adding Data Analysis – Solution

Using years of service and profit generated as promotion criteria, do you notice any differences between job titles?

We want to focus on employees in the upper right quadrant of the scatter plot. In that area, there seems to be an equal representation of Sales Rep. I, Sales Rep. II, and Sales Rep. III.



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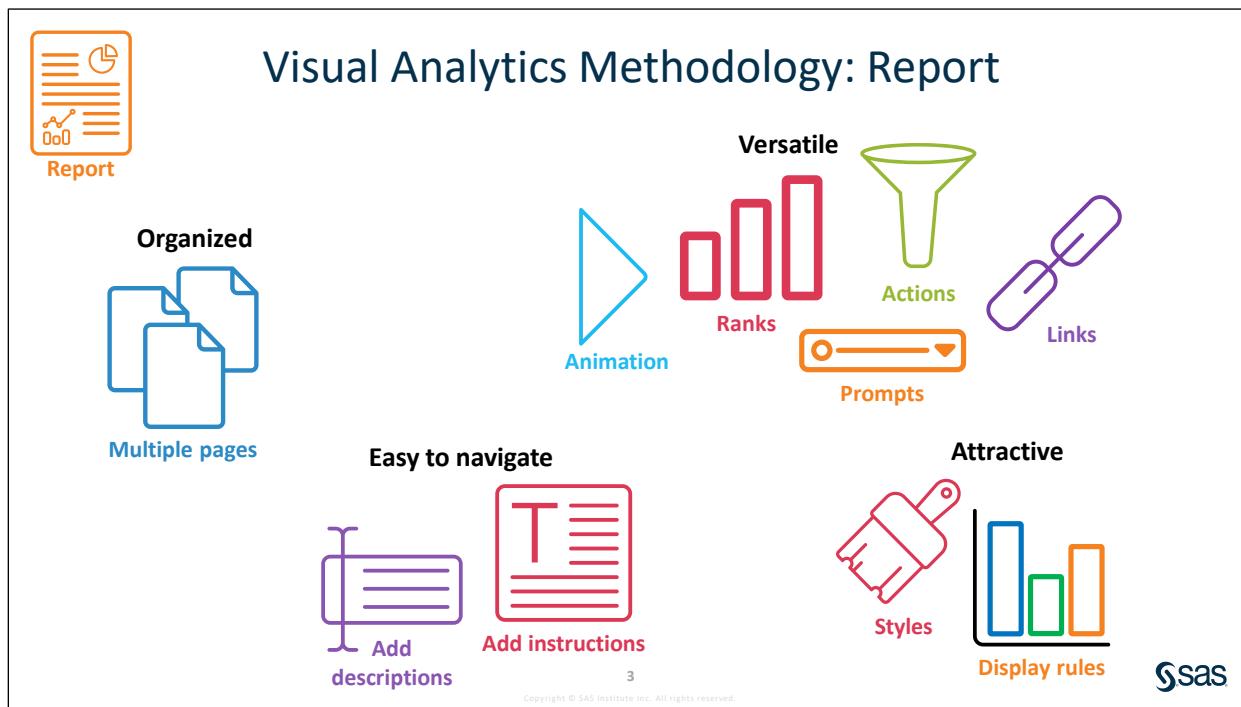
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Lesson 4 Designing Reports with SAS® Visual Analytics

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4.1 Creating a Simple Report



For more information about how to create effective reports, see www.sas.com/beautifulreports.

Business Scenario: Customers



Marketing



Create report



Profits



Orders



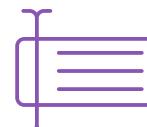
Customer Age Group



Order Month



Add titles and labels



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Objects: Graphs (Reporting)



Untitled

Köln Torino Utrecht Rotterdam
Paris la Defense Stuttgart Milano
Amsterdam Roma
Barcelona Brooklyn
Hamburg Berlin 'S-Gravenhage
Edinburgh Frankfurt am Main München

Use a word cloud to show summary information in an appealing fashion.



Profit

\$2.1M

Order Type

- Retail Sale
- Catalog Sale
- Internet Sale

Use a donut chart (pie chart) to compare a few groups whose values vary greatly.

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Pie chart

A pie chart displays a part-to-whole relationship of a measure data item in a circle divided into multiple slices for each value of a category data item. Each slice in the pie chart represents the relative contribution of each part to the whole. A pie chart will not show a slice with a zero or negative response.

Note: It is very difficult to compare the relative sizes of slices in a pie chart, so pie charts should be used sparingly and only in special circumstances (for example, to highlight large differences in categories).

Note: In Report Builder, the default pie chart is a donut chart (a pie chart with a hole in the center). Donut charts are more effective in comparing relative sizes because they make the viewer focus on reading lengths of arcs rather than proportions of slices.

Word cloud

A word cloud analyzes each value in a category data item as a single text string, where the size of each word in the cloud can indicate either the frequency of that word or the value of a measure and the color of the word can indicate the value of another measure.

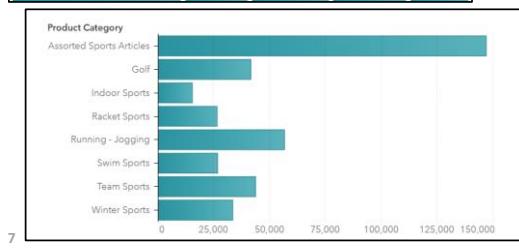
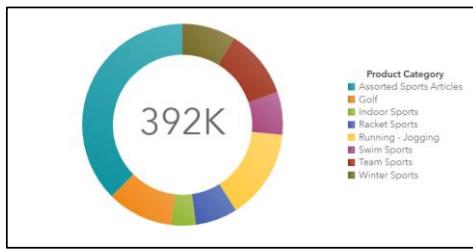
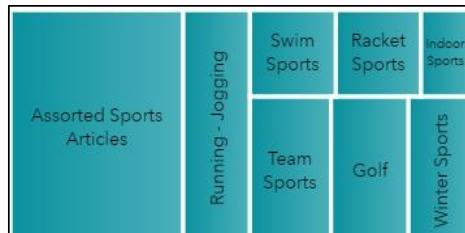
Note: Word clouds should not be used when analytical accuracy is desired because it is very difficult to compare the relative sizes of different words.

- Words that have more letters seem larger than words that have fewer letters.
- Words that contain large letters (like o, m, and w) receive more attention than words that contain smaller letters (like l, i, and f).
- Words whose letters contain ascenders (the part of a lowercase letter that projects above the body of the letter: b, d, h) or descenders (the part of a lowercase letter that projects below the body of the letter: g, p, q) receive more attention than words that do not.

For these reasons, word clouds are mostly used for aesthetic reasons.

4.01 Activity

Each graph below shows the number of orders for each product category. Does Golf or Team Sports have more orders? Which chart did you use?



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4.02 Multiple Choice Question

What type of chart would you use to show profit information by continent?

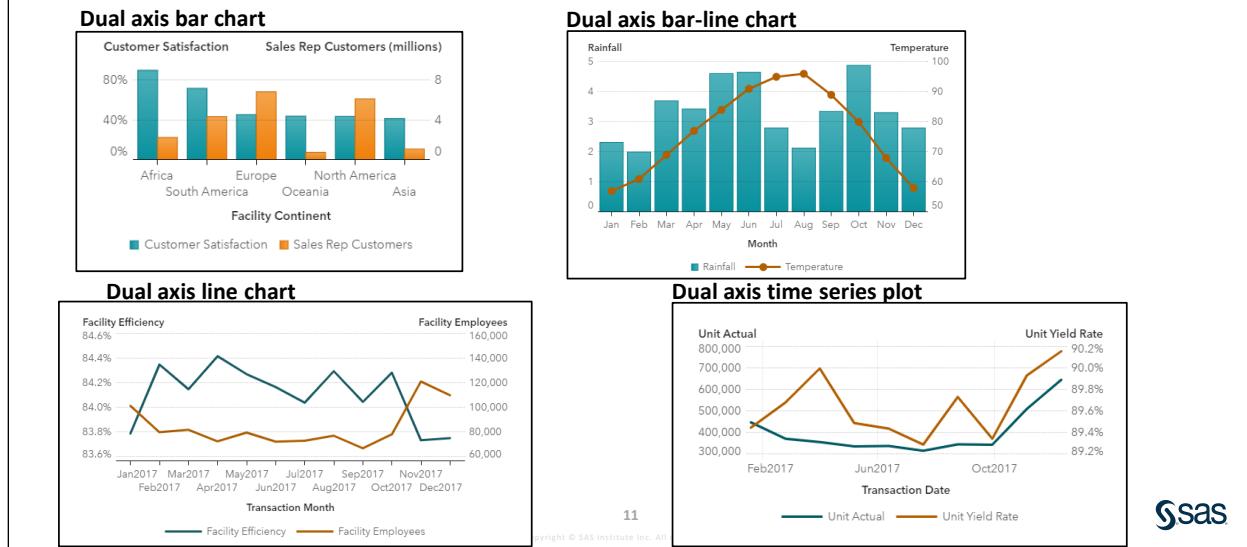
- a. bubble plot
- b. pie chart
- c. bar chart
- d. treemap

Continent	Profit
Africa	(\$127.68)
Asia	\$15,503.70
Europe	\$5,659,450.60
North America	\$2,121,645.57
Oceania	\$462,934.63

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Objects: Graphs (Dual Axis)

Use *dual axis* charts and plots to compare two series with different ranges.



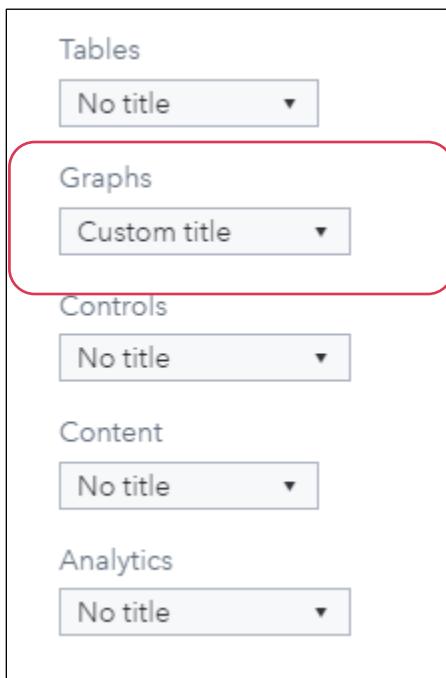
Dual axis bar chart	A dual axis bar chart displays two bar charts with a shared category axis and separate response axes. Use a dual axis bar chart when the value for both measures does not depend on the prior value. For example, in the chart above, the values of Customer Satisfaction and Sales Rep Customers for South America is not impacted by the values for Africa.
Dual axis bar-line chart	A dual axis bar-line chart combines a bar chart and a line chart on a shared category axis. The bar chart and the line chart have separate response axes. For the bar, use a measure whose value does not depend on the prior value. For the line, use a measure whose value does depend on the prior value. For example, in the chart above, the value of Temperature for February depends on the value for January. However, the value of Rainfall for February does not depend on the value for January.
Dual axis line chart	A dual axis line chart displays data by using two lines that connect the data values for a shared category axis on separate response axes. Use a dual axis line chart when the value for both measures depends on the prior value. For example, in the chart above, the values of Facility Efficiency and Facility Employees in February are impacted by the values for January.
Dual axis time series plot	A dual axis time series plot displays two time series with a common time axis on separate response axes.



Creating a Simple Report

This demonstration illustrates how to create a simple report using Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Select **Report Builder** in the Action Button area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo4.1** to open the report.
7. Change the settings to add custom titles to all objects.
 - a. Select **Eric** \Rightarrow **Settings** in the upper right corner.
 - b. Select **General** under **SAS Visual Analytics**.
 - c. Scroll down and change **No title** to **Custom title** for **Graphs**.



- d. Click **Close**.
8. Hide data items.
 - a. In the left pane, click the **Data** icon.
 - b. Click  (**Actions**) and select **Show or hide data items**.

- c. Click  (Remove all) to move all data items to the Hidden items list.
- d. Double-click the following data items to add them to the Displayed items list:

Customer Age Group

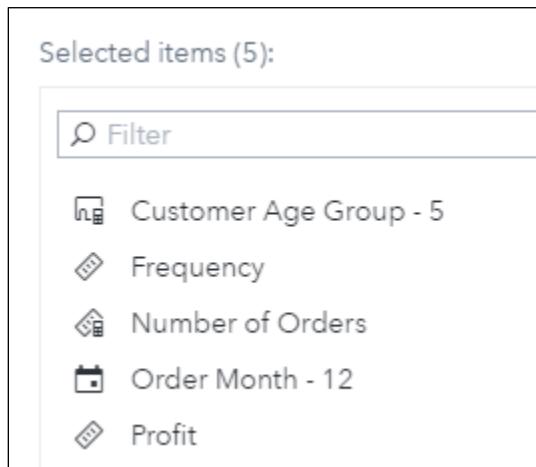
Frequency

Number of Orders

Order Month

Profit

The Displayed items list should resemble the following:



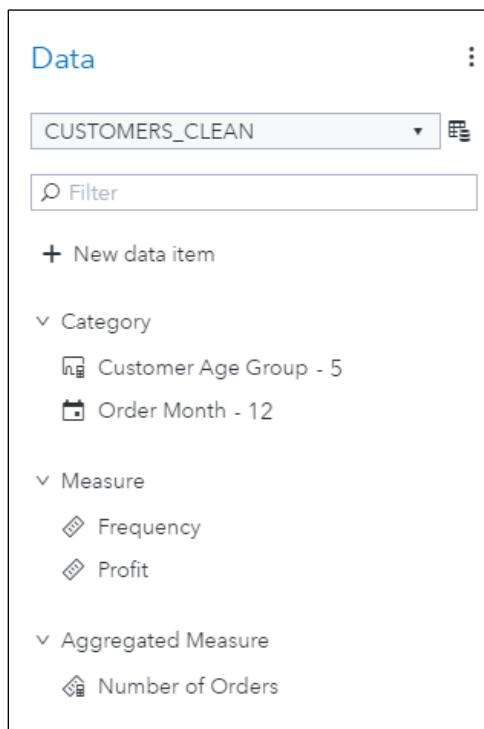
Selected items (5):

Filter

-  Customer Age Group - 5
-  Frequency
-  Number of Orders
-  Order Month - 12
-  Profit

- e. Click **OK**.

The Data pane should resemble the following:



Data

CUSTOMERS_CLEAN

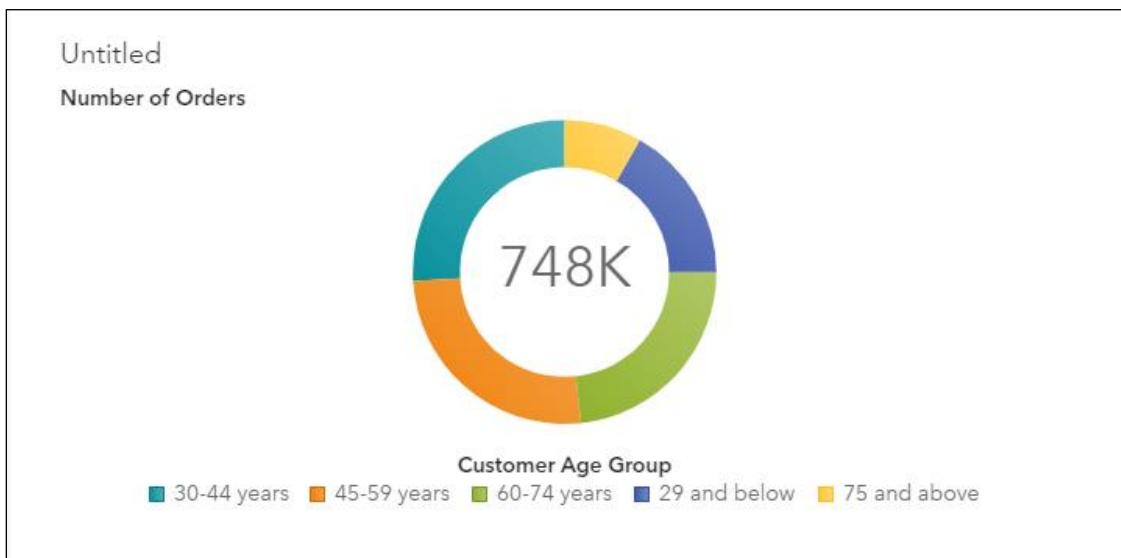
Filter

- + New data item
- Category
 -  Customer Age Group - 5
 -  Order Month - 12
- Measure
 -  Frequency
 -  Profit
- Aggregated Measure
 -  Number of Orders

9. Create a pie chart.

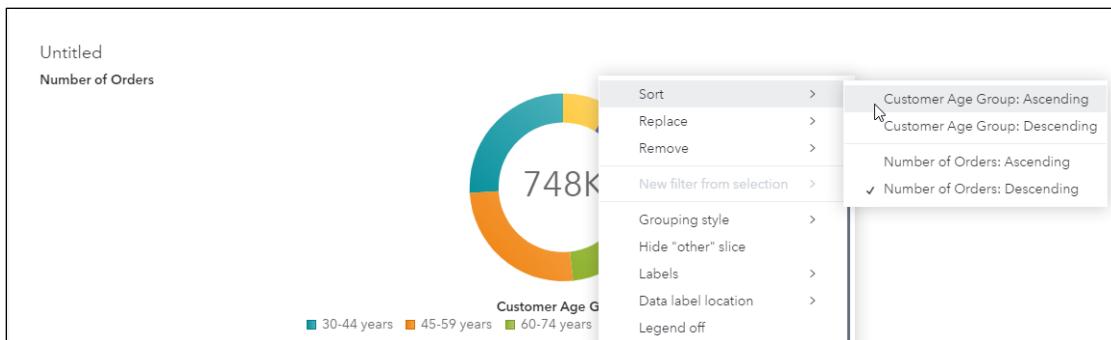
- In the left pane, click the **Objects** icon.
- Drag the **Pie Chart** object, from the Graphs group, to the top of the canvas.
- In the right pane, click the **Roles** icon.
- For the **Category** role, select **Add** \Rightarrow **Customer Age Group**.
- For the **Measure** role, select **Frequency** \Rightarrow **Number of Orders**.

The pie chart should resemble the following:



By default, the slices in a pie chart are sorted by the measure in descending order.

- In the pie chart, right-click **Customer Age Group** below the pie chart and select **Sort** \Rightarrow **Customer Age Group: Ascending**.



The updated pie chart should resemble the following:

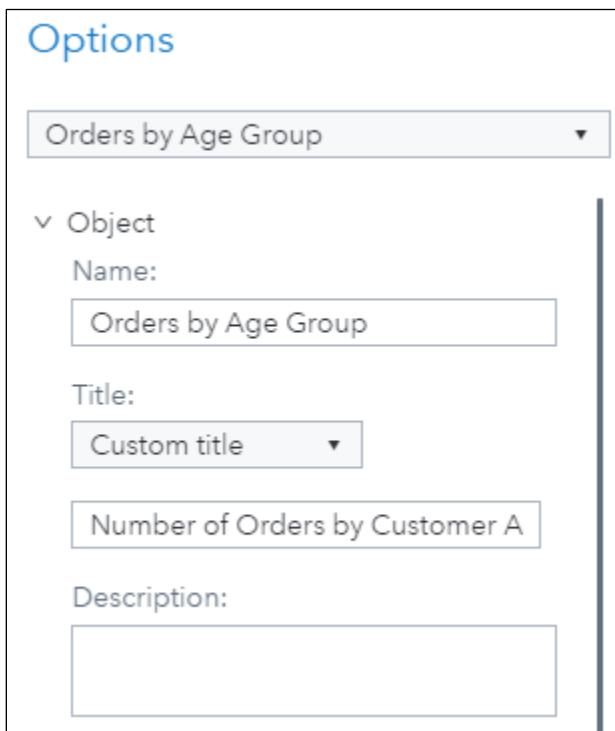


- g. Double-click the title, **Untitled**.

A font formatting tool appears that you can use to format the title.

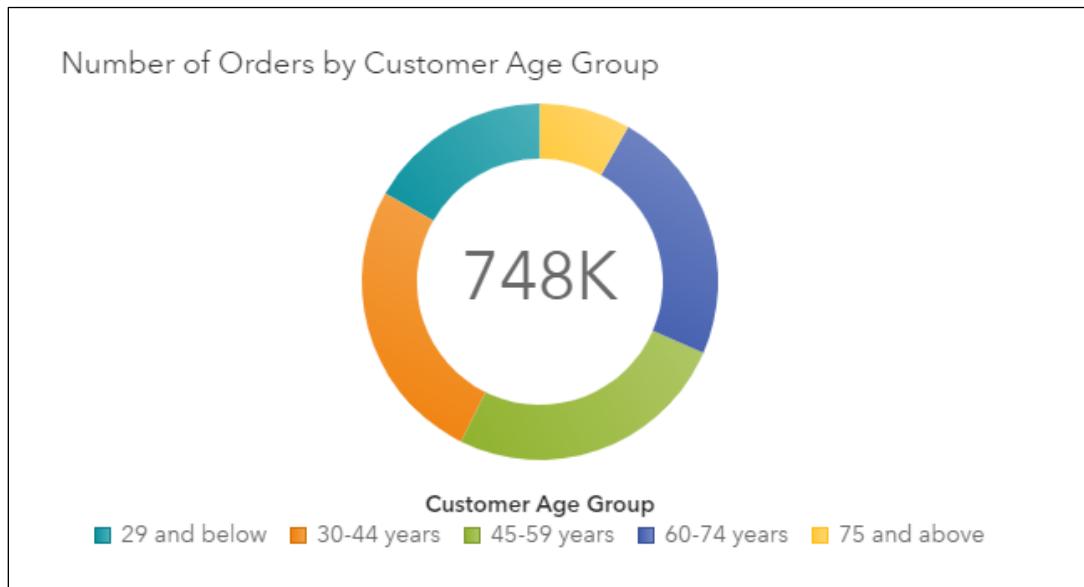


- h. Enter **Number of Orders by Customer Age Group** as the title.
 i. In the right pane, click the **Options** icon.
 j. If necessary, expand the Object group and enter **Orders by Age Group** in the **Name** field.



- k. In the Pie group, clear “Other” slice.
 l. Clear **Label**.

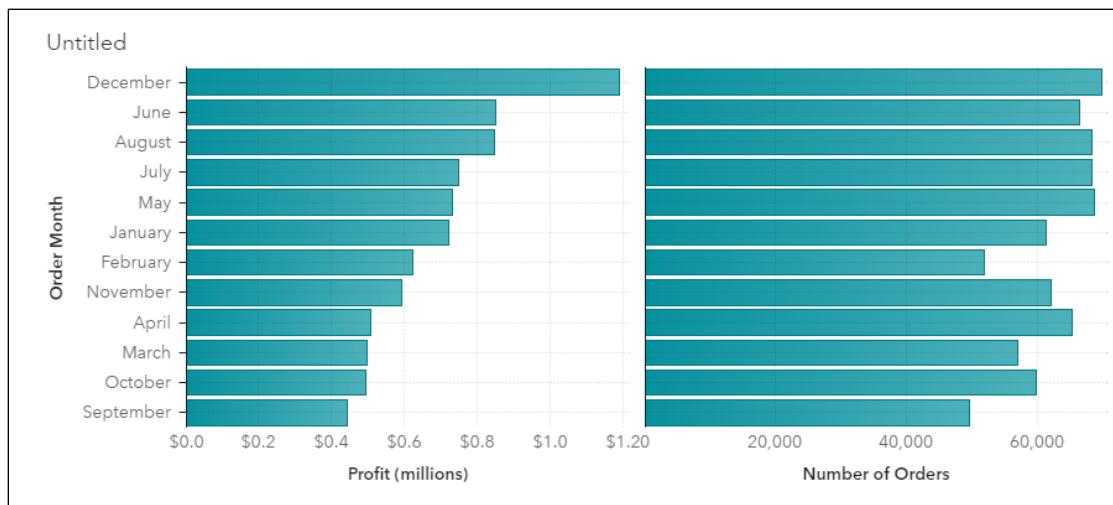
The updated pie chart should resemble the following:



10. Create a bar chart.

- In the left pane, click the **Objects** tab.
- Drag the **Bar Chart** object, from the **Graphs** group, to the drop zone on the right side of the pie chart.
- In the right pane, click the **Roles** tab.
- For the **Category** role, select **Add** \Rightarrow **Order Month**.
- For the **Measure** role, select **Frequency** \Rightarrow **Profit**.
- For the **Measure** role, select **Add** \Rightarrow **Number of Orders** and click **OK**.

The bar chart should resemble the following:



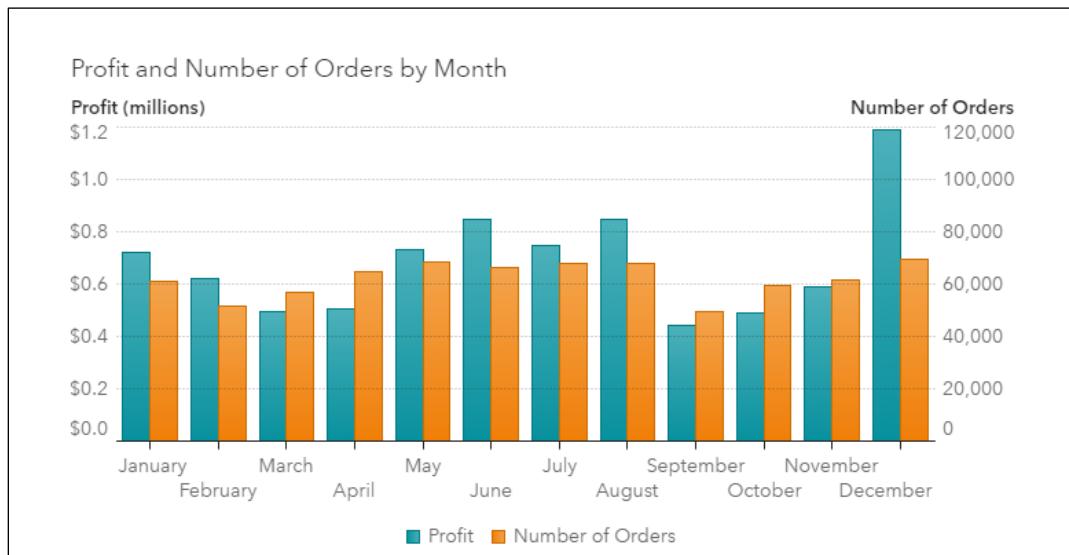
Because **Profit** and **Number of Orders** have different ranges, they are displayed in different bar charts. We can change to a dual axis bar chart to display both measures together.

- g. In the upper right corner of the chart, click  (More) and select **Change Bar Chart to Dual Axis Bar Chart**.

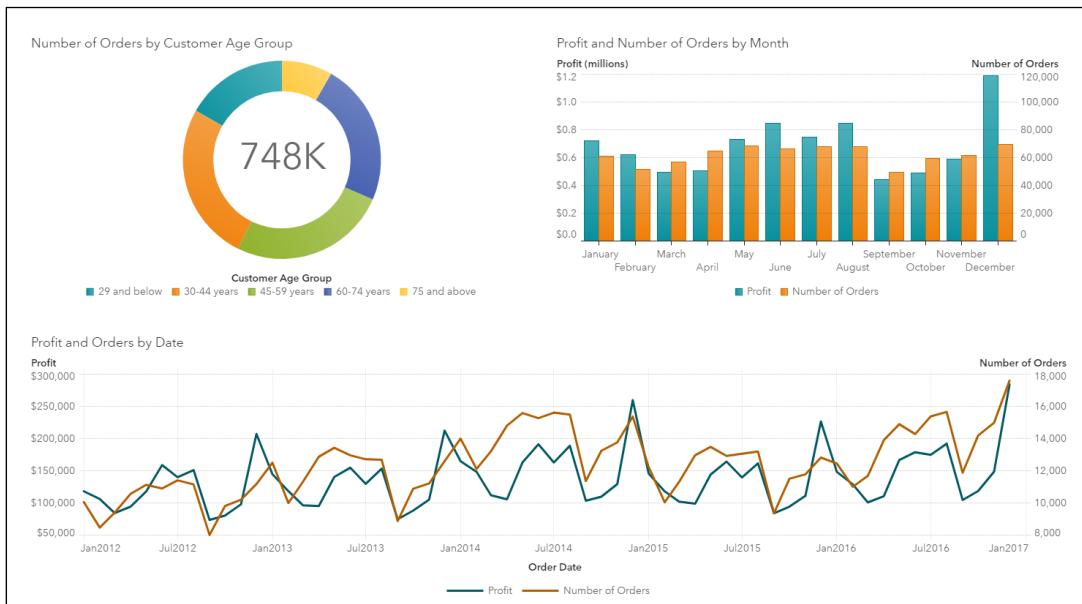
Note: This option is not available if the object is in  (Maximize) view.

- h. In the dual axis bar chart, right-click **Order Month** on the horizontal axis and select **Sort** \Rightarrow **Order Month: Ascending**.
- i. In the right pane, click the **Options** icon.
- j. In the Object group, enter **Profit and Orders** in the **Name** field.
- k. Enter **Profit and Number of Orders by Month** in the **Title** field.
- l. Expand the **X Axis Options** group.
- m. Clear **Axis label**.

The updated dual axis bar chart should resemble the following:



The report should resemble the following:



11. In the upper right corner, click (Menu) and select **Save**.

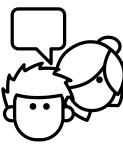
12. Select **Eric** **Sign out** in the upper right corner to sign out.

End of Demonstration

Practice Scenario: Employees



Human Resources



Create report



Number of employees



Profits



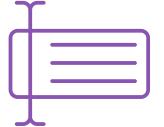
Location



Anniversary Month



Add titles and labels



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Practice

1. Creating a Simple Report

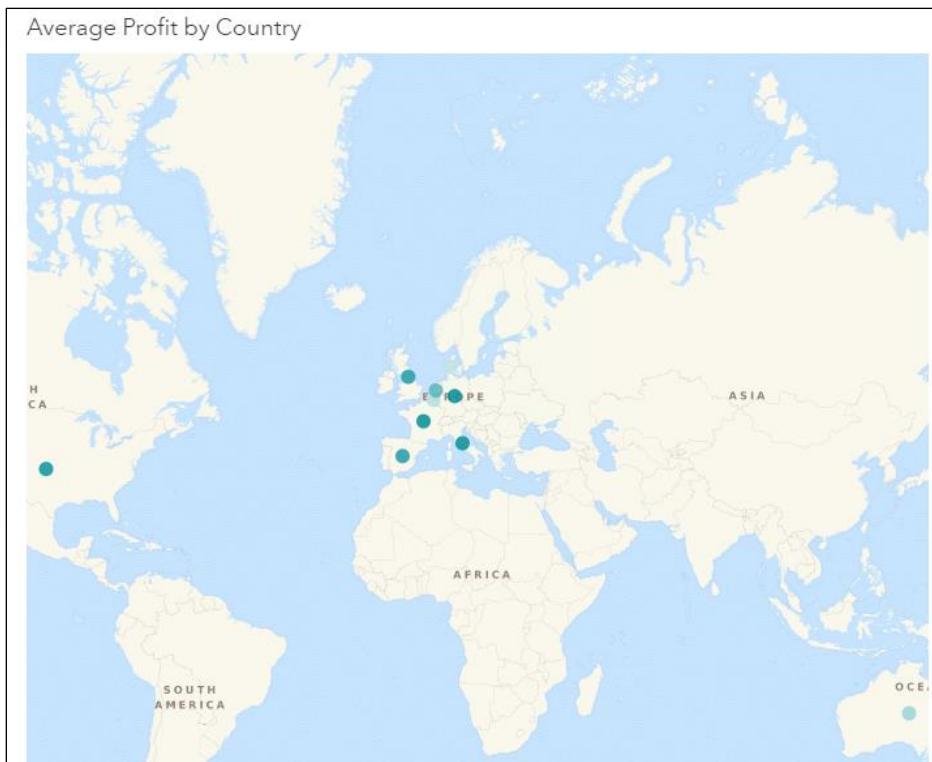
- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice4.1** report from the **Shared Data/Basics/Practices (HR)** folder.
- Create a geo map to the left of the bar chart. Modify the following options for the geo map:

Object: Name	Average Profit by Country
Object: Custom Title	Average Profit by Country
Map: Type	Coordinates
Legend: Visibility	Off

- Assign the following data items to the specified roles:

Category	Employee Country
Color	Average Profit
Data tip values	Number of Employees

The geo map should resemble the following:



- e. Create a dual axis bar-line chart at the bottom of the canvas. Assign the following data items to the specified roles:

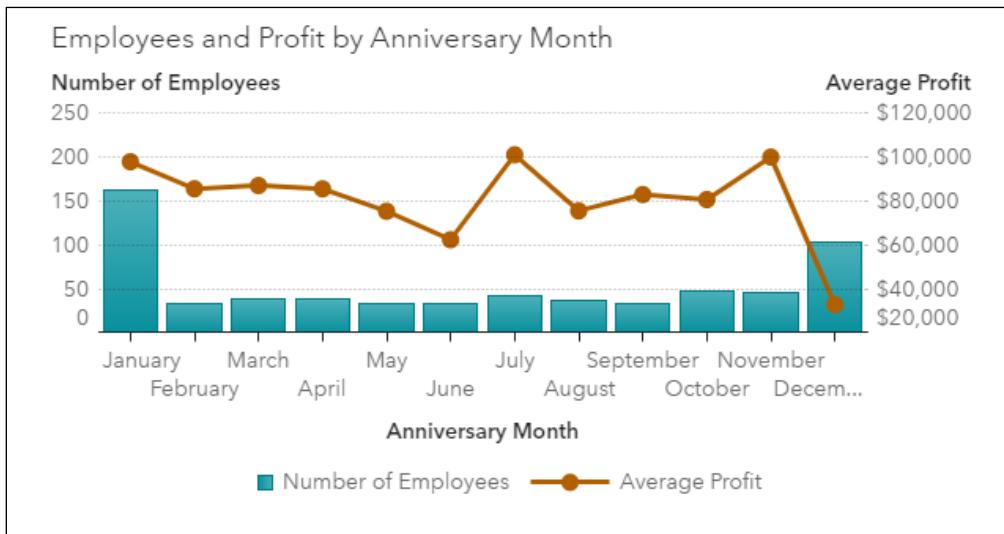
Category	Anniversary Month
Measure (bar)	Number of Employees
Measure (line)	Average Profit

- f. Modify the following options for the dual axis bar-line chart:

Object: Name	Employees and Profit by Anniversary Month
Object: Custom Title	Employees and Profit by Anniversary Month
Line: Markers	<selected>

- g. Sort the bars by **Anniversary Month** in ascending order.

The dual axis bar-line chart should resemble the following:



The report should resemble the following:



- h. Save the report.
- i. Sign out of Visual Analytics.

End of Practices

4.2 Creating Interactive Reports

Business Scenario: Customers



Marketing

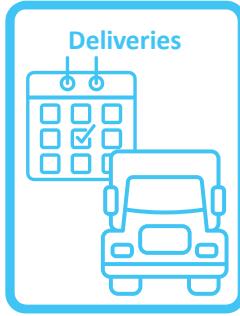


Profit and orders by gender

ORION STAR Sports & Outdoors



Customer orders



Deliveries



Top 10 cities by orders

17

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Creating Reports with Multiple Pages



Report

Focus on a single idea



Focus on a single idea

Use hidden pages to provide details



Use hidden pages to provide details

Limit the number of objects



Limit the number of objects

Stand on its own



Stand on its own

Limit the number of pages



Limit the number of pages

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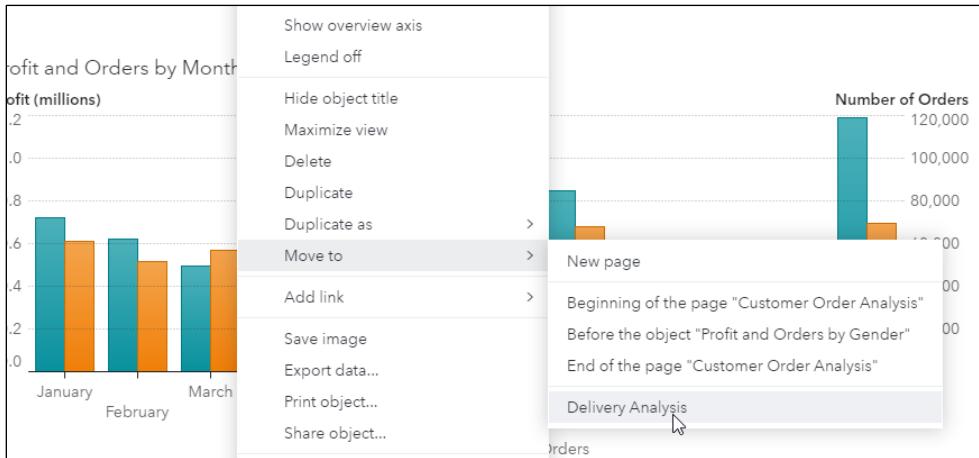
Each page in your report can use one or more data sources and can contain one or more report objects. There is no limit to the number of pages that can be added to a report. However, it is a good idea to limit the number of pages in a report to make your report easier to access, easier to navigate, and easier to understand. If you need more than six or seven visible pages to tell your data story, you should consider creating multiple reports and use links between reports to provide additional information. Links are discussed in more detail in a later section.



Working with Pages and Ranks

This demonstration illustrates how to create new pages, how to move graphs between pages, and how to apply ranks to graphs using Report Builder.

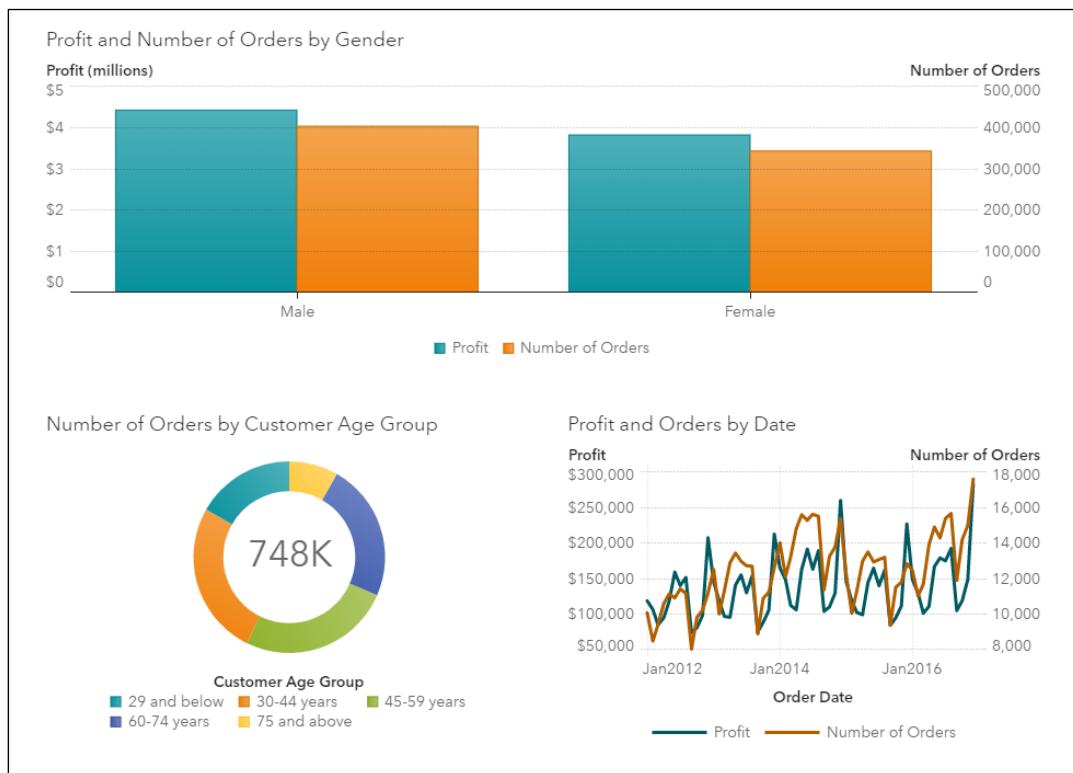
1. From the browser window, select **SAS Home Page** from the bookmarks bar.
 2. Enter **Eric** in the **User ID** field.
 3. Enter **Student1** in the **Password** field.
 4. Click **Sign In**.
 5. Select **Report Builder** in the Action Button area.
- The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo4.2a** to open the report.
 7. Create a new page.
 - a. In the upper left corner of the report, click (New page) next to **Page 1**.
 - b. Double-click the **Page 2** heading to make it editable.
 - c. Enter **Delivery Analysis** and press Enter.
 - d. Click **Page 1** to make it active.
 - e. Right-click **Page 1** and select **Rename page**.
 - f. Enter **Customer Order Analysis** and press **Enter**.
 8. Move the Profit and Orders by Month bar chart to the new page.
 - a. Right-click the **Profit and Orders by Month** bar chart and select **Move to** **Delivery Analysis**.



Note: You can also drag an object and drop it onto the new page tab. Alternatively, objects can be moved from one page to another using Outline in the left pane.

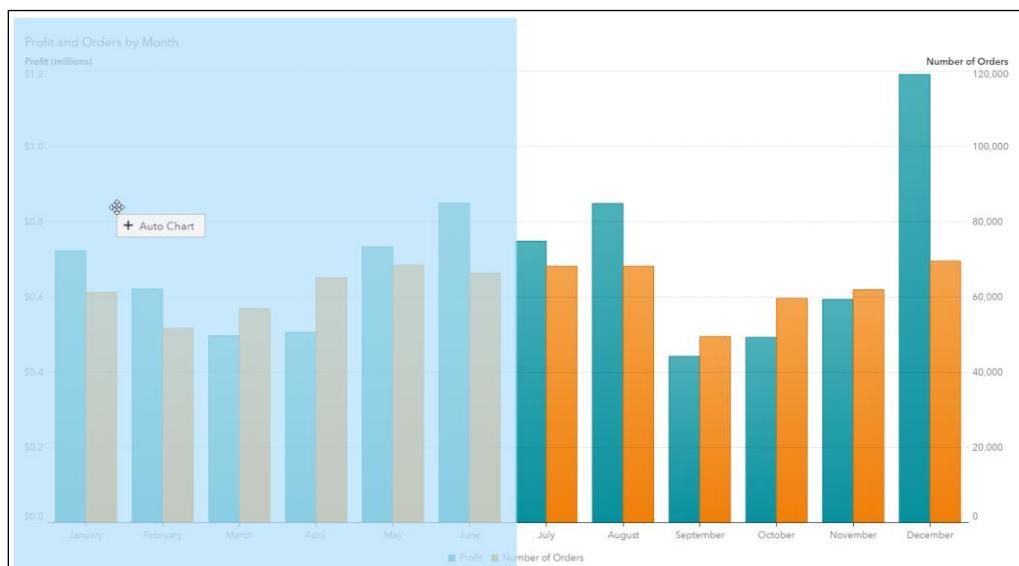
9. Click the **Customer Order Analysis** tab to make it active.

10. Rearrange the graphs on the Customer Order Analysis page so that it resembles the following:



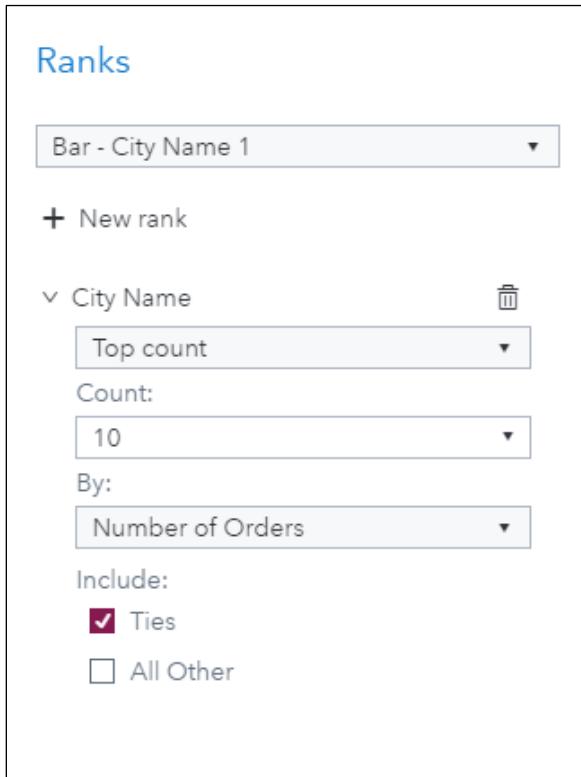
11. Create a bubble plot from an Auto Chart.

- Click the **Delivery Analysis** tab to make it active.
- Click the **Data** icon in the left pane.
- Select **City Name, Days to Delivery, Number of Orders, and Profit**.
- Drag the data items to the left of the bar chart.



Note: The Auto Chart created a bar chart.

- e. In the right pane, click the **Ranks** icon.
- f. In the Ranks pane, select **New rank** \Rightarrow **City Name**.
- g. Verify that **Top count** is specified.
- h. Verify that **10** is specified for the **Count** field.
- i. Select **Number of Orders** for the **By** field.
- j. Select the box for **Ties**.



- k. Select **(More) Change Bar Chart \Rightarrow Bubble Plot**.

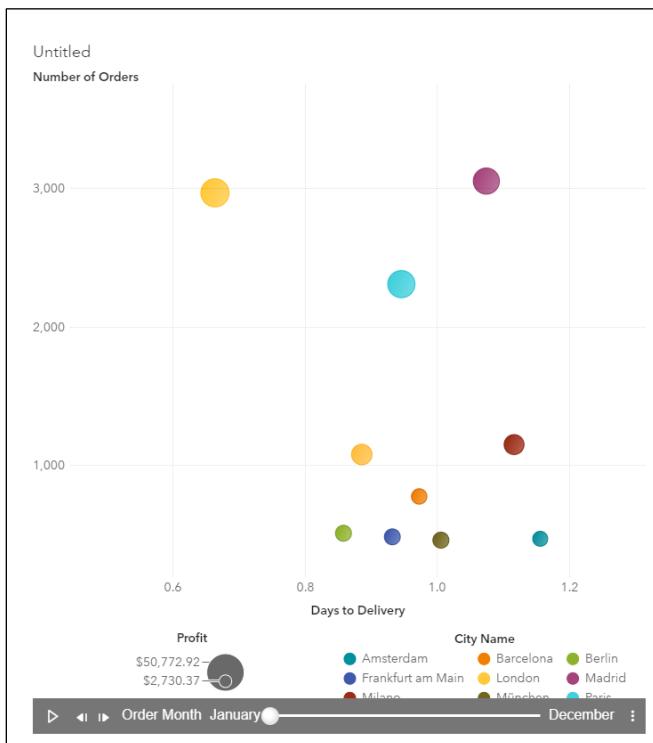
A warning appears in the lower right corner of the bubble plot.

No data appears because too many values were returned from the query. Filter your data to reduce the number of values.

There are too many distinct values of city to display as bubbles in the plot.

- l. In the Roles pane, move **City Name** to the **Group** role.

- m. For the **Animation** role, select **Add** \Rightarrow **Order Month**.



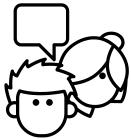
- n. In the right pane, click the **Options** icon.
o. In the Object group, enter **Order Information by Month** in the **Name** field.
p. Enter **Top 10 Cities by Number of Orders** in the **Title** field.

The bubble plot should resemble the following:



- q. Click in the lower left corner of the bubble plot to play the animation.
r. When you are finished viewing the animation, click .
12. In the upper right corner, click (**Menu**) and select **Save**.
13. Select **Eric** \Rightarrow **Sign Out** in the upper right corner.

End of Demonstration

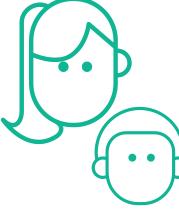


Human Resources

Practice Scenario: Employees



Employees



Profits



Profit by product group



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Practice

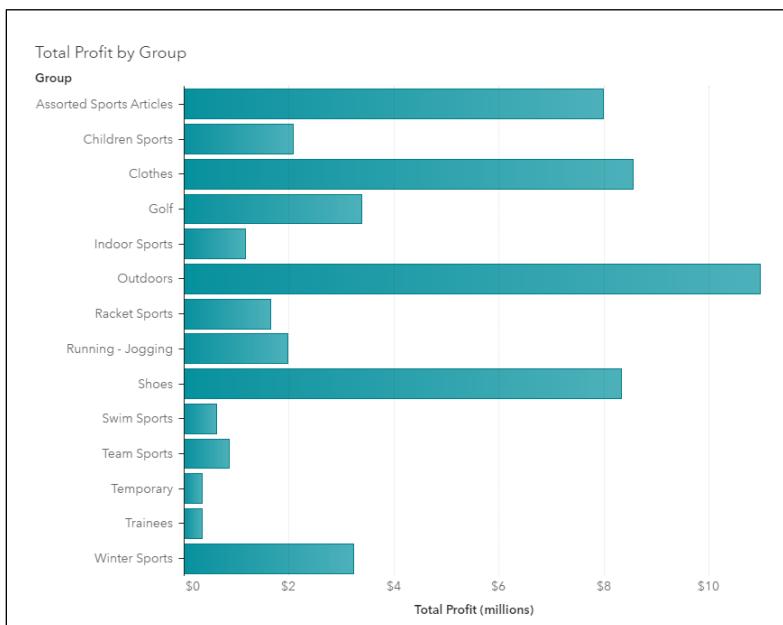
2. Working with Pages

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice4.2a** report from the **Shared Data/Basics/Practices (HR)** folder.
- Add a new page to the report.
 - Change the name of the new page to **Profit Analysis**.
 - Change the name of **Page 1** to **Employee Analysis**.
- Create a bar chart on the Profit Analysis page by assigning the following data items to the specified roles:

Category	Group
Measure	Total Profit

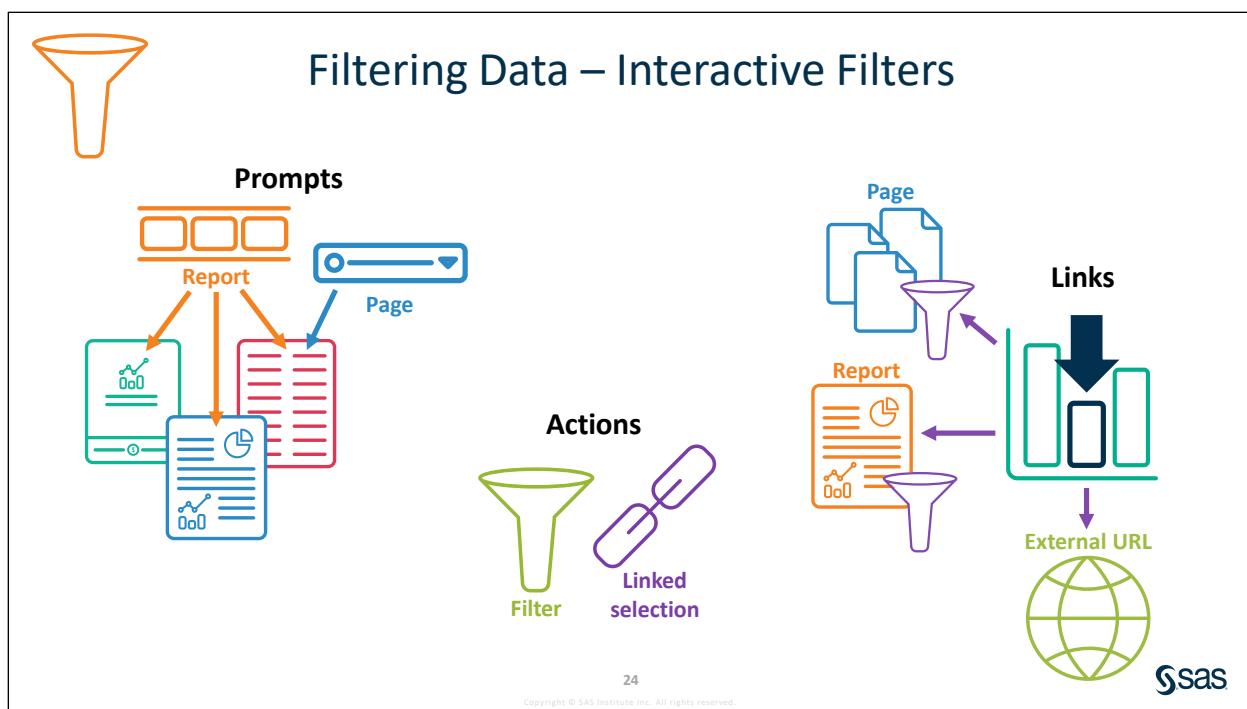
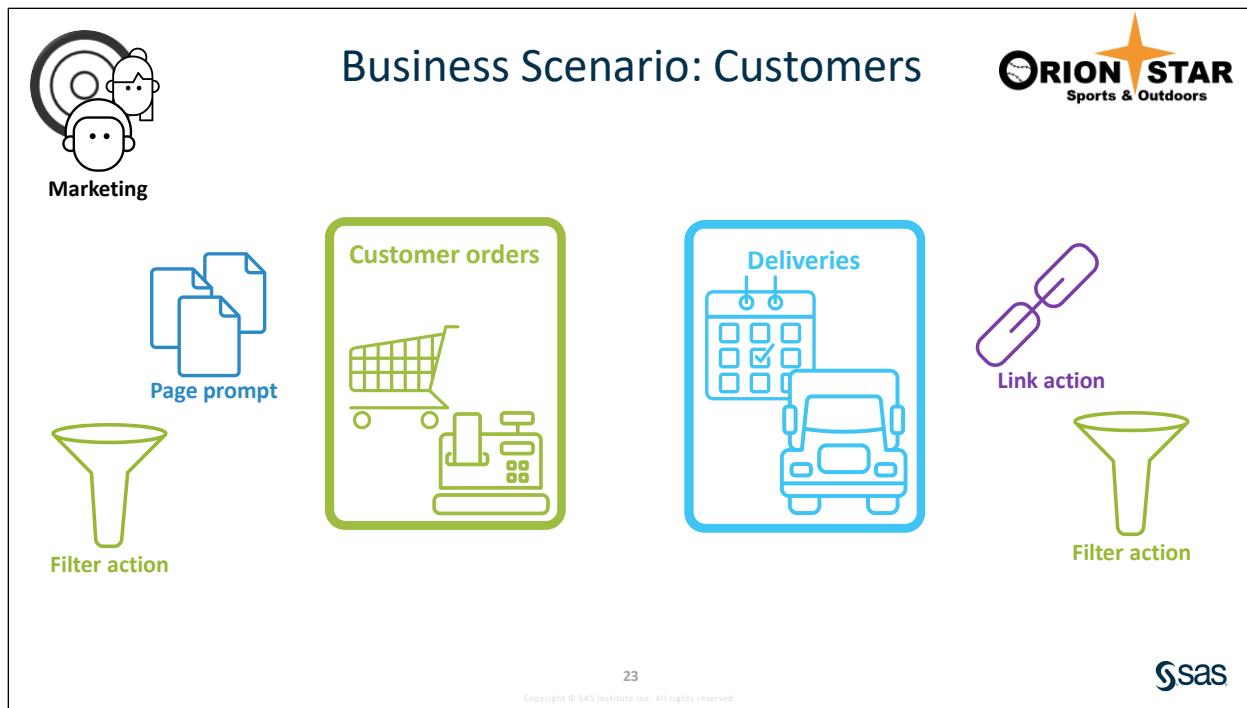
- Specify **Total Profit by Group** as the name and title of the bar chart.
- Sort the bars by **Group** in ascending order.

The Profit Analysis page should resemble the following:



- Remove the Y Axis label.
- Save the report.
- Sign out of Visual Analytics.

End of Practices



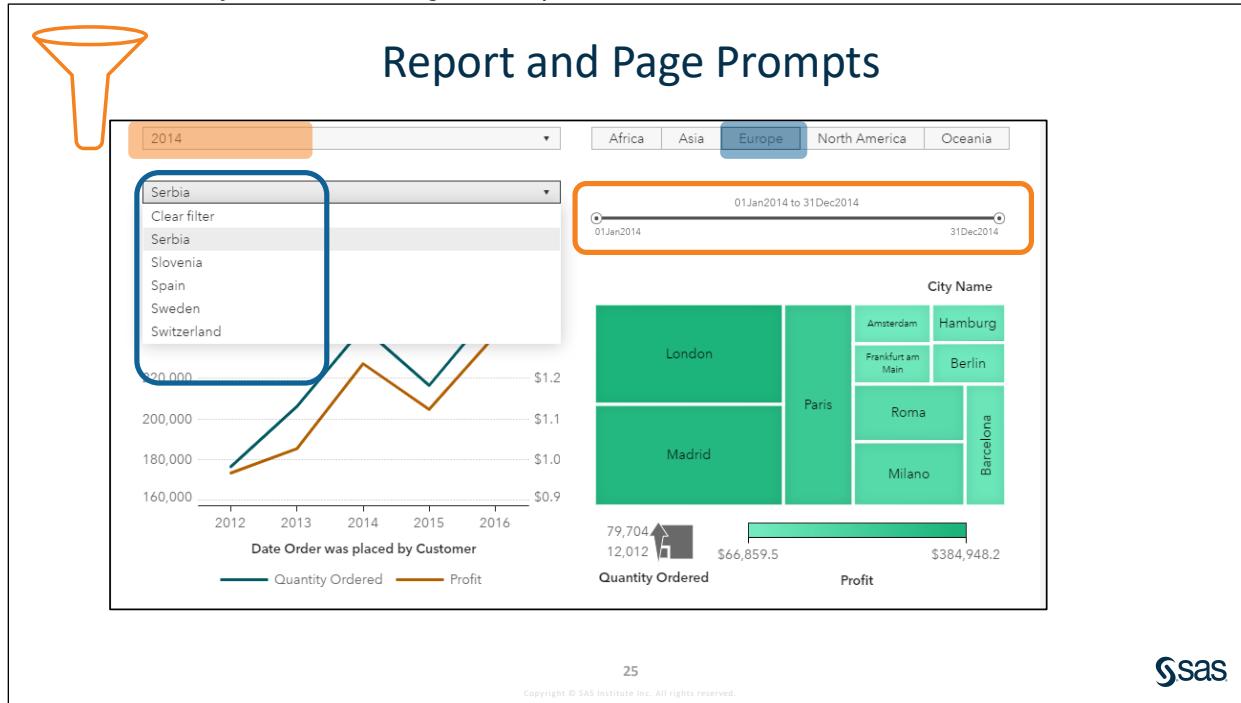
The following types of filters can be modified by report viewers:

Report prompt	Automatically subsets the data for all objects in the report as long as the report object uses the same data source as the prompt.
Page prompt	Automatically subsets the data for all objects on the page as long as the report object uses the same data source as the prompt.*
Filter action	Subsets the data in the target object based on selections in a source object.
Link selection action	Highlights the data in the target object based on selections in a source object.
Links	Subsets the report, page, or an external URL based on the selections in a source object. Link actions pass a value to filter the target object (report or page) when the source and target are based on the same data source.

*For all prompts and actions, if the report objects use different data sources, automatic mappings are applied. You can modify the data source mappings by right-clicking the control and selecting **Edit data source mappings**. For more information about mapping data sources, see “Map Data Sources for Actions and Links” in the *SAS® Visual Analytics 7.5: Working with Report Data* documentation.

For more information about prompts, see “Working with Controls” in the *SAS® Visual Analytics 7.5: Working with Report Content* documentation.

For more information about actions and links, see “Working with Report Actions and Links” in the *SAS® Visual Analytics 7.5: Working with Report Data* documentation.



Note: Report and page control areas are not displayed by default.

Objects: Controls

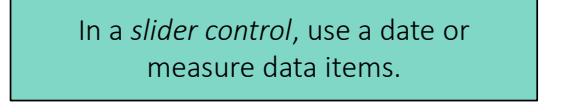
- Assorted Sports Articles
- Children Sports
- Clothes
- Golf
- Indoor Sports
- Outdoors
- Racket Sports
- Running - Jogging
- Shoes
- Swim Sports
- Team Sports
- Winter Sports

In a *list control*, use a category to enable viewers to select multiple values.



The list control can be used only as a report or page prompt inside a prompt container.

In a *slider control*, use a date or measure data items.



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A control is a report object that filters or narrows the scope of the data viewed in the report. Controls provide a way for report viewers to focus on specific areas of interest.

Note: If two or more control objects are used in the report or page prompt location, by default the AND operator is used for the filter.

Note: Auto controls can be created by dragging data items to the report or page prompt area.

Data Items	Control Type
Category with 1–4 distinct values	Button bar
Category with 5–40 distinct values	Drop-down list
Category with more than 40 distinct values	Text input
Datetime	Slider
Measure	Slider

List	A list control enables a viewer to select one or more category values from a list. Note: List controls can be used only as a report prompt or page prompt if it is located inside a prompt container.
Slider	A slider control enables a viewer to move a selector horizontally or vertically to select a single value or a range of values. A slider control will accept only date time or measure data items. Note: The single-point slider control can be used to populate the value of a parameter.

Objects: Controls

The screenshot shows three examples of controls:

- Button bar:** A horizontal bar with four buttons: Children, Clothes & Shoes, Outdoors, and Sports. A callout box says: "On a *button bar*, use a category with few distinct values."
- Text input:** A vertical list starting with 'G' and items like Gloves & Mittens, Golf, Golf Clothes, Green Tomato, and Gymnastic Cloth... A callout box says: "In a *text input* control, use a category with a lot of distinct values."
- Drop-down list:** A vertical list starting with "Product Category" and options like Clear filter, Assorted Sports ..., Children Sports, Clothes, Golf, Indoor Sports, Outdoors, Racket Sports, Running - Jogging, Shoes, Swim Sports, Team Sports, and Winter Sports. A callout box says: "In a *drop-down list*, use a category with a moderate number of distinct values."

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Button bar	A button bar control displays buttons, in a horizontal or vertical layout. A report viewer can select a button to filter a list of category values.
Drop-down list	A drop-down list control enables a viewer to select an item from a list of category values.
Text input	A text input control enables a viewer to enter text in a field to filter the list of category values.

Note: The button bar, drop-down list, and text input controls can be used to populate the value of a parameter. For more information about parameters, see “Working with Parameters in Reports” in the *SAS® Visual Analytics 7.5 documentation*.

4.03 Activity

Given the distinct values, which control object would you use to filter for each category displayed below?

▼ Category

- Product Category - 12
- Product Group - 57
- Product Line - 4
- Product Name - 3.2K

28

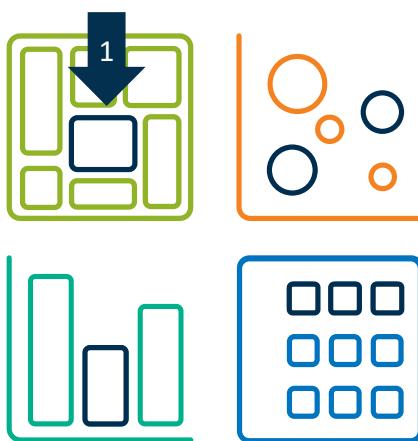


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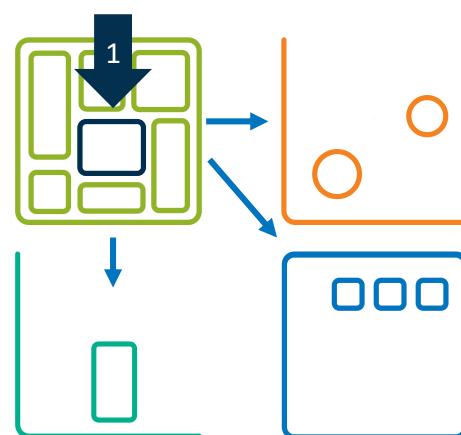
Actions



Linked selection



Filter



30



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Actions are used to direct a report viewer's attention to specific results in a report. The following actions are available:

Linked selection	A linked selection enables you to show the same data highlighted simultaneously in two or more tables, graphs, or controls. The data for the linked selection has the same appearance in each object, which makes the data easily apparent to report viewers.
Filter	A filter is used to restrict the data that is returned from a query to a data source. Filters are simply a set of rules or conditions that you specify to subset the data that is displayed in a table or graph.

Adding Actions to a Page

The screenshot shows a SAS Visual Analytics report interface. On the left, there is a sidebar with a 'Report' icon. The main content area features a map of Europe with a specific location highlighted. Below the map is a table showing sales data for Italy across different order types: Internet Sale, Retail Sale, and Catalog Sale. To the left of the map and table is a bar chart showing Profit (millions) and Quantity Ordered for these same categories. A red box highlights the 'Retail Sale' bar in the chart, and a purple box highlights the 'Retail Sale' row in the table. Arrows indicate the linkage between the highlighted data points in the chart and the table. The chart also includes a legend for Profit (teal) and Quantity Ordered (orange). The table has columns for Customer Country, Order Type, and Profit.

Customer Country	Order Type	Profit
Italy	Internet Sale	\$82,530.75
Italy	Retail Sale	\$753,591.11
Italy	Catalog Sale	\$94,893.16



Working with Prompts and Actions

This demonstration illustrates how to add page prompts and actions to create interactive reports using Report Builder.

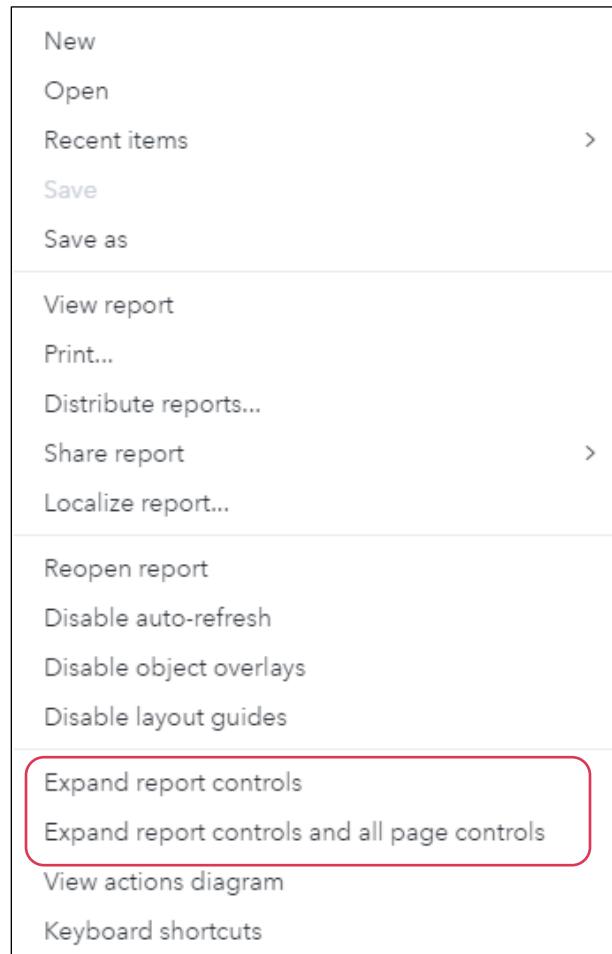
1. From the browser window, select **SAS Home Page** from the bookmarks bar.
 2. Enter **Eric** in the **User ID** field.
 3. Enter **Student1** in the **Password** field.
 4. Click **Sign In**.
 5. Select **Report Builder** in the Action Button area.
- The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo4.2b** to open the report.
 7. Add a page prompt to Customer Order Analysis.
 - a. If necessary, click the **Customer Order Analysis** page to make it active.
 - b. Click (**Options**) and select **Expand page controls** on the Customer Order Analysis tab.

The screenshot shows the SAS Visual Analytics interface. On the left, there's a chart titled "Customer Order Analysis" with a Y-axis ranging from \$3 to \$5. The chart has a teal bar. On the right, there's a list of items: Profit and Number, Profit (millions), \$5, \$4, \$3. Above the list, there's a header with tabs: "Customer Order Analysis", "Delivery Analysis", and a "+" sign. A context menu is open over the "Customer Order Analysis" tab, listing options: Rename page, Delete page, Hide page, Duplicate page, Print page..., Expand page controls (which is highlighted with a cursor icon), and Expand all page controls.

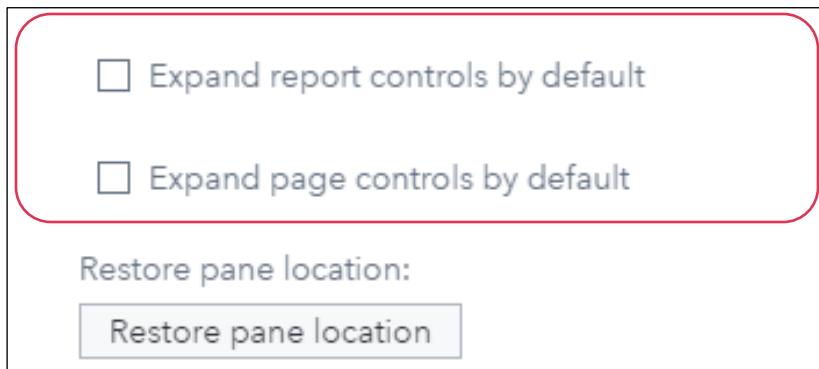
The page prompt area is shown on the page:



Note: You can also display report controls and all page controls for the report. To display the report controls, click (Menu) and select **Expand report controls**. To display both report and page controls, click (Menu) and select **Expand report controls and all page controls**.



Note: In the general settings for Report Builder, you can specify whether to expand report and page controls by default for new reports and pages, respectively.



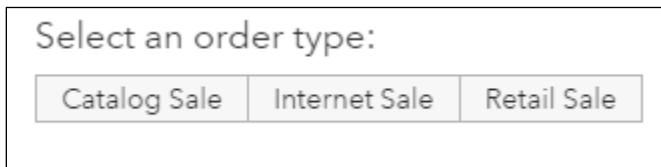
- c. In the left pane, click the **Data** icon.
- d. Drag **Order Type** from the Category group to the **Drop a data item or control to create a page prompt** area.

An auto control determines the best control object to use for the selected data.



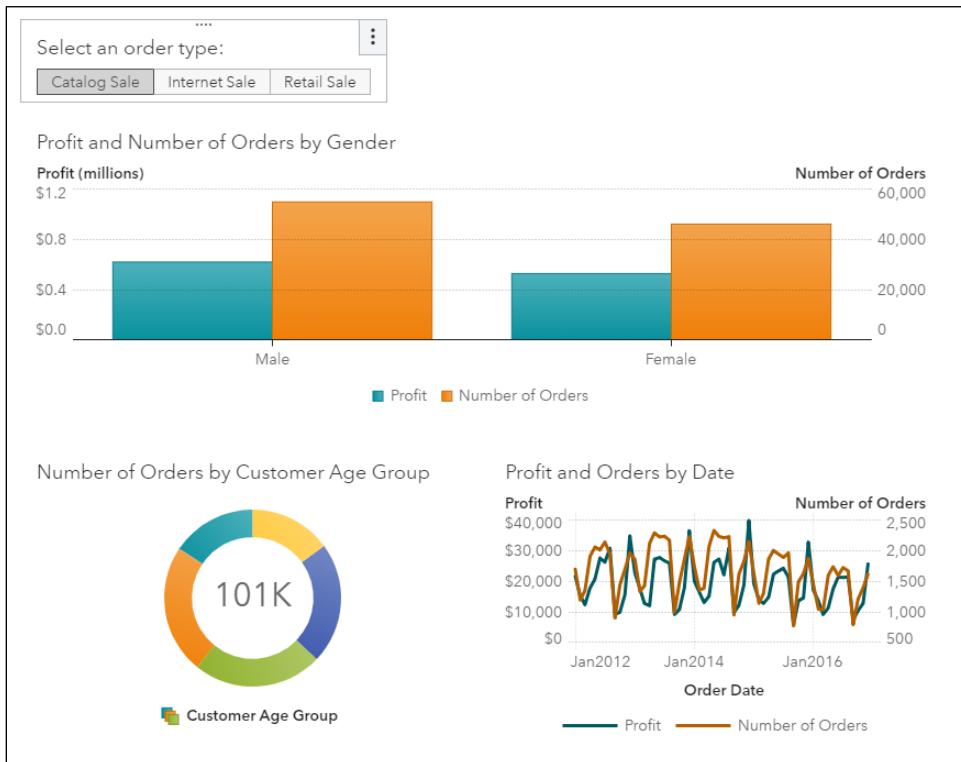
- e. In the right pane, click the **Options** icon.
- f. In the Object group, enter **Order Type Selector** in the **Name** field.
- g. Select **Custom Title** for the title.
- h. Enter **Select an order type:** in the **Title** field.

The auto control should resemble the following:

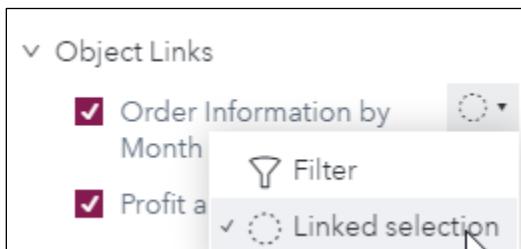


- Click **Catalog Sale** in the control to filter the objects on the page.

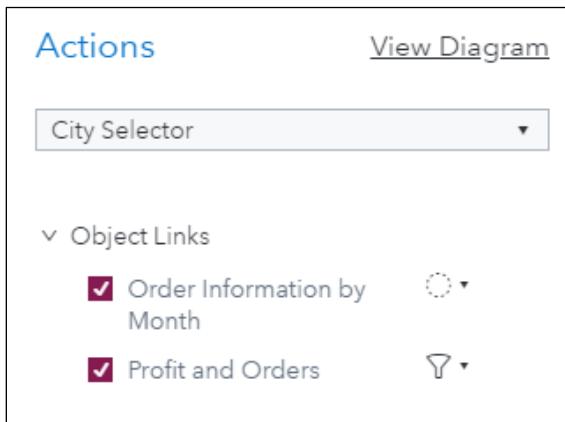
The Customer Order Analysis section should resemble the following:



- Click **Catalog Sale** in the control to deselect it.
- Add actions between objects on the Delivery Analysis page.
 - Click the **Delivery Analysis** page to make it active.
 - Click the drop-down list control to select it.
 - In the right pane, click the **Actions** icon.
 - In the Actions pane, expand **Object Links** if necessary.
 - Select **Profit and Orders** (the dual axis bar chart).
 - Verify that (Filter) is selected.
 - Select **Order Information by Month** (the bubble plot) in the Actions pane.
 - Select **Linked selection**.

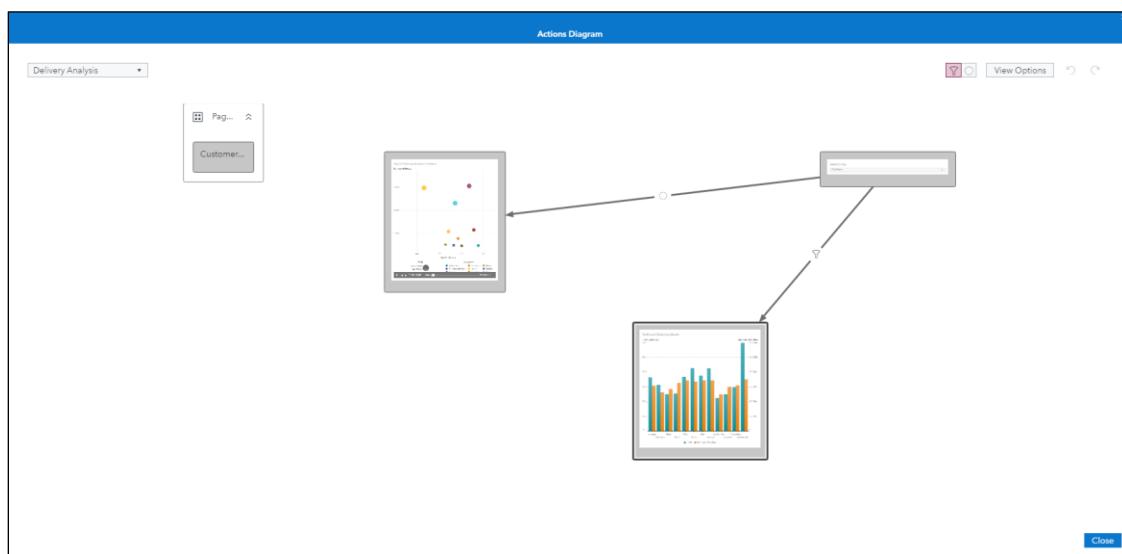


The Actions pane should resemble the following:



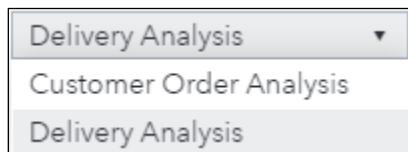
9. In the Actions pane, select **View Diagram**.

The Actions Diagram window appears.

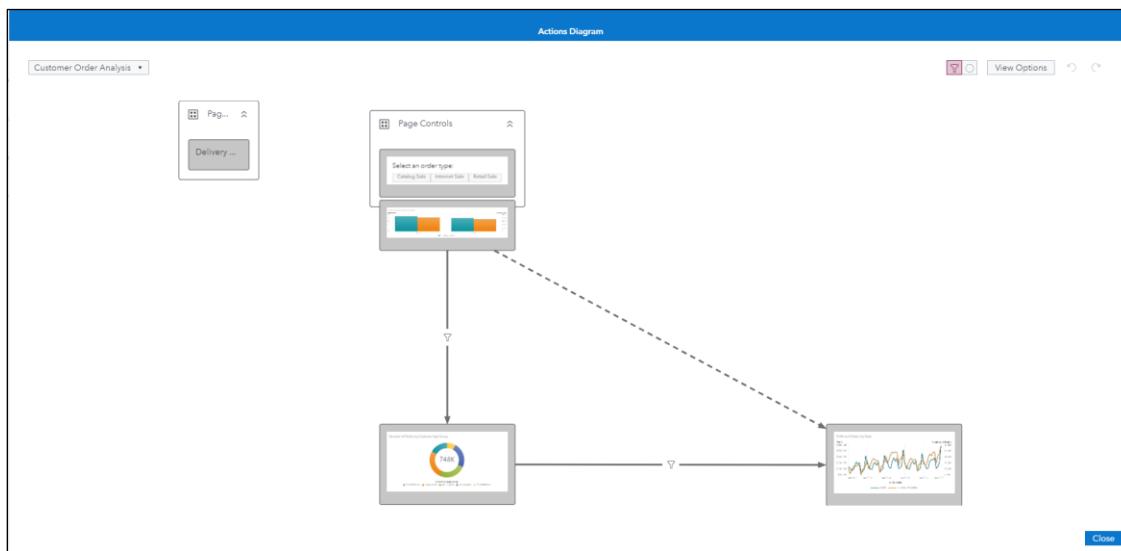


Note: The Actions Diagram window can also be used to create actions between objects. Simply click and drag between objects to create the action.

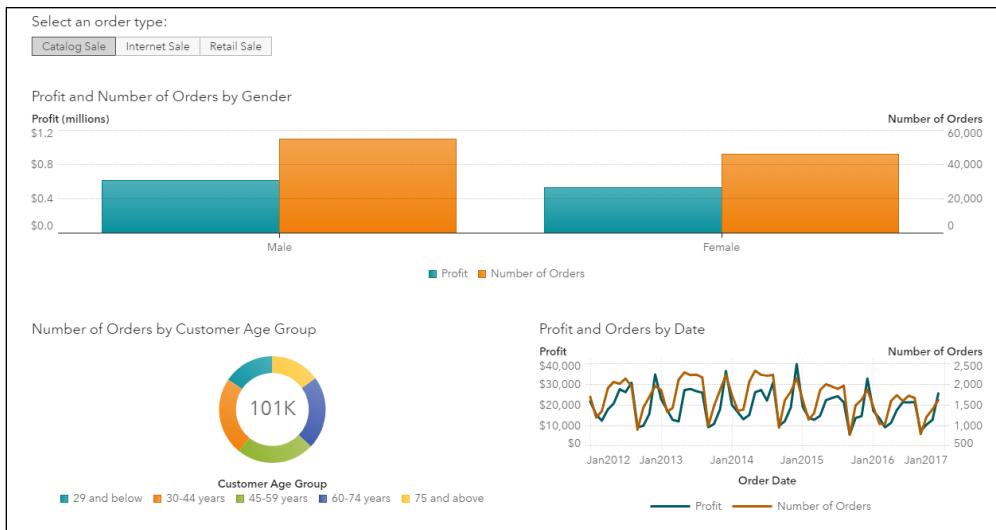
10. Select **Customer Order Analysis** in the drop-down list control.



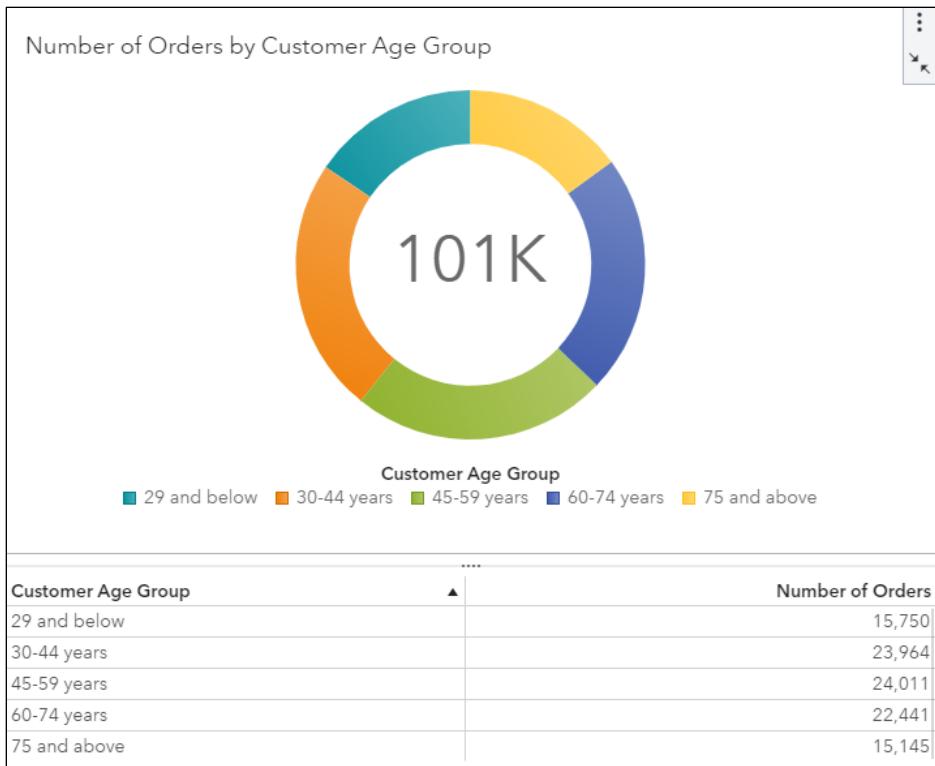
The Actions Diagram is displayed for the Customer Order Analysis page.



11. Click **Close**.
12. In the upper right corner, click (Menu) and select **Save**.
13. View the report.
 - a. In the upper right corner, click (Menu) and select **View report**.
The report opens in the Report Viewer.
 - b. Click **Catalog Sale** in the button bar.
The Customer Order Analysis page updates to show information about catalog products ordered.

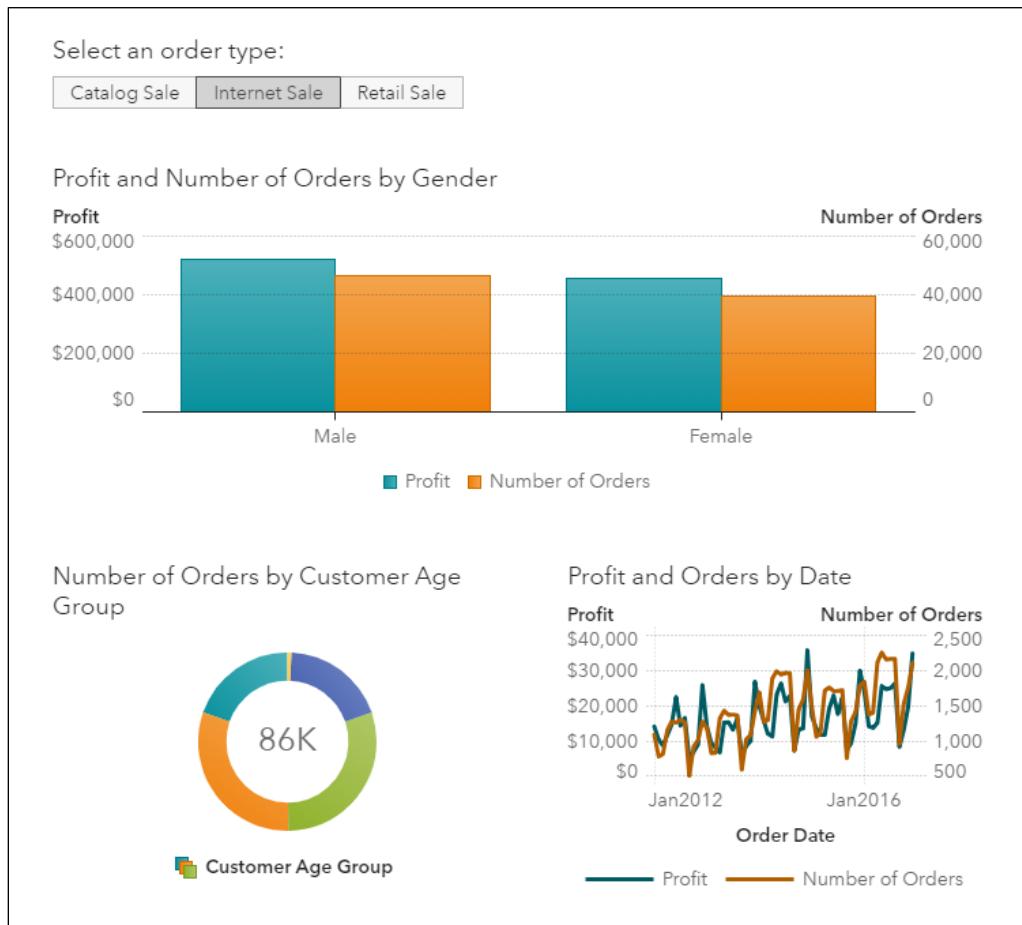


- c. In the upper right corner of the pie chart, click  (Maximize).

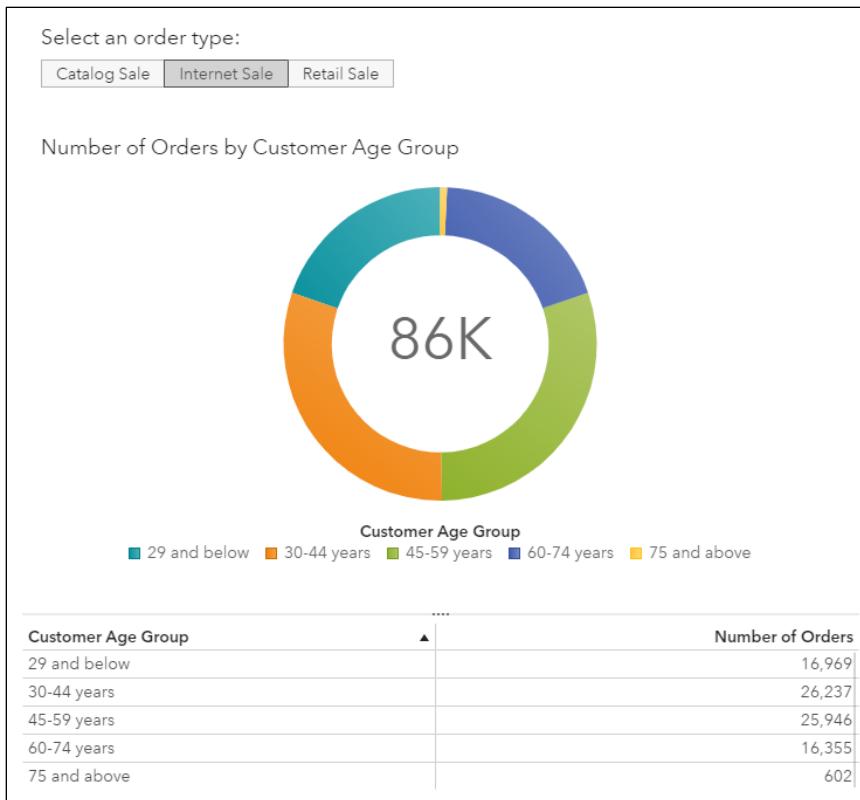


- d. In the upper right corner of the pie chart, click  (Restore).
- e. Click **Internet Sale** on the button bar.

The Customer Order Analysis page updates to show information about internet products ordered.



- f. In the upper right corner of the pie chart, click  (Maximize).

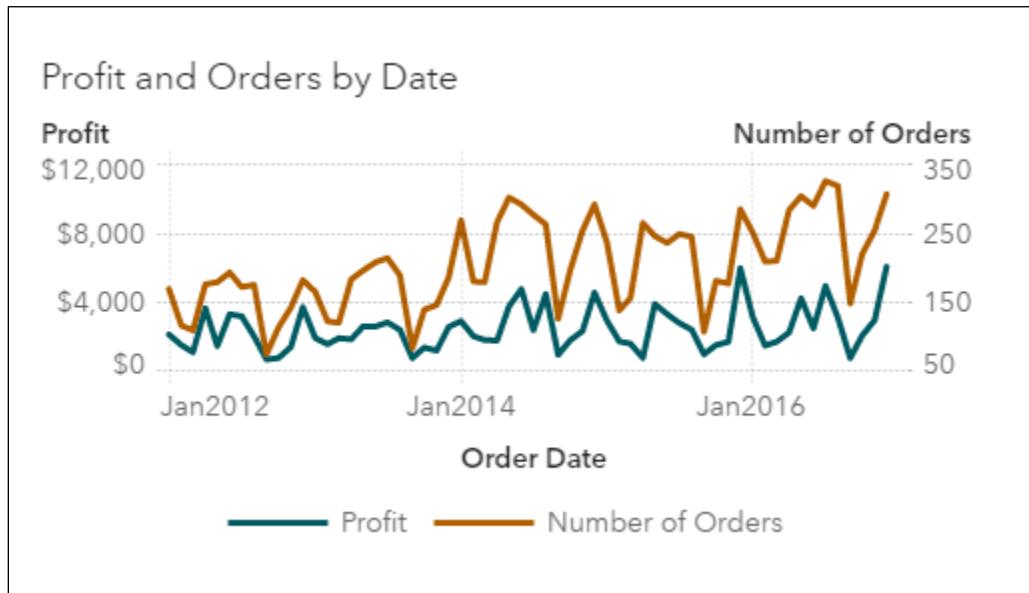


A lower percentage of all internet orders is placed by customers in the older age groups (60-75 years and 75 and above) compared to younger age groups. This appears to be a generational difference. How do we plan for this difference in ordering patterns among different age groups? Do we expect this difference to continue over time, or do we expect the difference to eventually get smaller?

- g. In the upper right corner of the pie chart, click  (Restore).
- h. Click the bars for **Female** in the dual axis bar chart.

- i. Click the slice for **30–44 years** (orange slice) in the pie chart.

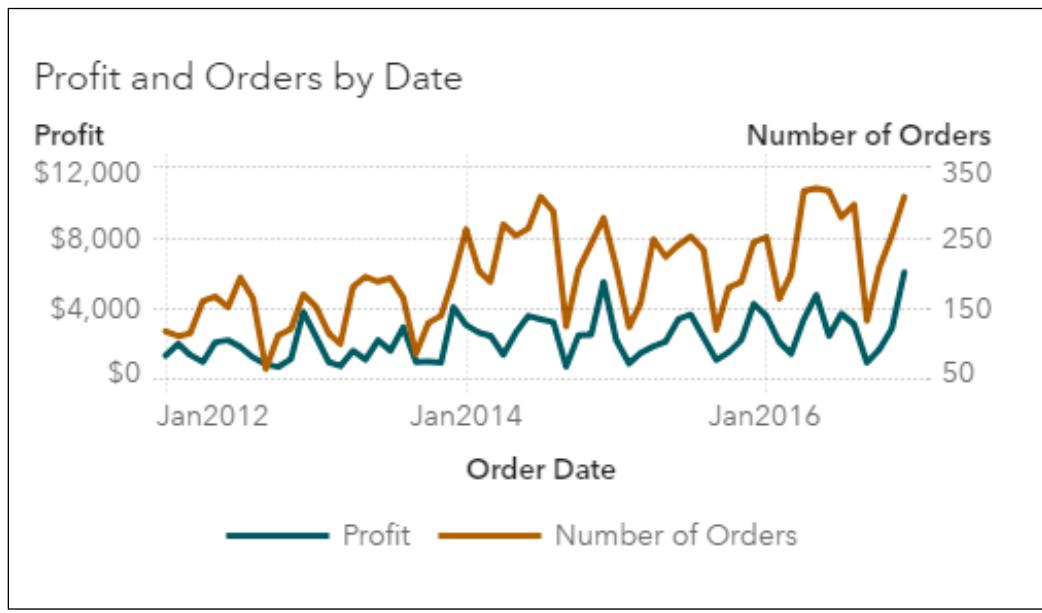
The dual axis time series plot should resemble the following:



For adults between 30-44 years, there are **Profit** peaks around December of each year. This could indicate mothers buying presents for their children.

- j. Click the slice for **45–59 years** (green slice) in the pie chart.

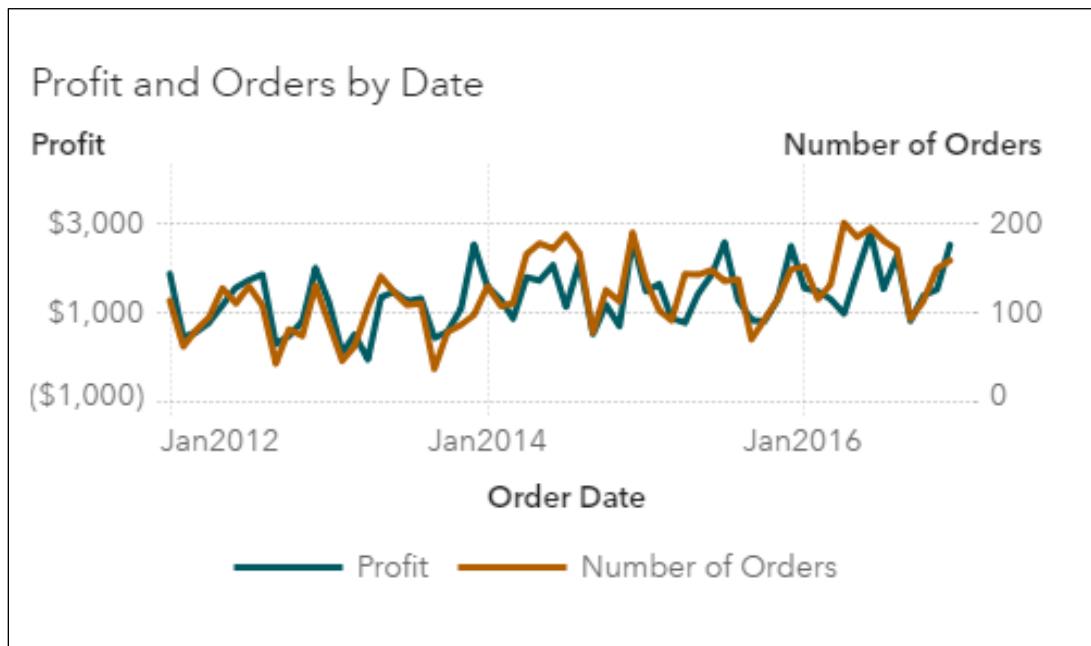
The dual axis time series plot should resemble the following:



For adults between 45-59 years, the **Profit** values seem more consistent throughout the year. This could indicate that mothers do not buy as many presents as children get older.

- k. Click the slice for **60–74 years** (blue slice) in the pie chart.

The dual axis time series plot should resemble the following:

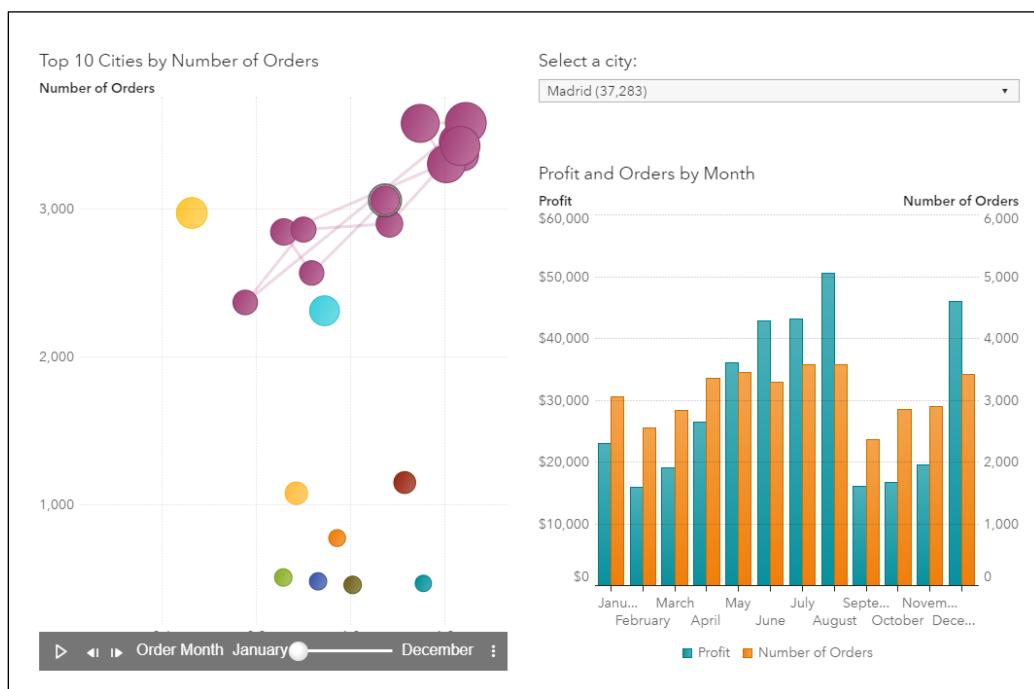


For adults between 60–74 years, the **Profit** peaks have returned in December. This could indicate grandmothers buying presents for their grandchildren.

- l. Click the **Delivery Analysis** tab to make the page active.

- m. Select **Madrid** in the drop-down list control.

The bubble for Madrid is highlighted in the bubble plot, and the dual axis bar chart is filtered to show profit and orders by month for Madrid.



Looking at the bubble plot, you can see a positive association between the number of orders and the days to delivery for Madrid. As the number of orders increase, so does the time it takes to receive the delivery. Looking at the dual axis bar chart, you can see that the number of orders peak around the summer and winter months. This could indicate more interest in buying sports and outdoor products during this time. However, notice that profits spike in August and December. Why are profits so much higher in those specific months?

- n. Click **Close** in the upper right corner to close the report.
14. Select **Eric** ⇒ **Sign Out** in the upper right corner.

End of Demonstration





Practice

3. Working with Prompts and Actions

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice4.2b** report from the **Shared Data/Basics/Practices (HR)** folder.
- Add a report prompt that uses a button bar to select the employee status.
- Modify the following options for the button bar:

Name	Employee Status Selector
Title	Select an employee status:

The button bar should resemble the following:

Select an employee status:

Active
Retired

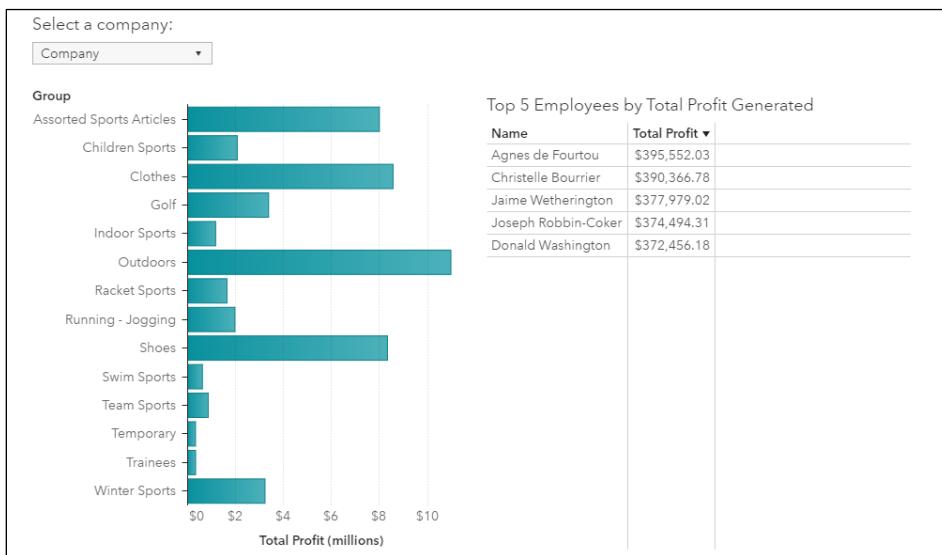
- Add the following actions between objects on the Employee Analysis page:
 - The geo map filters the bar chart and the dual axis bar-line chart.
 - The bar chart highlights the dual axis bar-line chart.
- On the Profit Analysis page, add a rank to the list table to show the top five employees by **Total Profit**.

Note: Add a rank for **all** visible categories.

The list table should resemble the following:

Top 5 Employees by Total Profit Generated	
Name	Total Profit ▾
Agnes de Fourtou	\$395,552.03
Christelle Bourrier	\$390,366.78
Jaime Wetherington	\$377,979.02
Joseph Robbin-Coker	\$374,494.31
Donald Washington	\$372,456.18

The Profit Analysis page should resemble the following:



- g.** Save the report.
- h.** View the report and answer the following questions:

Which job title has the highest average profit among active employees in Australia?

Answer: _____

For Orion USA, which active sales representative had the highest total profit generated for the Indoor Sports group?

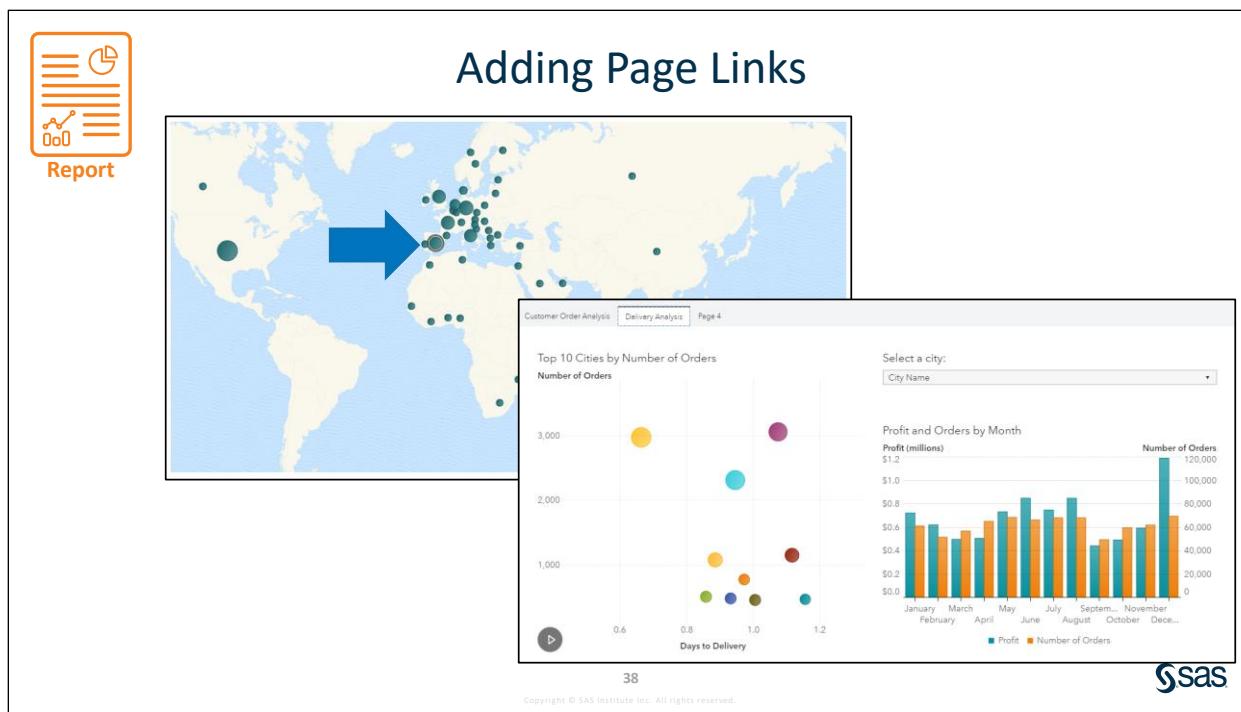
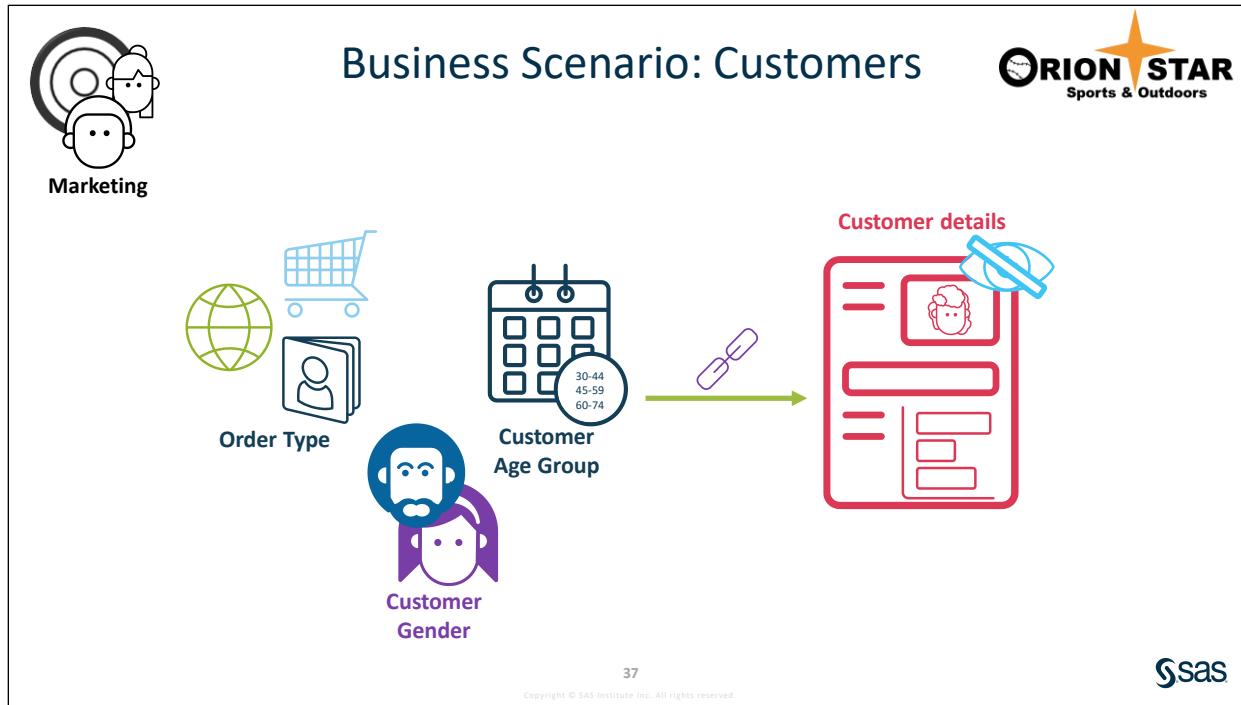
Answer: _____

For Orion France, how many active sales representatives sold items for the Racket Sports group?

Answer: _____

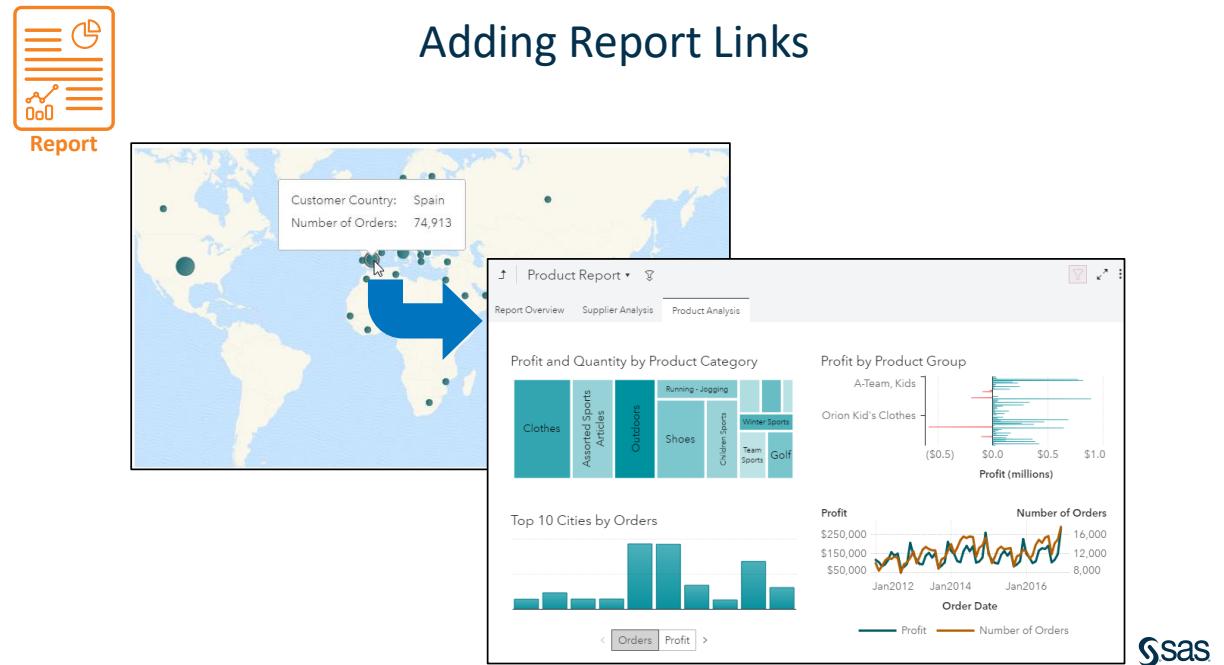
- i.** Close the report.
- j.** Sign out of Visual Analytics.

End of Practices



Linking has elements of both a filter and an action. A page that is the target of a link is filtered by the values selected in the linked report object.

If the source and the target use the same data source, an automatic filter is passed through the link. If the source and the target use different data sources, you have the ability to map data sources, so a filter is passed through the link.

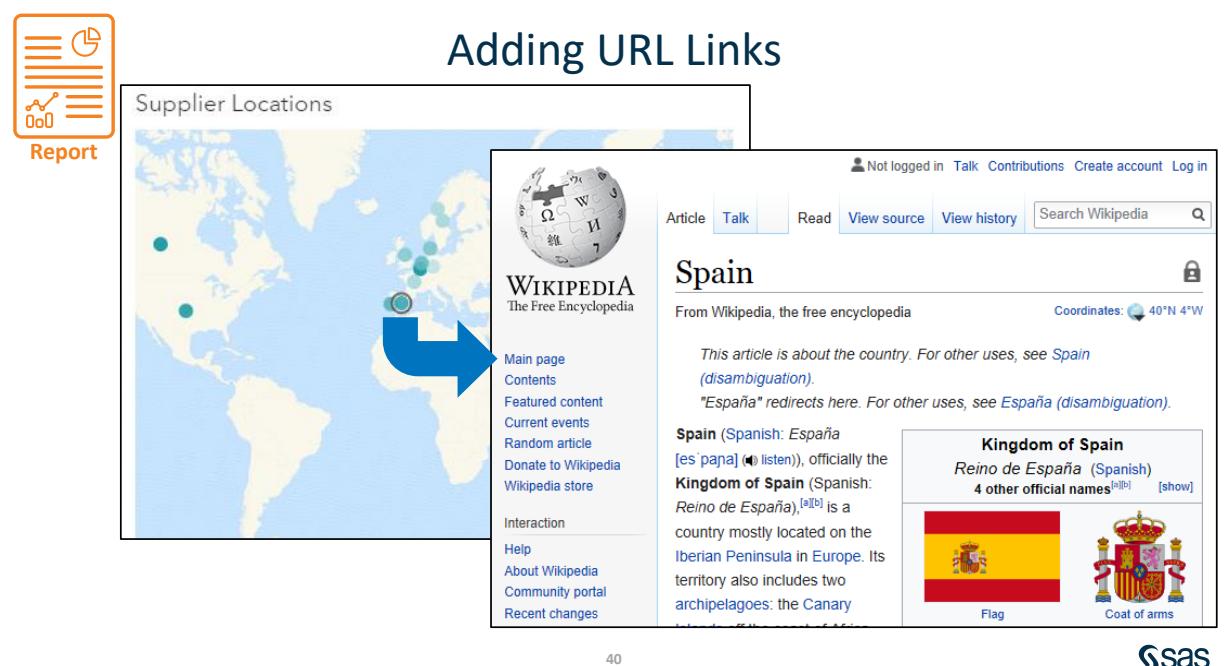


Adding Report Links

The screenshot shows a world map with a callout pointing to a detailed Product Report window. The map highlights Spain with a green dot and displays the text "Customer Country: Spain" and "Number of Orders: 74,913". The Product Report window contains several charts and tables, including a bar chart of Profit and Quantity by Product Category, a treemap of Profit by Product Group, and a line chart of Top 10 Cities by Orders over time.

If the destination report contains multiple pages, then when you define the link, you can choose the initial page of the destination report that opens first.

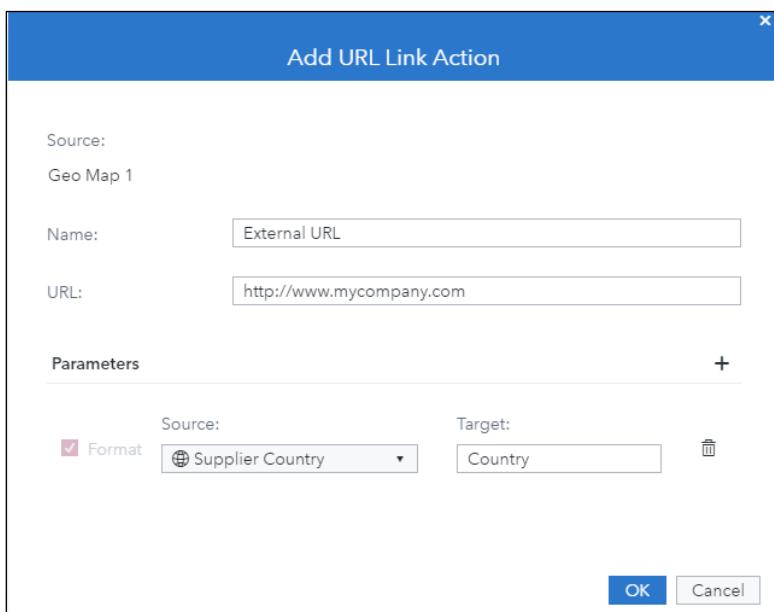
Note: You cannot test report links from within Report Builder. You must save the report and then switch to the SAS Report Viewer to test report links.



Adding URL Links

The screenshot shows a world map with a callout pointing to a Wikipedia page about Spain. The map highlights Spain with a green dot. The Wikipedia page includes the title "Spain", a summary, and sections for "Main page", "Contents", and "Kingdom of Spain". It also features the Spanish flag and coat of arms.

Note: You can specify additional parameters to pass a data item value to the URL.





Working with Hidden Pages and Page Links

This demonstration illustrates how to create hidden pages and how to add page links to create interactive reports using Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Select **Report Builder** in the Action Button area.

The Welcome to SAS Visual Analytics window appears.

6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo4.2c** to open the report.
7. Change the name of Page 3 and hide the page.
 - a. Click the **Page 3** tab to make the page active.
 - b. Double-click the **Page 3** heading to make it editable.
 - c. Enter **Customer Details** and press Enter.
 - d. Click  (**Options**) and select **Hide page** to make the page hidden.

Note: Hidden pages do not appear when viewing the report unless they are linked to.

8. Add links between objects.
 - a. Click the **Customer Order Analysis** page to make it active.
 - b. Click the pie chart to make it active.
 - c. In the right pane, click the **Actions** icon.
 - d. In the Actions pane, expand **Page links**.
 - e. Select **Customer Details**.

The Actions pane should resemble the following:

Actions

[View Diagram](#)

Orders by Age Group

Object Links

- Profit and Orders by Date

Page Links

- Delivery Analysis
- Customer Details

Report Links

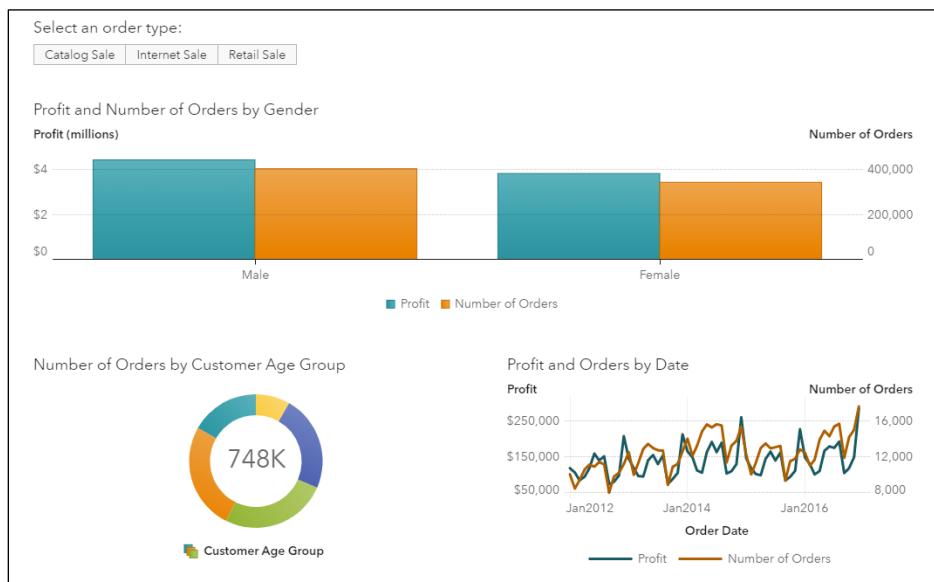
URL Links

9. In the upper right corner, click (**Menu**) and select **Save**.

10. View the report.

- a. In the upper right corner, click (**Menu**) and select **View report**.

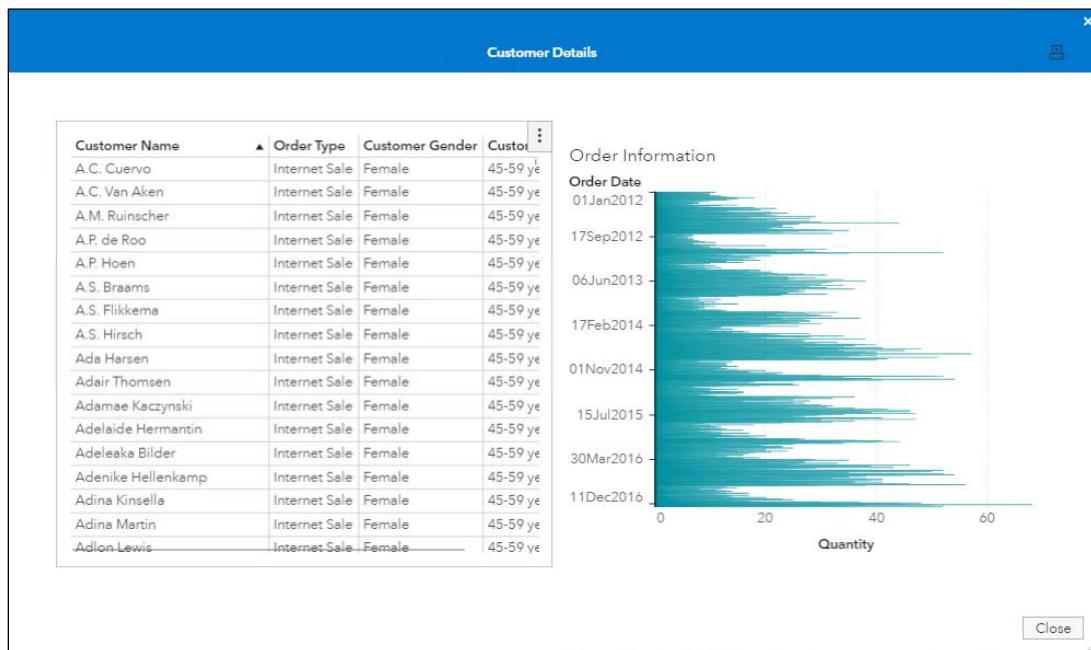
The report opens in the Report Viewer.



- b. Select **Internet Sale** in the page prompt.

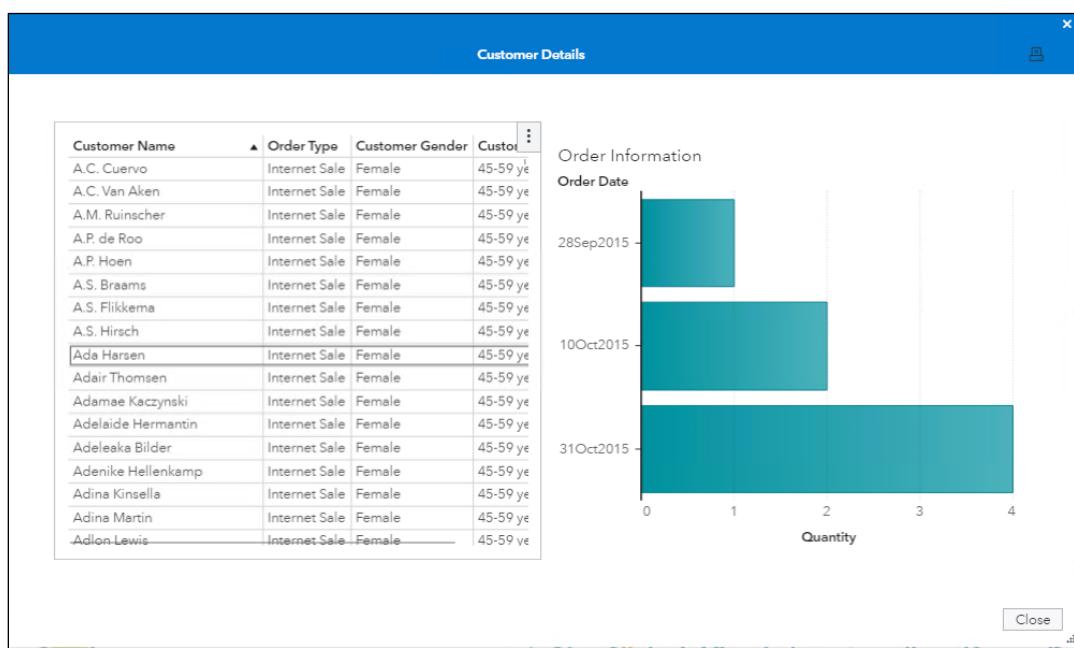
- c. Select **Female** in the dual axis bar chart.
- d. Double-click the slice for **45–59 years** (green slice) in the pie chart.

The Customer Details info window appears and shows details about female customers in the 45–59 age group who placed orders via the internet.



- e. Select the row for **Ada Harsen** in the list table.

The info window should resemble the following:

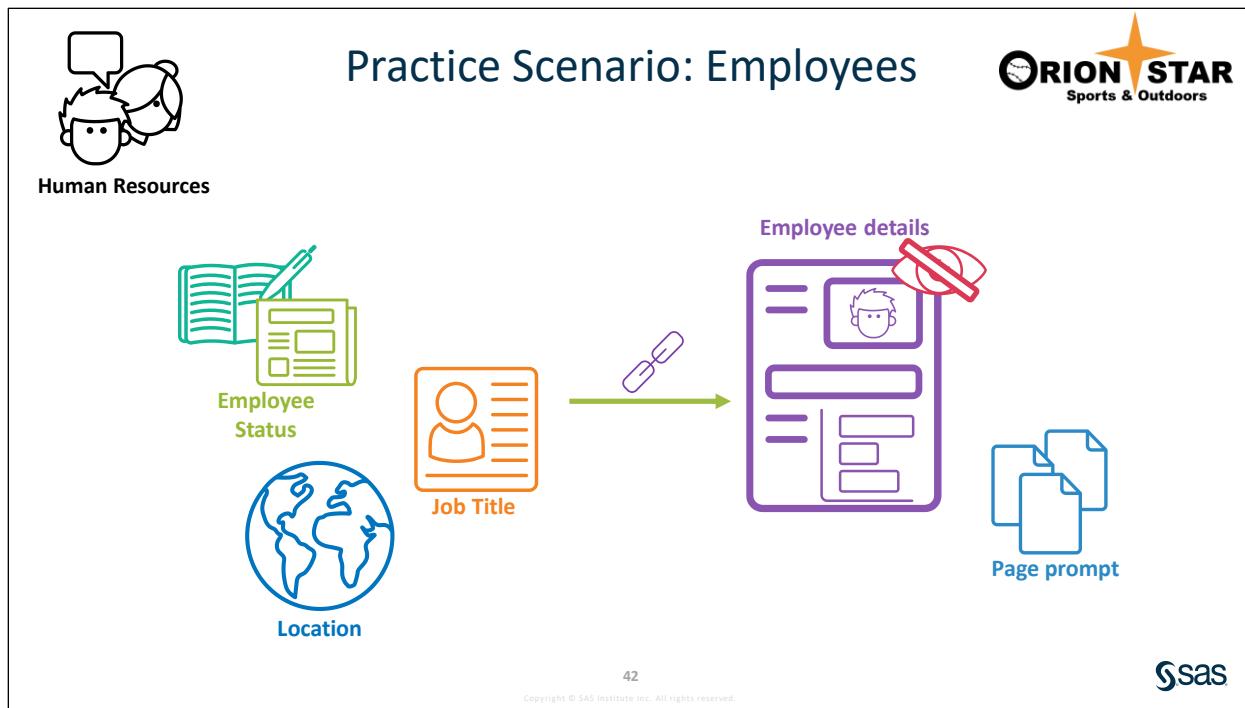


Ada seems to place a lot of orders in the same time frame (fall). Why does she place orders during the same time period? Does her birthday or a friend's birthday fall near this time? If so, we might want to try to offer her discounts at other times of year to increase her orders.

f. Click **Close**.

11. Select **Eric** ⇒ **Sign Out** in the upper right corner to sign out.

End of Demonstration





Practice

4. Working with Hidden Pages and Links

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
- b. Open the **VA1- Practice4.2c** report from the **Shared Data/Basics/Practices (HR)** folder.
- c. Hide **Page 3** and rename the page as **Employee Details**.
- d. Add a page prompt to the Employee Details page that uses a slider control to select a range of values for years of service.
- e. Modify the following options for the slider control:

Object: Name	Years of Service Selector
Object: Custom Title	Select a range of years:
Slider: Act on aggregated data in filtered object	<selected> Note: This option will check Set fixed range .
Slider: Minimum	0
Slider: Maximum	45

Note: Select the entire range of years for the slider control.

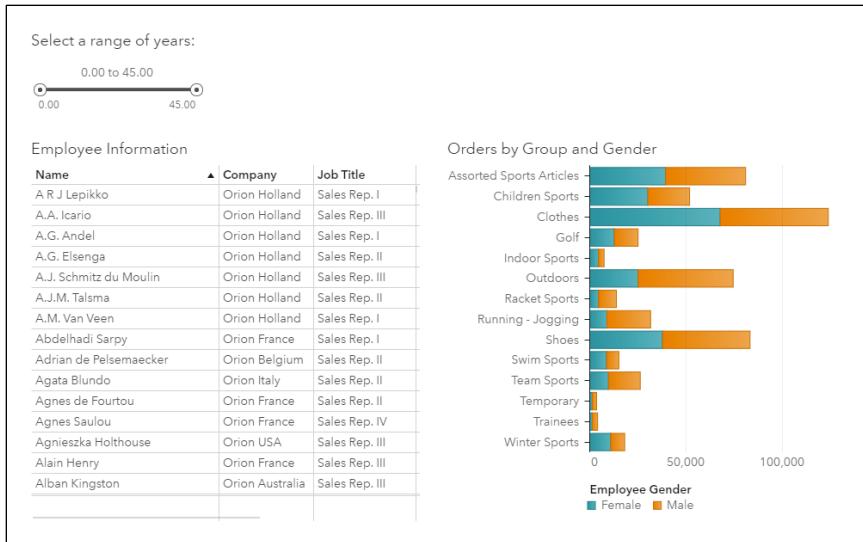
The slider control should resemble the following:

Select a range of years:

0.00 to 45.00



The Employee Details page should resemble the following:



- f. Add a page link from the bar chart on the Employee Analysis page to the Employee Details page.
- g. Save the report.
- h. View the report and answer the following questions:

How many employees retired in Italy with the Sales Rep. III job title?

Answer: _____

Management has decided to start promotions with active employees in the United States with the Sales Rep. I job title. Of the active employees with 25 or more years of service, how many generate a total profit more than \$200,000?

Answer: _____

Note: When changing years of service in the slider control, use the Tab key instead of the Enter key.

- i. Close the report.
- j. Sign out of Visual Analytics.

End of Practices

4.3 Working with Display Rules

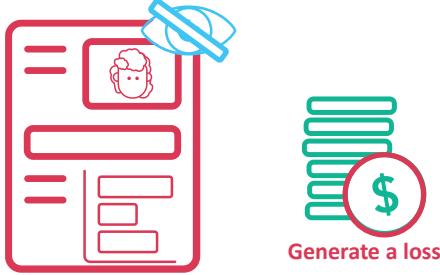
Business Scenario: Customers




Customer orders



Customer details



ORION STAR Sports & Outdoors

Marketing

More than 100,000 orders

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Sas

Graph-Level Display Rules




Color-mapped values



Product Category

Product Category	Profit
Winter Sports	\$500,000
Outdoors	\$450,000
Clothes	\$350,000
Running - Jogging	\$250,000
Racket Sports	\$200,000
Golf	\$150,000
Children Sports	\$100,000
Shoes	\$80,000
Team Sports	\$60,000
Swim Sports	\$40,000
Indoor Sports	\$20,000
Assorted Sports Articles	\$10,000

Product Category

Product Category	Profit
Assorted Sports Articles	\$5,000
Golf	\$100,000
Indoor Sports	\$15,000
Racket Sports	\$180,000
Running - Jogging	\$220,000
Swim Sports	\$10,000
Team Sports	\$30,000
Winter Sports	\$450,000

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Sas

Expression	Expression display rules are based on the value of a measure data item. For a graph, the expression display rule can be applied to the background of the graph (shown above) or to the graph itself. If the graph contains a hierarchy, you can specify the hierarchy levels where the display rule will be applied.
Color-mapped values	Color-mapped values display rules are based on the value of a category data item but cannot be applied to date or datetime data items.

Table-Level Display Rules



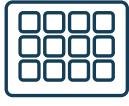
Color-mapped values



Product Line	Order Type	Profit	Number of Orders
Outdoors	Catalog Sale	\$240,285.38	17,405
Outdoors	Internet Sale	\$219,349.93	14,746
Outdoors	Retail Sale	\$1,227,449.64	75,465
Sports	Catalog Sale	\$623,088.07	44,946
Sports	Internet Sale	\$518,276.21	38,605
Sports	Retail Sale	\$3,049,267.28	221,875



Expression



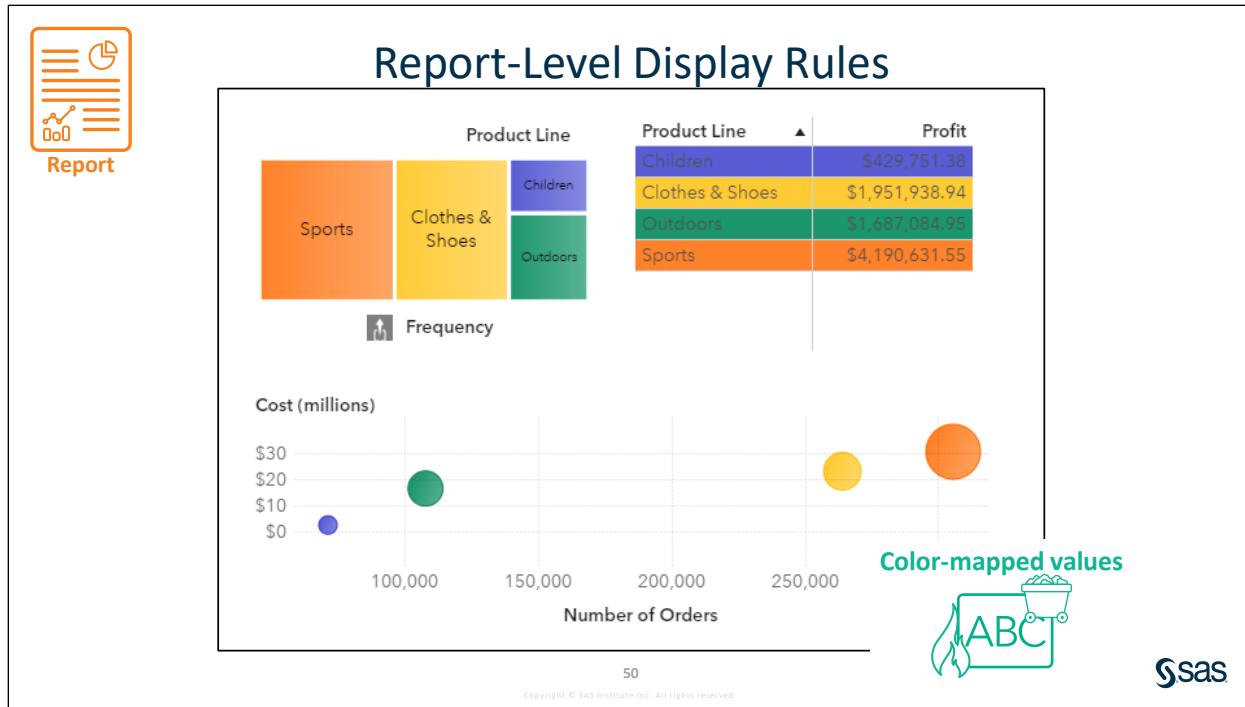
Gauge

Product Line	Order Type	Profit	Number of Orders
Outdoors	Catalog Sale	\$158,255.69	6,508 █
Outdoors	Internet Sale	\$139,890.22	5,643 █
Outdoors	Retail Sale	\$808,424.14	33,085 █
Sports	Catalog Sale	\$269,932.92	18,235 █
Sports	Internet Sale	\$239,914.54	15,810 █
Sports	Retail Sale	\$1,427,440.28	94,469 █

Sas

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Expression	Expression display rules are based on the value of a measure data item. For a list table, the expression display rule can be applied to the measure used in the expression, to another column in the table, or to the entire row. Crosstabs accept only expression display rules. If the crosstab contains a hierarchy or totals and subtotals are displayed, you can specify the hierarchy levels or intersections where the display rule will be applied.
Color-mapped values	Color-mapped values display rules are based on the value of a category data item, but cannot be applied to date or date time data items. For a list table, the color-mapped values display rule can be applied to any column in the table or to the entire row.
Gauge	Gauge display rules are based on intervals for a measure data item. For a list table, the gauge display rule can be added to any column in the table and can be displayed to the left of the value, to the right of the value, or replace the value.



A report-level display rule applies to all objects in the report.



Working with Graph-Level Display Rules

This demonstration illustrates how to add graph-level display rules using Report Builder.

1. From the browser window, select **SAS Home Page** from the bookmarks bar.

2. Enter **Eric** in the **User ID** field.

3. Enter **Student1** in the **Password** field.

4. Click **Sign In**.

5. Select **Report Builder** in the Action Button area.

The Welcome to SAS Visual Analytics window appears.

6. Click **Open**.

a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.

b. Double-click **VA1-Demo4.3** to open the report.

7. Add a custom sort for **Customer Order Type**.

a. Click the **Data** icon.

b. Right-click **Order Type** and select **Custom sort**.

The Add Custom Sort window appears.

1) Double-click the following values, in order, to add them to the Sorted Items list:

Retail Sale

Catalog Sale

Internet Sale

Sorted Items (3):

Retail Sale

Catalog Sale

Internet Sale

2) Click **OK**.

The Button bar is updated to reflect the custom sort.

Select an order type:

Retail Sale

Catalog Sale

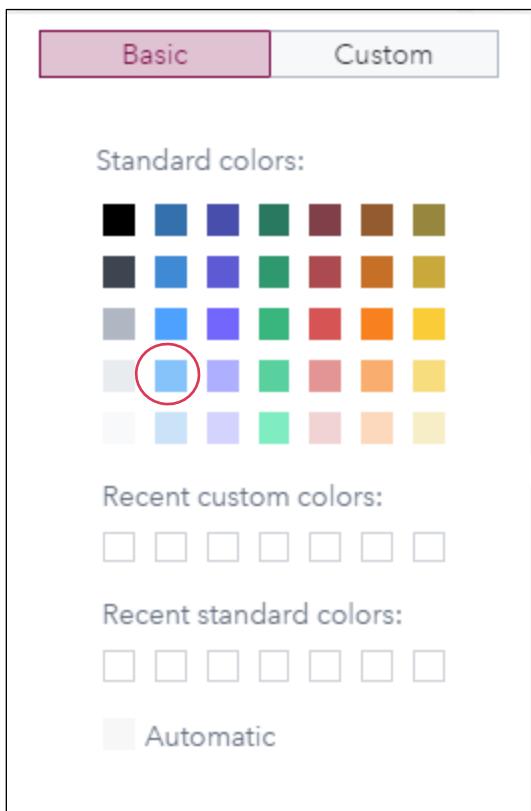
Internet Sale

8. Change the style of the button bar.

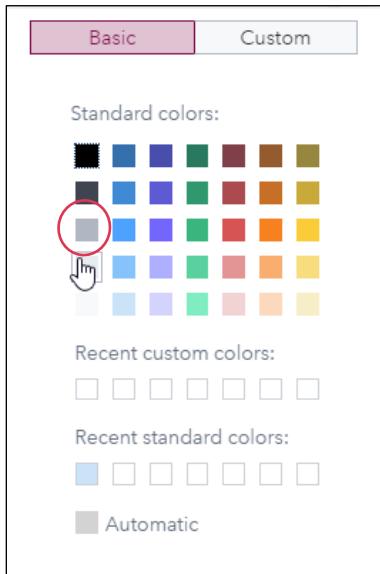
a. Select the **Order Type Selector** button bar.

b. In the right pane, click the **Options** icon.

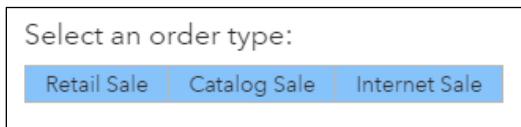
- c. In the Button Bar group, click  (Select a color) below **Background color**.
- d. Select **Light Blue**.



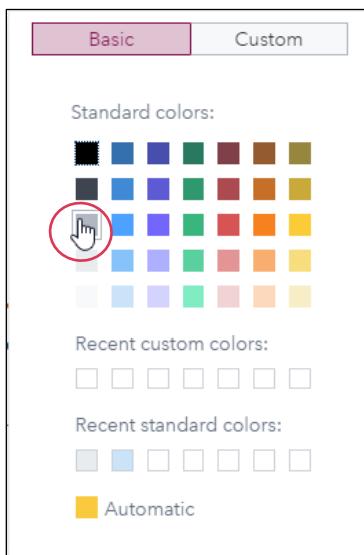
- e. Click  (Select a color) below **Background selection color**.
- f. Select **Light gray**.

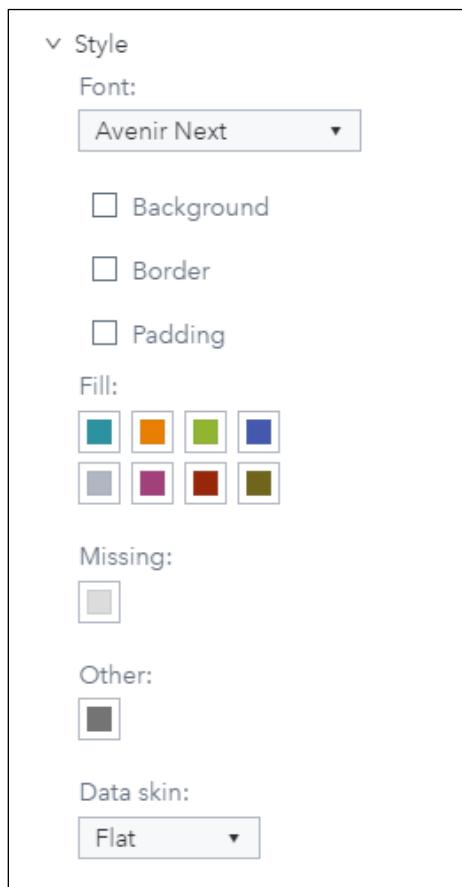


The button bar should resemble the following:

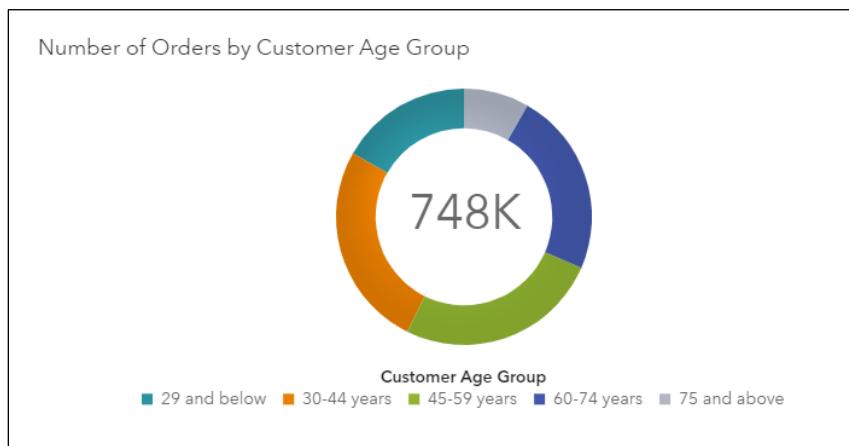


9. Change the color of a slice in the pie chart.
 - a. Select the **Number of Orders by Age Group** pie chart to make it active.
 - b. If necessary, click the **Options** icon.
 - c. Expand the **Style** group.
 - d. In the Fill section, select the yellow box and change the color to **Gray**.



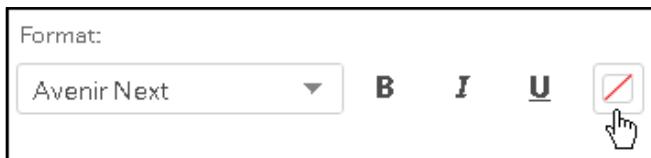
e. Select **Flat** for **Data skin**.

The pie chart should resemble the following:

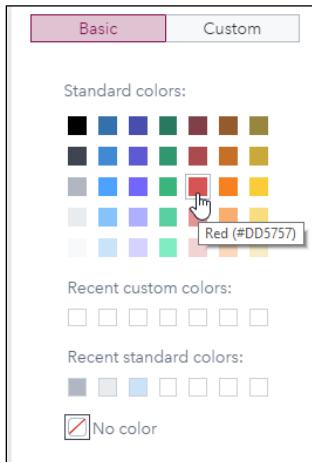


10. Add a display rule to the list table on the Customer Details page.

- a. Click the **Customer Details** page to make it active.
- b. Click the list table to make it active.
- c. In the right pane, click the **Rules** icon.
- d. In the Display Rules pane, select **New rule** \Rightarrow **Profit**.
- e. In the New Display Rule, select **< (less than)** for the **Operator** field.
- f. Verify that **0** is specified for the **Value** field.
- g. In the Format area, click  (**Select a font color**).



- h. Choose **Red** as the color.



- i. For the background color, click  (**Select a background color**).
- j. Choose **Gray**.
- k. Scroll down and verify that **Row** is specified for the **Placement** field.

The New Display Rule should resemble the following:

Profit

Rule Type: Expression

Operator: <

Value: 0

Format: AvenirNext **I** **U**

Background Color:

Placement: Row

Allow alerts for this rule

- I. Click **OK**.

The Display Rules pane should resemble the following:

Display Rules

Customer Information

+ New rule

Table Rows

Profit

Profit < 0

m. If necessary, scroll down in the list table to find a row where **Profit** is less than 0.

Customer Name	Order Type	Customer Gender	Customer Age Group
©ime Rituper	Catalog Sale	Male	60-74 years
©tefka Tertnik	Internet Sale	Female	60-74 years
A Amanda Mitchell	Retail Sale	Female	60-74 years
A R J Swart Rc	Catalog Sale	Male	29 and below
A R J Swart Rc	Internet Sale	Male	29 and below
A.A. Broekhuisen	Retail Sale	Male	75 and above
A.A. Broekhuisen	Catalog Sale	Male	75 and above
A.A. Busselaar	Retail Sale	Male	29 and below
A.A. Busselaar	Internet Sale	Male	29 and below
A.A. Duim	Internet Sale	Male	30-44 years
A.A. Duim	Catalog Sale	Male	30-44 years
A.A. Duim	Retail Sale	Male	30-44 years
A.A. Hautvast	Retail Sale	Male	75 and above
A.A. Hilhorst	Catalog Sale	Male	60-74 years
A.A. Hilhorst	Retail Sale	Male	60-74 years

11. In the upper right corner, click  (**Menu**) and select **Save**.

12. View the report.

- In the upper right corner, click  (**Menu**) and select **View report**.

The report opens in the Report Viewer.

- Select **Retail Sale** on the button bar.

The geo map should resemble the following:



There are no retail sales in a number of countries because we have stores only in a few countries: Australia, Belgium, Denmark, France, Germany, Italy, Netherlands, Spain, United Kingdom, and United States. If we wanted to expand our retail stores to new countries, Canada might be a logical choice.

- c. Select **Internet Sale** from the button bar.

The geo map should resemble the following:



Through the internet, we can reach more countries and more customers. Perhaps we can start marketing campaigns in South America as we currently have no customers in that continent.

- d. Select **Canada** in the geo map.

The page updates and the other objects are filtered to show product orders in Canada.

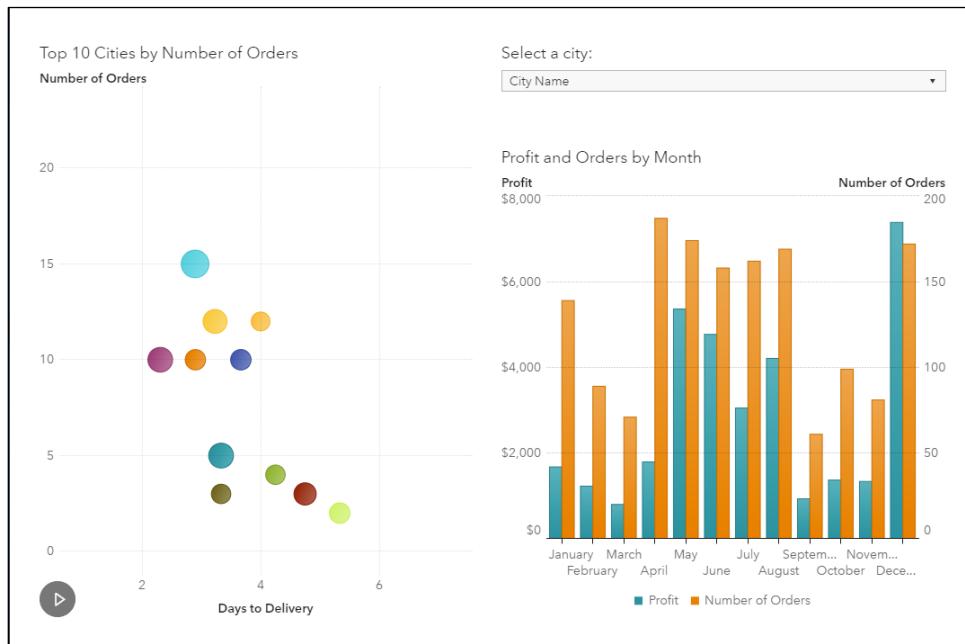
- e. In the upper right corner of the dual axis bar chart, click  (**Maximize object**).



In Canada, profits are higher for females even though the number of orders placed by females is lower. This is one of the only countries where orders placed by females are more profitable than males. What is Canada doing to generate this behavior? Are they targeting their marketing campaigns toward females? Do they have a different product mix? This might be something to investigate to try to increase profits from females in other countries.

- f. In the upper right corner of the dual axis bar chart, click  (**Restore**).
g. Double-click **Canada** in the geo map.

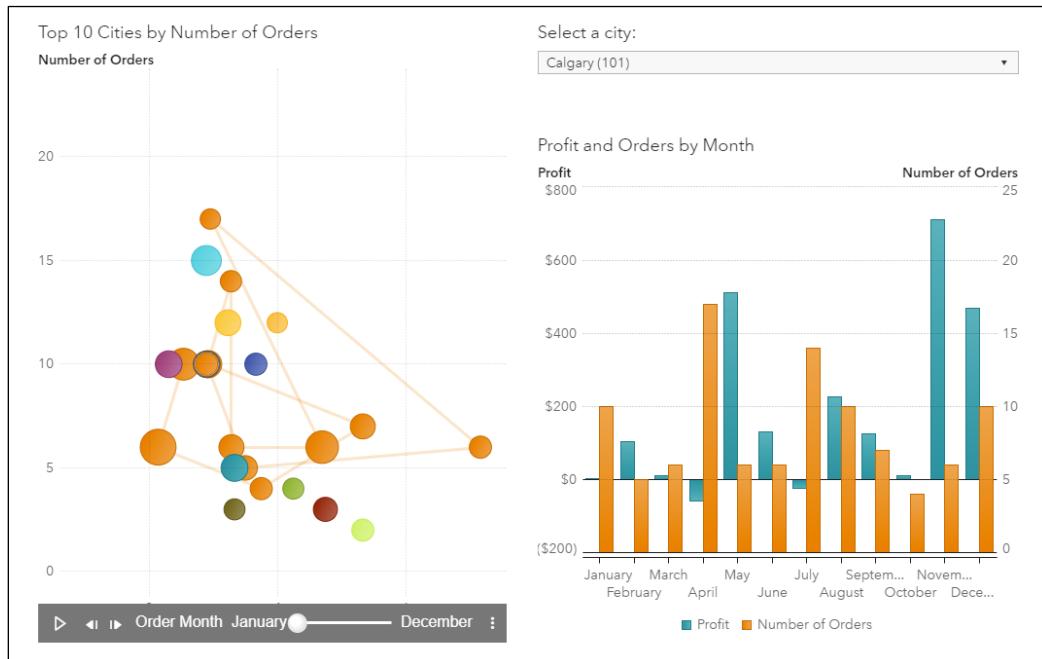
The Delivery Analysis page is displayed and filtered to show information about Canada.



The monthly profits and orders in Canada seem to follow a similar trend to other countries (higher in the summer and winter months). However, it is interesting to note that there seems to be a strong uptick in profits in December. Why does this happen?

- Select **Calgary** in the drop-down list control.

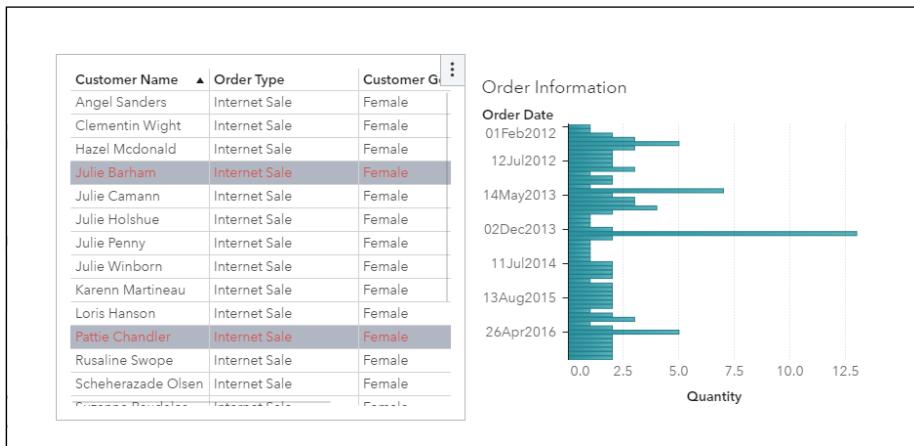
The page is updated to resemble the following:



Internet orders placed in Calgary do not always produce a profit. Most notable is the negative profits in both April and July, even though orders are quite high for those months.

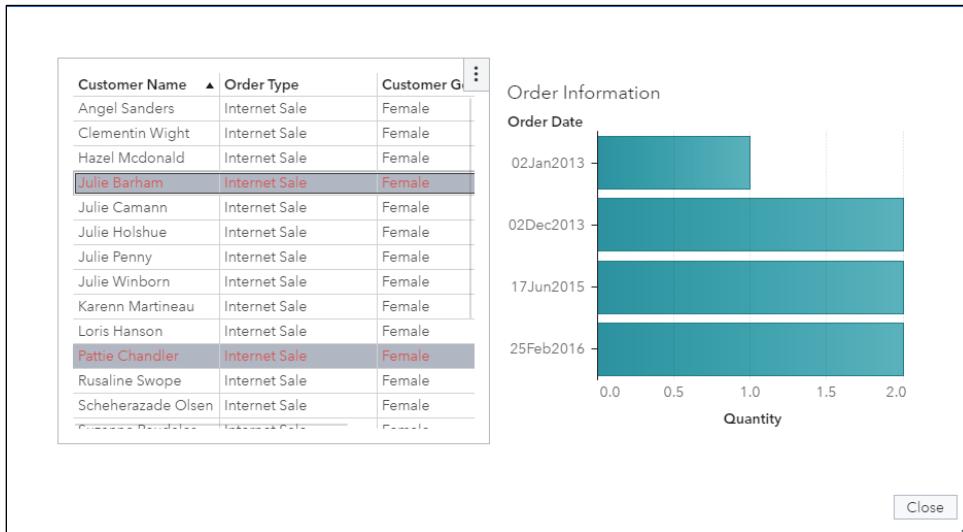
Conversely, profits in November and December are high even though the number of orders are pretty low. Is it the types of items that are ordered in those months that are creating this phenomenon?

- i. Click  in the upper left corner to return to the Customer Order Analysis page.
 - j. Select **Female** in the dual axis bar chart.
 - k. Double-click the **75 and above** slice (gray slice) in the pie chart.
- The Customer Details info window appears and shows details about female Canadian customers in the 75 and above age group who placed orders via the internet.
- l. Click  (Drag to resize) in the lower right corner.



- m. Scroll down in the list table and select the row for **Julie Barham**.

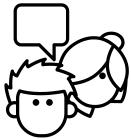
The hidden window should resemble the following:



Julie has placed a number of orders through the internet but has generated a negative profit for the company. It might be worth investigating the orders to understand why this occurs.

- n. Click **Close**.
- 13. Select **Eric** \Rightarrow **Sign Out** in the upper right corner to sign out.

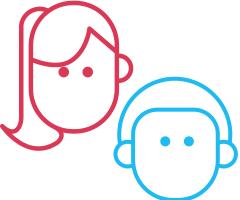
End of Demonstration



Human Resources

Practice Scenario: Employees





Distinguish genders



Employee Report



Profits



Level of Profit



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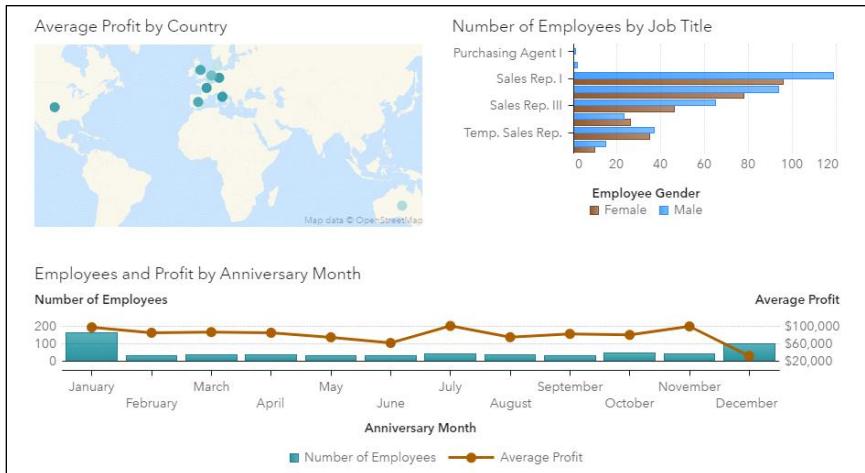
Practice

5. Working with Report-Level and Graph-Level Display Rules

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Practice4.3** report from the **Shared Data/Basics/ Practices (HR)** folder.
- Add a report-level display rule for gender by assigning the following colors to the values:

Employee Gender	Color
Male	Blue
Female	Dark Orange

The Employee Analysis page should resemble the following:

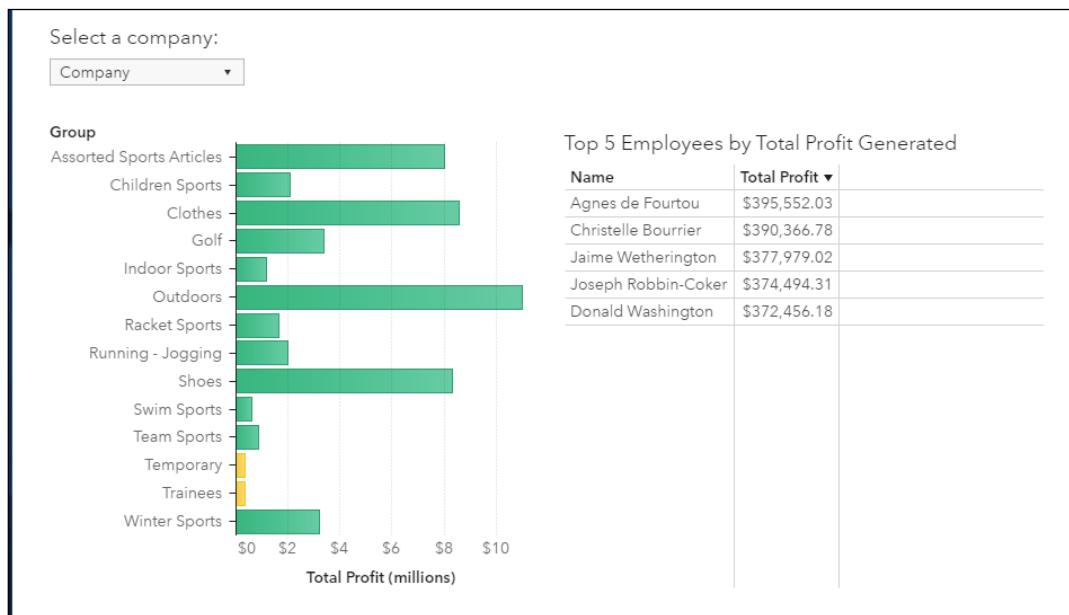


- Add three expression display rules to the bar chart on the Profit Analysis page by assigning the following colors to the ranges of **Total Profit**:

Total Profit Ranges	Color
Total Profit < 200,000	Red
200,000 <= Total Profit <= 500,000	Yellow
Total Profit > 500,000	Green

Note: Apply the display rule to the bars of the chart.

The Profit Analysis page should resemble the following:



- e. Save the report.
- f. View the report and answer the following questions:

How many employees retired in Spain? How many retired with the Sales Rep. I job title? Of those, how many were female?

Answer: _____

View the Profit Analysis page. Among active employees in Orion Spain, how many groups generated a total profit above \$500,000?

Answer: _____

- g. Sign out of Visual Analytics.

End of Practices

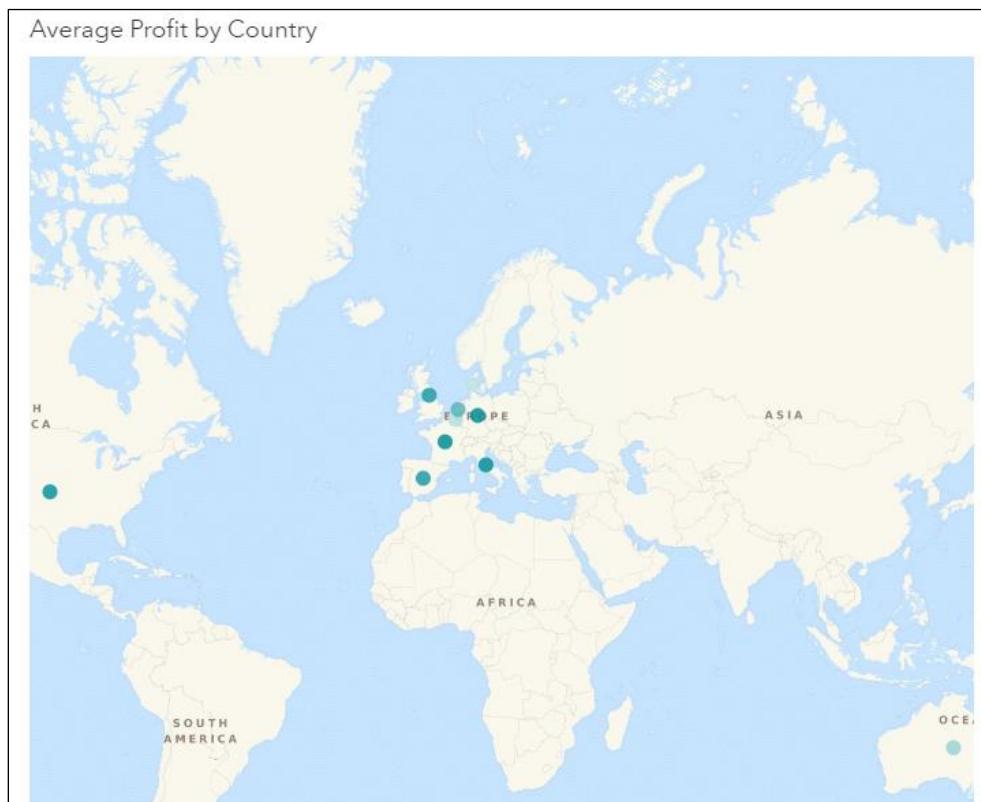
4.4 Solutions

Solutions to Practices

1. Creating a Simple Report

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open the **VA1- Practice4.1** report from the **Shared Data/Basics/ Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/ Practices(HR)** folder.
 - 4) Double-click **VA1- Practice4.1** to open the report.
- c. Create a geo map, to the left of the bar chart. Modify options for the geo map.
 - 1) In the left pane, click the **Objects** icon.
 - 2) Drag the **Geo Map** object, from the Graphs group, to left side of the canvas.
 - 3) In the right pane, click the **Options** icon.
 - 4) In the Object group, enter **Average Profit by Country** in the **Name** field.
 - 5) Select **Custom title** for the **Title** field.
 - 6) Enter **Average Profit by Country** in the **Title** field.
 - 7) In the Map group, select **Coordinates** for the **Type** field.
 - 8) In the Legend group, select **Off** for the **Visibility** field.
- d. Assign data items to the specified roles.
 - 1) In the right pane, click the **Roles** icon.
 - 2) For the **Category** role, select **Add** \Rightarrow **Employee Country**.
 - 3) For the **Color** role, select **Add** \Rightarrow **Average Profit**.
 - 4) For the **Data tip values** role, select **Add** \Rightarrow **Number of Employees** and click **OK**.

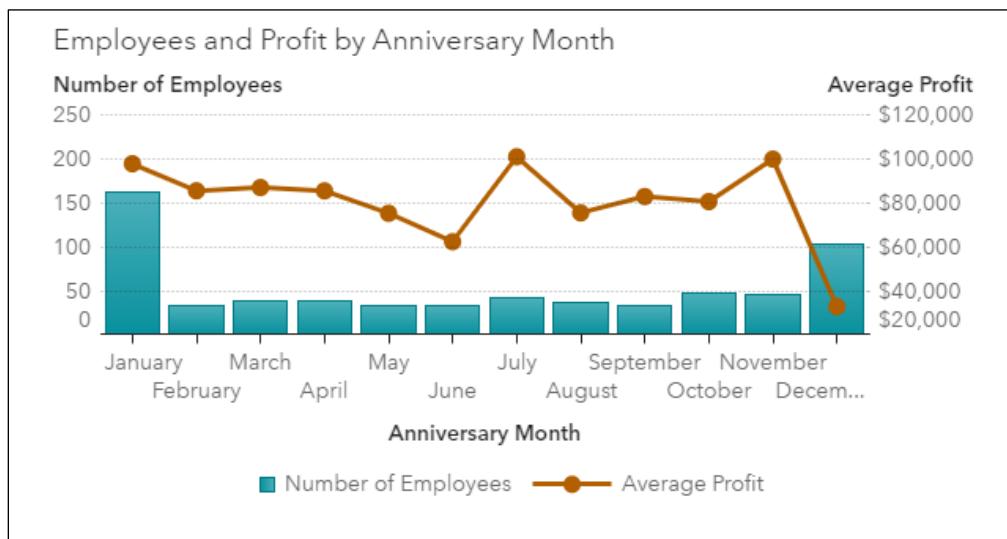
The updated geo map should resemble the following:



- e. Create a dual axis bar-line chart at the bottom of the canvas.
 - 1) In the left pane, click the **Objects** icon.
 - 2) Drag the **Dual Axis Bar-Line Chart** object, from the **Graphs** group, to the bottom of the canvas.
 - 3) In the right pane, click the **Roles** icon.
 - 4) For the **Category** role, select **Add** \Rightarrow **Anniversary Month**.
 - 5) For the **Measure (bar)** role, select **Add** \Rightarrow **Number of Employees**.
 - 6) For the **Measure (line)** role, select **Add** \Rightarrow **Average Profit**.
- f. Modify options for the dual axis bar-line chart.
 - 1) In the right pane, click the **Options** icon.
 - 2) In the Object group, enter **Employees and Profit by Anniversary Month** in the **Name** field.
 - 3) Select **Custom title** for the **Title** field.
 - 4) Enter **Employees and Profit by Anniversary Month** in the **Title** field.
 - 5) In the Line group, select **Markers**.

- g. Sort the bars. In the dual axis bar-line chart, right-click **Anniversary Month** on the horizontal axis and select **Sort** ⇒ **Anniversary Month: Ascending**.

The dual axis bar-line chart should resemble the following:



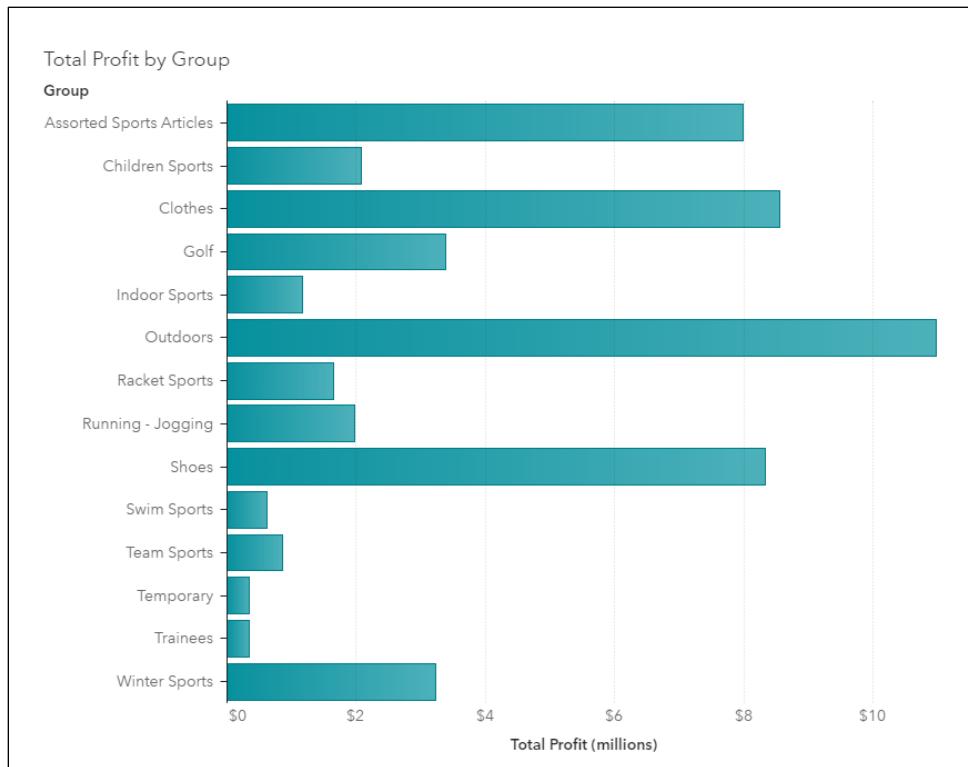
- h. To save the report, click (Menu) in the upper right corner and select **Save**.
 i. To sign out, select **Eric** ⇒ **Sign Out** in the upper right corner.

2. Working with Pages

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open the **VA1- Practice4.2a** report from the **Shared Data/Basics/ Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/ Practices(HR)** folder.
 - 4) Double-click **VA1- Practice4.2a** to open the report.
- c. Add a new page to the report and rename pages.
 - 1) In the upper left corner of the report, click (**New page**) next to **Page 1**.
 - 2) Double-click the **Page 2** heading to make it editable.
 - 3) Enter **Profit Analysis** and press Enter.
 - 4) Click **Page 1** to make it active.
 - 5) Double-click the **Page 1** heading to make it editable.
 - 6) Enter **Employee Analysis** and press Enter.

- d. Create a bar chart on the Profit Analysis page.
 - 1) If necessary, click **Profit Analysis** to make it active.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Bar Chart** object, from the Graphs group, to the canvas.
 - 4) In the right pane, click the **Roles** tab.
 - 5) For the **Category** role, select **Add \Rightarrow Group**.
 - 6) For the **Measure** role, select **Number of Employees \Rightarrow Total Profit**.
- e. Specify **Total Profit per Group** as the name of the bar chart.
 - 1) In the right pane, click the **Options** icon.
 - 2) In the Object group, enter **Total Profit by Group** in the **Name** field.
 - 3) Select **Custom title** for the **Title** field.
 - 4) Enter **Total Profit by Group** in the **Title** field.
- f. Sort the bars. In the new bar chart, right-click **Group** on the vertical axis and select **Sort \Rightarrow Group: Ascending**.

The new bar chart should resemble the following:



- g. To remove the Y Axis label, uncheck the **Axls label** under **Y Axis Options**.
- h. To save the report, click  (**Menu**) in the upper right corner and select **Save**.
- i. To sign out, select **Eric \Rightarrow Sign Out** in the upper right corner.

3. Working with Prompts and Actions

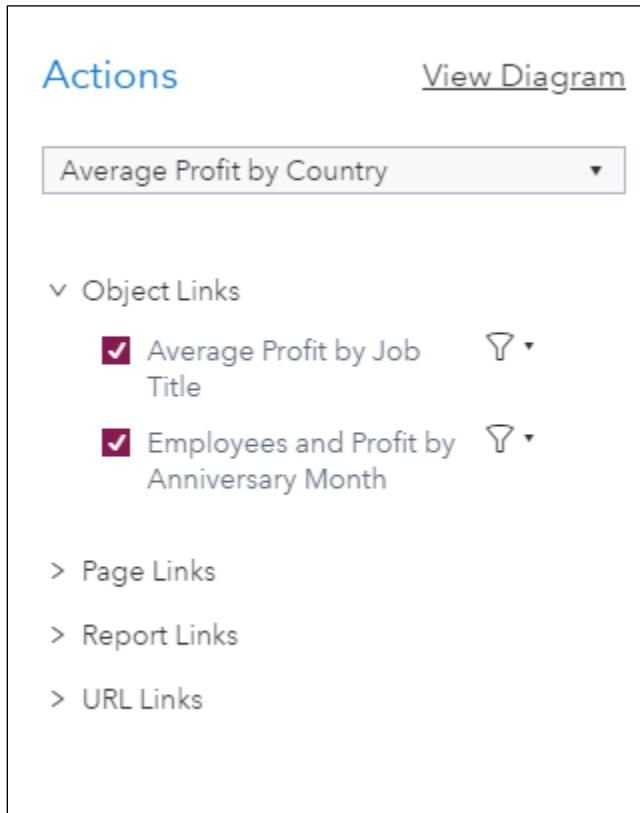
- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open the **VA1- Practice4.2b** report from the **Shared Data/Basics/ Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/ Practices(HR)** folder.
 - 4) Double-click **VA1- Practice4.2b** to open the report.
- c. Add a report prompt that uses a button bar to select the employee type.
 - 1) In the upper right corner of Visual Analytics, click  (**Menu**) and select **Expand report controls**.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Button Bar** object, from the Controls group, to the **Drop a data item or control to create a report prompt** area.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the **Category** role, select **Add \Rightarrow Employee Status**.
- d. Modify options for the button bar.
 - 1) In the right pane, click the **Options** icon.
 - 2) In the Object group, enter **Employee Status Selector** in the **Name** field.
 - 3) Select **Custom title** for the **Title** field.
 - 4) Enter **Select an employee status:** in the **Title** field.

The button bar should resemble the following:


- e. Add actions between objects on the Employee Analysis page.
 - 1) If necessary, click the **Employee Analysis** page to make it active.
 - 2) Click the geo map on the page to select it.
 - 3) In the right pane, click the **Actions** icon.
 - 4) In the Actions pane, expand **Object Links**, if necessary.
 - 5) Select **Average Profit by Job Title** (the bar chart).
 - 6) Verify that  (**Filter**) is selected.

- 7) Select **Employees and Profit by Anniversary Month** (the dual axis bar-line chart) in the Actions pane.
- 8) Verify that  (**Filter**) is selected.

The Actions pane should resemble the following:



Actions [View Diagram](#)

Average Profit by Country ▾

Object Links

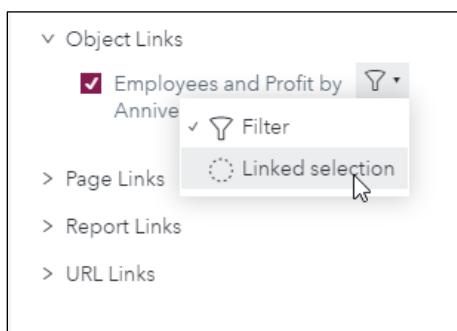
- ✓ Average Profit by Job Title 
- ✓ Employees and Profit by Anniversary Month 

Page Links

Report Links

URL Links

- 9) In the canvas, click the bar chart to select it.
- 10) In the right pane, click the **Actions** icon.
- 11) In the Actions pane, expand **Object Links**, if necessary.
- 12) Select **Employees and Profit by Anniversary Month** (the dual axis bar-line chart).
- 13) Select **Linked selection**.



Object Links

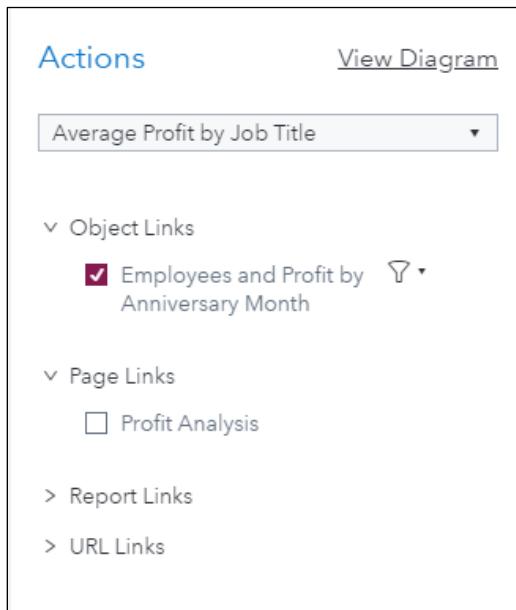
✓ Employees and Profit by Anniversary Month  

Page Links

Report Links

URL Links

The Actions pane should resemble the following:



- f. On the Profit Analysis page, add a rank to the list table to show the top five employees by **Total Profit**.
- 1) Click the **Profit Analysis** page to make it active.
 - 2) Click the list table to select it.
 - 3) In the right pane, click the **Ranks** icon.
 - 4) In the Ranks pane, select **New rank** \Rightarrow **All visible categories**.
 - 5) Verify that **Top count** is specified.
 - 6) Enter **5** for the **Count** field.
 - 7) Verify that **Total Profit** is specified for the **By** field.

The Ranks pane should resemble the following:

The list table should resemble the following:

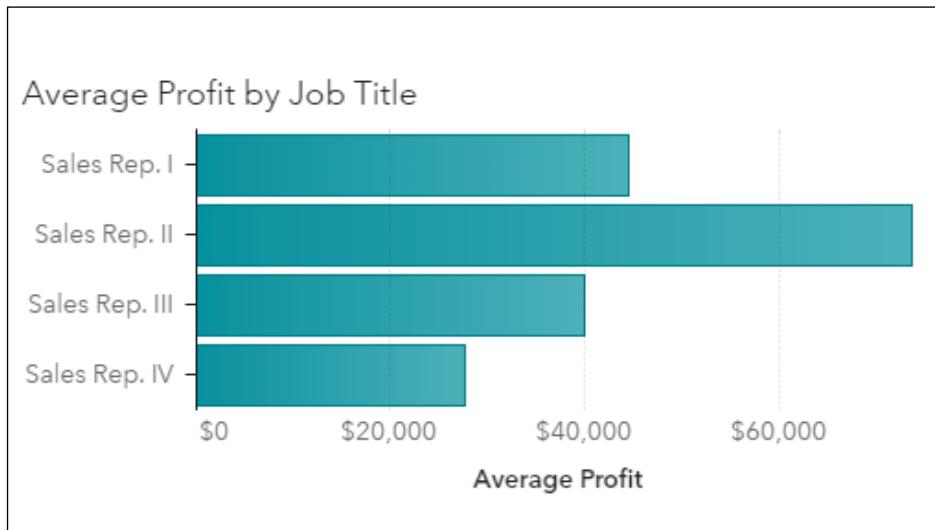
Name	Total Profit ▾
Agnes de Fourtou	\$395,552.03
Christelle Bourrier	\$390,366.78
Jaime Wetherington	\$377,979.02
Joseph Robbin-Coker	\$374,494.31
Donald Washington	\$372,456.18

- g. To save the report, click (Menu) in the upper right corner and select **Save**.
- h. View the report and answer the questions.
 - 1) In the upper right corner, click (Menu) and select **View report**. The report opens in the Report Viewer.
 - 2) Answer the questions.

Which job title has the highest average profit among active employees in Australia?

Answer: **Sales Rep. II (\$73,430.56)**

- On the Employee Analysis page, select Active in the Employee Status Selector (report prompt).
- In the geo map, click the AU coordinate.



For Orion USA, which active sales representative had the highest total profit generated for the Indoor Sports group?

Answer: **Tywanna Mcdade (\$178,299.60)**

- Click the Profit Analysis tab.
- In the Company Selector (page prompt), select Orion USA.
- Click the Indoor Sports bar on the bar chart.

Top 5 Employees by Total Profit Generated	
Name	Total Profit ▼
Tywanna Mcdade	\$178,299.60
Daniel Pulliam	\$172,949.97
Clement Davis	\$17,429.24

For Orion France, how many active sales representatives sold items for the Racket Sports group?

Answer: One employee (Marc Zampa)

- In the Company Selector (page prompt), select Orion France.
- Click the Racket Sports bar on the bar chart.

Top 5 Employees by Total Profit Generated	
Name	Total Profit ▾
Marc Zampa	\$66,109.84

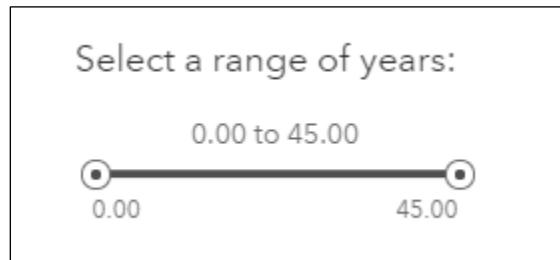
- i. Close the report.
- j. To sign out, select **Eric** ⇒ **Sign Out** in the upper right corner.

4. Working with Hidden Pages and Links

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open the **VA1- Practice4.2c** report from the **Shared Data/Basics/ Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/ Practices(HR)** folder.
 - 4) Double-click **VA1- Practice4.2c** to open the report.
- c. Hide **Page 3** and rename the page as **Employee Details**.
 - 1) Click **Page 3** to make it active.
 - 2) Click  (**Options**) and select **Hide page** to make the page hidden.
 - 3) Double-click the **Page 3** heading to make it editable.
 - 4) Enter **Employee Details** and press Enter.
- d. Add a page prompt to the Employee Details page that uses a slider control to select a range of years of service.
 - 1) On the Employee Details page, click  (**Options**) and select **Expand report controls and all page controls**.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag **Slider**, from the Controls group, to the **Drop a data item or control to create a page prompt** area.

- 4) In the right pane, click the **Roles** icon.
 - 5) For the **Measure/Date** role, select **Add \Rightarrow Years of Service**.
- e. Modify options for the slider control.
- 1) In the right pane, click the **Options** icon.
 - 2) In the Object group, enter **Years of Service Selector** in the **Name** field.
 - 3) Select **Custom title** for the **Title** field.
 - 4) Enter **Select a range of years:** in the **Title** field.
 - 5) In the Slider group, select **Act on aggregated data in filtered objects**.
- Note:** This option will check **Set fixed range**.
- 6) Enter **0** in the **Minimum** field.
 - 7) Enter **45** in the **Maximum** field.
 - 8) In the slider control, move the left and right arrows to select the entire ranges of years.

The slider control should resemble the following:



- f. Add a page link from the bar chart on the Employee Analysis page to the Employee Details page.
- 1) Click the **Employee Analysis** page to make it active.
 - 2) Click the bar chart to make it active.
 - 3) In the right pane, click the **Actions** icon.
 - 4) On the Actions pane, expand **Page Links**, if necessary.
 - 5) Select **Employee Details**.

The Actions pane should resemble the following:

- g. To save the report, click (Menu) in the upper right corner and select **Save**.
 - h. View the report and answer the questions.
- 1) In the upper right corner, click (Menu) and select **View report**. The report opens in the Report Viewer.
 - 2) Answer the questions.

How many employees retired in Italy with the Sales Rep. III job title?

Answer: Two employees (Giulia Buonocunto and Giuseppe Franco Scoditti)

Employee Information					
Name	Company	Job Title	Annual Salary	Total Profit	
Giulia Buonocunto	Orion Italy	Sales Rep. III	\$29,555.00	\$51,603.44	
Giuseppe Franco Scoditti	Orion Italy	Sales Rep. III	\$30,460.00	\$44,768.20	

- On the Employee Analysis page, select Retired in the Employee Status Selector (report prompt).
- In the geo map, click the IT coordinate.
- Double-click the Sales Rep. III bar on the bar chart.

- Click  (Drag to resize) in the lower right corner of the info window to increase the size of the window.

In the Employee Details window, the list table lists the employees that meet these criteria:

- Click Close to close the Employee Details window.

Management has decided to start promotions with active employees in the United States with the Sales Rep. I job title. Of the active employees with 25 or more years of service, how many generate a total profit more than \$200,000?

Answer: Five employees

Employee Information					
Name	Company	Job Title	Annual Salary	Total Profit	▼
Ray Abbott	Orion USA	Sales Rep. I	\$25,660.00	\$371,506.09	
Eric Michonski	Orion USA	Sales Rep. I	\$26,990.00	\$280,590.08	
Donald Court	Orion USA	Sales Rep. I	\$27,100.00	\$271,089.42	
Tachaun Voron	Orion USA	Sales Rep. I	\$25,125.00	\$260,146.86	
Glorina Myers	Orion USA	Sales Rep. I	\$26,025.00	\$220,995.63	

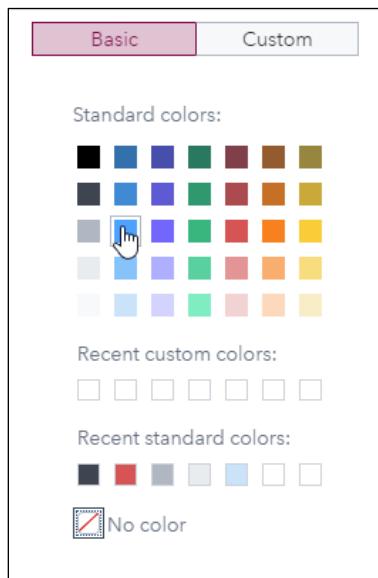
- On the Employee Analysis page, select Active in the Employee Status Selector (report prompt).
- In the geo map, click the US coordinate.
- Double-click the Sales Rep. I bar on the bar chart.
- Click  (Drag to resize) in the lower right corner of the info window to increase the size of the window.
- In the Years of Service Selector, click the circle on the left and enter 25 as the value and press Enter.
- In the list table, click the Total Profit heading twice to sort in descending order.
- Click Close to close the Employee Details window.

- i. Close the report.
- j. To sign out, select **Eric** ⇒ **Sign Out** in the upper right corner.

5. Working with Report-Level and Graph-Level Display Rules

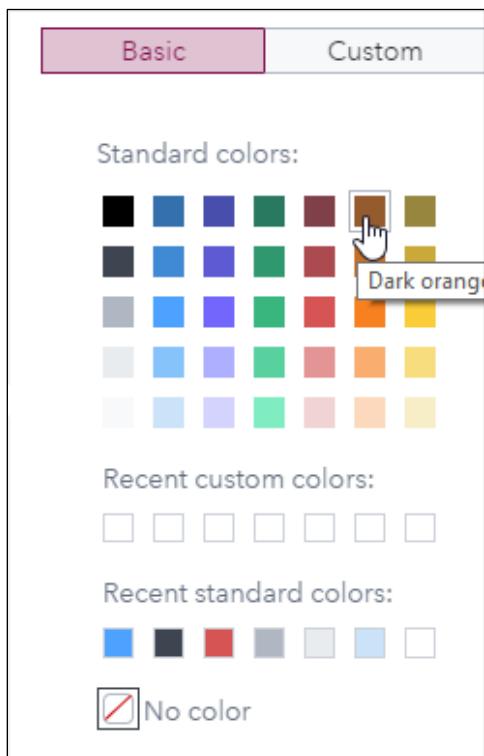
- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home Page** from the bookmarks bar.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Home is displayed by default.
- b. Open the **VA1- Practice4.3** report from the **Shared Data/Basics/ Practices (HR)** folder.
 - 1) Select **Report Builder** in the Action Button area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/ Practices(HR)** folder.

- 4) Double-click **VA1- Practice4.3** to open the report.
- c. Add a report-level display rule for gender.
- 1) In the right pane, click the **Rules** icon.
 - 2) In the Display Rules pane, select **New rule**.
 - 3) In the New Display Rule window, enter **Male** as the first value.
 - 4) Click (**Select a style**) on the left of the value.
 - 5) Choose **Blue** as the color.



- 6) Click (**Add**).
- 7) Enter **Female**.
- 8) Click (**Select a style**) on the left of the value.

- 9) Choose **Dark orange** as the color.

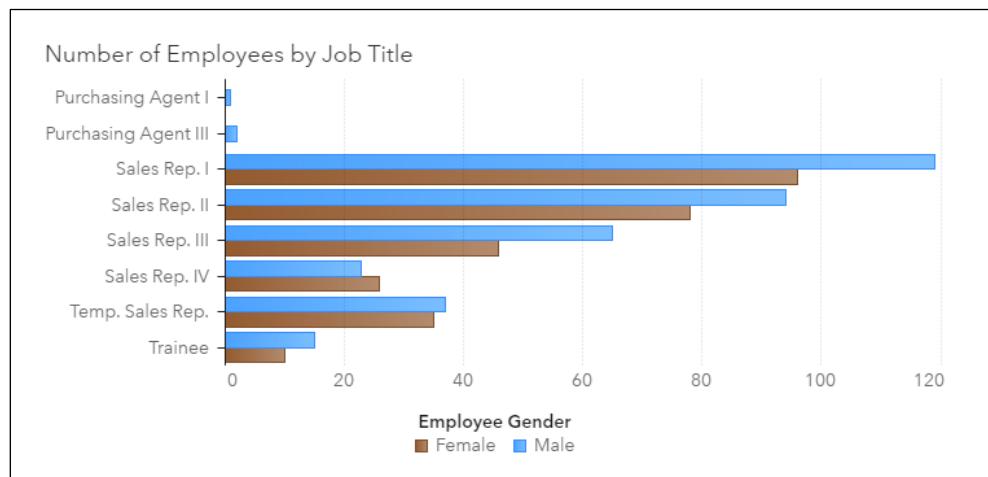


- 10) Click **OK**.

The Display Rules pane should resemble the following:

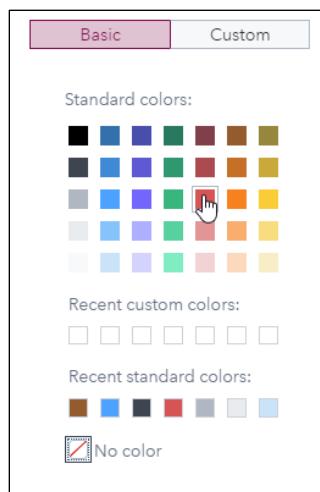
A screenshot of the SAS Display Rules pane. The title bar says "Display Rules". Below it is a dropdown menu showing "Employee Analysis". There is a "+ New rule" button. Under the "Report" section, there is a heading "Any Category" followed by two entries: "Male" with a blue square icon and "Female" with a brown square icon.

The bar chart should resemble the following:



- d. Add three expression display rules to the bar chart on the Profit Analysis page.

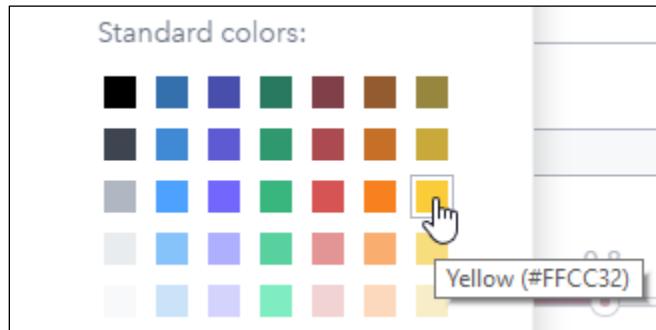
- 1) Click the **Profit Analysis** page to make it active.
- 2) Click the bar chart to make it active.
- 3) If necessary, in the right pane, click the **Rules** icon.
- 4) In the Display Rules pane, select **New rule** ⇒ **Total Profit**.
 - a) Select < (less than) for the **Operator** field.
 - b) Enter **200,000** for the **Value** field.
 - c) Select **Graph** for the **Style Area** field.
 - d) For the **Style** field, click (**Select a style**).
 - e) Choose **Red** as the color.



- f) Click **OK**.

5) In the Display Rules pane, select **New rule** \Rightarrow **Total Profit**.

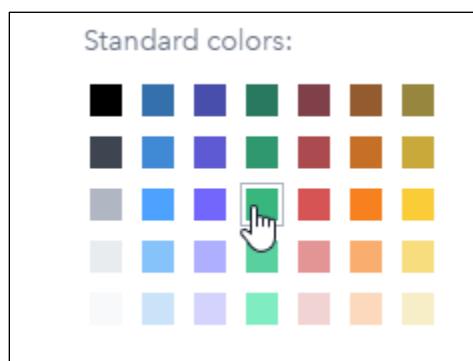
- Select $\leq\leq$ ($\leq x \leq$) for the **Operator** field. Enter **200,000** for the **Min** field.
- Enter **500,000** for the **Max** field.
- Select **Graph** for the **Style Area** field.
- For the **Style** field, click  **(Select a style)**.
- Choose **Yellow** as the color.



f) Click **OK**.

6) In the Display Rules pane, select **New rule** \Rightarrow **Total Profit**.

- Verify that $>$ (greater than) is selected for the **Operator** field.
- Enter **500,000** for the **Value** field.
- Select **Graph** for the **Style Area** field.
- For the **Style** field, click  **(Select a style)**.
- Choose **Green** as the color.



f) Click **OK**.

The Display Rules pane should resemble the following:

Display Rules

Total Profit per Group

+ New rule

Object

Total Profit

Total Profit > 500000

Total Profit

Total Profit BetweenInclusive(20000...

Total Profit

Total Profit < 200000

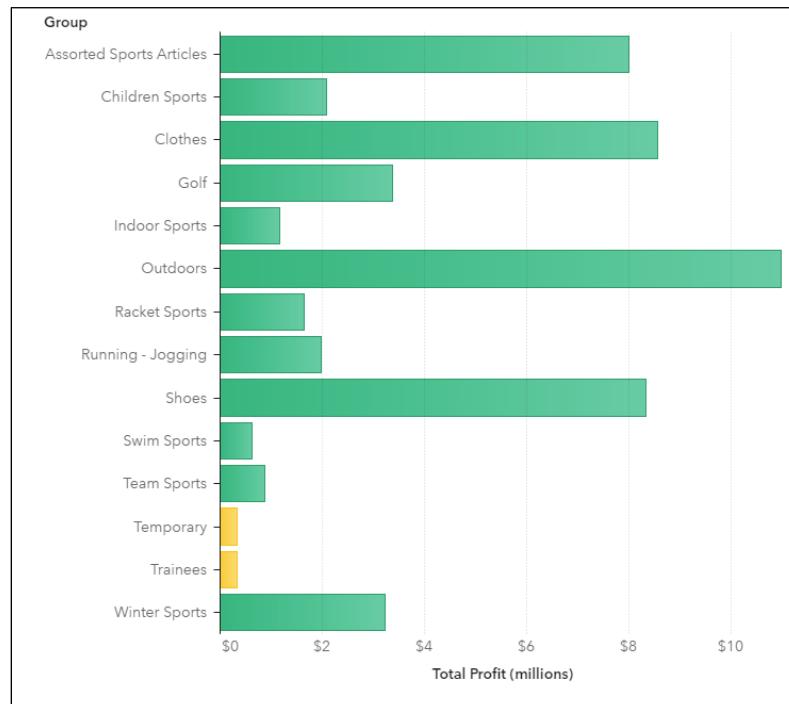
Report

Any Category

Male

Female

The bar chart should resemble the following:

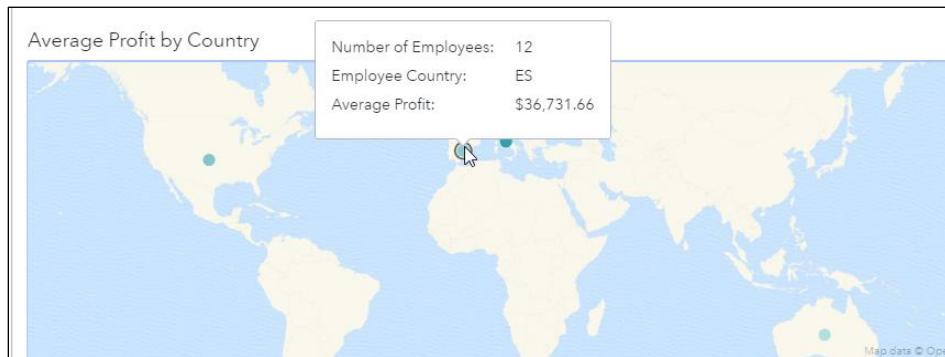


- e. To save the report, click  (Menu) in the upper right corner and select **Save**.
- f. View the report and answer the questions.
 - 1) In the upper right corner, click  (Menu) and select **View report**. The report opens in the Report Viewer.
 - 2) Answer the questions.

How many employees retired in Spain? How many retired with the Sales Rep. I job title? Of those, how many were female?

Answer: **Twelve employees retired in Spain. Four employees retired with the Sales Rep. I job title. Of those, three were female.**

- On the Employee Analysis page, select **Retired** in the Employee Status Selector (report prompt).
- In the geo map, click the ES coordinate.
The data tip shows details about Spain.



- In the upper right corner of the bar chart, click  (Maximize).
The details table at the bottom shows the total number of employees for each group:

Job Title	Number of Employees	Employee Gender
Sales Rep. I	3	Female
Sales Rep. I	1	Male
Sales Rep. II	1	Male
Sales Rep. III	1	Male
Total Sales Rep.	3	Female

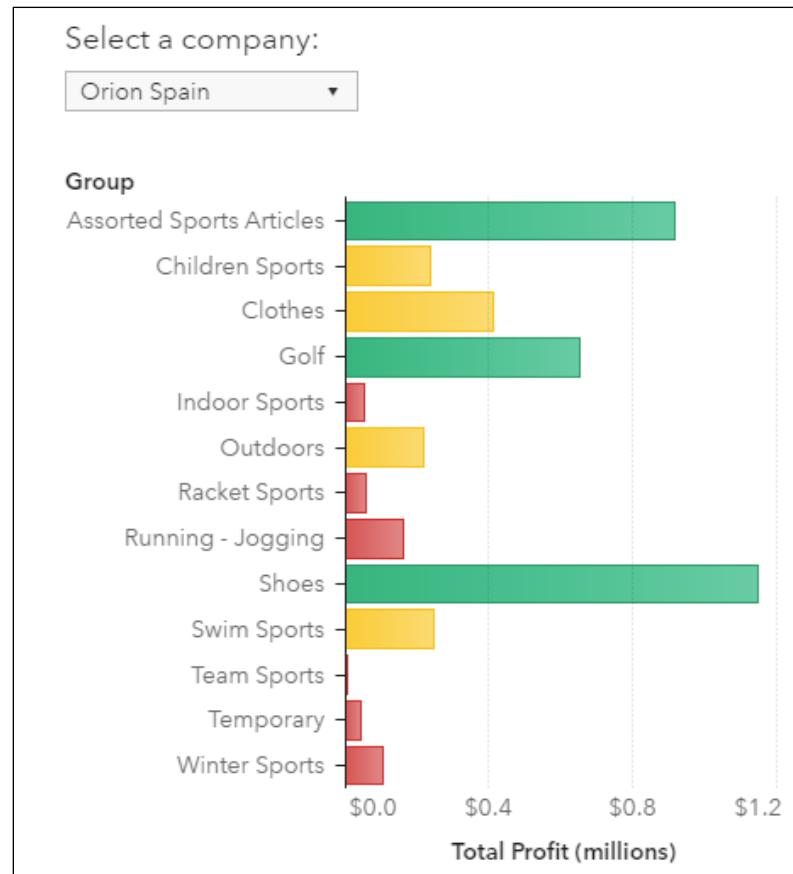
- In the upper right corner of the bar chart, click  (Restore).

View the Profit Analysis page. Among active employees in Orion Spain, how many groups generated a total profit above \$500,000?

Answer: Three groups (**Assorted Sports Articles, Golf, and Shoes**)

- Click the Profit Analysis tab.
- Select Active in the Employee Status Selector (report prompt).
- Select Orion Spain from the Company Selector (page prompt).

View the bar chart:



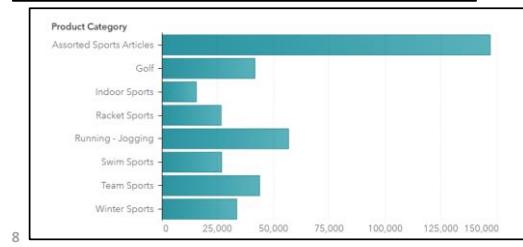
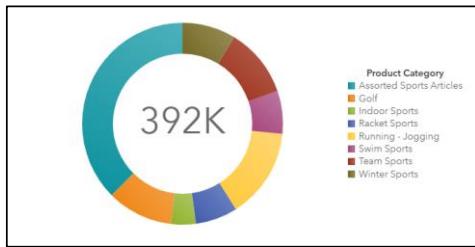
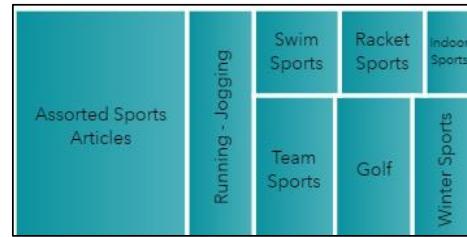
g. To sign out, select **Eric** ⇒ **Sign Out** in the upper right corner.

End of Solutions

Solutions to Activities and Questions

4.01 Activity – Correct Answer

Does Golf or Team Sports have more orders? **Team Sports**



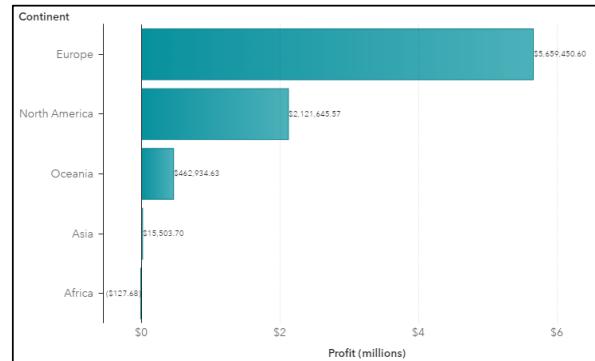
sas

4.02 Multiple Choice Question – Correct Answer

What type of chart would you use to show profit information by continent?

- a. bubble plot
- b. pie chart
- c. bar chart
- d. treemap

Bubble plots require three measures.

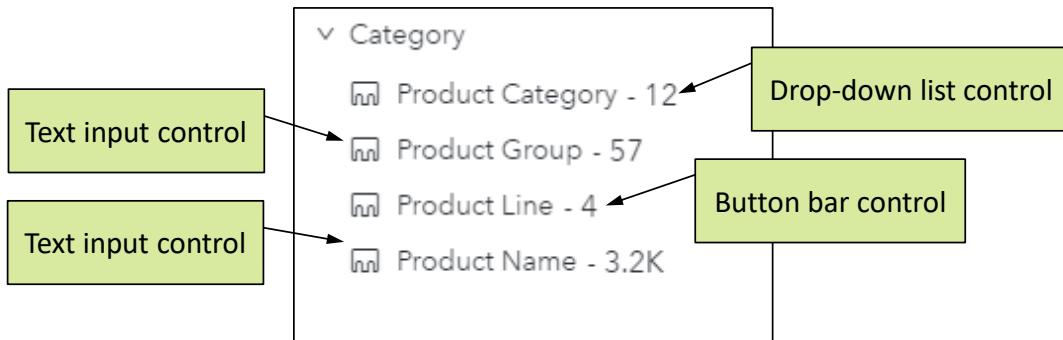


Pie charts and treemaps cannot display negative values.

sas

4.03 Activity – Correct Answer

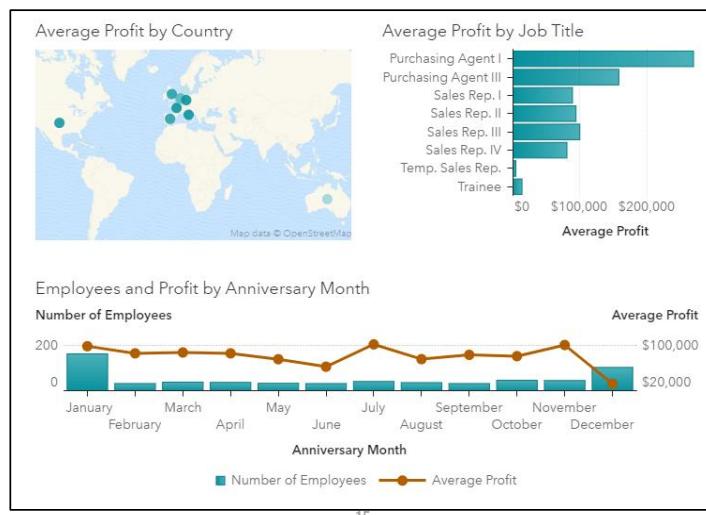
Given the distinct values, which control object would you use to filter for each category displayed below?



Practice Review

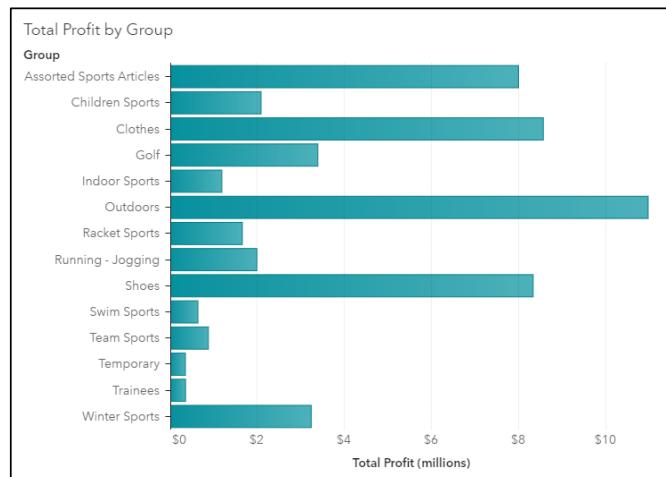
4.1 Creating a Simple Report – Solution

The report should resemble the following:



4.2 Working with Pages – Solution

The Profit Analysis page should resemble the following:

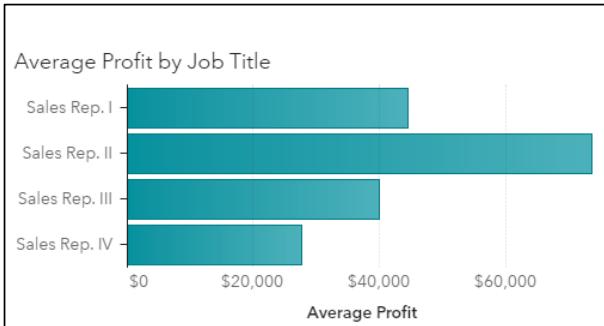


4.3 Working with Prompts and Actions – Solution

Which job title has the highest average profit among active employees in Australia?

Sales Rep. II (\$73,430.56)

Filters: Employee Status=Active, Employee Country=AU



35


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4.3 Working with Prompts and Actions – Solution

For Orion USA, which active sales representative had the highest total profit generated for the Indoor Sports group?

Tywanna Mcdade (\$178,299.60)

Filters: Employee Status=Active, Company=Orion USA, Group=Indoor Sports

Top 5 Employees by Total Profit Generated	
Name	Total Profit ▾
Tywanna Mcdade	\$178,299.60
Daniel Pulliam	\$172,949.97
Clement Davis	\$17,429.24

Filters: Employee Status=Active, Company=Orion France, Group=Racket Sports

Top 5 Employees by Total Profit Generated	
Name	Total Profit ▾
Marc Zampa	\$66,109.84

36


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For Orion France, how many active sales representatives sold items for the Racket Sports group?

One employee (Marc Zampa)

4.4 Working with Hidden Pages and Page Links – Solution

How many employees retired in Italy with the Sales Rep. III job title?

Two employees

Filters: Employee Status=Retired, Employee Country=IT, Job Title=Sales Rep. III

Employee Information					
Name	Company	Job Title	Annual Salary	Total Profit	
Giulia Buonocunto	Orion Italy	Sales Rep. III	\$29,555.00	\$51,603.44	
Giuseppe Franco Scoditti	Orion Italy	Sales Rep. III	\$30,460.00	\$44,768.20	

44



4.4 Working with Hidden Pages and Page Links – Solution

Management has decided to start promotions with active employees in the United States with the Sales Rep. I job title. Of the active employees with 25 or more years of service, how many generate a total profit more than \$200,000?

Five employees

Filters: Employee Status=Active, Employee Country=US, Job Title=Sales Rep. I, Years of Service=25+

Employee Information					
Name	Company	Job Title	Annual Salary	Total Profit	
Ray Abbott	Orion USA	Sales Rep. I	\$25,660.00	\$371,506.09	
Eric Michonski	Orion USA	Sales Rep. I	\$26,990.00	\$280,590.08	
Donald Court	Orion USA	Sales Rep. I	\$27,100.00	\$271,089.42	
Tachaun Voron	Orion USA	Sales Rep. I	\$25,125.00	\$260,146.86	
Glorina Myers	Orion USA	Sales Rep. I	\$26,025.00	\$220,995.63	

45



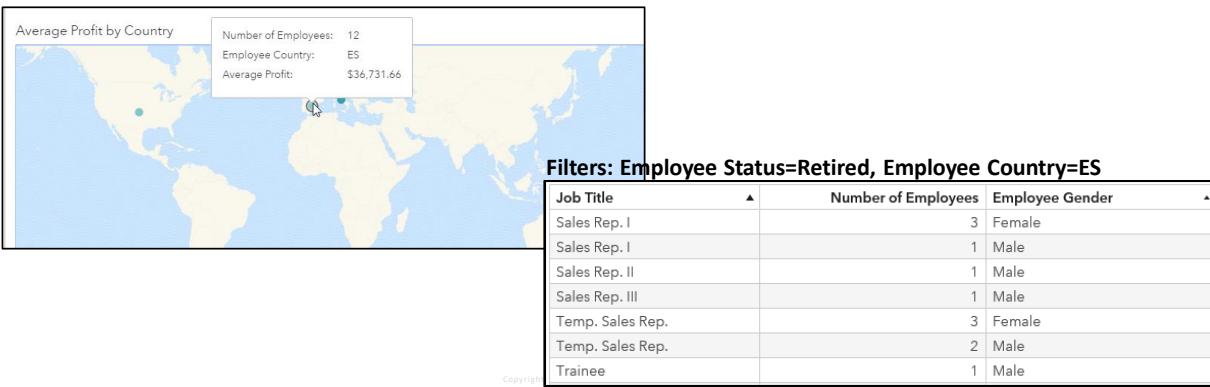
4.5 Working with Report-Level and Graph-Level Display Rules – Solution

How many employees retired in Spain? **Twelve employees**

How many retired with the Sales Rep. I job title? **Four employees**

Of those, how many were female? **Three employees**

Filters: Employee Status=Retired, Employee Country=ES



4.5 Working with Report-Level and Graph-Level Display Rules – Solution

Among active employees in Orion

Spain, how many groups generated a total profit above \$500,000?

Three groups

