



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

Course Notes

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

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Lesson 1 Getting Started with SAS® Visual Analytics

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1.1 Introduction to SAS Visual Analytics

Objectives

- Describe the purpose of SAS Visual Analytics.
- Describe the features of SAS Visual Analytics.
- Describe SAS Cloud Analytic Services (CAS).
- Discuss the SAS Viya architecture.
- List the components of SAS Visual Analytics.

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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

SAS Visual Analytics enables users to perform the following tasks:

- apply the power of SAS analytics to massive amounts of data
- visually explore and find patterns in your data
- quickly create reports or dashboards
- share insights with anyone, anywhere, via the web or a mobile device
- quickly create powerful statistical models*
- work with factorization machines, forests, gradient boosting, neural networks, and support vector machines**

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

** The ability to work with factorization machines, forests, gradient boosting, neural networks, and support vector machines is available if SAS Visual Data Mining and Machine Learning is licensed at your site.

Using SAS Visual Analytics, users can enhance the analytic power of their data, explore and investigate new data sources, uncover relevant patterns, and create reports. In traditional reporting, the resulting output is well defined up front. That is, you know what you are looking at and what you need to convey. However, data discovery invites you to plumb the data, its characteristics, and its relationships. Reports can then be made available on a mobile device or on the web.

Cloud Analytic Services (CAS)



Cloud Analytic Services (CAS) is the server that provides the run-time environment for data management and analytics with SAS Viya.

CAS uses a high-performance, in-memory engine along with a distributed architecture to execute multi-threaded analytic code, rapidly processing requests against data of any size. CAS provides the following features:

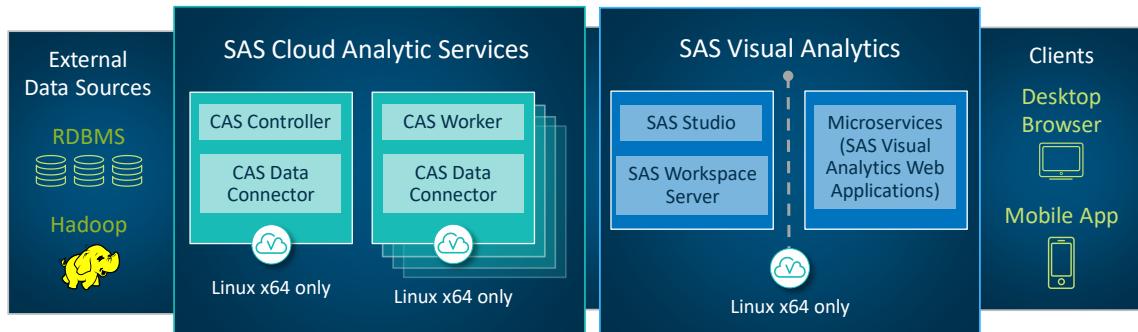
- high speed
- resiliency
- scalability
- node-to-node communication
- worker node fault tolerance

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SAS Viya Architecture



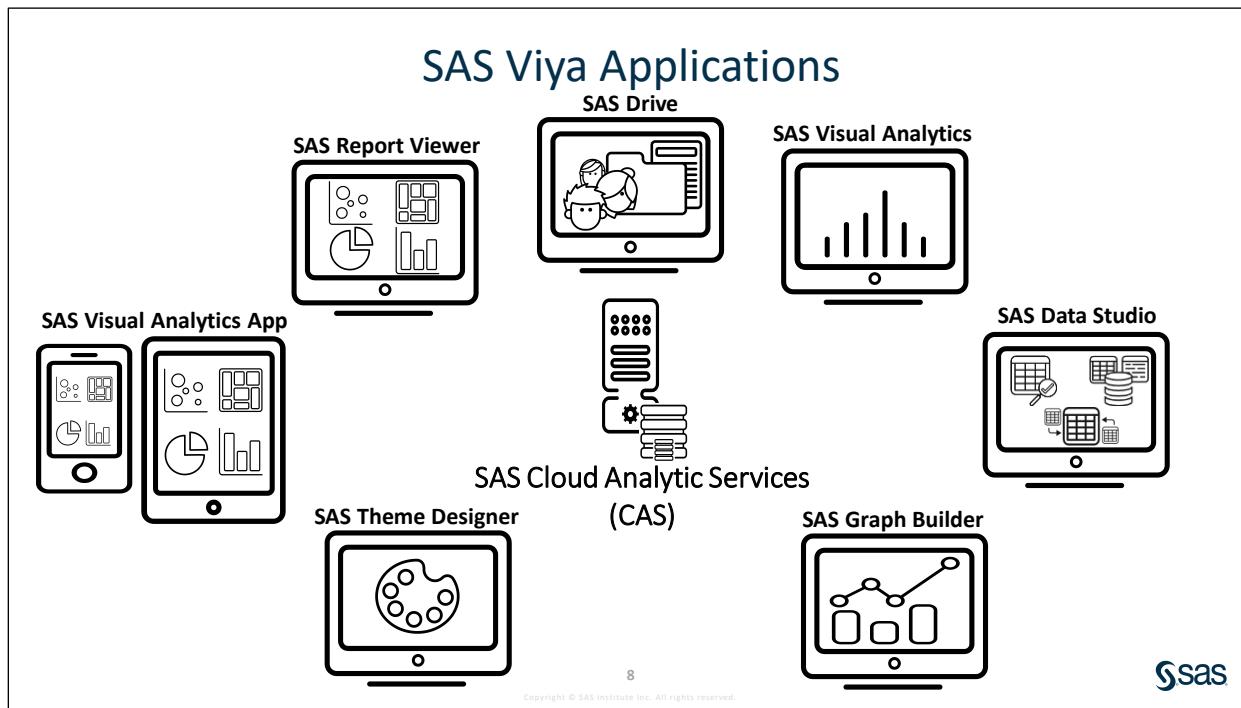
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At the heart of SAS Viya is Cloud Analytic Services, an in-memory, distributed analytics engine. It uses scalable, high-performance, multi-threaded algorithms to rapidly perform analytical processing on in-memory data of any size. Cloud Analytic Services is designed to run in a single-machine symmetric multiprocessing (SMP) or multi-machine massively parallel processing (MPP) configuration (shown above), supporting multiple platform and infrastructure configurations.

Cloud Analytic Services also has a communications layer that supports fault tolerance. So when CAS is running in an MPP configuration, it can continue processing requests even after losing connectivity to some nodes. This communication layer also enables you to remove or add nodes while the server is running.



SAS Application	Description
SAS Drive	Collaborative interface for accessing, organizing, and sharing content
SAS Report Viewer	View reports in a browser
SAS Visual Analytics App	View reports on a tablet or mobile device
SAS Visual Analytics	Visualize data interactively, create interactive reports, build statistical models
SAS Data Studio	Prepare data using data transforms
SAS Theme Designer	Create custom themes for the application or reports
SAS Graph Builder	Create customized graph objects
SAS Cloud Analytic Services (CAS)	Cloud-based, run-time environment server for data management and analytics

The following applications (not pictured above) are also available with SAS Visual Analytics:

SAS Application	Description
SAS Studio	Perform programming tasks
SAS Data Explorer	View, reload, and import data to CAS
SAS Environment Manager	Manage the environment
SAS Lineage Viewer	View and understand relationships between objects (tables, plans, reports)

1.2 Exploring the Visual Analytics Course Environment

Objectives

- Describe the SAS Visual Analytics methodology.
- Discuss Orion Star Sports & Outdoors and how it relates to the business scenario.
- Describe the different types of Visual Analytics users.
- Describe the users and folders used in the course environment.
- Identify the components of SAS Drive.

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SAS Visual Analytics Methodology



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Access	In the Access phase, you identify source tables that will be used in Visual Analytics and load those tables into CAS.
Investigate	In the Investigate phase, you inspect the source 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 can be 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, a global retailer with traditional stores, an online store, and a large catalog business.



3,151 products



68,300 customers



648 employees



64 suppliers



747,953 orders

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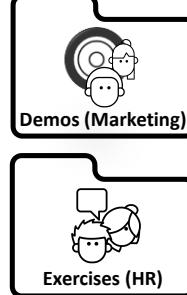
Business Scenario



Before you begin working with the data, you need to familiarize yourself with the Visual Analytics environment, the folder structure, the users, and their capabilities.



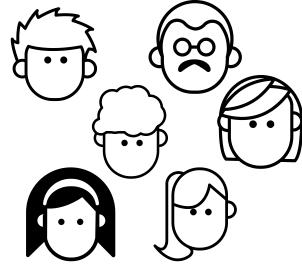
SAS Drive



Demos (Marketing)



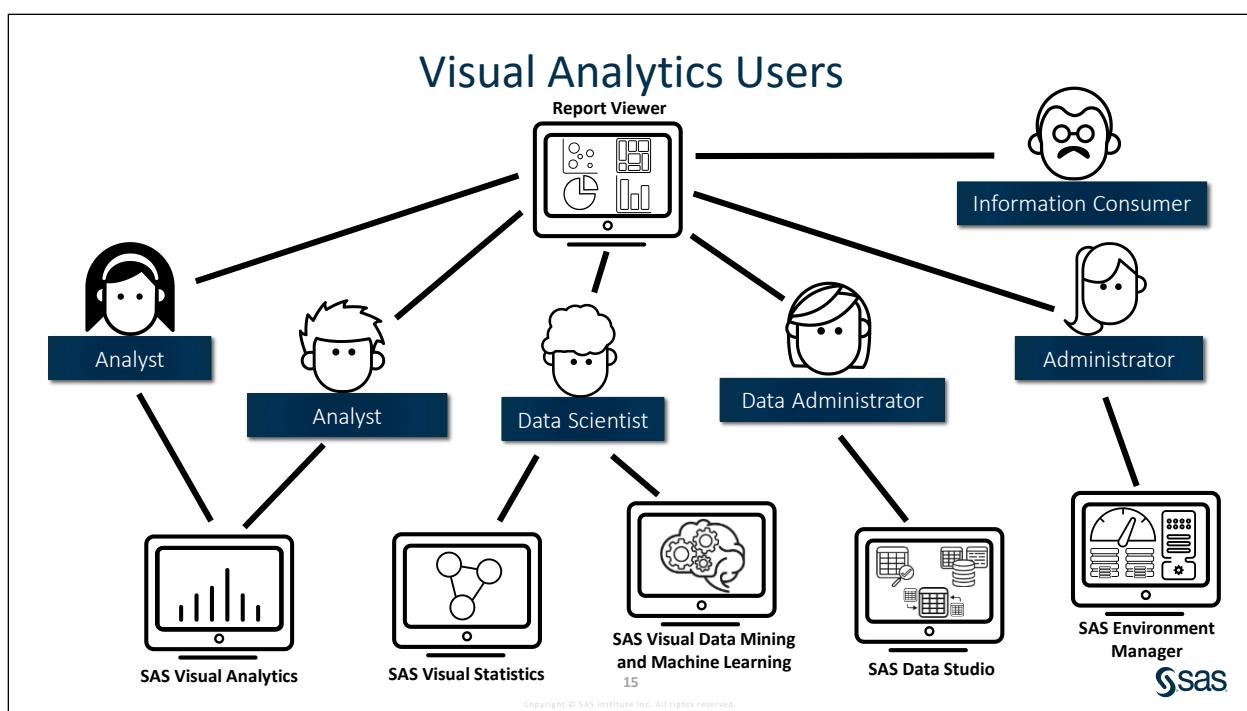
Exercises (HR)



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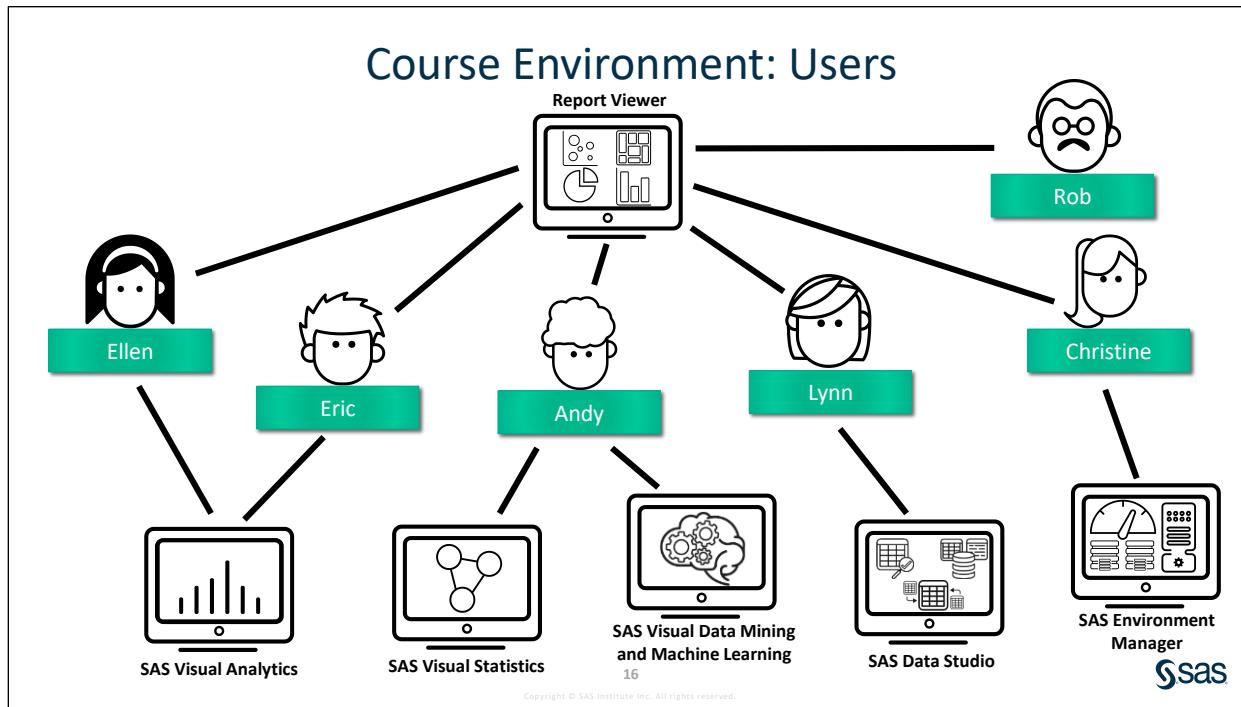
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SAS provides an initial set of rules to control your users' access to functionality. By default, initial rules are created at installation for the following users:

- **All authenticated users** - Users can access selected functions within applications, such as the Dashboard, Data, Servers, and Content pages in SAS Environment Manager and functionality in SAS Visual Analytics. Users can also perform operations on folders and on the objects that the folders contain.
- **SAS administrators** - Users can access everything that is under the control of the general authorization system.



Note: This slide shows a possible configuration of users in an environment. Custom groups can be created to limit the application and functionality available for each user based on their job role.

1.01 Multiple Answer Question

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

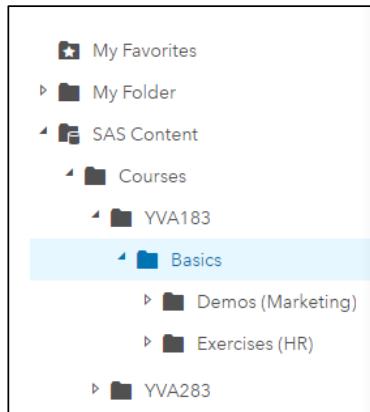
- a. information consumer
- b. analyst
- c. data scientist
- d. data administrator or data quality steward
- e. administrator

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Course Environment: Folders

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



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Note: The SAS Viya for Learners environment is set up to facilitate learning and training. Each student uses the same environment and has access to the same starter plans and starter reports, but cannot edit content. Any changes to plans and reports must be saved as copies in your My Folder location.

1.02 Multiple Choice Question

Which of the following statements is true?

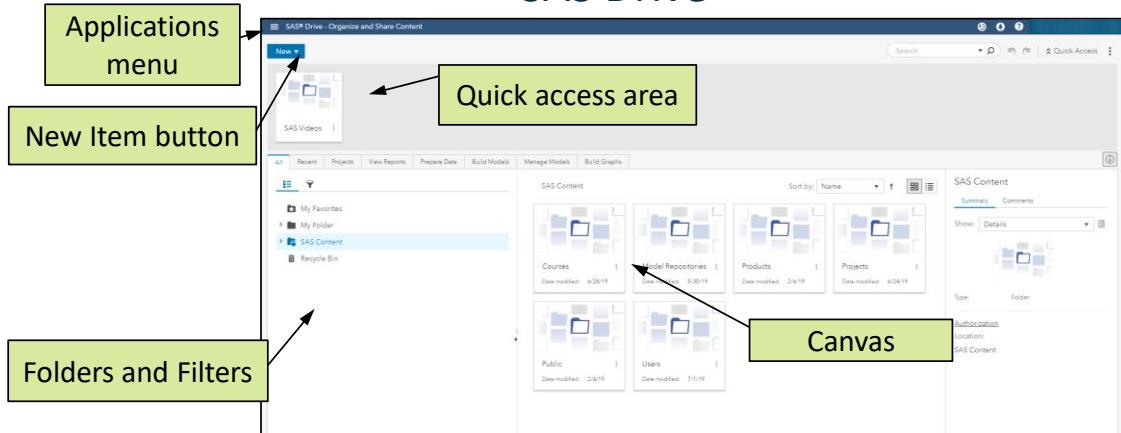
- a. All users have the ability to create reports.
- b. Administrators control access to reports.
- c. Only administrators can create reports.

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SAS Drive



The applications available depend on your assigned permissions and the products licensed by your site.

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Icon	Name	Description
	Applications menu	Enables you to access other applications
	New Item button	Enables you to create new objects
	Quick Access	Area to store your most-used items
	Folders and Filters	Access your folders or filter the folder list
	Undo and Redo	Undo or redo previous actions
	Recent Items	Displays the recent objects that have been accessed
	Notifications	Displays the number of notifications that you have
	Help	Access online Help
	Menu	Enables you to add links, shortcuts, manage your tabs, and upload files and folders
	Information	Hides and displays the information pane
	Summary	Displays summary or detailed information about the item type, date created, date modified, with whom the item is shared, and any assigned tags
	Comments	Enables you to add comments and attachments to an item



Exploring SAS Drive

This demonstration illustrates signing in and exploring the components of SAS Drive.

- From the browser window, sign in to SAS Viya for Learners.

- Click (Menu) and select **Manage tabs** in the upper right corner.
 - Click (Remove all) to hide all the displayed tabs.
- Note:** All tabs are moved except the All tab and the Recent tab.
- Double-click **View Reports** to add it to the Displayed tabs pane.

Manage Tabs

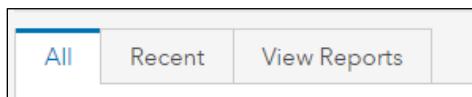
Select the tabs to display in SAS Drive.

Hidden tabs (6):	Displayed tabs (3):
Build Graphs	All
Build Models	Recent
Develop SAS Code	View Reports
Manage Decisions	
Manage Models	
Projects	

Navigation icons: back, forward, up, down, ellipsis.

5. Click **OK**.

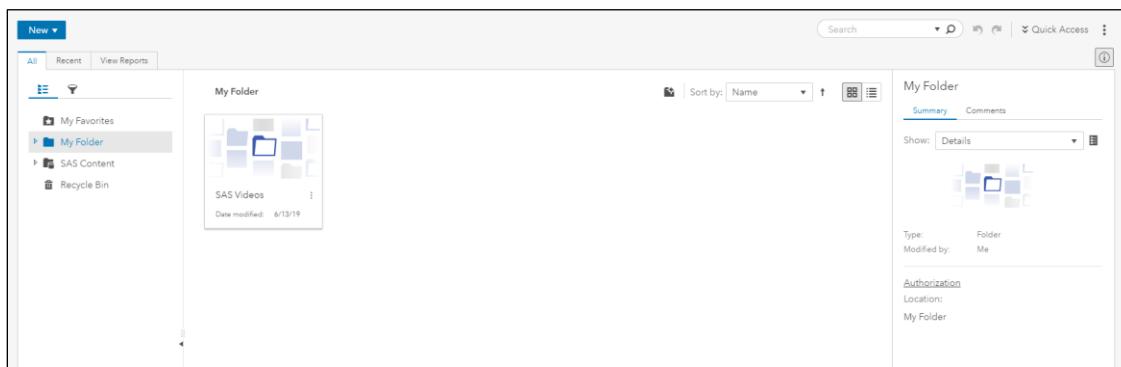
SAS Drive displays the three tabs that you specified.



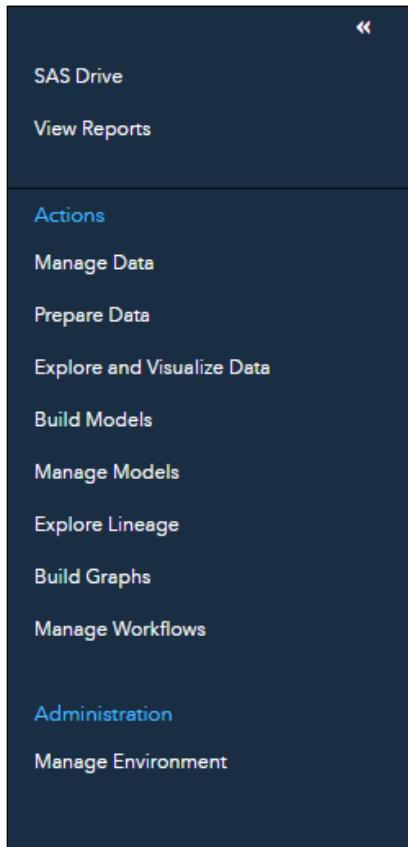
6. Click in the top right corner to hide Quick Access.



SAS Drive should resemble the following:

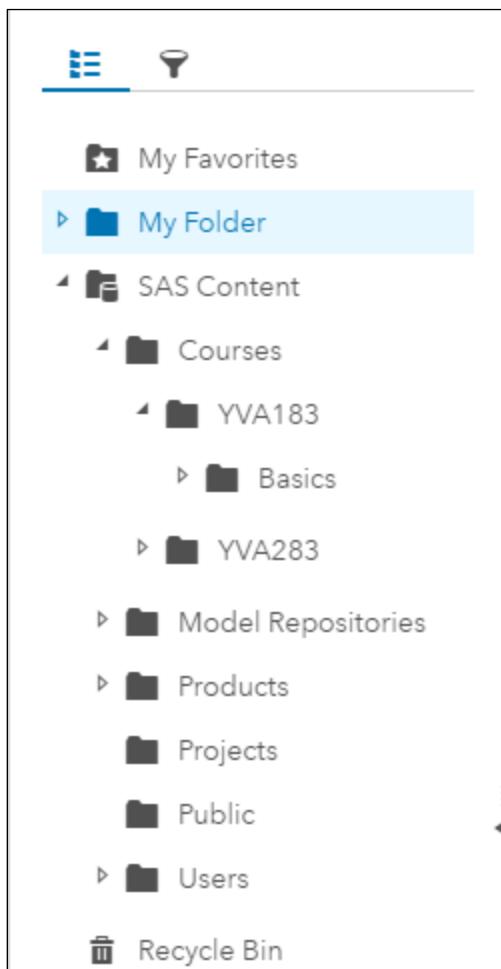


7. Click  (Show application menu) in the upper left corner to view the available applications.



8. Click  (Hide applications menu) to close the Side menu.

9. On the All tab, expand **SAS Content** ⇒ **Courses** ⇒ **YVA183**.



10. Select the **Basics** folder.

The Basics folder contains two folders and two reports.

The screenshot shows the contents of the 'Basics' folder. At the top, there is a breadcrumb trail: 'SAS Content > Courses > YVA183 > Basics'. To the right of the trail are sorting options: 'Sort by: Name' with a dropdown arrow, a 'Sort by' button with an upward arrow, and three icons for grid, list, and details view. Below the trail are four items arranged in a row:

- Demos (Marketing)**: Shows a grid icon and a date modified of 3/10/19.
- Exercises (HR)**: Shows a grid icon and a date modified of 3/10/19.
- Product Report**: Shows the Orion Star Sports & Outdoors logo and a date modified of 7/24/18.
- Ugly Report**: Shows a bar chart icon and a date modified of 8/15/18.

11. Click  (**Actions**) for Product Report and select **Add to Favorites**.

12. Select the **My Favorites** folder on the left.

Product Report is added to the My Favorites folder.

The screenshot shows the SAS Viya interface. On the left, a sidebar titled 'My Favorites' is expanded, showing various categories like 'My Folder', 'SAS Content', 'Courses', 'Model Repositories', 'Products', 'Projects', 'Public', 'Users', and 'Recycle Bin'. In the main panel, there is a section titled 'My Favorites' with the 'ORION STAR Sports & Outdoors' logo. Below the logo, there is a card for 'Product Report' with the date 'Date modified: 7/24/18'.

13. View settings.

- In the upper right corner, select <*user login*> \Rightarrow **Settings**.
- If necessary, select **General** under the **Global** section.

The screenshot shows the 'Settings' page. On the left, a sidebar has 'Global' expanded, with 'General' selected. Other options in the sidebar include 'Region and Language', 'Accessibility', 'SAS Drive', 'Initial Screen', and 'Tabs'. The main panel shows the 'General' section. It includes a 'Theme:' section with a radio button for 'Use the default theme (Illuminate)' (which is selected) and another for 'Choose a theme' with a dropdown menu set to 'Illuminate'. There is also a 'Reset' link at the top right. Below that is a 'Reset to show all warning and information messages:' section with a 'Reset Messages' button. At the bottom is a 'Profile picture:' section showing a blue placeholder icon.

Note: Global settings apply to all the SAS Viya applications.

- c. Select **Initial Screen** under the **SAS Drive** section.

The screenshot shows the 'Settings' page with the left sidebar expanded to show 'Global' and 'SAS Drive' sections. Under 'SAS Drive', the 'Initial Screen' tab is selected and highlighted with a blue background. The main panel is titled 'Initial Screen' and contains a 'Set initial screen' dropdown menu with 'SAS Drive' selected. A 'Reset' link is located in the top right corner of this panel.

This enables you to set the initial screen that you want to appear when you sign in to SAS Drive.

- d. Select **Tabs** under the SAS Drive section.

The Displayed tabs list reflects the changes that you made earlier in Manage tabs.

The screenshot shows the 'Settings' page with the left sidebar expanded to show 'Global' and 'SAS Drive' sections. Under 'SAS Drive', the 'Tabs' tab is selected and highlighted with a blue background. The main panel is titled 'Tabs' and contains two lists: 'Hidden tabs (5)' and 'Displayed tabs (3)'. The 'Hidden tabs' list includes 'Build Graphs', 'Build Models', 'Manage Models', 'Prepare Data', and 'Projects'. The 'Displayed tabs' list includes 'All', 'Recent', and 'View Reports'. To the right of the 'Displayed tabs' list are four small icons: a left arrow, a right arrow, a double arrow, and a vertical ellipsis. On the far right, there are four downward-pointing arrows with horizontal lines through them, likely for reordering the displayed tabs.

- e. Click **Close**.

End of Demonstration

1.03 Activity

Sign in to SAS Viya for Learners. What applications can you access?

Hint: Use the Side menu of SAS Drive.

Do not sign out of SAS Drive.

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1.04 Activity

While signed in with your credentials, navigate to **SAS Content** ⇒ **Courses** ⇒ **YVA183** ⇒ **Basics**. Add the **Product Report** object to the Quick Access area of SAS Drive.

Note: You might need to expand the Quick Access area.

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1.3 Viewing Visual Analytics Reports

Objectives

- Discuss the applications where Visual Analytics reports can be viewed.
- Describe the SAS Report Viewer interface.
- Interact with reports in SAS Report Viewer by drilling, linking, and filtering.
- Interact with report objects by exporting data, saving an image, and adding comments.

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Business Scenario



Before you begin working for your assigned division at Orion Star, your manager wants you to look at a report created by the Sales team to understand the features that can be used within reports.

The report shows details about the suppliers and products of Orion Star and was created to help executives, marketing managers, and sales representatives better understand our products.



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Viewing SAS Visual Analytics Reports

Report Viewer

SAS Visual Analytics App

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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.

SAS Report Viewer Interface

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The Product Report contains three visible pages: Report Overview, Supplier Analysis, and Product Analysis. The **Report Overview** page gives an overview of the report and describes the other sections of the report. The **Supplier Analysis** page gives details about the suppliers for Orion Star, including information about locations, the products manufactured, and the quantity sold and profit generated by each supplier. The **Product Analysis** page gives details about the products sold by Orion Star, including information about product categories and groups, the top 10 cities by orders and profits, and historical details.

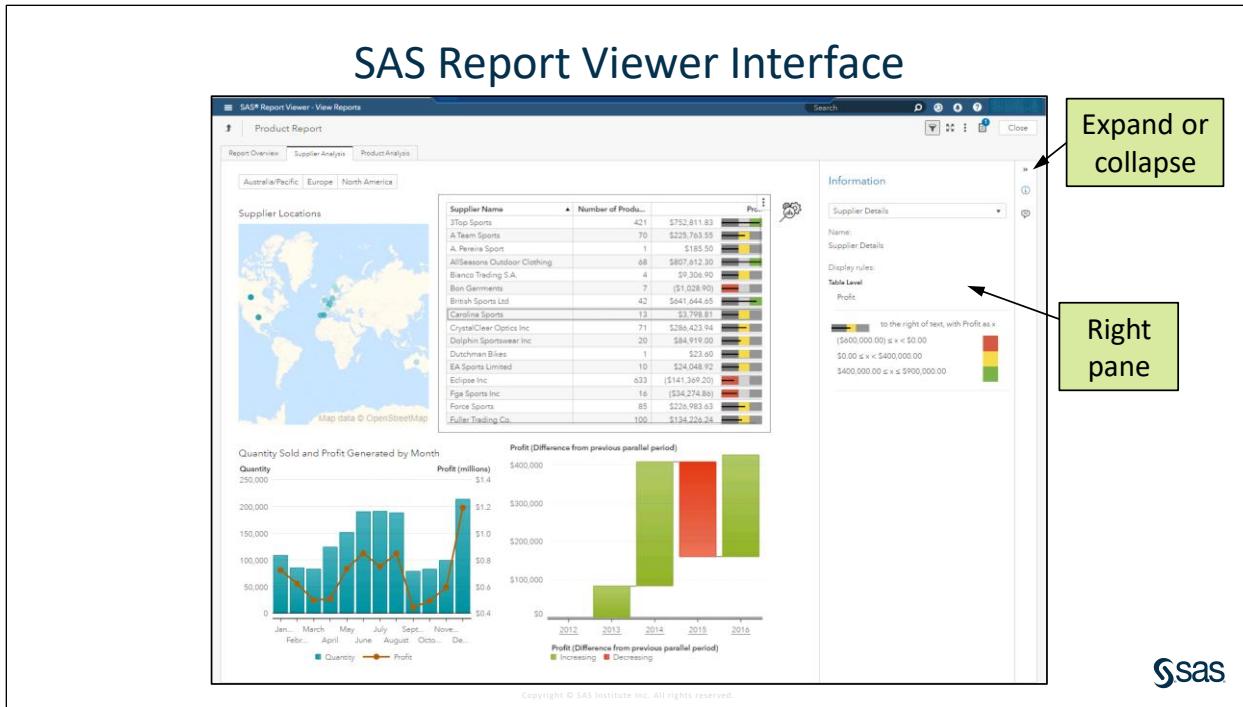
Note: Only users who have the appropriate capabilities can edit the report.

You can print, email a link to a report, or generate a link to a report or object from SAS Report Viewer or SAS Visual Analytics. 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



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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>



Using SAS Report Viewer

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

1. From the browser window, sign in to SAS Viya for Learners.
2. View and interact with the Product Report.
 - a. Double-click **Product Report** in the Quick Access area to open 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.

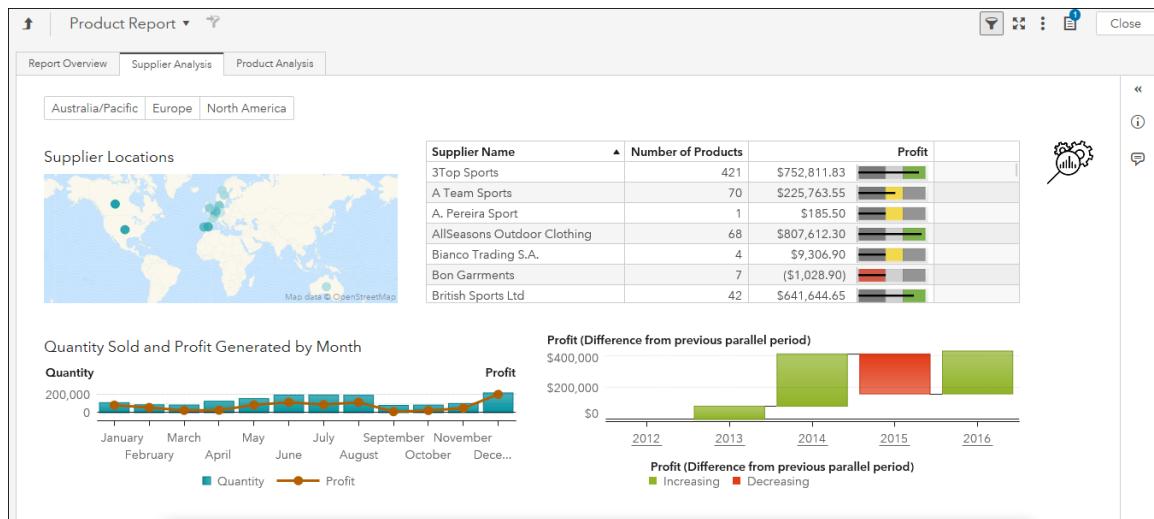
Product Analysis
View details about the products sold by Orion Star Sports and Outdoors, including information about product categories and groups, the top 10 cities by orders and profits, and historical details.

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

- 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.



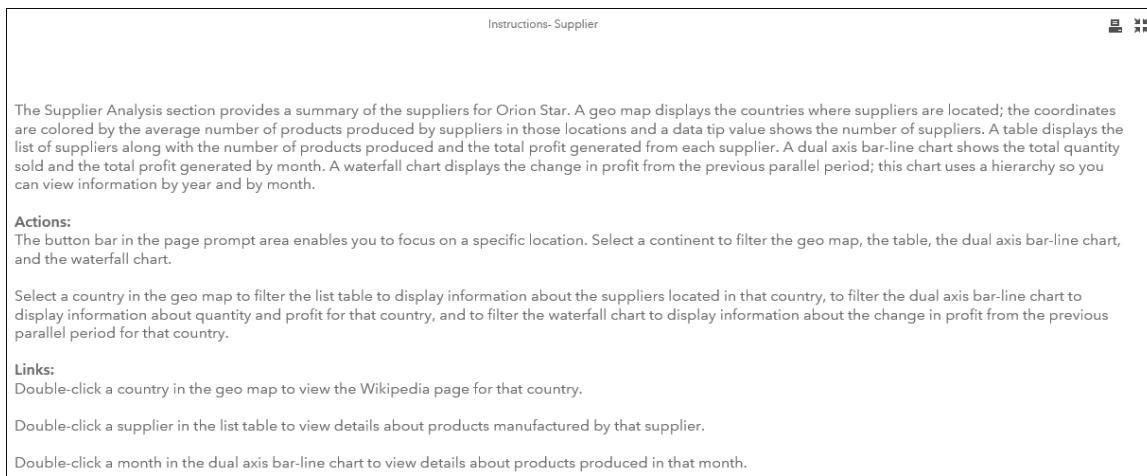
The Supplier Analysis page contains several report objects and filters.

- 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 info window. This hidden page includes information about the page, including details about the report objects, actions, and links.

- d. Click  (Maximize view) in the upper right corner of the info window.



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.

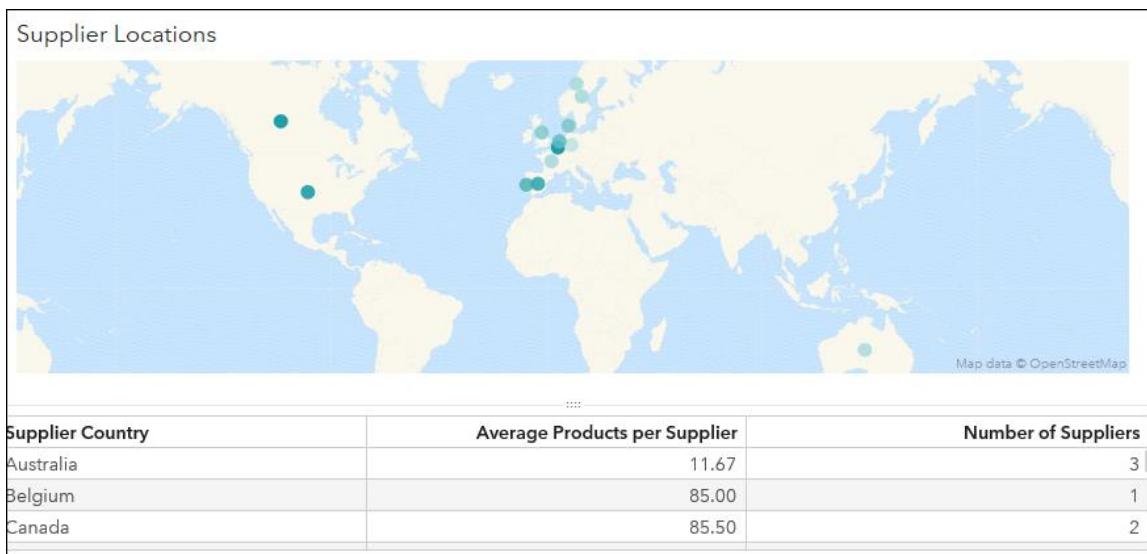
Select a country in the geo map to filter the list table to display information about the suppliers located in that country, to filter the dual axis bar-line chart to display information about quantity and profit for that country, and to filter the waterfall chart to display information about the change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

- e. Click **Close** to close the info window.
3. 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).

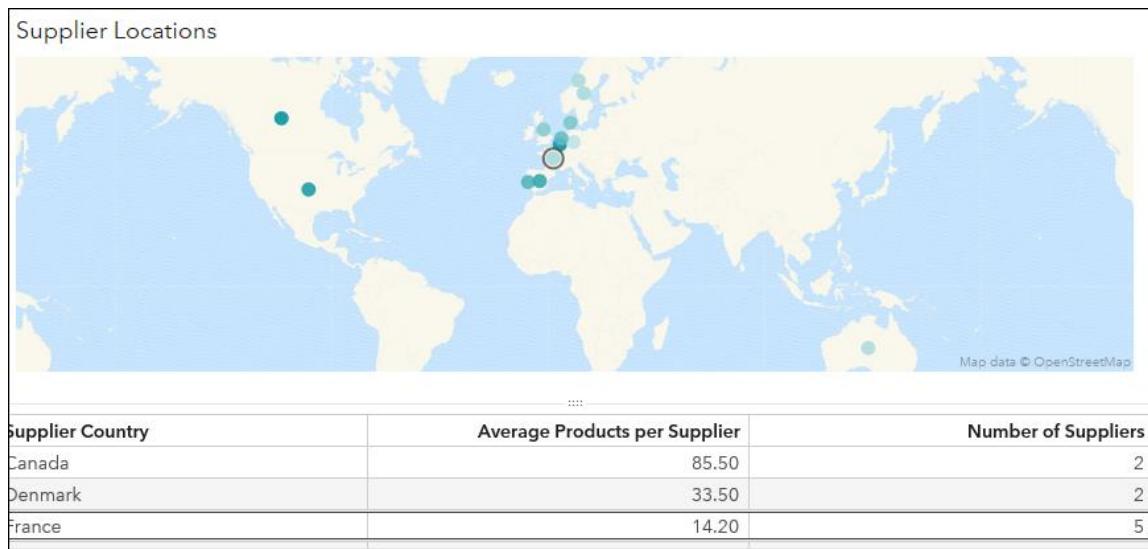


Supplier Locations

Supplier Country	Average Products per Supplier	Number of Suppliers
Australia	11.67	3
Belgium	85.00	1
Canada	85.50	2

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.

- b. Scroll through the list and select the row for **France**.

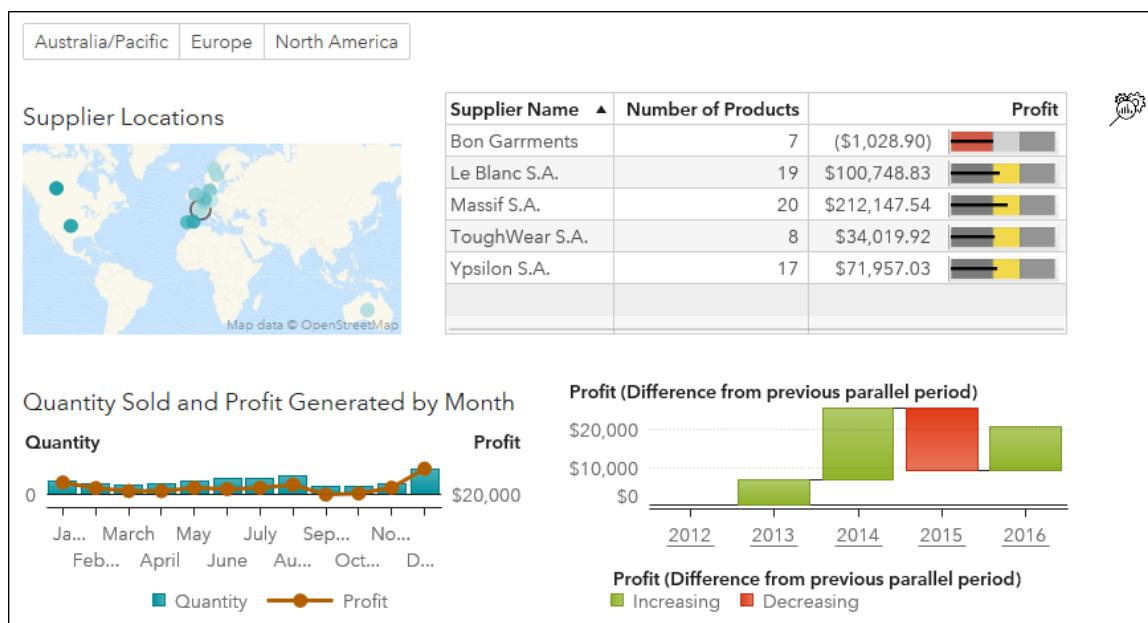


The country is highlighted in the geo map.

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.

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

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	

Interactive filters:

Supplier Country = 'France'

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**.

An info window displays information about products produced by that supplier.

- Click  (Maximize view) in the upper right corner of the info window.



The info window contains two main sections: a treemap on the left and a list table on the right.

Treemap: The treemap shows two main categories: "Clothes & Shoes" (large teal area) and "Sports" (smaller teal vertical bar). The "Sports" category is further subdivided into Stockings & Socks, Fitness Slouch Socks, Forrest Backpacking Socks, Grizzly Hiking, Assorted Sports articles, Maxrun 'Liner Socks, and Sports Training Socks.

List Table: The list table displays product details for each item in the "Sports" category. The columns are Supplier Name, Product Group, Product Name, Quantity, Profit, and Number of Orders.

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

Because the list table and the objects in the info window 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**.



The info window remains the same, but the row for the Holmes Super Break Bag is now highlighted in the list table. The treemap also highlights the "Sports" category, which contains this specific product.

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 info window.
- In the list table, double-click **Massif S.A.**.

An info window displays information about products produced by that supplier.

- m. Click  (**Maximize view**) in the upper right corner of the info window.

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
Sports	Clothes & Shoes	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 9.6 Ski Parcel-Fdx95	268	\$1,471.40	171
				Massif Cut Z 9.6 Ski...	Sum: 9,996	Sum: \$212,147.54	Total: 6,103

- n. 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**.

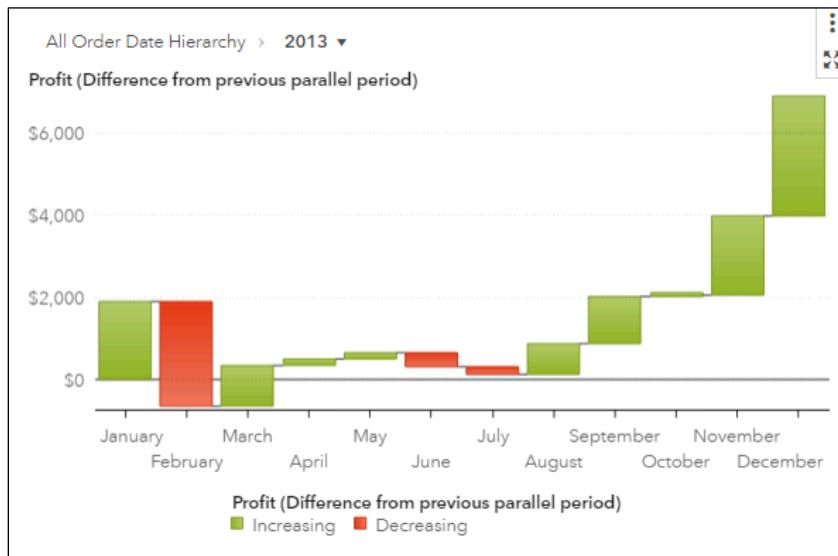
Supplier Name	Product Group	Product Name	Quantity	Profit	Number of Orders
Massif S.A.	Ski Dress	Massif Men's Monitor Bomber Jacket	304	\$9,838.14	168
Massif S.A.	Knitwear	Massif Men's Polar Fleece Jacket	533	\$2,636.00	328
Massif S.A.	Ski Dress	Massif Men's Pro Jacket	207	\$15,021.70	124
Massif S.A.	Ski Dress	Massif Men's Shell Jacket	195	\$13,175.70	130
			Sum: 1,239	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.

- o. Click **Close** to close the info window.

- p. 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.



- q. In the upper right corner of the waterfall chart, click and select **Export data**.
r. Accept the default selections in the Export Data window.

Export Data

Rows:

1-12

Columns:

Select all

Order Month

Profit (Difference from previous parallel period)

Options:

Formatted data

Detailed data

File type:

Excel workbook (*.xlsx) ▾

OK **Close**

- s. Click **OK**.

An Excel workbook with the name of the graph (Supplier Profit Analysis) is created with the data used to create the current view of the waterfall chart.



- t. Click **Supplier Profit Analysis.xlsx** in the bottom of the browser to view it.

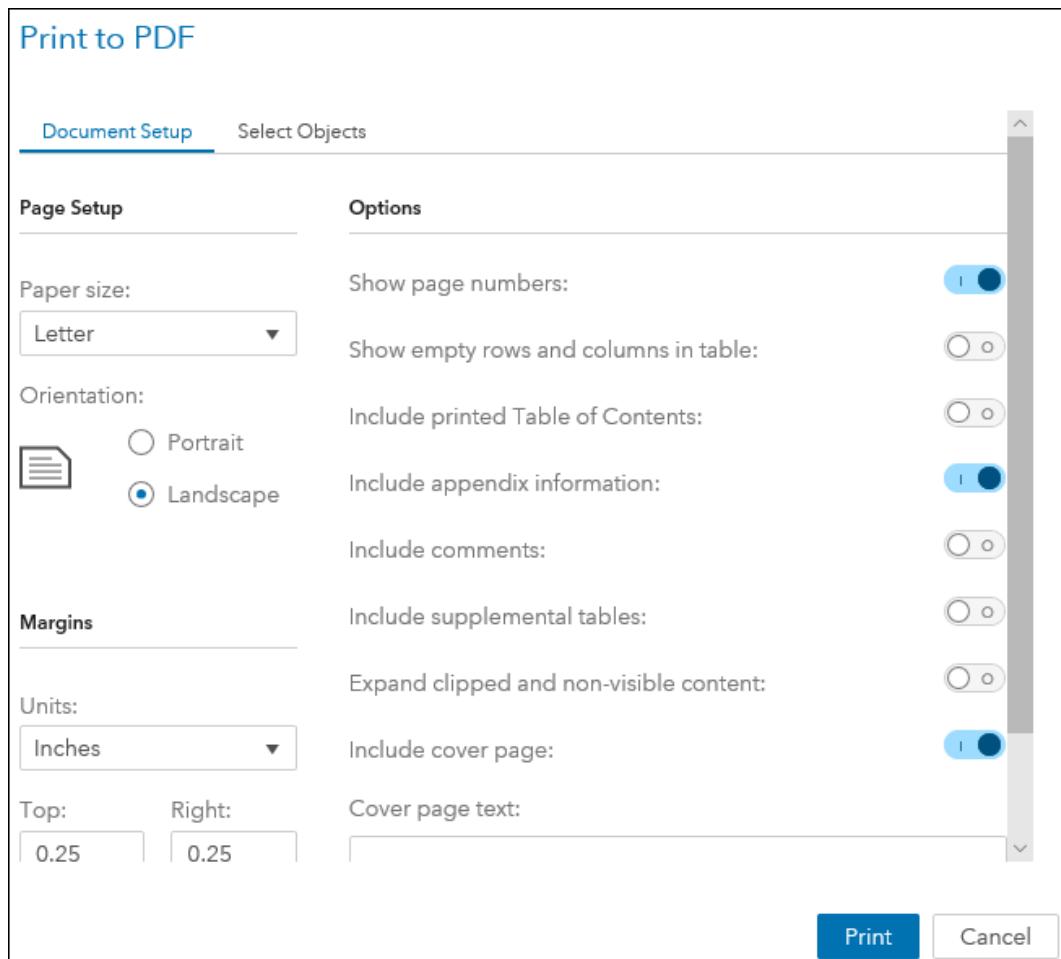
Order Month	Profit (Difference from previous parallel period)
January	\$1,908.75
February	(\$2,577.37)
March	\$994.33
April	\$166.23
May	\$169.23
June	(\$359.11)
July	(\$178.26)
August	\$732.85
September	\$1,154.75
October	\$26.02
November	\$1,946.35
December	\$2,898.20

- u. If needed, select **Enable Editing**.
- v. Select **File** ⇒ **Save As** to save a copy.
- w. Navigate to the Desktop.
- x. Enter **Supplier Profit Analysis 2013.xlsx** in the **File name** field.
- y. Click **Save**.
- z. Click in the top right corner to close the Excel file.

4. Investigate printing options.

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

The Print to PDF window appears.



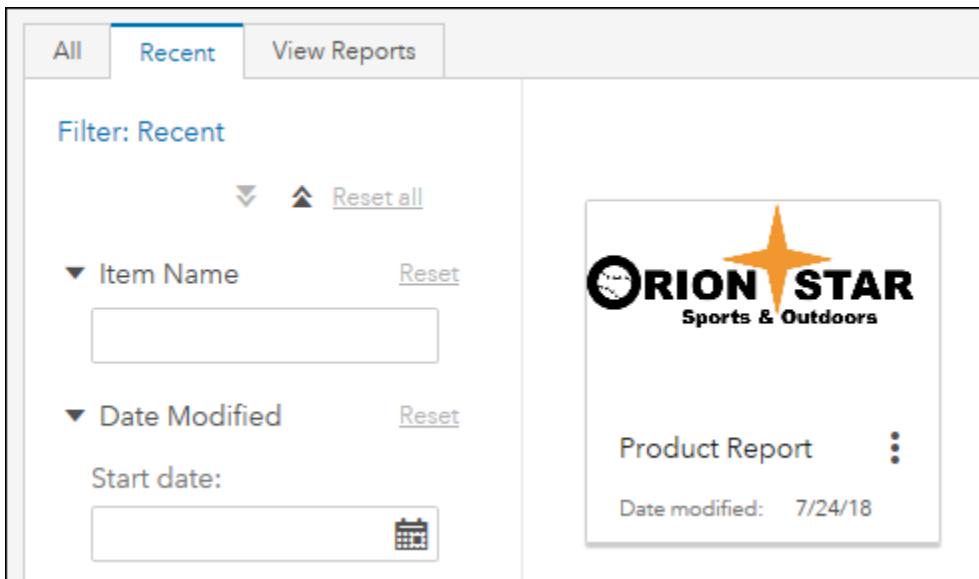
You can specify options for the PDF document, including whether a table of contents and page numbers are displayed. You also have the option of choosing which objects appear in the PDF.

- Click **Cancel**.
- 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.

6. Click  (Show applications menu) and select **SAS Drive** in the upper left corner to return to SAS Drive.

The Product Report should appear on the Recent tab.



The screenshot shows the SAS Report Viewer interface. At the top, there are three tabs: All, Recent (which is selected and highlighted in blue), and View Reports. Below the tabs is a search bar labeled "Filter: Recent" with a "Reset all" button. There are two expandable filter sections: "Item Name" and "Date Modified". Under "Item Name", there is a text input field. Under "Date Modified", there is a "Start date:" label and a calendar icon. To the right of the filters is a preview panel for a report titled "ORION STAR Sports & Outdoors Product Report". The preview shows the report's title and a "Date modified: 7/24/18" timestamp. A vertical ellipsis button is located to the right of the report title.

Note: When you close a report in SAS Report Viewer, the viewer state is remembered. This includes the current page, any hierarchy drill-downs, selected filters, and so on. This means that the next time you open the same report, you return to the same part of the report with all previous selections and actions in place. To prevent this, click **More options** and select **Restore default report state** before closing the report.

End of Demonstration



Practice

1. Viewing a Report in the Report Viewer

- a. Open the browser and sign in to SAS Viya for Learners.
- 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.
- e. Return to SAS Drive.

End of Practices

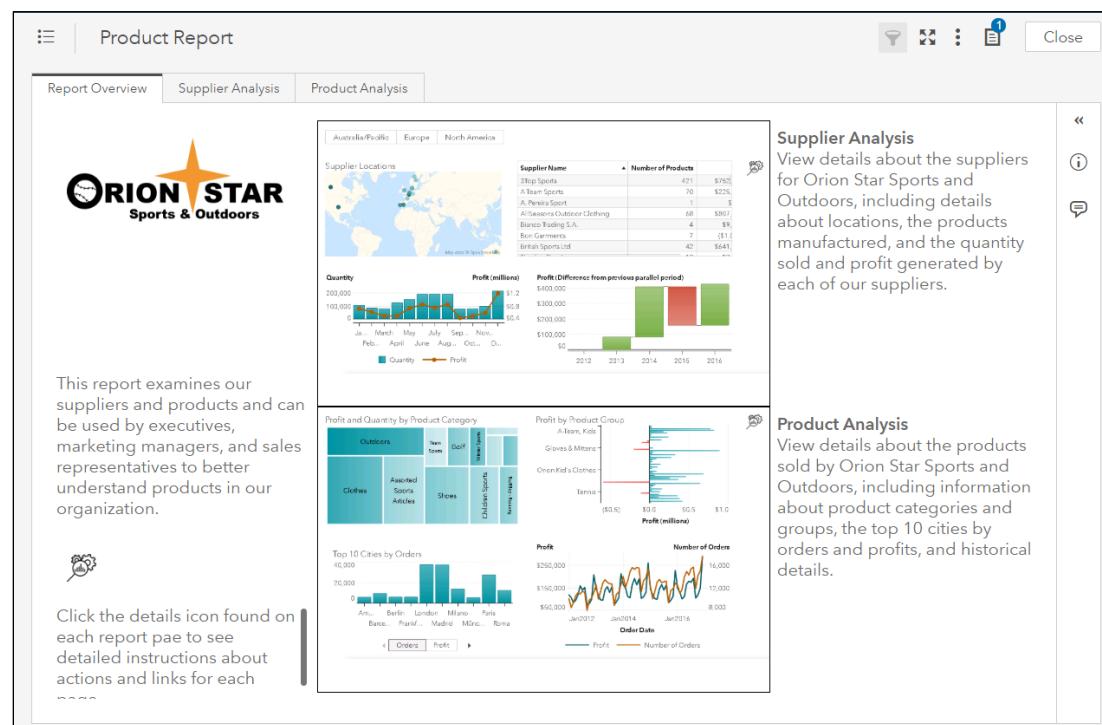
1.4 Solutions

Solutions to Practices

1. Viewing a Report in the Report Viewer

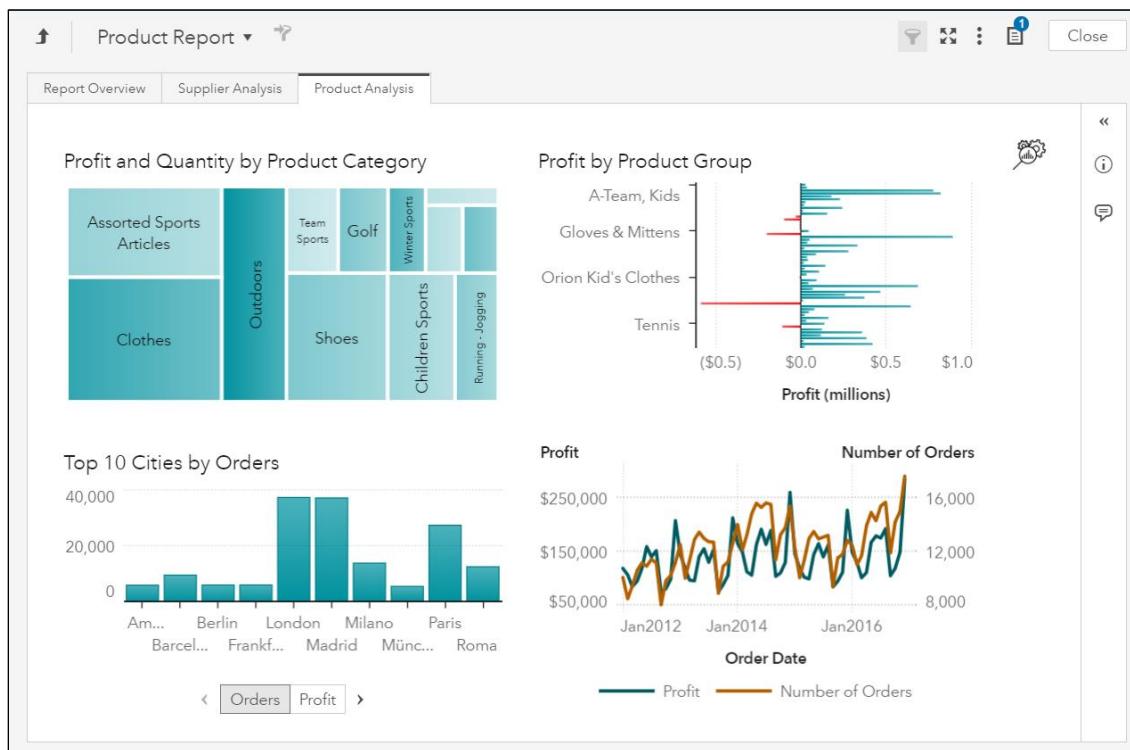
- Open the browser and sign in to SAS Viya for Learners.
- Verify that the **All** tab is selected. Open and interact with the Product Report in the Report Viewer.
 - Navigate to the **SAS Content\Courses\YVA183\Basics** folder.
 - Double-click **Product Report**.

The Product Report opens in the Report Viewer.



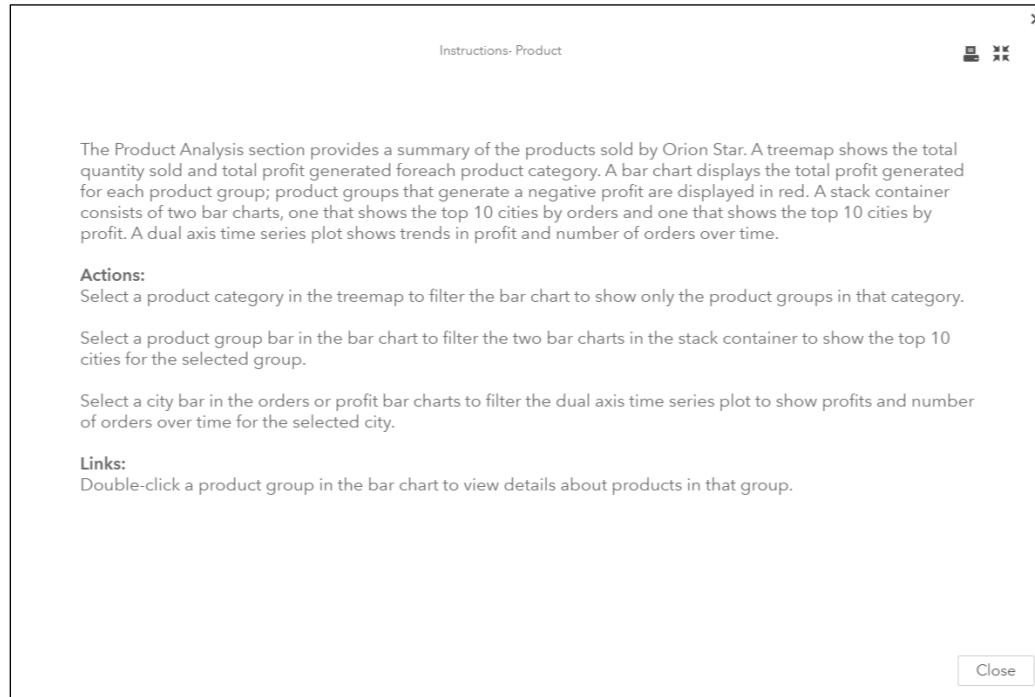
c. View the Product Analysis page.

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 stack 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 info window 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 info window.

- 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).
- Scroll through the detail data to find the category with the lowest number of orders.

Product Category	Quantity	Profit	Number of Orders
Clothes	332,355	\$1,289,492.36	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
Racket Sports	41.683	\$836,949.47	20,589

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

Product Category	Quantity	Profit	Number of Orders
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	\$1,067,262.44	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.
- Click  (Maximize) in the upper right corner of the info window.
- 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....)	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 info window.

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 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.
- Return to SAS Drive.
 - Click (**Show applications menu**) and select **SAS Drive** in the upper left corner to return to SAS Drive.

End of Solutions

Solutions to Activities and Questions

1.02 Multiple Choice Question – Correct Answer

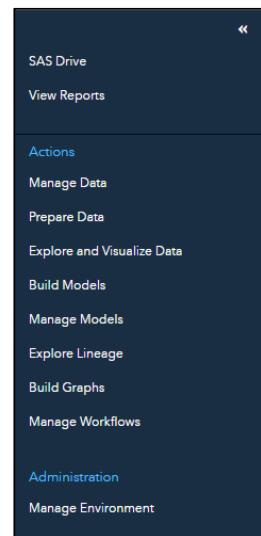
Which of the following statements is true?

- 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.

1.03 Activity – Correct Answer

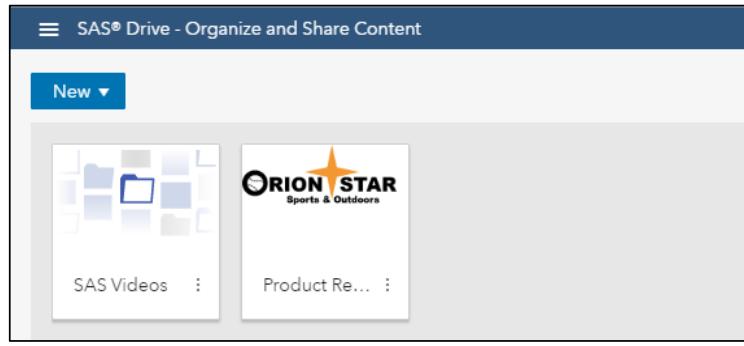
Sign in to SAS Viya for Learners. What applications can you access?



1.04 Activity – Solution

While signed in with your credentials, navigate to **SAS Content** ⇒ **Courses** ⇒ **YVA183** ⇒ **Basics**. Add the **Product Report** object to the Quick Access area of SAS Drive.

Note: You might need to expand the Quick Access area.



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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?



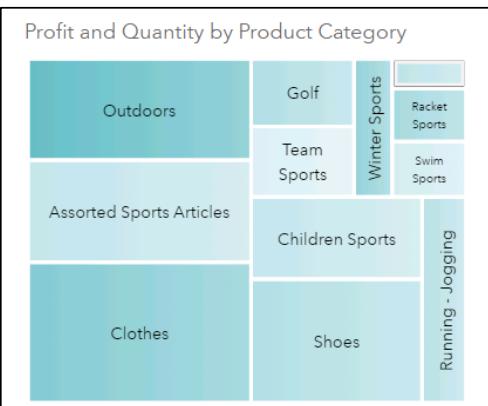
Links:
Double-click a product group in the bar chart to view details about products in that group.

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).



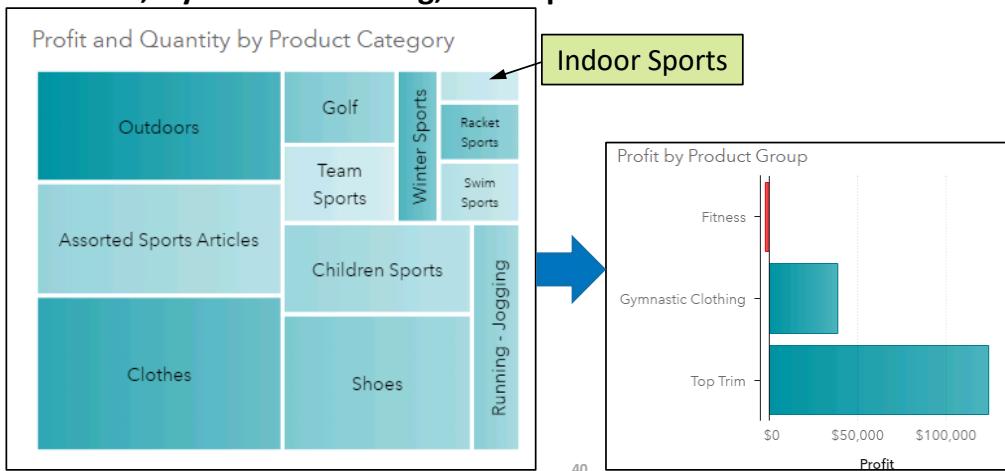
Product Category	Quantity	Profit	Number of Orders
Golf	75,072	\$875,320.00	32,270
Indoor Sports	23,245	\$160,689.61	11,755
Outdoors	239,583	\$1,687,084.95	107,616

Product Category	Quantity	Profit	Number of Orders
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	\$1,067,262.44	26,174

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



1.1 Viewing a Report in the Report Viewer – Solution

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



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

Click to sort in ascending order.

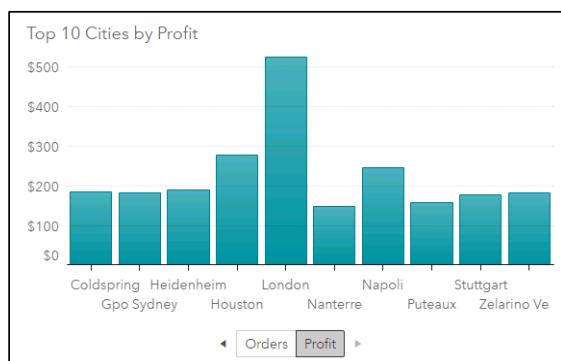
42



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.



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

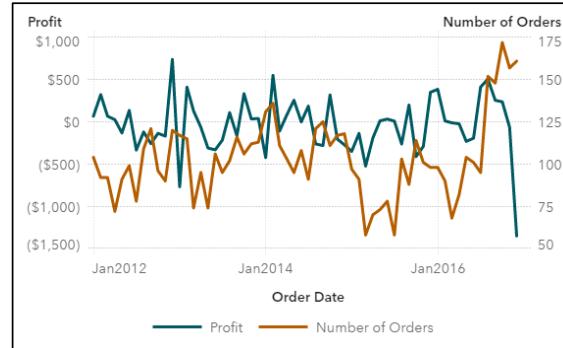
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1.1 Viewing a Report in the Report Viewer – Solution

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



Lesson 2 Preparing Data Using SAS® Data Studio

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Practice	2-20
2.2 Transforming Data Using SAS Data Studio	2-21
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2.1 Investigating Data in SAS Visual Analytics

Objectives

- Describe the data used in the demonstrations and exercises.
- Discuss the Access phase of the SAS Visual Analytics methodology.
- Discuss the types of files that can be loaded into CAS using self-service import.
- Discuss the Investigate phase of the Visual Analytics methodology.
- Describe the SAS Visual Analytics interface.
- Discuss when to use list tables and crosstabs in Visual Analytics.
- Describe how the automatic chart changes based on the selected data items.

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Business Scenario: Data



Demonstrations



68,300 customers



747,953 orders

Orion Star has many SAS data sets that contain information for the different divisions. In order to use this data in Visual Analytics, the following actions need to be performed:

- Tables need to be loaded into CAS.
- Data quality issues need to be corrected.
- Some data items might need to be created for the analysis.

Other things might be discovered along the way.

Exercises



648 employees

4

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Business Scenario: Customers



You have been hired as an analyst and report designer for the Marketing Division of Orion Star.

Here is the information for your first assignment:

- The Marketing team has asked for an analysis of profits.
- The Shipping team has asked for an analysis of delivery times.

You need to access and investigate the data to determine whether it is ready to be used by the analysts.



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Visual Analytics Methodology: Access

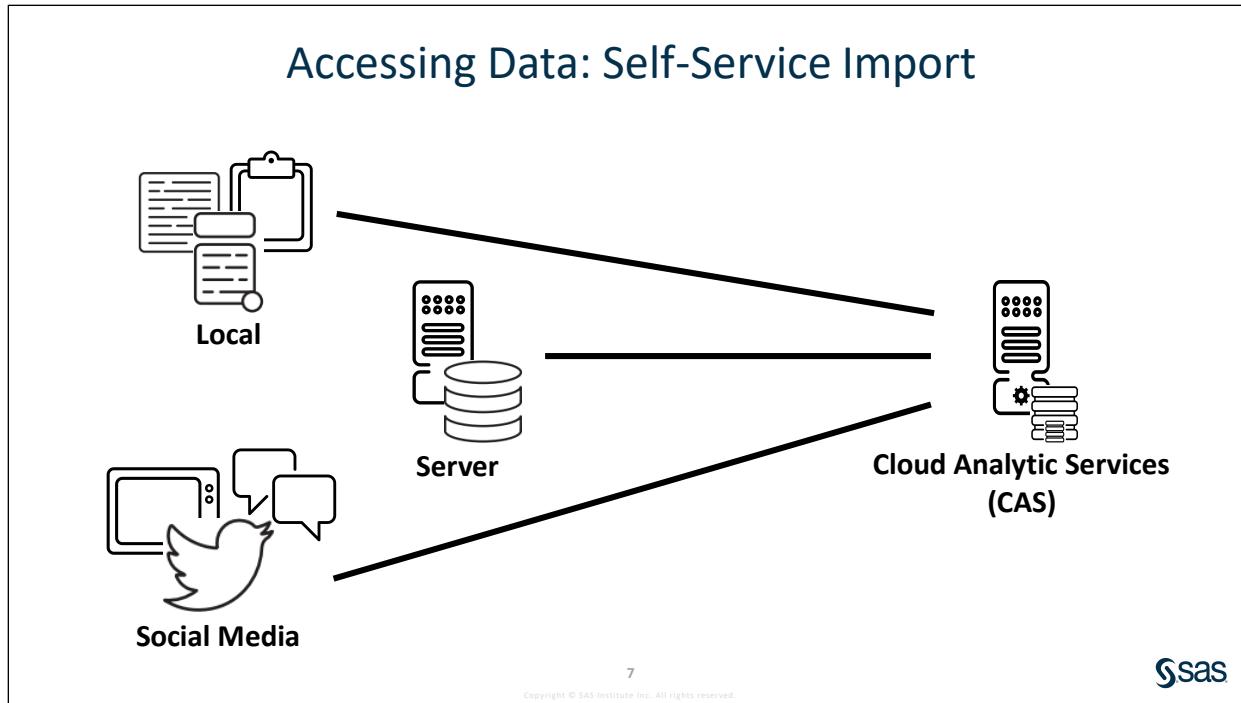
In the **Access** phase, you might need to complete the following steps:

- Identify or create analysis tables (or do both).
- Load the analysis tables into CAS using one of the following methods:
 - importing data using SAS Environment Manager
 - creating plans in SAS Data Studio
 - uploading data using the task in SAS Enterprise Guide
 - executing SAS code (using SAS Studio or Enterprise Guide)
 - using self-service import
 - executing other supported open languages: Python, Lua, Java



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

Document Directory	You can extract text and metadata from a collection of documents in a caslib and write this information to a table in a caslib. SAS Visual Text Analytics can then analyze the text and metadata in this table.
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).
Social Media	<p>After authenticating with Facebook, Google Analytics, Twitter, YouTube, or Google Drive and providing search criteria, you can import data to the CAS 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>
Esri	You can use this service to combine Esri enrichment data with data from a table that you select in your CAS environment.

Visual Analytics Methodology: Investigate

In the **Investigate** phase, you need to inspect the tables and answer questions such as the following:

- How big is the data?
- How is the data shaped?
- Are there any data quality issues? Missing values?
- Are there any data items that need to be calculated for the analysis?

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SAS Visual Analytics Interface

The interface includes a top navigation bar with 'Search', a magnifying glass icon, a question mark icon, and a user profile icon. Below the navigation bar is a toolbar with various icons. The main area is divided into three panes: 'Page tabs' on the left, 'Canvas' in the center, and 'Right pane' on the right. The 'Left pane' contains 'Report 1' and 'Page 1'. The 'Right pane' has sections for 'Options', 'Rules', 'Actions', 'Rules', 'Filters', and 'Report'. A central 'Canvas' area has a placeholder message: 'Drag data items or objects here.' A 'More options' button is located in the top right corner of the interface.

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The left pane contains the following icons:

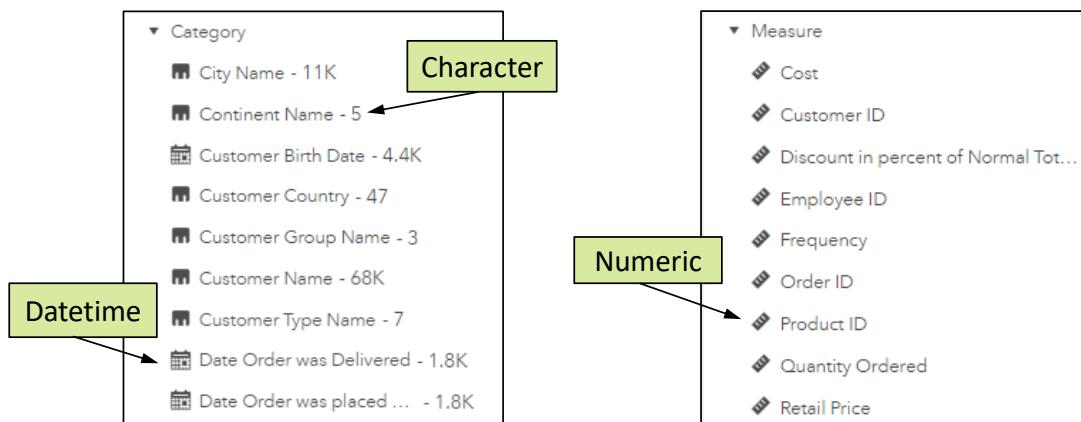
Data	The Data pane enables you to work with data sources, create new data items (hierarchy, calculated item, aggregated measure), add a data source filter, and view and modify properties for data items.
Objects	The Objects pane provides a list of tables, graphs, gauges, controls, analytics, containers, and content objects that can be included in the report.
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 enables you to create links, filter actions, and linked selection actions between objects.
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.

Data Types in Visual Analytics

There are two main data classifications in Visual Analytics:



In Visual Analytics, character and datetime data items are treated as categories—in other words, 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—in other words, data items whose values can be used in computations.

Objects: Tables

Click to sort

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.
Sas

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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

An *automatic chart* selects the chart type based on the assigned data.

Automatic charts provide a quick view of the data.

Automatic chart is the default object.

Map data © OpenStreetMap

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Sas

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 of 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*

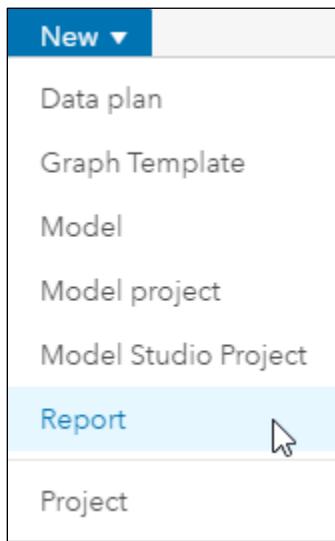
* The actual chart type depends on the cardinality of the data.



Accessing and Investigating Data

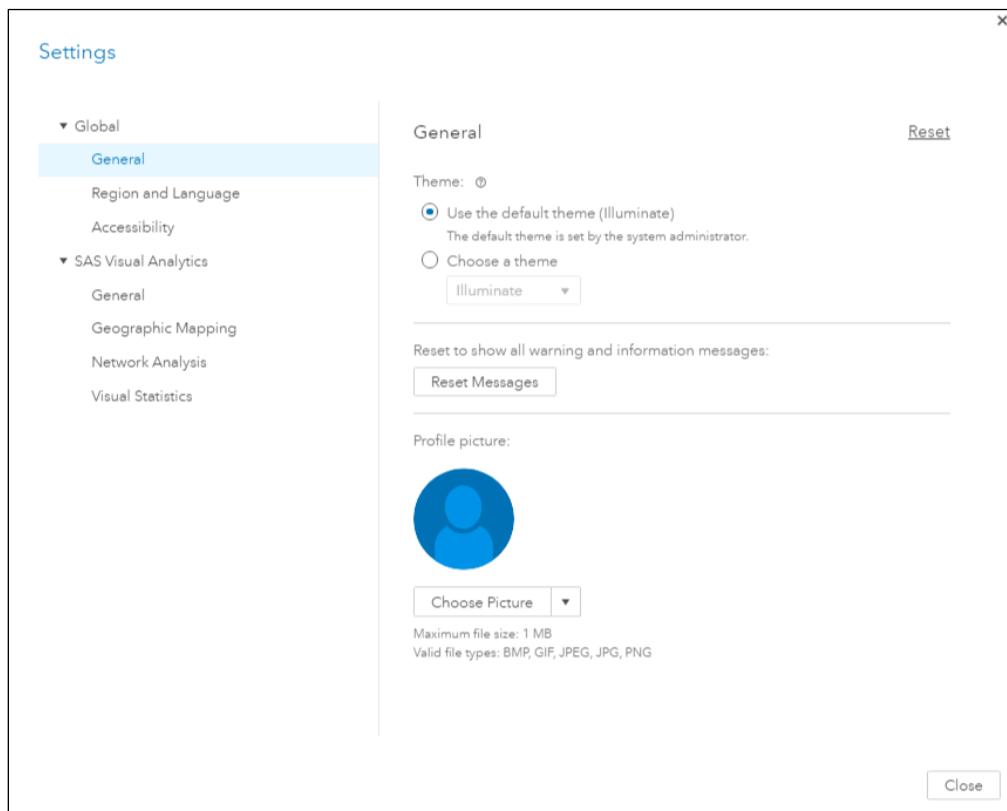
This demonstration illustrates how to access data in Visual Analytics and how to investigate data for the business scenario.

1. From the browser window, sign in to SAS Viya for Learners, if necessary.
2. If necessary, click **New** and select **Report** in the top left corner of SAS Drive.



3. Check the general settings for SAS Visual Analytics.
 - a. Select <user name> ⇨ **Settings**.

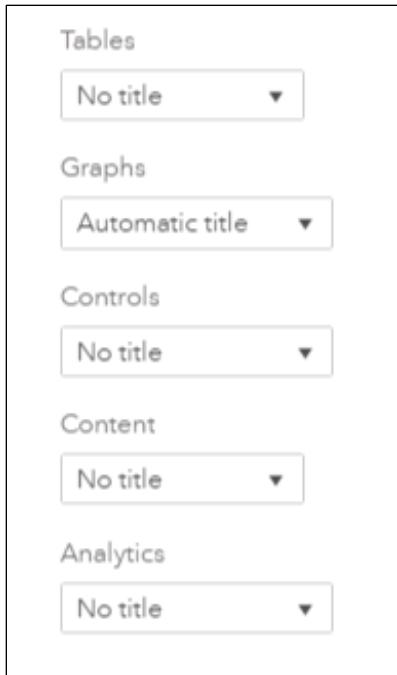
The Settings window appears.



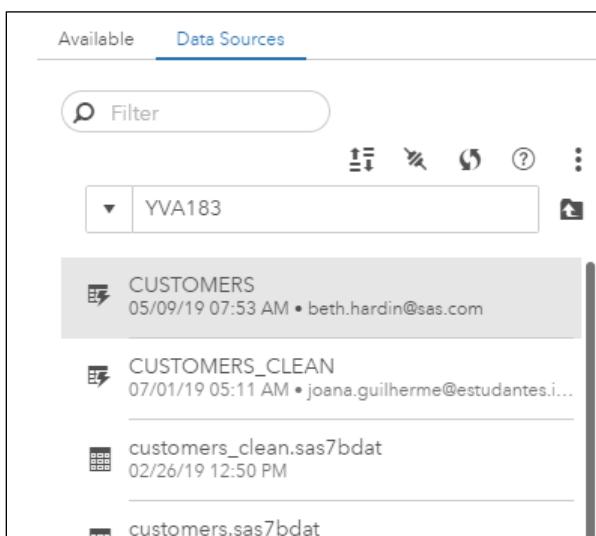
- b. Select **General** under SAS Visual Analytics.
- c. Scroll down to **When adding a new object to a report, use the following default object title settings**.
- d. Click  (**More information about this option**).

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.
4. Select data in SAS Visual Analytics.
- a. Click the **Data** icon in the left pane.
 - b. In the Open Data Source window, click **Data Sources**.
 - c. Double-click **cas-v4e020-default**.
- Note:** Your CAS default server might be different from the one selected above.
- d. Double-click **YVA183 PATH**.
 - e. Click **CUSTOMERS**.



Note: If the **CUSTOMERS** table is not listed, select **customers.sas7bdat** and click ⚡ (**Load into memory**) in the top right corner.

f. Click **OK**.

The Data pane is displayed, and it lists the data items from the **CUSTOMERS** table.

Report 1

Data

CUSTOMERS

Filter

New data item

Category

- City Name - 11K
- Continent Name - 5
- Customer Birth Date - 4.4K
- Customer Country - 47
- Customer Group Name - 3
- Customer Name - 68K
- Customer Type Name - 7
- Date Order was Delivered - 1.8K
- Date Order was placed ... - 1.8K
- Name of Street - 21K
- Order Type - 3
- Postal code - 19K
- State Name - 272

Measure

- Cost
- Customer ID
- Discount in percent of Normal Tot...

Drag data items or objects here.

5. 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 Name - 68K
- Customer Type Name - 7
- Date Order was Delivered - 1.8K
- Date Order was placed ... - 1.8K
- Name of Street - 21K
- Order Type - 3
- Postal code - 19K
- State Name - 272

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

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

The screenshot shows the Data pane in SAS Data Studio. A tree view on the left has 'Measure' expanded, revealing a list of data items. Each item is preceded by a small icon representing its type. The items listed are: Cost, Customer ID, Discount in percent of Normal Tot..., Employee ID, Frequency, Order ID, Product ID, Quantity Ordered, Retail Price, Street ID, xyContinentLat, and xyContinentLon.

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

7. 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 Name	Customer Type Name
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Africa	07Apr1953	South Africa	Orion Club members	Adams, Mr. Johann	Orion Club members low activity
	Europe	07Oct1938	United Kingdom	Orion Club members	Dunkin, Mr. James	Orion Club members medium a
	Europe	12Jan1958	Austria	Orion Club members	Finster, Mr. Richard	Orion Club members high activ
	Africa	07Apr1953	South Africa	Orion Club members	Adams, Mr. Johann	Orion Club members low activity
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Europe	07Oct1938	United Kingdom	Orion Club members	Dunkin, Mr. James	Orion Club members medium a
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Europe	07Oct1938	United Kingdom	Orion Club members	Dunkin, Mr. James	Orion Club members medium a
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Europe	12Jan1958	Austria	Orion Club members	Finster, Mr. Richard	Orion Club members high activ
	Europe	08May1953	United Kingdom	Orion Club Gold members	Pedder, Ms. Natalie	Orion Club Gold members medi
	Africa	07Apr1953	South Africa	Orion Club members	Adams, Mr. Johann	Orion Club members low activity
	Europe	04Dec1990	Ireland	Orion Club Gold members	Donnelly, Mr. Flor	Orion Club Gold members medi

- 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 (unit cost), Quantity Ordered, Retail Price (total revenue)
Age Group	Customer Birth Date
Gender	Customer Name (Pedder, Ms. Natalie or Finster, Mr. Richard)
Days to Delivery	Date Order was Delivered, Date Order was placed by Customer

8. Click  (New page) in the upper left corner next to **Page 1**.
9. 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:

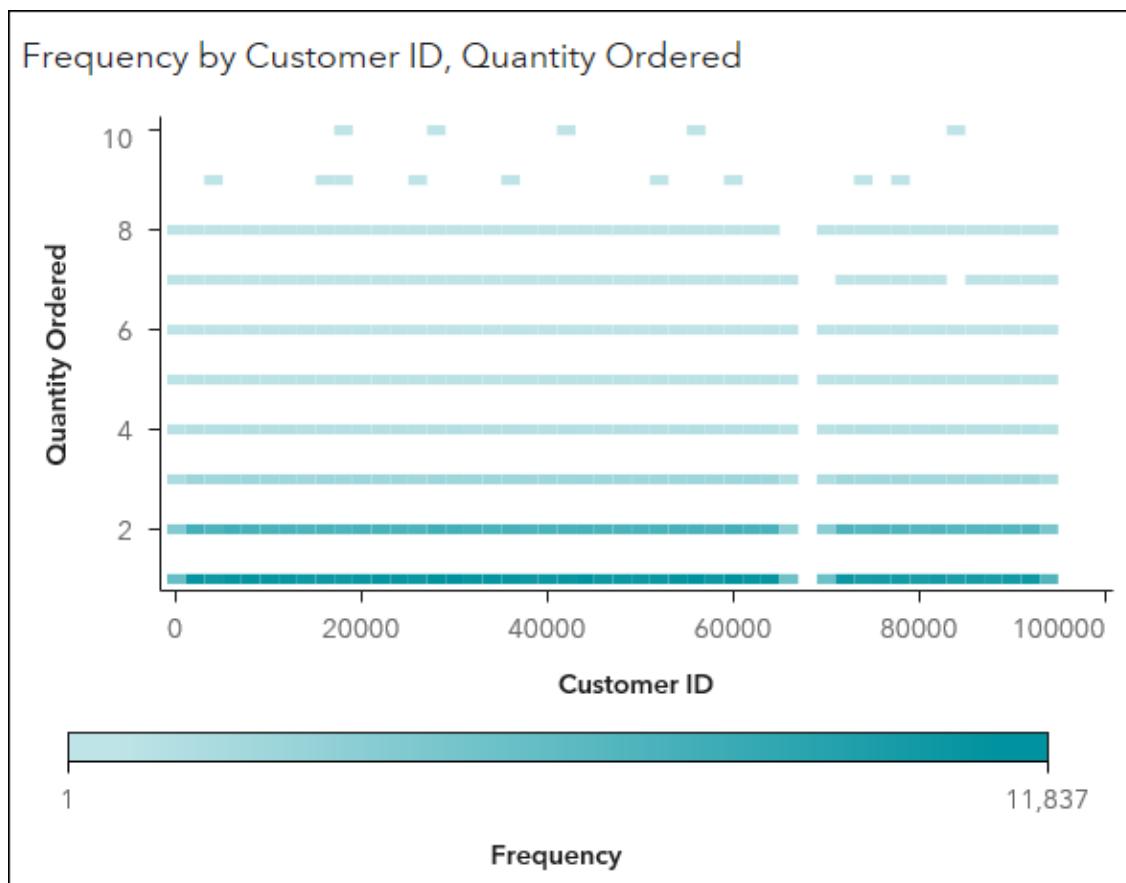
Order Type	Frequency
Catalog Sale	127,129
Internet Sale	108,570
Retail Sale	715,970

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

10. 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.

11. 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,...

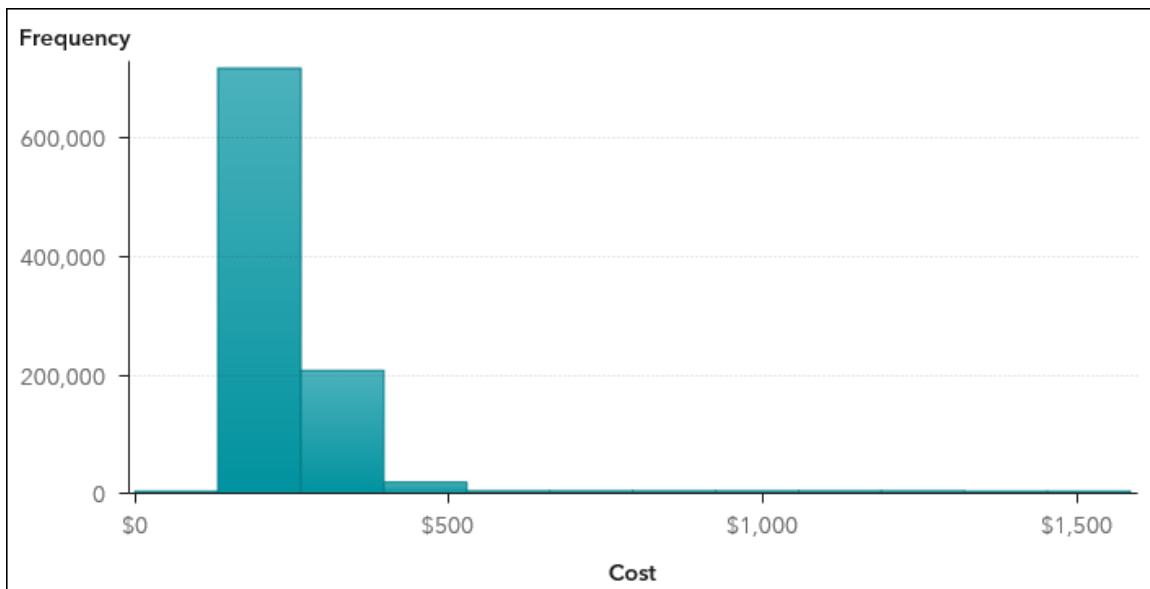
Note: **Customer ID**, **Employee ID**, **Order ID**, and **Product ID** are numeric values and are classified as measures by default. They should be classified as categories because they should not be used in calculations. The results of summing or averaging these data items returns meaningless information.

- 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.
12. In the upper right corner, click (Menu) and select **Save as**.
13. Navigate to **My Folder**.
14. Enter **VA1- Demo2.1** in the **Name** field.
15. Click **Save**.

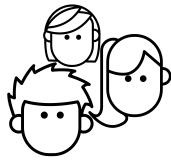
End of Demonstration

Business Scenario: Employees

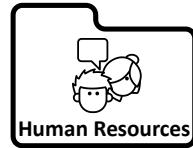


You have been hired as an analyst and report designer for the Human Resources Division of Orion Star.

For your first assignment, the Human Resources team has asked for an analysis of salaries to determine which employees could be eligible for promotion based on job title, tenure, hire month, and sales accomplishments. You need to access and investigate the data to determine which modifications need to be made to satisfy their requirements.



648 employees





Practice

1. Accessing and Investigating Data

- a. From the browser window, sign in to SAS Viya for Learners, if necessary.
- b. Access SAS Visual Analytics.
- c. Open the **VA1- Exercise2.1** report in the **SAS Content/Courses/YVA183/Basics/Exercises (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: _____

How is **Employee Name** arranged?

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 in **My Folder**.

End of Practices

2.2 Transforming Data Using SAS Data Studio

Objectives

- Discuss the Prepare phase of the Visual Analytics methodology.
- Describe the Data Studio interface.
- Discuss the information displayed in the Table Profile window.
- Discuss the information displayed in the Column Profile window.
- Apply data transformations (rename, modify classification, remove white space, change case, filter, remove) to columns in SAS Data Studio.
- Create new columns (splitting, calculated) in SAS Data Studio.

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Business Scenario: Customers



The **CUSTOMERS** table contains a total of 951,669 observations and 24 columns. Each row represents a product ordered by a customer, so there are multiple rows for each order and multiple rows for each customer.

The following data cleansing operations need to be performed:

Rename

Retail Price ➔ **Total Revenue**
Cost ➔ **Unit Cost**

Convert column

Customer_ID
Order_ID



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

Name	Description	Distinct Counts	Cleansing?
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	Split
Customer Type Name	Loyalty member level	7	
Customer ID	Unique identifier for customer	68,300	Change data type Trim white space
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	Change data type Trim white space
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

Business Scenario: Customers



The Marketing team has asked you for an analysis of profits, and the Shipping team has asked for an analysis of delivery times.

In order to perform this analysis, the following data items need to be calculated:

- **Customer_LastName**, **Title**, and **Customer_FirstName**
- **Profit**
- **Days to Delivery**
- **Customer Age** and **Customer Age Group**
- **Customer Gender**

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Note: The following data items are not needed for the analysis and will be removed: **Customer Name** (after the split), **Street Name**, **Street ID**, **Date Order was Delivered** (after calculation), **Employee ID**, **Product ID**, **xyContinentLat**, and **xyContinentLon**.

Note: **Profit** and **Days to Delivery** are calculated in SAS Data Studio. **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 Data Studio using custom code. These data items can also be calculated in SAS Visual Analytics, which you see in a later chapter.

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.*

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

Visual Analytics Methodology: Prepare

In the **Prepare** phase, you need to complete the following tasks:

Correct any data issues discovered.

- split columns
- change case
- change data type or format (or both)
- remove white space
- delete or rename columns
- sort columns

Create new calculated items needed for analysis.

Note: These transformations and calculations are saved in a plan.



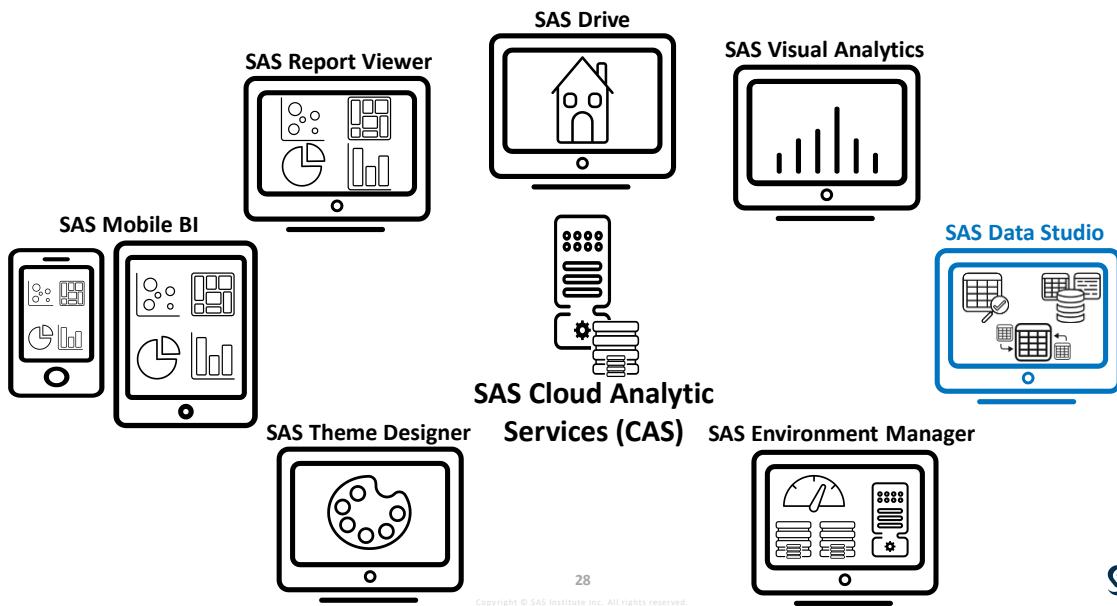
27

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A *plan* is a collection of actions or data transforms performed on a table.

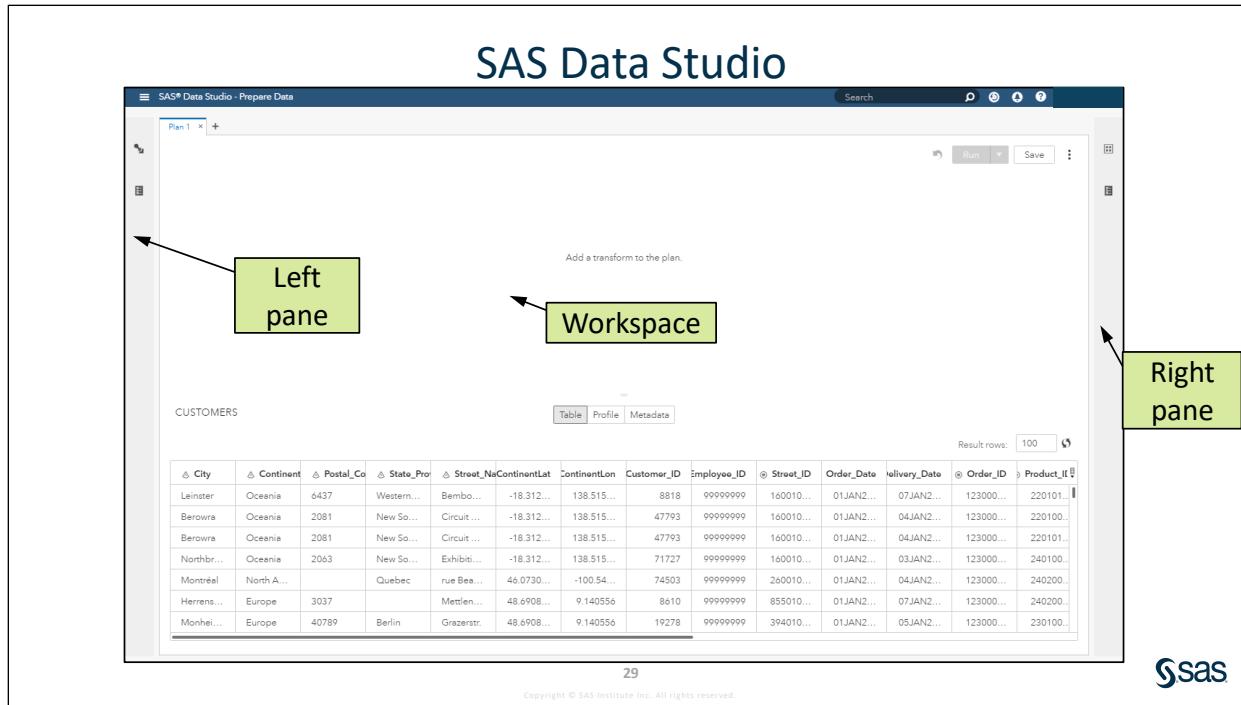
SAS Viya Applications



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In SAS Data Studio, you can view metrics about your tables and columns, and perform data transformations on your data by creating plans. The data source must be loaded into CAS before data can be prepared in SAS Data Studio. If you open a table that is not loaded, it is automatically loaded to the CAS server.

Note: Only the first 300 columns are displayed in the workspace. However, this does not affect your ability to work with all of the data in the table. Any changes made apply to the entire table, not just the columns that are displayed.

Area	Description
Data transformations	Enables you to add transformations.
Properties	Enables you to view properties of the source table.
Workspace	Enables you to view and prepare data.
Plan	Displays a list of all actions associated with the plan.
Properties	Enables you to view properties of the result table.

Table, Profile, and Metadata Information

At the bottom of the workspace, you can view the Table, Profile, and Metadata information about the table.

The screenshot shows the SAS Data Studio interface with three tabs at the bottom: Table, Profile, and Metadata. The Table tab displays the CUSTOMERS table with 100 results. The Profile tab shows basic statistics for each column, such as Mean, Median, and Mode. The Metadata tab lists the columns with their data types and formats.

Column	Unique	Null	Blank	Pattern Count	Mean	Median	Mode	Standar...
City	1.0%	0.0%	0.0%	731				London
Customer	0.0%	0.0%	0.0%		4			Europe
CustomerCount	0.2%	0.0%	0.0%		77.76	50.50	45.00	85.28
Customer_BirthDate	0.01%	0.0%	0.0%		15			Unite...
Customer_Group	0.01%	0.0%	0.0%		3,867.29	4,812.00	1,277.00	5,977.98

#	Name	Label	Type	Raw Length	Formatted Length	Format
1	Profits	Profit	double	8	6	DOLLAR
2	Days to Delivery	Days to Delivery	double	8	12	
3	Total Revenue	Retail Price	double	8	13	DOLLAR
4	Unit Cost	Cost	double	8	13	DOLLAR
5	Customer ID	Customer ID	char	16	16	\$CHAR
6	Order ID	Order ID	char	16	16	\$CHAR
7	Customer_Leather	Customer Leather	char	60	60	

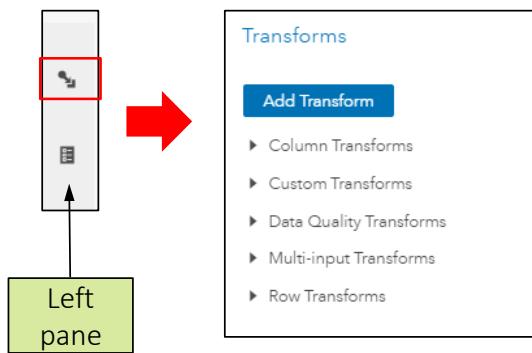
30



The Profile tab enables you to view or create a data profile report. A *data profile report* enables you to recognize data patterns, identify quality issues in the data, and review basic statistics for the selected table.

Data Transformations

You can perform data transforms such as changing data types, splitting columns, creating calculated columns, joining tables, and filtering data.



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The following data transformations are available from the Transforms pane:

Column Transforms

Change case	Changes the case in columns. If SAS Data Preparation is licensed at your site, then you have access to more advanced casing options using the Casing transform.
Convert column	The data type options for a column include Character, Double, VarChar, DateTime, Date, and Time. The availability of the types depends on how the table was imported.
Rename	Renaming the column in SAS Data Studio changes the name of the data item, not the label. In Visual Analytics, labels are displayed in the Data pane.
Remove	Removing a column in SAS Data Studio removes it from the CAS table created by the plan.
Split	Enables you to split a column using a specified delimiter.
Trim whitespace	Removes white space in a column. Options are Compress all whitespace, Trim leading and trailing whitespace, Trim leading whitespace, or Trim trailing whitespace.

Custom Transforms

Calculated column	Enables you to enter a DATA step expression to create a column.
Code	Enables you to add custom code (DATA step or CASL) to perform actions on your data.

Data Quality Transforms

Note: The data quality transforms are available with SAS Data Preparation only. If SAS Data Preparation is licensed at your site, then you can access the data quality transforms.

▼ Data Quality Transforms
Casing
Field extraction
Gender analysis
Identification analysis
Match and cluster
Matchcodes
Parsing
Standardize

Multi-input Transforms

Append	Enables you to add incremental data to a single table.
Join	Enables you to join multiple tables.

Row Transforms

Analytic partitioning	You can use the Analytical Partitioning transform to create a column in the target table that specifies training, validation, and test values randomly in a new field. These values are used to create partitions for validation purposes using SAS Visual Analytics.
Filter	Filtering by a column in SAS Data Studio removes rows from the CAS table created by the plan. There is no limit to the number of filters that can be applied to a table. If you create a filter for a column that contains a large number of distinct values, it is recommended that you break the filter into smaller filters, as creating a filter with more than 1,000 distinct values will prevent you from saving the plan.
Transpose	Moves data from column to rows.
Unique identifier	You can use the Unique identifier transform to create a column in the target table that contains a unique value for each row in the table. These unique row identifiers are used in text topics in SAS Visual Analytics.

2.01 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
1	\$35.50	\$34.50
1	\$166.60	\$166.80

2.02 Activity

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

Order_Date	Delivery_Date
27Jun2016	01Jul2016
24Jul2014	31Jul2014
04Jan2016	07Jan2016
31Mar2012	04Apr2012
26Feb2014	27Feb2014
02Mar2014	03Mar2014
16Jun2015	20Jun2015
30Jun2015	05Jul2015
07May2013	10May2013
08Nov2016	12Nov2016
17May2013	18May2013

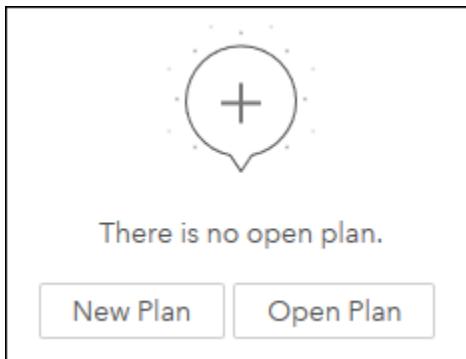


Preparing Data

This demonstration illustrates how to view table and column profile information and view plan actions in SAS Data Studio.

1. From the browser window, sign in to SAS Viya for Learners, if necessary.
2. If necessary, click **New** and select **Data plan** in the top left corner of SAS Drive.

SAS Data Studio appears. You can open a table by creating a new plan or by opening an existing plan.



3. Click **Open Plan**.
 - a. In the Open window, navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1-Demo2.2** to open the plan.

The steps of the plan are executed when the plan is opened.
4. View metadata, profile, and table information for the source table.
 - a. In the bottom pane, click **Metadata**.



The Metadata view shows a list of columns (and their types) for the source table.

CUSTOMERS (session)							Table	Profile	Metadata
#	Name	Label	Type	Raw Length	Formatted...	Format			
1	⊕ Profit	Profit	double	8	6	DOLLAR			
2	⊕ Days to Delivery	Days to Delivery	double	8	12				
3	⊕ Total Revenue	Retail Price	double	8	13	DOLLAR			
4	⊕ Unit Cost	Cost	double	8	13	DOLLAR			
5	▲ Customer ID	Customer ID	char	16	16	\$CHAR			
	▲ OrderID								

- b. In the bottom pane, click **Profile**.

- c. If necessary, click **Run Profile** to execute the profile.

CUSTOMERS (session)					
<input type="button" value="Table"/> <input type="button" value="Profile"/> <input type="button" value="Metadata"/>					
Date profiled: Jun 15, 2018 11:41 AM					
Column	Unique	Null	Blank	Pattern Count	Mean
▲ Customer Group	<0.01% (3)			3	
♯ Customer ID	7.18% (68300)				45,44...
▲ Customer Name	7.12% (67806)			3,734	
▲ Customer Type	<0.01% (7)			7	
♯ Delivery Date	0.19% (1840)				19,95...
♯ Discount	0.04% (4)	99.04% (942...)			0.38
♯ Employee ID	0.07% (648)				24,85...
▲ OrderTypeLabel	<0.01% (3)			3	

Basic profile metrics (Unique, Mean, Standard Deviation, Standard Error, Minimum, Maximum, Data Type, and Data Length) appear for all the columns in the **CUSTOMERS** data source.

Note: Advanced profile metrics (Null, Blank, Pattern Count, Median, Mode, Actual Type, Minimum Length, Maximum Length, Ordinal Position, Primary Key Candidate, and Non-null Count) appear if SAS Data Preparation is licensed at your site.

- d. In the bottom pane, click **Table**.

CUSTOMERS (session)								
<input type="button" value="Table"/> <input type="button" value="Profile"/> <input type="button" value="Metadata"/>								
Result rows: 100 <input type="button" value="More"/>								
④ Profit	Days to Delivery	Total Revenue	④ Unit Cost	▲ Customer	▲ Order ID	▲ Customer	▲ Title	▲ Customer
\$-0	0	\$78.20	\$39.30	32068	123112...	Johncox	Ms.	Roma
\$-0	5	\$45.60	\$23.00	34348	123112...	Stern	Ms.	Eithne
\$3	0	\$43.80	\$40.80	34544	123112...	Lyons	Ms.	Christine
\$20	0	\$166.80	\$48.80	36225	123112...	Kilgore	Ms.	Kusum
\$-0	0	\$54.00	\$54.20	36723	123112...	Gillow	Ms.	Eilene

A sample of rows from the **CUSTOMERS** data source is displayed. These results might vary.

5. In the left pane, click  (**Properties for the source table**) to show details about the source table.

Source Table - CUSTOMERS 

Columns Rows
24 **951.7 K**

Size
530.2 MB

Label:
(not available)

Location:
cas-shared-default/Public

 Date created:
Jun 15, 2018 11:19 AM

 Date modified:
Jun 15, 2018 11:19 AM

Encoding:
utf-8

Tags (0):
No items have been added. 

6. In the right pane, click  **(Plan)** to view details about the steps performed in SAS Data Studio.

Plan

1. Rename
2. Convert Column
3. Trim Whitespace
4. Trim Whitespace
5. Split
6. Trim Whitespace
7. Split
8. Remove
9. Calculated Column
10. Calculated Column

7. With step 10 selected, **Calculated Column**, view the calculation.

Calculated Column - Step 10 of 10

Run 

9 Calculated Column 10 Calculated Column



1	Delivery_Date-Order_Date
---	--------------------------

Replace existing column

Create new column Days to Delivery

[Options for new columns](#)

8. Select step 9, **Calculated Column** to view the calculation.

Calculated Column - Step 9 of 10

Run Save

9 Calculated Column 10 Calculated Column

('Total Revenue'n - ('Unit Cost'n * 'Quantity'n))

Replace existing column
 Create new column Profit

[Options for new columns](#)

9. Click **Options for new columns**.

Name of new column:	Type:	Length:	Label:	Format:
Profit	Double ▾	8	Profit	DOLLAR

10. Click **OK**.11. Select step 5, **Split**, to view the transformation.

Split - Step 5 of 10

Run Save

5 Split 6 Trim Whitespace 7 Split

Source column: Split data:

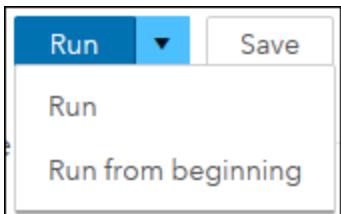
Customer_Name On a delimiter

Delimiter: Name of new column 1:
 Comma Customer_LastName

Name of new column 2:
 RIGHT_Customer_Name

[Options for new columns](#)

12. Click  and select **Run from beginning** to run the plan.



13. Save the plan and the result table.

- In the upper right corner of the plan, click  (More) and select **Save As**.
- Verify that **VA1-Demo2.2** is entered in the **Name** field.
- Verify that **Save plan and table** is selected at the bottom of the window.
- Verify that **CUSTOMERS_CLEAN** is listed in the **Table name** field.
- Verify that **cas-shared-default/Public** is specified for the **Library** field.
- Verify that **Replace table** is selected for the **If the name of the target table already exists** option.

The bottom portion of the Save As window should resemble the following:

Name:	Type:	
<input type="text" value="VA1-Demo2.2"/>	<input type="text" value="Data plan"/>	
<input checked="" type="radio"/> Save plan and table <input type="radio"/> Save plan <input type="radio"/> Save table		
Table name:	Label:	Library:
<input type="text" value="CUSTOMERS_CLEAN"/>	<input type="text" value="Enter label"/>	<input type="text" value="cas-shared-default/Public"/> 
If the name of the target table already exists: <input type="radio"/> Cancel save <input checked="" type="radio"/> Replace table		

- Click **Cancel**.

Note: When a plan is saved, the result table is automatically loaded to the CAS server.

Note: You can open the result table for the plan in another application by clicking  (More) and selecting **Actions** \Rightarrow **Saved table** \Rightarrow **Explore and Visualize Data**.

End of Demonstration

Business Scenario: Employees



The **EMPLOYEES** table contains a total of 648 observations and 24 columns. Each row represents a current or past employee of Orion Star and contains salary information and summary information about that employee's sales (number of orders, profit, quantity ordered).

The following data cleansing operations need to be performed:

- Rename **Manager at 1. level** to **Manager_ID**.
- Convert **Employee Country** to uppercase.
- Change **Employee ID** to character.
- Filter for the **Sales** and **Purchasing** departments.

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Business Scenario: Employees



The Human Resources team has asked for an analysis of salaries to determine which employees could be eligible for promotion based on tenure, hire month, and sales accomplishments.

In order to perform this analysis, the following data items need to be calculated:

- **Employee_Name** and **Title**
- **Anniversary Month**
- **Employee Tenure**
- **Employee Type** (Retired or Active)

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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 Data Studio. **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 Data Studio using custom code. These data items can also be calculated in SAS Visual Analytics, 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. From the browser window, sign in to SAS Viya for Learners, if necessary.
- b. Open and run the **VA1- Exercise2.2** plan in the **Shared Data/Basics/Exercises (HR)** folder.
- c. View properties for the result table and answer the following question:

How many rows are in the **EMPLOYEES** table after the actions of the plan are applied?

Answer: _____

- d. View details about the steps performed in the plan and answer the following questions:

How many convert column actions were performed? On which column (or columns)?

Answer: _____

Which column was changed to uppercase?

Answer: _____

Which column was split? What was the delimiter?

Answer: _____

What filter was applied to the table?

Answer: _____

What is the name of the new output table created from the plan?

Hint: Click  (**More**) and select **Save as** to view the name of the output table.

Answer: _____

Note: You do not need to save the plan.

End of Practices

2.3 Solutions

Solutions to Practices

1. Accessing and Investigating Data

- a. From the browser window, sign in to SAS Viya for Learners, if necessary.
- b. Access SAS Visual Analytics.

To access SAS Visual Analytics, click  (Show applications menu) and select **Explore and Visualize Data**. The Welcome to SAS Visual Analytics window appears.

- c. Open the **VA1- Exercise2.1** report in the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Click **Open**.
 - 2) In the Open window, navigate to the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 3) Double-click the **VA1- Exercise2.1** 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.

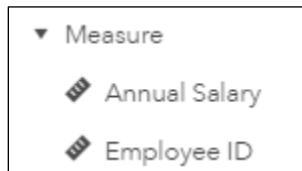
View the list of Category data items on the Data pane.

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

How is **Employee Name** arranged?

Answer: Employee Name is arranged as First Last, Title.

Employee Name
Internet/Catalog Sales
Sian Shannan, Mr
Petrea Soltau, Ms
Caterina Hayawardhana, Ms
Fang Wilson, Ms
Koavea Pa), Mr
Leonid Karavdic, Mr
Judy Chanharasy, Ms
Samantha Waal, Ms
Christina Ngan, Ms
Fadi Nowd, Mr

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.

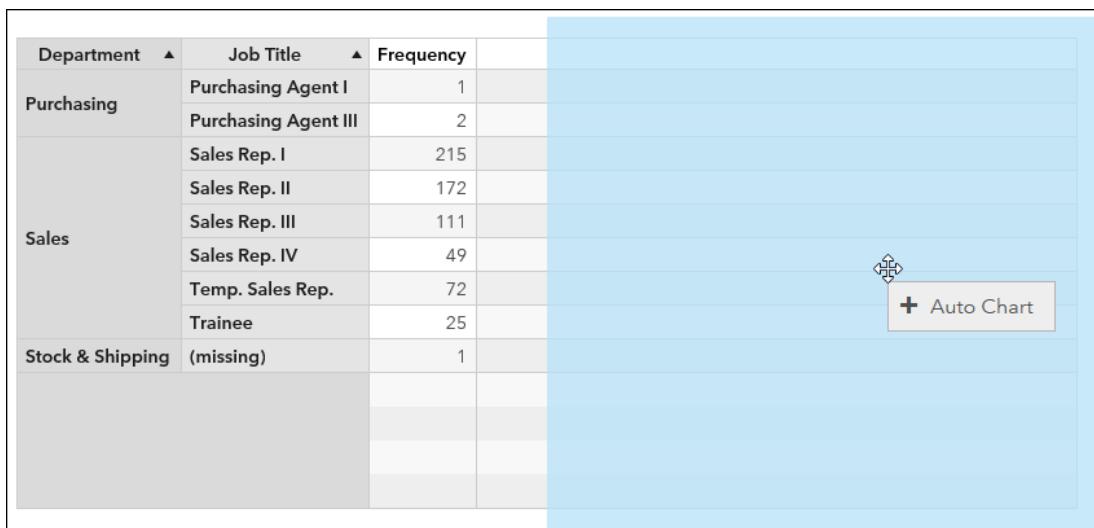
Which department contains the missing job title?

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.

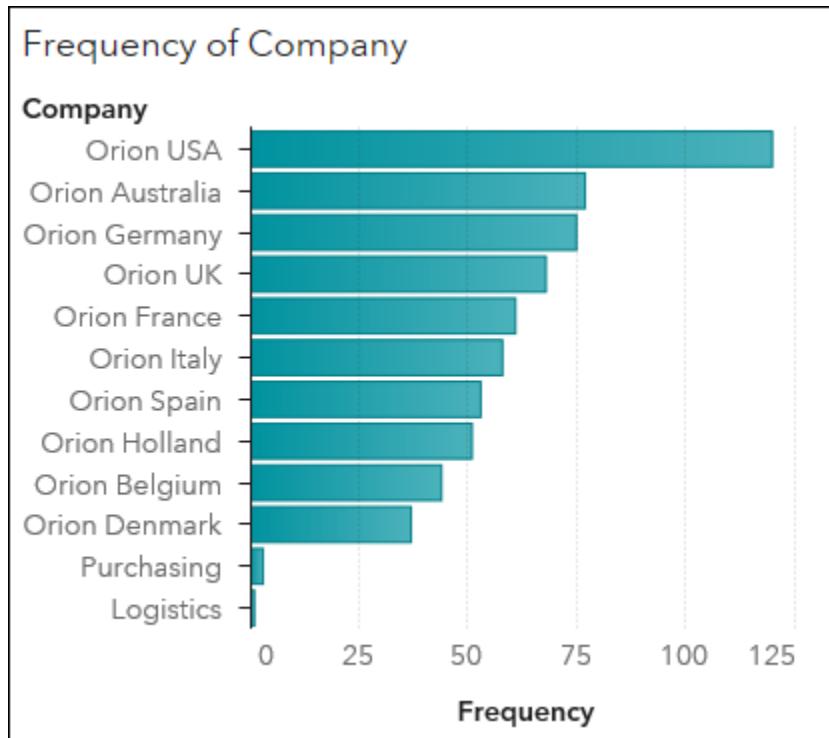


What is the largest company? The smallest?

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

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 in **My Folder**.
 - 1) Save the report by clicking  (Menu) and selecting **Save As**.
 - 2) Navigate to **My Folder** and select **Save**.
2. **Preparing Data**
 - a. From the browser window, sign in to SAS Viya for Learners, if necessary.
 - b. Open and run the **VA1- Exercise2.2** plan in the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Click  (Show applications menu) and select **Prepare Data**.
 - 2) Click **Open Plan**.
 - 3) Navigate to the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 4) Double-click **VA1- Exercise2.2** to open the plan.
 - 5) Select **Run** to execute the plan, if necessary.

- c. View properties for the result table and answer the question.

In the right pane, click  (Properties for the result table).

Result Table - EMPLOYEES (...)

Columns	Rows
16	647
Size	
232.5 KB	
Label:	(not available)
Location:	cas-shared-default/Public
Date created:	Jun 15, 2018 01:42 PM
Date modified:	Jun 15, 2018 01:42 PM
Encoding:	utf-8

How many rows are in the **EMPLOYEES** table after the actions of the plan are applied?

Answer: 647 rows, one for each employee at Orion Star

- d. View details about the steps performed in the plan and answer the questions.

In the right pane, click  (Plan).

How many convert column actions were performed? On which column (or columns)?

Answer: One convert column action was performed on the Employee_ID column.

Plan

1. Rename
2. Convert Column
3. Trim Whitespace
4. Change Case
5. Filter
6. Split
7. Remove
8. Calculated Column

- Select the Convert Column step.

Convert Column - Step 2 of 8 Run ⋮

2 Convert Column — 3 Trim Whitespace — 4 C ↗

Source column:	Conversion:	
# Employee_ID	CHARACTER	
Informat or format:	New column:	
BEST16.	Employee ID	
Length:	Format:	Label:
16	\$CHAR	Employee ID
? +		

Which column was changed to uppercase?

Answer: Employee_Country

- Select the Change Case step.

Change Case - Step 4 of 8

Source column: Employee_Country

Case: Uppercase

Replace source column (radio button selected)

Create new column (radio button unselected)

Which column was split? What was the delimiter?

Answer: Employee_Name was split using a comma delimiter.

- Select the Split step.

Split - Step 6 of 8

Source column: Employee_Name

Split data: On a delimiter

Delimiter: Comma

Name of new column 1: EmployeeName

Name of new column 2: Title

Options for new columns

What filter was applied to the table?

Answer: Department in ('Purchasing', 'Sales')

- Select the Filter step.

What is the name of the new output table created from the plan?

Answer: EMPLOYEES_CLEAN

- Click (More) and select Save as.

Name:	Type:
VA1-Exercise2.2	Data plan
<input checked="" type="radio"/> Save plan and table <input type="radio"/> Save plan <input type="radio"/> Save table	
Table name:	Label:
EMPLOYEES_CLEAN	Enter label
Library: cas-shared-default/Public	
If the name of the target table already exists: <input type="radio"/> Cancel save <input checked="" type="radio"/> Replace table	

- Click Cancel.

End of Solutions

Solutions to Activities and Questions

2.01 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
1	\$35.50	\$34.50
1	\$166.60	\$166.80

$$\text{Profit} = \text{Total Revenue} - (\text{Unit Cost} * \text{Quantity})$$



2.02 Activity – Correct Answer

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

$$\text{Days to Delivery} = \text{Delivery Date} - \text{Order Date}$$

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

Order_Date	Delivery_Date
27Jun2016	01Jul2016
24Jul2014	31Jul2014
04Jan2016	07Jan2016
31Mar2012	04Apr2012
26Feb2014	27Feb2014
02Mar2014	03Mar2014
16Jun2015	20Jun2015
30Jun2015	05Jul2015
07May2013	10May2013
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

▼ Measure
❖ Annual Salary
❖ Employee ID

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

How is **Employee Name** arranged?

First Last, Title

Employee Name
Internet/Catalog Sales
Sian Shannan, Mr
Petrea Soltau, Ms
Caterina Hayawardhana, Ms
Fang Wilson, Ms
Koavea Pa), Mr
Leonid Karavdic, Mr
Judy Chantherasy, Ms
Samantha Waal, Ms
Christina Ngan, Ms



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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).

Active

Employee Termination Date
30Jun2010
-
-
-
-
31Jan2010
31Aug2010
30Apr2008

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 Rep. I	215
Sales	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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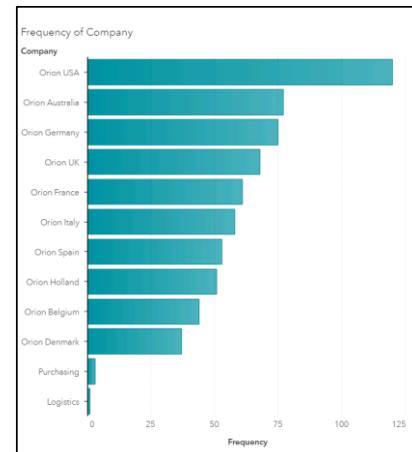
2.1 Accessing and Investigating Data – Solution

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

Maximum- 19,146,779.62

Average- 109,148.07

Total (sum)- 70,727,947.65

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

21



2.2 Preparing Data: Part 1 – Solution

View the properties of the result table and answer the following question:

How many rows are in the **EMPLOYEES** table after the actions of the plan are applied?

647 rows, one for each employee at Orion Star

Result Table - EMPLOYEES (...)	
Columns	Rows
16	647
Size	232.5 KB
Label:	(not available)
Location:	cas-shared-default/Public
Date created:	Jun 15, 2018 12:43 PM
Date modified:	Jun 15, 2018 12:43 PM
Encoding:	utf-8

40

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2.2 Preparing Data: Part 1 – Solution

View details about the steps performed in the plan and answer the following questions:

How many convert column actions were performed? On which column (or columns)?

One convert column actions (Employee _ID)

Which column was changed to uppercase?

Employee_Country

Which column was split? What was the delimiter?

Employee_Name (comma)

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2.2 Preparing Data: Part 1 – Solution

View details about the steps performed in the plan and answer the following questions:

What filter was applied to the table?

Department in ('Purchasing', 'Sales')

What is the name of the new output table created from the plan?

EMPLOYEES_CLEAN

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3.1 Working with Data Items

Objectives

- Discuss the Analyze phase of the SAS Visual Analytics methodology.
- Change data items (modify formats, modify aggregations, modify classifications, rename data items) in Visual Analytics for the analysis.

3



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Visual Analytics Methodology: Analyze

In the **Analyze** phase, you can evaluate the data by doing the following:

- modifying data item properties
- creating new calculated items needed for analysis
- applying any necessary filters for the analysis
- exploring relationships between data items using charts and graphs
- discovering trends and patterns between data items
- creating, testing, and comparing models based on patterns discovered*

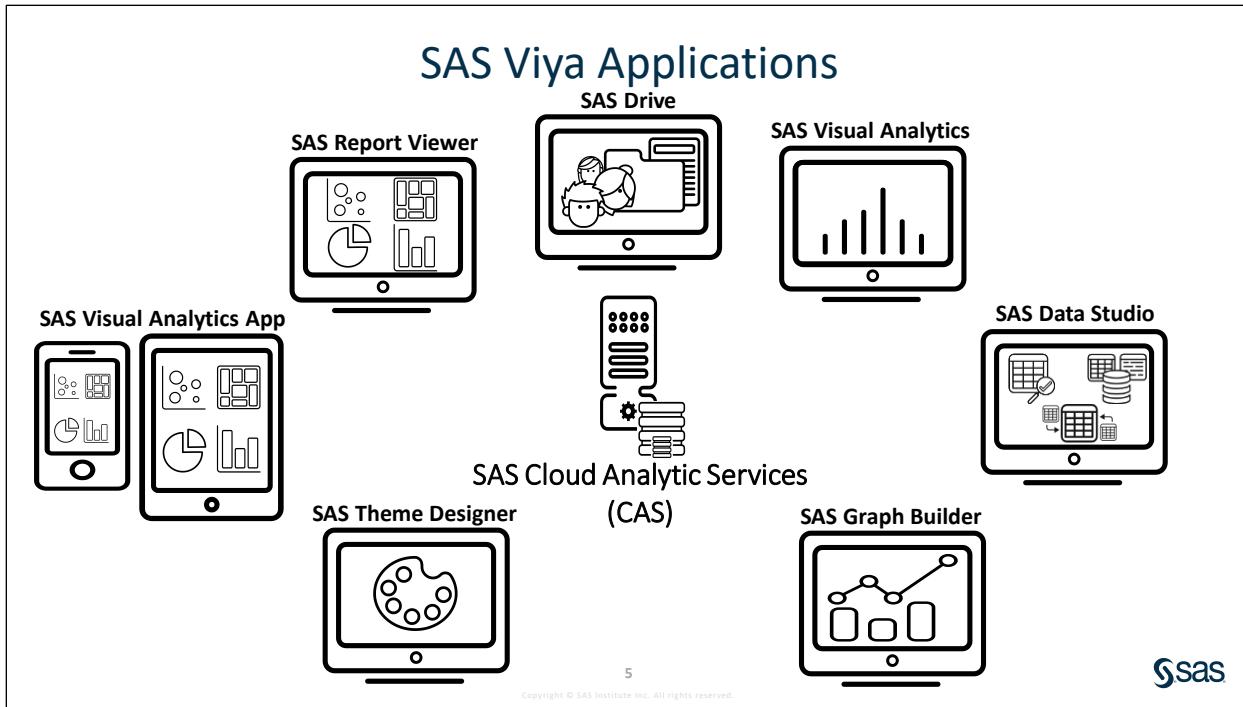


4



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



Business Scenario: Customers

Based on the investigation of the data and the assignment (analyze profits for the Marketing team and analyze delivery times for the Shipping team), you need to make some changes to data items in the **CUSTOMERS** table.

68,300 customers

747,953 orders

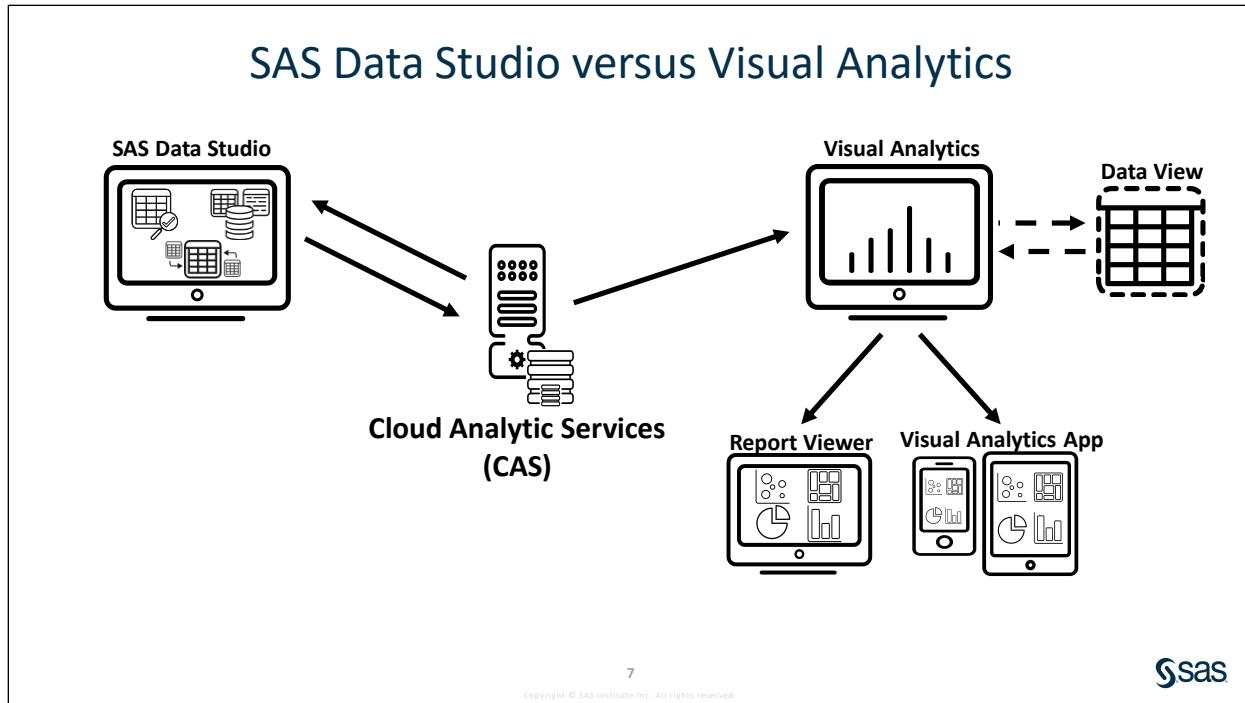
You can make more changes as you perform the analysis.

Modify
Formats
Aggregations

Rename
Data Items

6

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SAS Visual Data Studio uses a CAS table as input and creates a CAS table as output.

SAS Visual Analytics uses a CAS table as input and creates a report that can be viewed in the Report Viewer or Mobile BI app. Any changes to data made in Visual Analytics apply to the report only and do not affect the CAS table.

Beginning with Visual Analytics 8.3, report data views can be created to save and apply settings for a data source. A data view acts as a template for any settings that are modified, including data property changes, data source filters, hierarchies, geography data items, calculated items, and more. A data view does not update the CAS table. If the view is updated, your reports are not automatically updated with the new settings.

Data views are saved separately from your reports. If you create a data view in one report, you can apply it to other reports that use the same data source.

Data views can be shared so other users can also apply them to the data source.

A data source can have a default view as set by an administrator. You can also set the default view for yourself. A default data view is automatically applied anytime you add the data source to a report.

For more information about data views, see “Working with Data Views in Reports” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

Data Item Properties

In the Data pane, properties can be modified for each data item to aid in your analysis.

Category

Continent Name - 5
 Name:

 Classification:
▼

Datetime

Customer Birth Date - 4.4K
 Name:

 Format:
▼

Measure

Cost
 Name:

 Classification:
▼

 Format:
▼

 Aggregation:
▼

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In the Data pane, an icon next to each data item indicates the type 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 a default 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 type 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 Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. If necessary, click **New** and select **Report** in the top left corner of SAS Drive.
3. In the left pane, click **Data**.
4. In the Open Data Source window, click **Data Sources**.
5. Double-click **cas-v4e20-default**.

Note: Your CAS default server might be different from the one selected above.

6. Double-click **YVA183 PATH**.

File	Created
CATEGORIES.sashdat	01/10/18 05:06 PM
COURSES.sashdat	01/09/18 12:20 PM
CUSTOMER_LAT_LONG.sashdat	01/09/18 12:18 PM
CUSTOMERS_CLEAN.sashdat	01/09/18 12:34 PM

7. Select **CUSTOMERS_CLEAN**.

Note: If **CUSTOMERS_CLEAN** does not exist, then right-click **CUSTOMERS_CLEAN.sashdat** and select **Load**.

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 Data pane in SAS Data Studio. At the top, there is a dropdown menu set to "CUSTOMERS_CLEAN". Below it is a search bar labeled "Filter". A plus sign icon followed by "New data item" is present. A minus sign icon followed by "Category" is expanded, revealing a list of data items with their respective icons and counts:

- City Name - 11K
- Continent Name - 5
- Customer Birth Date - 4.4K
- Customer Country - 47
- Customer Group Name - 3
- Customer ID - 68K
- Customer Type Name - 7
- Customer_FirstName - 16K
- Customer_LastName - 42K
- Date Order was Delivered - 1.8K

9. If necessary, click the **Data** icon in the left pane.
10. Verify that **Customer ID** and **Order ID** appear in the Category group, because the data type was changed to character in SAS Data Studio.

Note: Character and datetime data items appear as categories in Visual Analytics.

11. Verify that the new columns created in SAS Data Studio (**Customer_FirstName**, **Customer_LastName**, and **Title**) appear in the Category group.

▼ Category

- City Name - 11K
- Continent Name - 5
- Customer Birth Date - 4.4K
- Customer Country - 47
- Customer Group Name - 3
- Customer ID - 68K
- Customer Type Name - 7
- Customer_FirstName - 16K
- Customer_LastName - 42K
- Date Order was Delivered - 1.8K
- Date Order was placed ... - 1.8K
- Order ID - 748K
- Order Type - 3
- Postal code - 19K
- State Name - 272
- Title - 2

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

Note: Numeric (double) data items appear as measures in Visual Analytics.

The screenshot shows a list of data items under the 'Measure' category. The 'Cost' section is expanded, showing 'Days to Delivery' and 'Profit'. Both 'Days to Delivery' and 'Profit' are highlighted with red rectangular boxes.

- ▼ Measure
- ❖ Cost
 - ❖ Days to Delivery
 - ❖ Profit
- ❖ Frequency
- ❖ Quantity Ordered
- ❖ Retail Price

Note: **Cost** and **Retail Price** were renamed in SAS Data Studio to **Unit Cost** and **Total Revenue**, respectively. Those new names are not reflected because Visual Analytics displays labels, not data source names.

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

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

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

- a. In the Measure group, click (Edit properties) next to **Profit**.
- b. Click (Edit) for the **Format** field.
- c. If needed, change **Width** to **12**.
- d. If needed, change **Decimals** to **2**.
- e. Click **OK**.

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

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

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

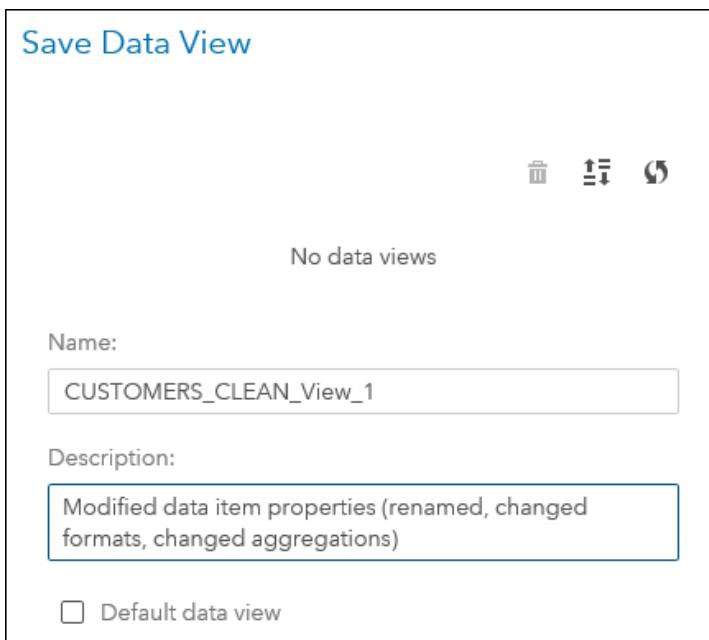
- a. In the Measure group, click  (Edit properties) next to **Days to Delivery**.
- b. Select **Average** for the **Aggregation** field.
- c. Enter **Average Days to Delivery** in the **Name** field and click  (Edit properties) to collapse the data item.

17. Rename data items.

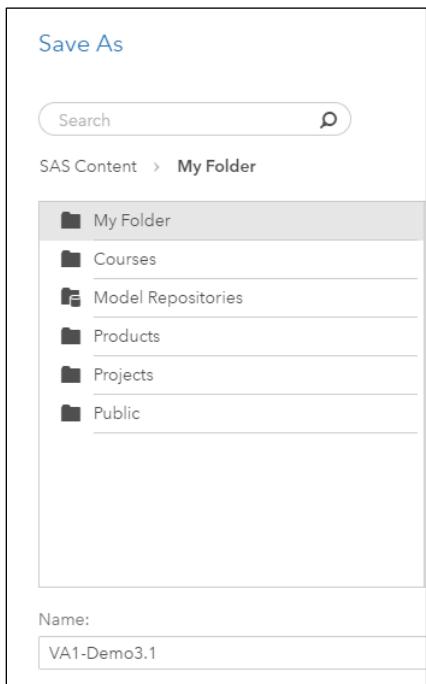
- a. In the Category group, click  (Edit properties) next to **Date Order was placed by Customer**.
- b. Enter **Order Date** in the **Name** field and click  (Edit properties) to collapse the data item.
- c. In the Measure group, click  (Edit properties) next to **Cost**.
- d. Enter **Unit Cost** in the **Name** field and click  (Edit properties) to collapse the data item.
- e. In the Measure group, click  (Edit properties) next to **Quantity Ordered**.
- f. Enter **Quantity** in the **Name** field and click  (Edit properties) to collapse the data item.
- g. In the Measure group, click  (Edit properties) next to **Retail Price**.
- h. Enter **Total Revenue** in the **Name** field and click  (Edit properties) to collapse the data item.

18. Create a data view.

- a. Click  (Actions) and select **Save data view**.
- b. Verify that **CUSTOMER_CLEAN_View_1** appears in the **Name** field.
- c. Enter **Modified data item properties (renamed, changed formats, changed aggregations)** in the **Description** field.



- d. Click **Save**.
19. Save the report.
- In the upper right corner, click  (Menu) and select **Save as**.
 - Navigate to **My Folder**.
 - Enter **VA1-Demo3.1** in the **Name** field.



- d. Click **Save**.

End of Demonstration

Business Scenario: Employees



Based on your investigation of the data and your assignment (analyze salaries to determine employees who can be promoted), you need to make some changes to data items in the **EMPLOYEES** table.



648 employees

You can make more changes as you perform the analysis.

Modify

Rename

Classifications
Formats

Data Items

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Practice

1. Working with Data Items

- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise3.1** report from the **SAS Content/Courses/YVA183/Basics/Exercises (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
Employee Name	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 in **My Folder**.

End of Practices

3.2 Exploring Data with Charts and Graphs

Objectives

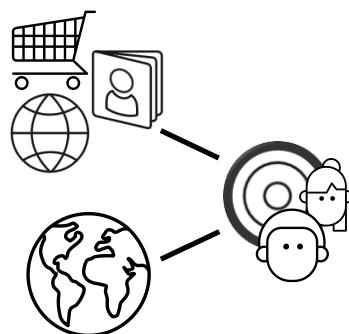
- Discuss when to use descriptive graphs (histogram, box plot, bar chart) in Visual Analytics.
- Maximize graphs objects to view details.
- Modify roles and options for graph objects.

Business Scenario: Customers

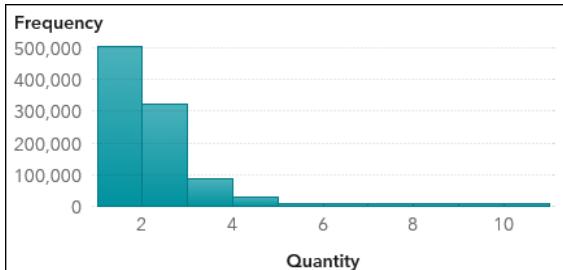


For the Marketing team, you have been asked to analyze profits. As a first step, you would like to understand the range of profits generated by Orion Star, as well as total profits for different order types and from different continents.

You will then use this analysis to determine the focus group for the next marketing campaign.



Objects: Graphs (Descriptive)



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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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 25th and 75th 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 a large number of 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).

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

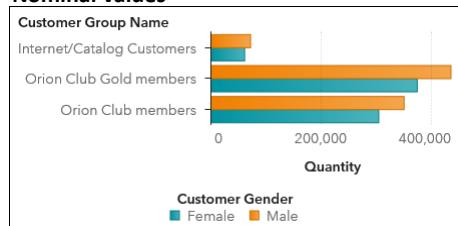
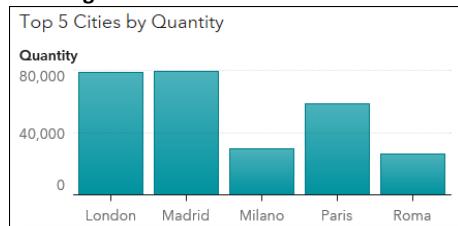
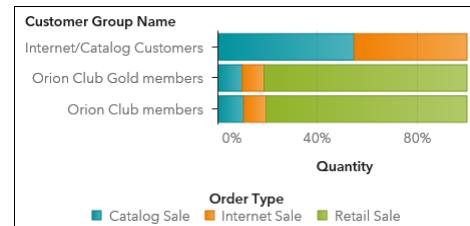
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Objects: Graphs (Descriptive)

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

Nominal values**Time series data****Rankings****Parts of a whole**

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.



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 Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to **SAS Content/Courses/YVA183/Basics/Demos (Marketing)**.
3. Right-click **VA1- Demo3.2a** and select **Edit**.
4. Turn off automatic graph titles.
 - a. In the upper right corner, select <*user name*> \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
No title ▾

Graphs
No title ▾

Controls
No title ▾

Content
No title ▾

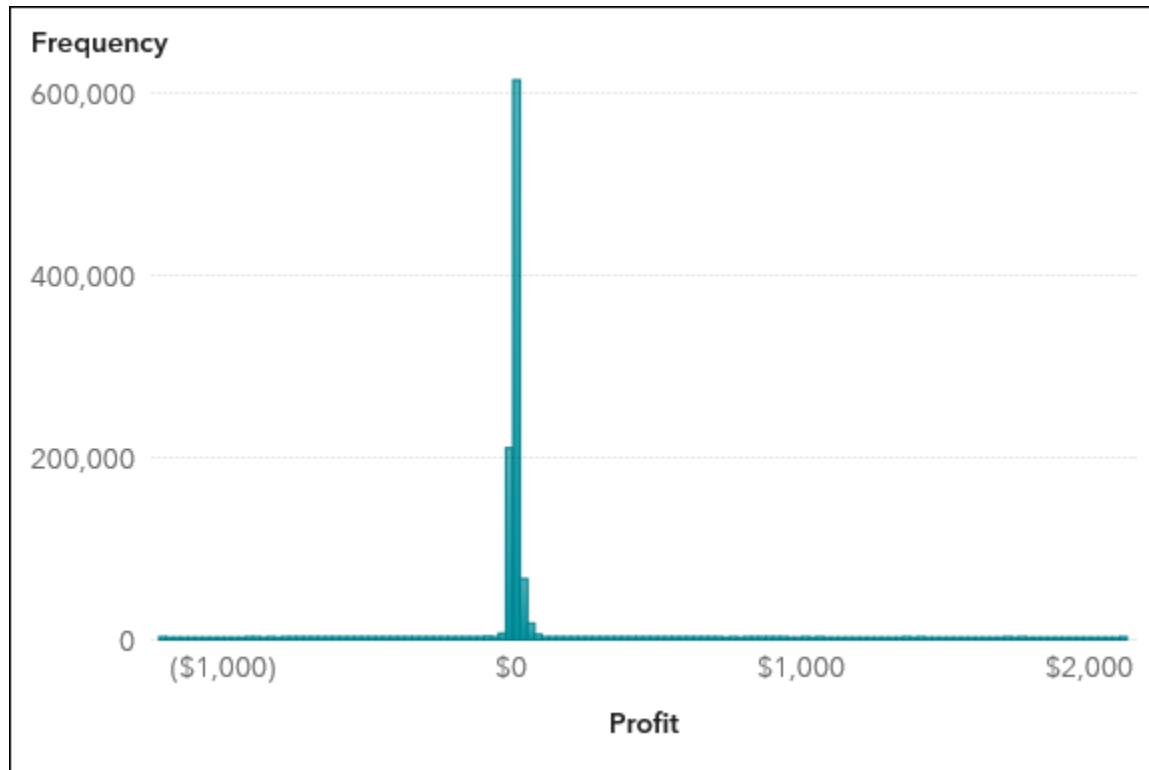
Analytics
No title ▾

- e. Click **Close**.

5. Create an automatic chart.

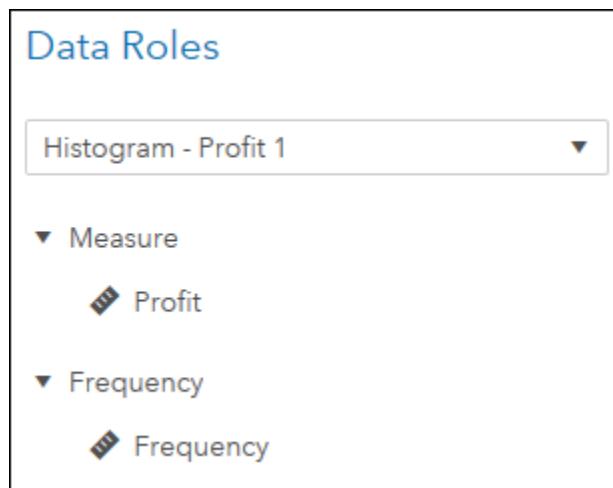
- In the left pane, click the **Data** icon.
- Drag **Profit** from the Data pane to the canvas.

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



A histogram is used to display the distribution of profits.

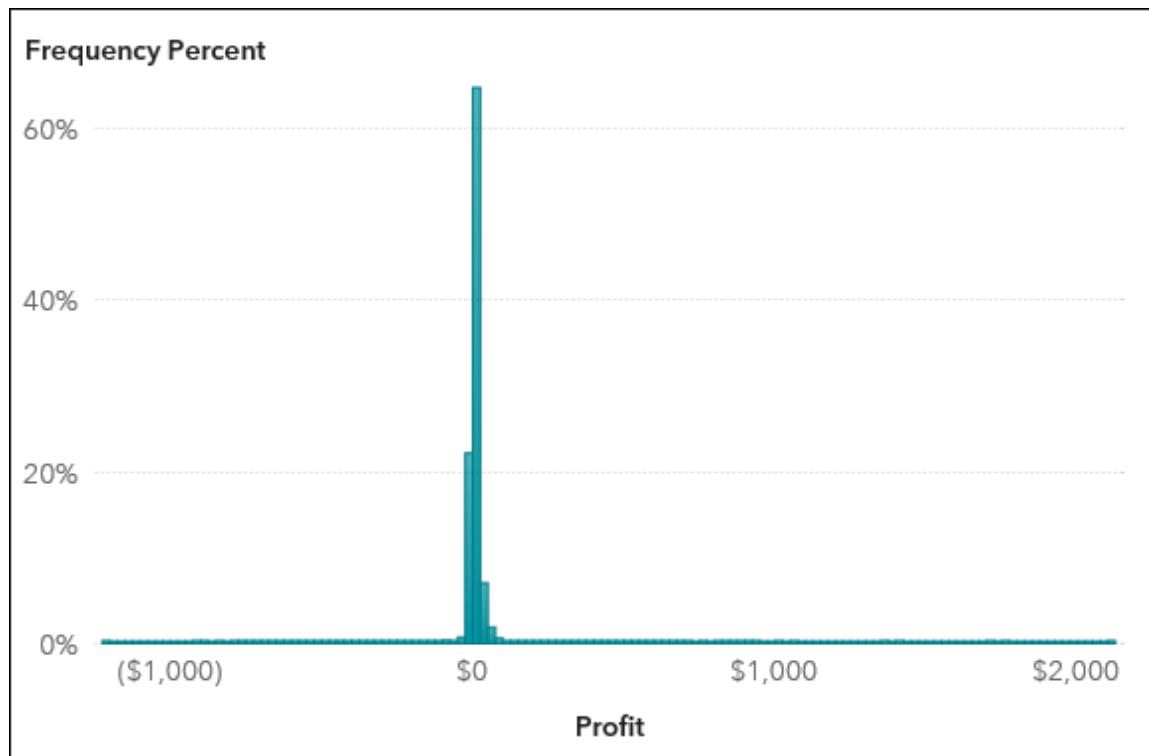
- If necessary, click the **Roles** icon in the right pane.



A histogram accepts two roles, Measure and Frequency.

- d. For the Frequency role, select **Frequency** \Rightarrow **Frequency Percent**.

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



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

- 1) Expand the **Object** group.
- 2) Enter **Distribution of Profit** in the **Name** field.

▼ Object

Name:

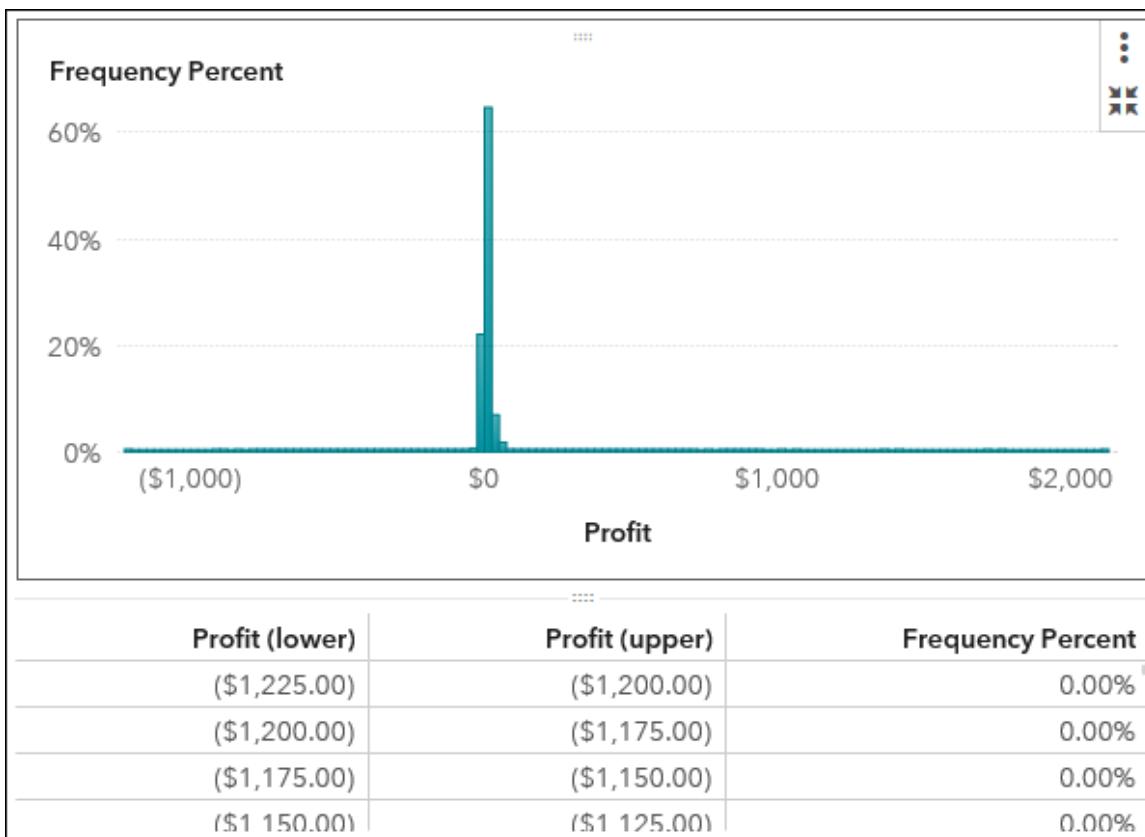
Title:

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

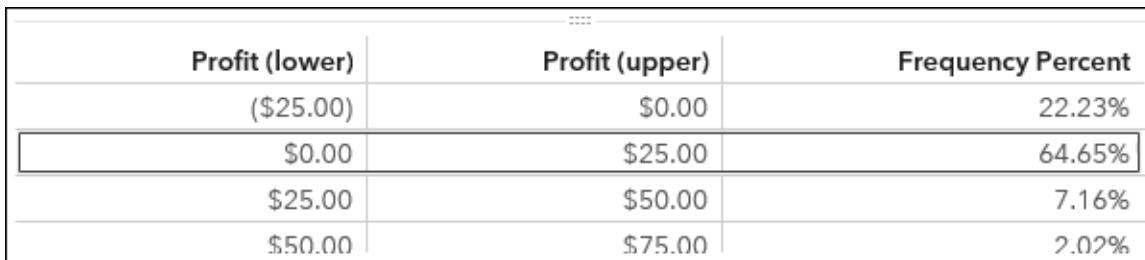
Title:

- f. 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.



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



The table shows the frequency percent for different profit ranges. One row is highlighted in yellow:

Profit (lower)	Profit (upper)	Frequency Percent
(\$25.00)	\$0.00	22.23%
\$0.00	\$25.00	64.65%
\$25.00	\$50.00	7.16%
\$50.00	\$75.00	2.02%

A majority of the products ordered are low profit items, in the \$0 to \$25 range. Also notice that a little more than 20% of items result in a loss. 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?

- i. In the upper right corner, click  (Restore).
6. Create a crosstab.
- In the left pane, click the **Objects** icon.
 - Drag the **Crosstab** object, from the Tables group, to the bottom of the canvas.
 - In the right pane, click the **Roles** icon.

- d. For the Rows role, select **Add** ⇒ **Order Type** and click **OK**.
- e. For the Measures role, select **Frequency** ⇒ **Profit**.

The Roles pane should resemble the following:

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**.

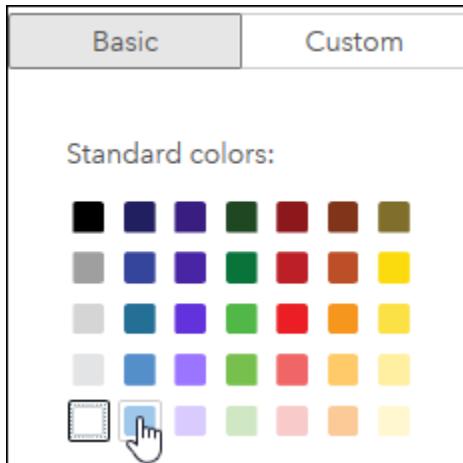
The updated crosstab should resemble the following:

Continent Name ▲	Africa	Asia	Europe	North Amer...	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	\$1,327,595.24	\$367,726.36

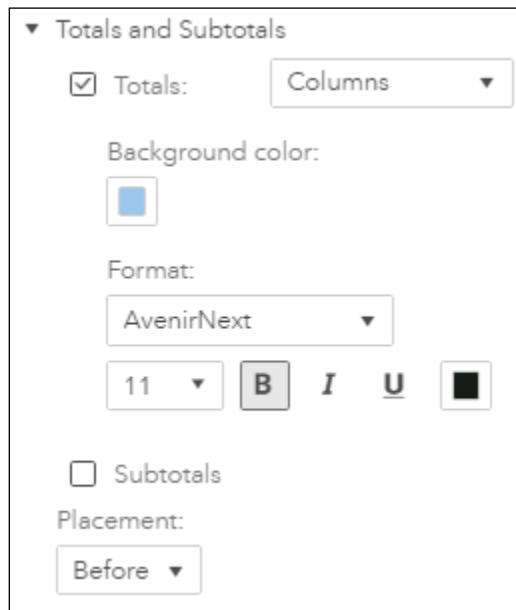
- g. In the right pane, click the **Options** icon.
- h. Expand the **Totals and Subtotals** section.
- i. Select the **Totals** check box.

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 **Sail blue**.



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



The updated crosstab should resemble the following:

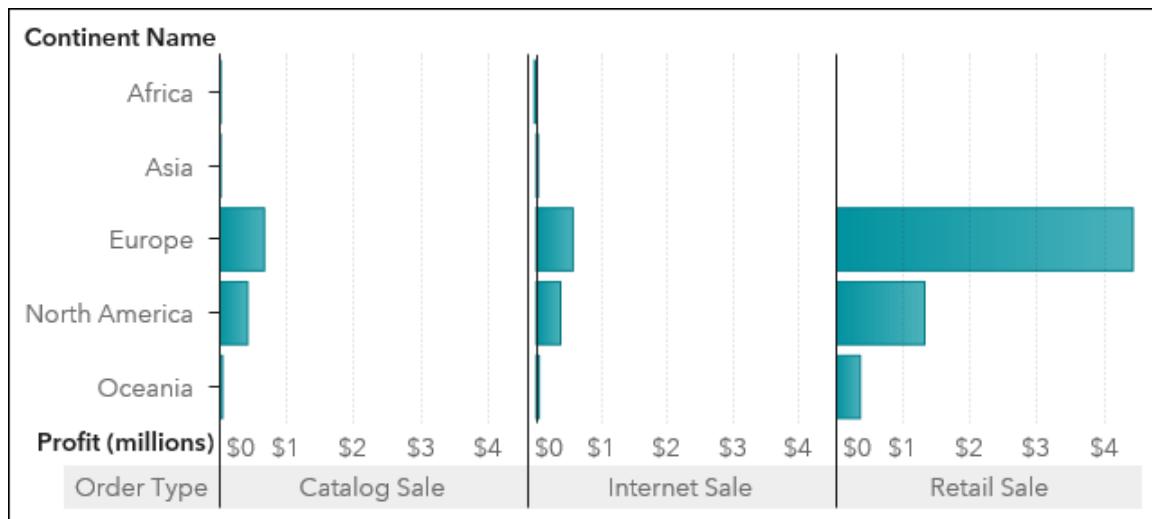
Continent Name ▲	Africa	Asia	Europe	North America	Oceania
Order Type ▲	Profit	Profit	Profit	Profit	Profit
Total	(\$127.68)	\$15,503.70	\$5,659,450.59	\$2,121,645.57	\$462,934.63
Catalog Sale	\$730.57	\$7,564.99	\$670,252.82	\$423,428.89	\$51,403.52
Internet Sale	(\$858.24)	\$7,938.71	\$559,663.83	\$370,621.44	\$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 located 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?

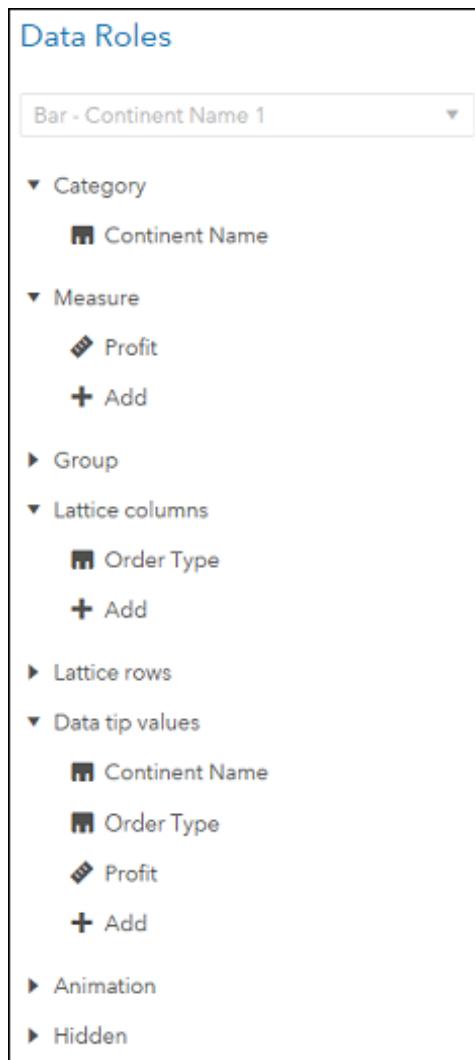
7. Change the crosstab to a bar chart.

- 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 bar chart has many more roles available.

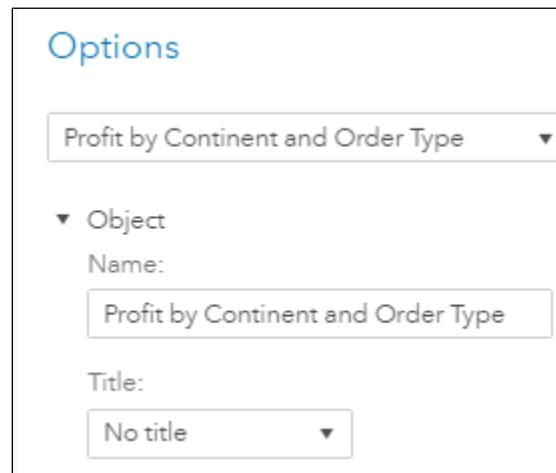
- Category data items can be added to the Group role to show additional bars for each category, or to the Lattice columns and Lattice rows roles to add additional bar charts for each distinct category.
- Category and Measure data items can be added to the Data tip values role to show additional information when a bar is selected.
- 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 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:

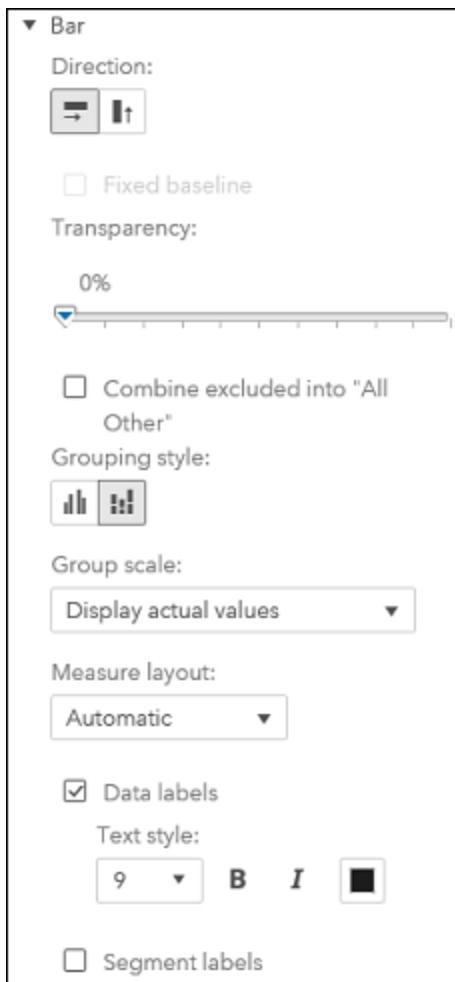


- d. In the right pane, click the **Options** icon.
e. Expand the **Object** group.
f. Enter **Profit by Continent and Order Type** in the **Name** field.

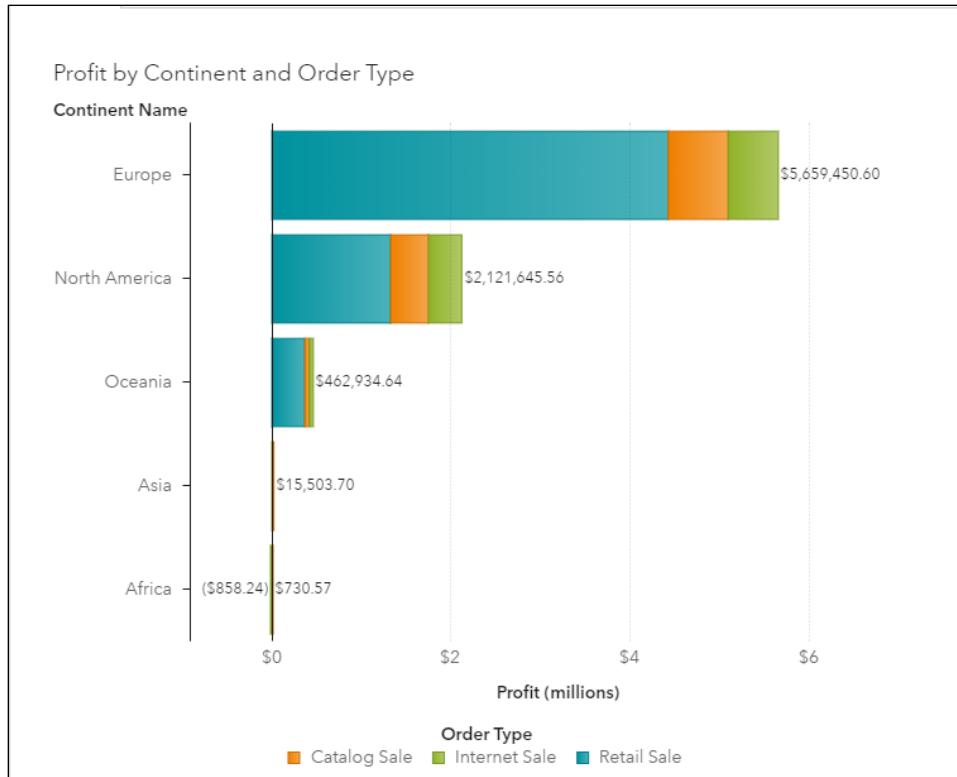


- g. In the Bar group, for the **Grouping style** field, click (**Stacked**).
h. Select **Data labels**.
i. Select **9** for the **Text style** field.

The Options pane should resemble the following:

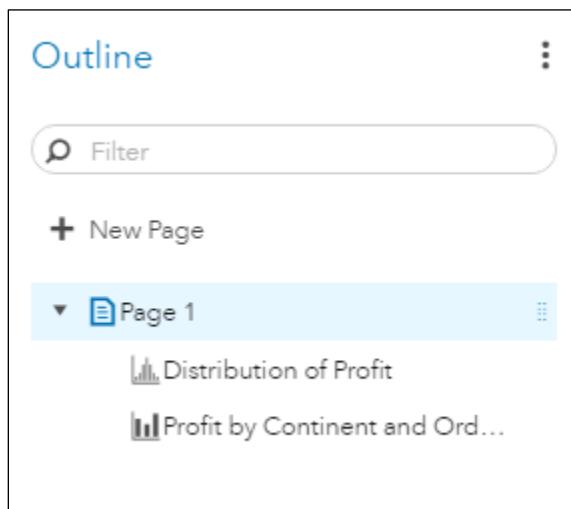


The updated bar chart should resemble the following:



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.

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



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

9. In the upper right corner, click (**Menu**) and select **Save As**.
10. Navigate to **My Folder**.
11. Click **Save**.

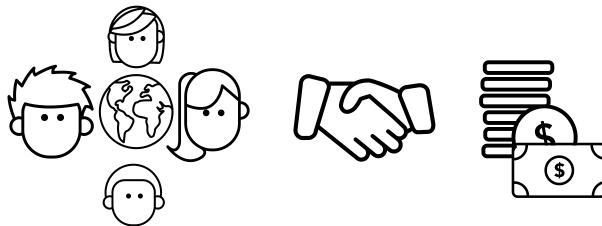
End of Demonstration

Business Scenario: Employees



For the Human Resources team, you have been asked to analyze salaries to determine which employees could be eligible for promotion. As a first step, you would like to understand the range of salaries at Orion Star, as well as total salaries by job title.

You will then use this analysis to determine the employees targeted for promotion.



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The SAS logo, which consists of a blue stylized 'S' followed by the word "sas" in a lowercase, sans-serif font.



Practice

2. Exploring Data: Part 1

- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise3.2a** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
- Create an automatic chart using the following data items:

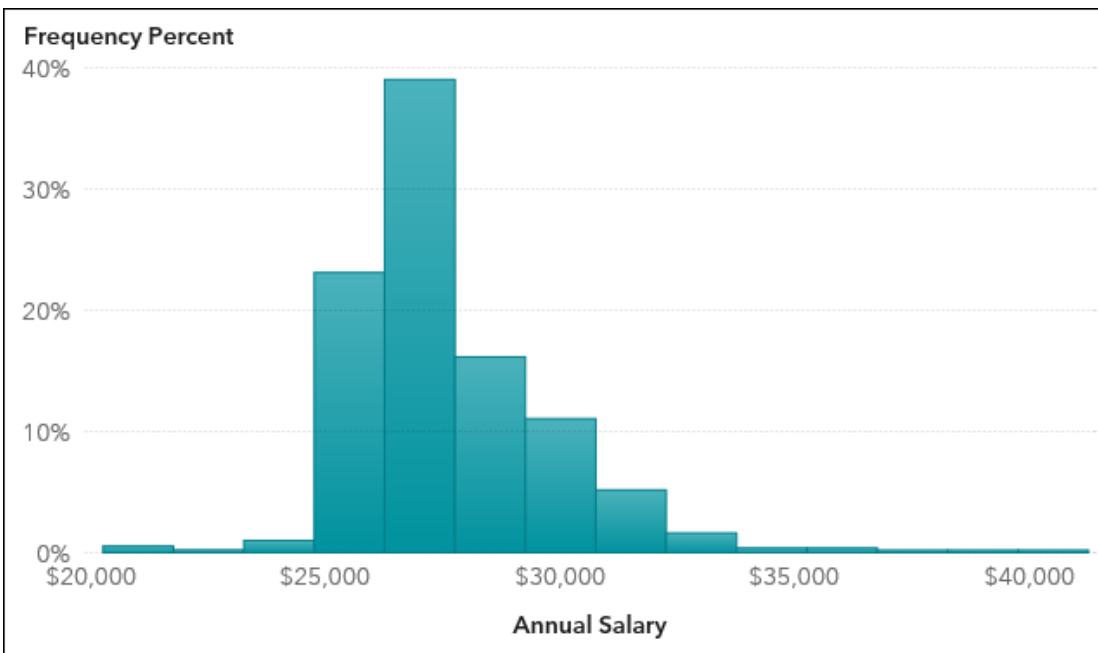
Annual Salary

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 a majority of salaries fall?

Answer: _____

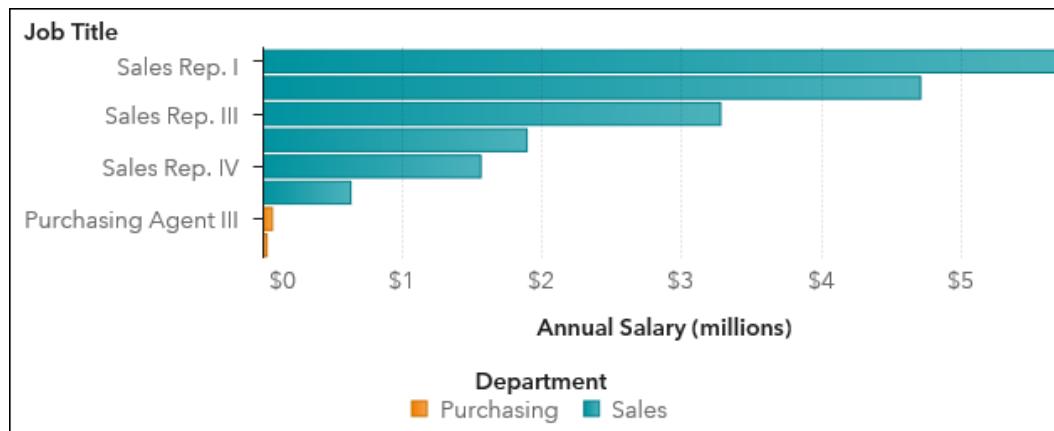
Hint: After answering the question, click (**Restore**) in the upper right corner.

- 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:

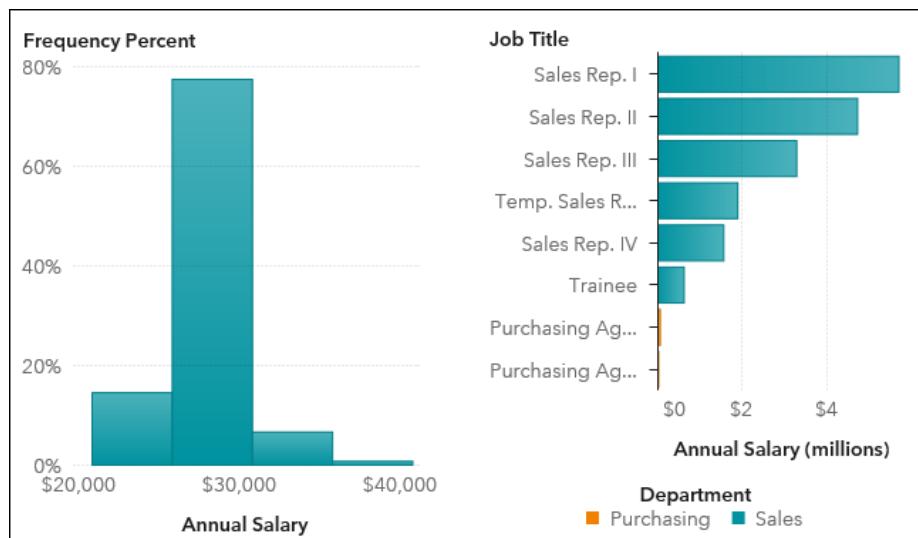
In which department are a majority of our salary costs spent? For which job title?

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 in **My Folder**.

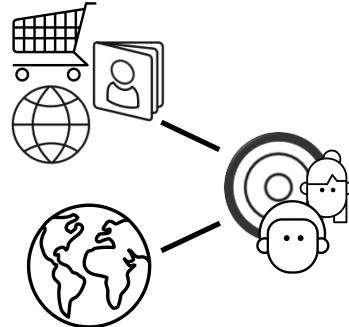
End of Practices

Business Scenario: Customers



In the previous analysis, you discovered that profits were lower in the internet and catalog channels. Continue to analyze profits by order type to determine ways to improve profits through these channels.

You also discovered that profits were lower in North America than in Europe, even though you expected the opposite. Continue to analyze profits by location to understand why this discrepancy exists and determine ways to improve profits in non-European countries.

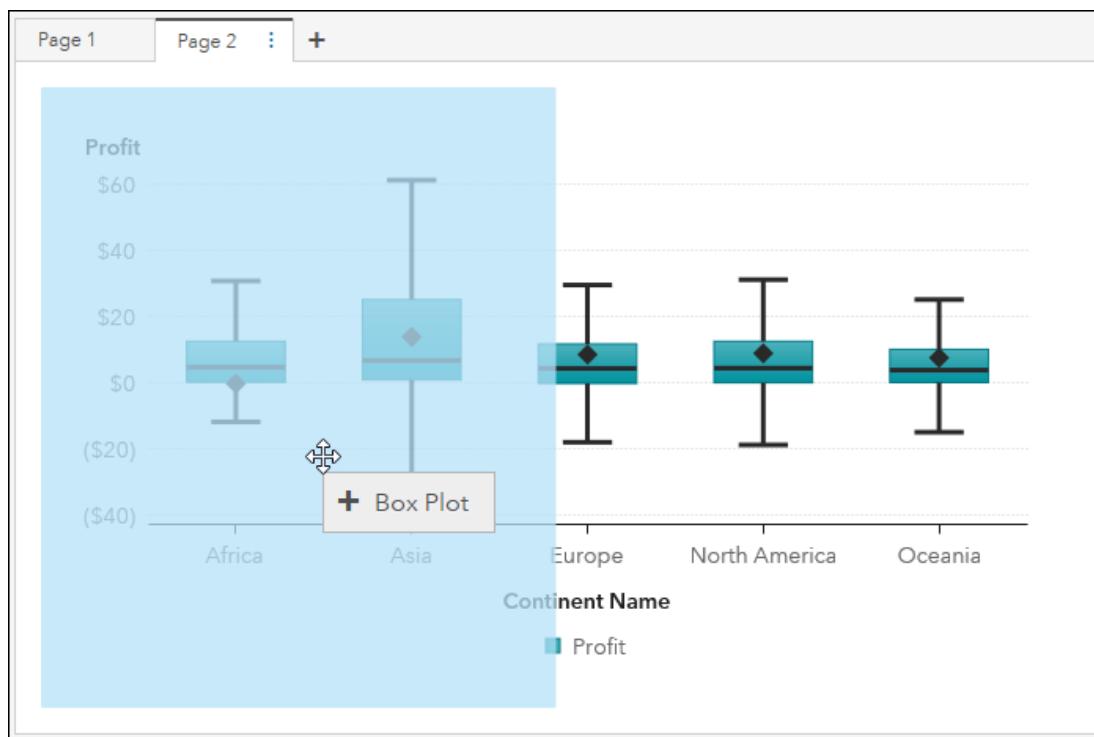




Exploring Data: Part 2

This demonstration illustrates how to use box plots to explore data in Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo3.2b** and select **Edit**.
4. In the upper left corner of the report, click the **Page 2** tab.
5. 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**.

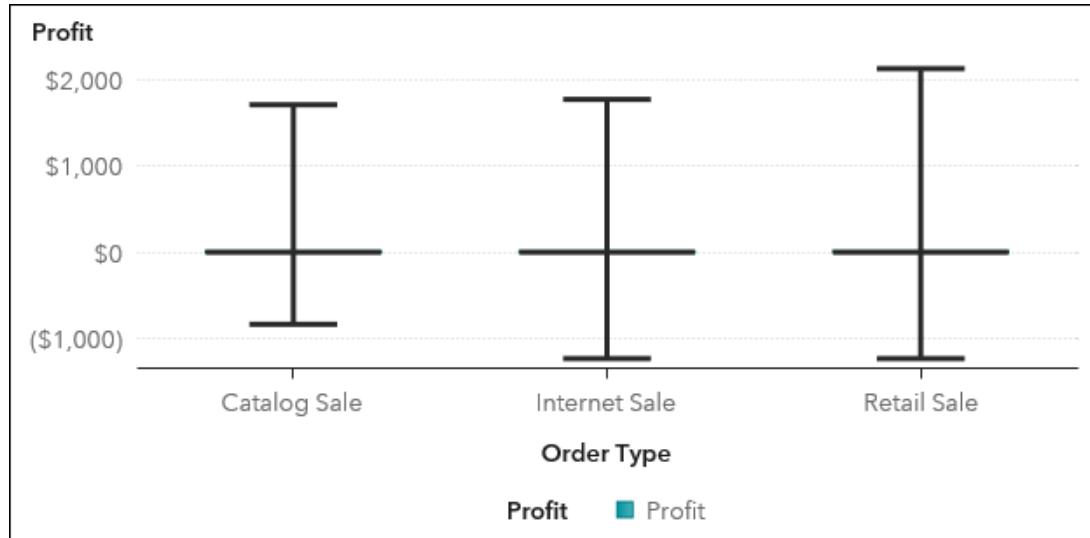
The Roles pane should resemble the following:

Data Roles

Box - Order Type 1 ▾

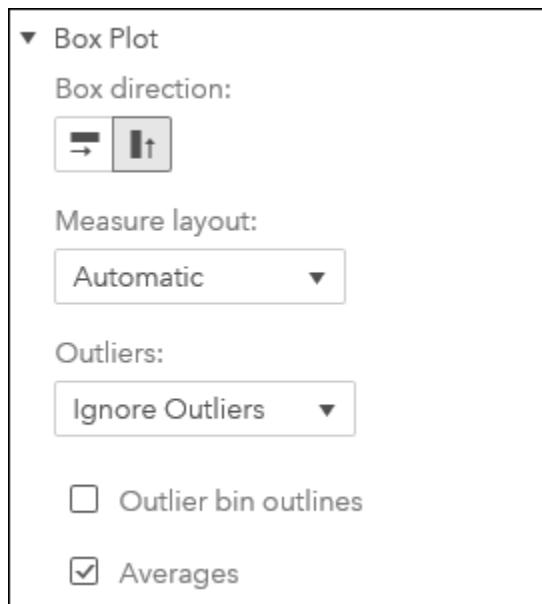
- ▼ Category
 - Order Type
- ▼ Measures
 - ₩ Profit
 - + Add
- ▼ Lattice columns
 - + Add
- ▼ Lattice rows
 - + Add

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.

- I. 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 located 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?

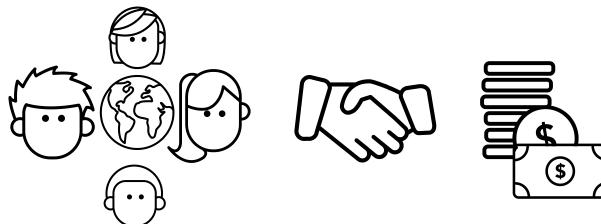
- n. In the upper right corner, click  (**Restore**).
6. In the upper right corner, click  (**Menu**) and select **Save As**.
7. Navigate to **My Folder**.
8. Click **Save**.

End of Demonstration

Business Scenario: Employees



In the previous analysis, you discovered that salary costs were higher for employees with the Sales Rep. I title. Continue to analyze salary costs by job title to determine employees that might qualify for promotion.





Practice

3. Exploring Data: Part 2

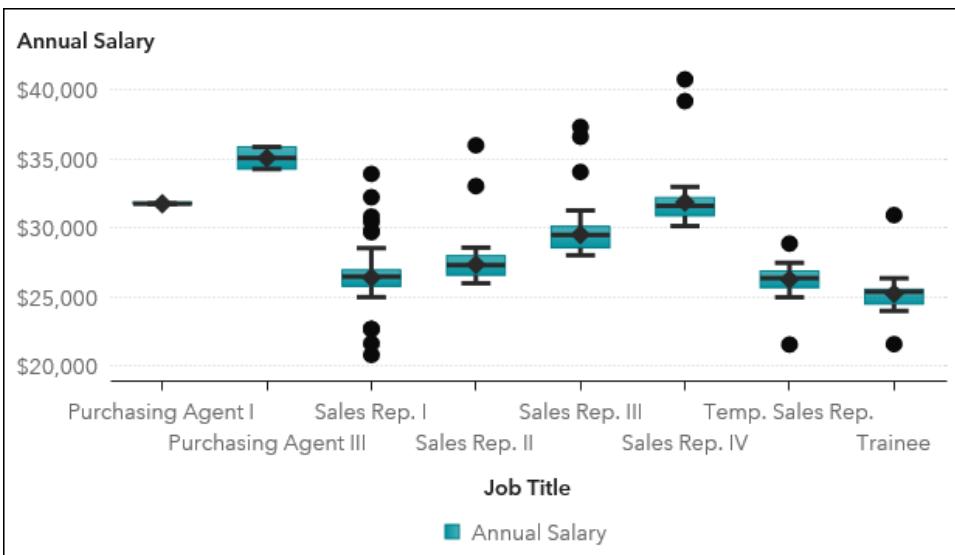
- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise3.2b** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
- On Page 2, create a box plot by assigning the following data items to the specified roles:

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 in **My Folder**.

End of Practices

3.3 Creating Data Items and Applying Filters

Objectives

- Describe the types of data items that can be created in Visual Analytics.
- Discuss the difference between calculated items and aggregated measures.
- Describe the various ways that data can be filtered in Visual Analytics.
- Discuss when to use geographic maps in Visual Analytics.

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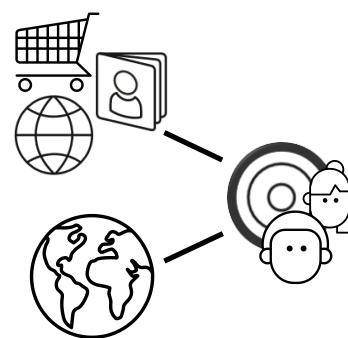
Business Scenario: Customers



In the previous analysis, you discovered higher total profits for retail sales despite slightly higher average profits for internet and catalog sales. Why are the total profits higher for this group?

In addition to the analysis of profits by order type and continent, you also need to analyze profits by gender and age group to determine a focus group for our next marketing campaign.

You need to create new data items for this analysis.



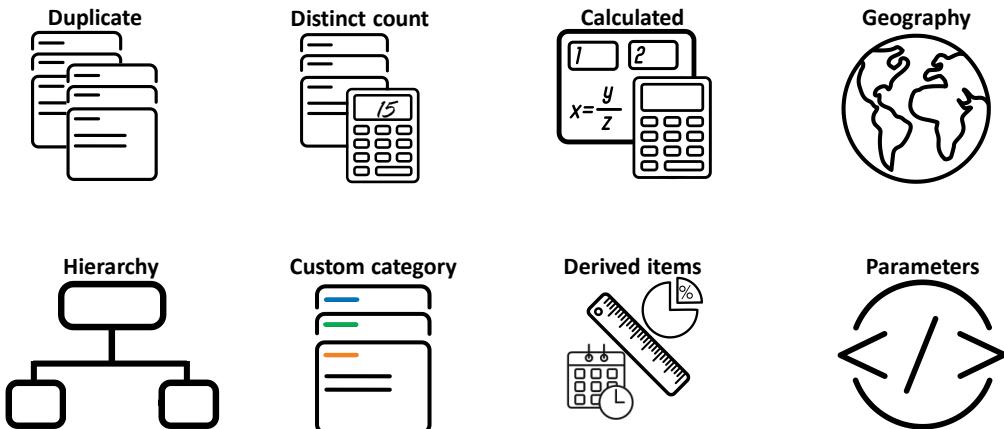
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Creating Data Items

The following data items can be created in Visual Analytics:



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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 8.3: 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 8.3: 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	Two types of calculated items can be created: calculated data items or aggregated measures. 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 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 8.3: Working with Report Data</i> documentation. For more information about operators, see “Reference: Operators for Data Expressions” in the <i>SAS® Visual Analytics 8.3: 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 polygon data from a separate data source with map regions (custom). For more information about creating geography data items, see “Working with Geography Data Items” in the <i>SAS® Visual Analytics 8.3: 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, has levels for year, quarter, month, and day. A date hierarchy created from a datetime data item has 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 8.3: 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 intervals, 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 8.3: 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>	
	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.
	<p>The following types of derived data items can be created from measure data items:</p>	
	Cumulative total	Displays a running total of all the values for the measure on which it is based.
	Data suppression	Obscures aggregated data if individual data values could easily be inferred. Data suppression replaces all values for the measure on which it is based with an asterisk (*) unless a value represents the aggregation of a specified minimum number of values. For more information, see “Reference: Operators for Data Expressions” in the <i>SAS® Visual Analytics 8.3: Working with Report Data</i> documentation
	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.
	Moving average	Displays a moving average (rolling average) for the measure on which it is based. The moving average calculates the average for each value with the specified number of preceding values
	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 previous parallel period	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.

	Percent of subtotals	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. Note: The Percent of subtotals derived item is available only for use in crosstabs. Note: The Percent of subtotals derived item is relative to the subset of data that is selected by your filters and ranks.
	Percent of total – sum	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. Note: The Percent of total – sum derived item is relative to the subset of data that is selected by your filters and ranks.
	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).
	For more information about derived items, see "Working with Data Items in a Report" in the <i>SAS® Visual Analytics 8.3: Working with Report Data</i> documentation.	
Parameters	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 8.3: Working with Report Data</i> documentation.	

Note: Creating calculated items and aggregated measures is discussed in more detail in the *SAS® Visual Analytics 2 for SAS® Viya®: Advanced* course.

Calculated Item: Example

Calculated items are created by performing operations on unaggregated data.

(Salary * Increase)

Gender	Salary	Increase	New Salary
Male	40,000		1.05
Female	65,000		1.10
Female	32,000		1.05
Male	80,000		1.10
Female	56,000		1.15



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The SAS logo consists of a stylized blue 'S' followed by the word 'sas' in a lowercase sans-serif font.

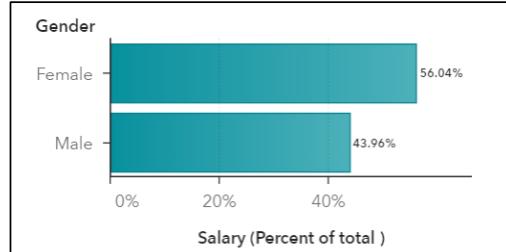
Aggregated Measure: Example

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

(Sum _ByGroup_ (Salary) / Sum _ForAll_ (Salary))

Gender	Salary
Male	40,000
Female	65,000
Female	32,000
Male	80,000
Female	56,000

Gender	Salary
Male	120,000
Female	153,000
TOTAL	273,000



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 sas

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)

A. calculated item

Hemisphere (from continents)

B. aggregated measure

GDP Growth (year-over-year)

Number of Employees (distinct count)

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Custom Category: Example

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

Calculated item



This calculated item and custom category produce equivalent results.

Custom category



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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...
01Jan1938
02Jan1938
03Jan1938
04Jan1938
05Jan1938
06Jan1938
07Jan1938
08Jan1938
09Jan1938
10Jan1938
11Jan1938
12Jan1938



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Calculated Columns: Customer Age

$$\text{Floor} \left(\left(\text{TreatAs} \left[\begin{array}{l} \text{Number} \\ \text{DatePart} \left(\text{Now} \right) \end{array} \right] - \text{TreatAs} \left[\begin{array}{l} \text{Number} \\ \text{Customer Birth Date} \end{array} \right] \right) / 365.25 \right)$$

The *Now* operator creates a datetime value using the current date and time, where the current date and time is evaluated every time you view the report.

The *DatePart* operator converts a datetime value to a date value.

The *TreatAs* operator enables a numeric, or datetime, value to be used as a different data type within other operators.

The *Floor* operator rounds the number down to the nearest integer.

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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 Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo3.3a** and select **Edit**.
4. In the upper left corner of the report, click the **Page 3** tab.
5. 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.

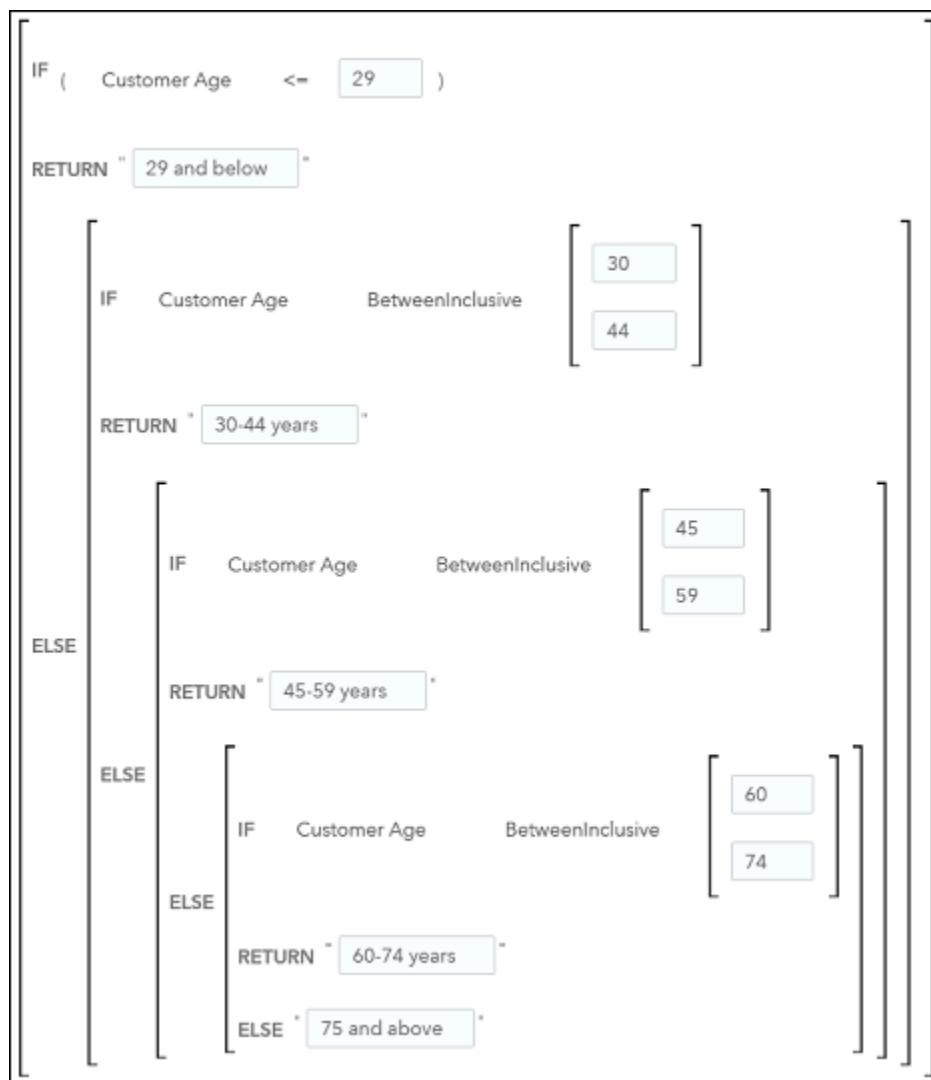
Note: You can view the calculation by right-clicking the calculated item and selecting **Edit**.

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

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

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

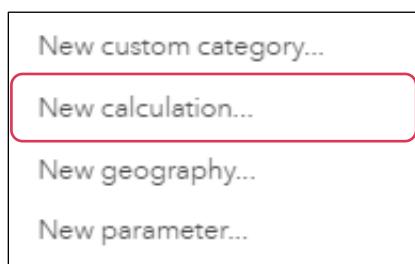
The expression should resemble the following:



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

6. 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:

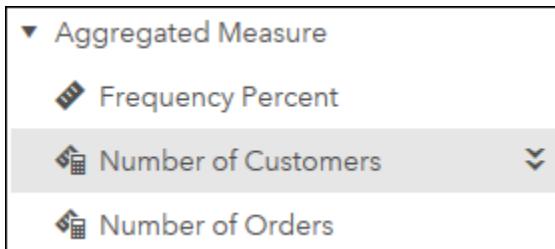
Create Calculation

Name:
Number of Customers

Type:
Distinct count ▾

- e. Click **OK**.

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



7. Create an automatic chart.

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

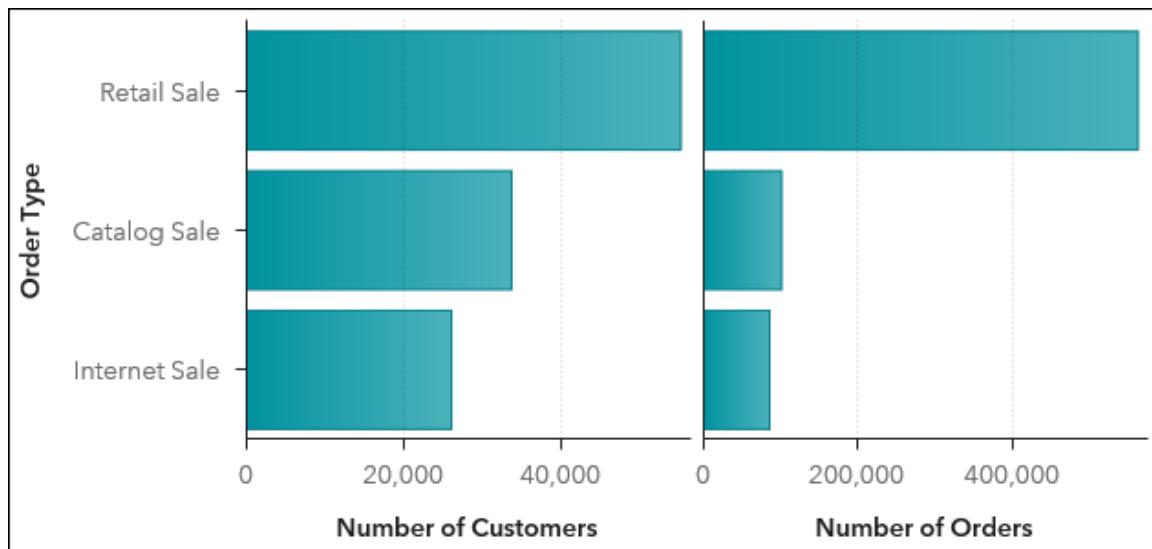
Number of Orders

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.



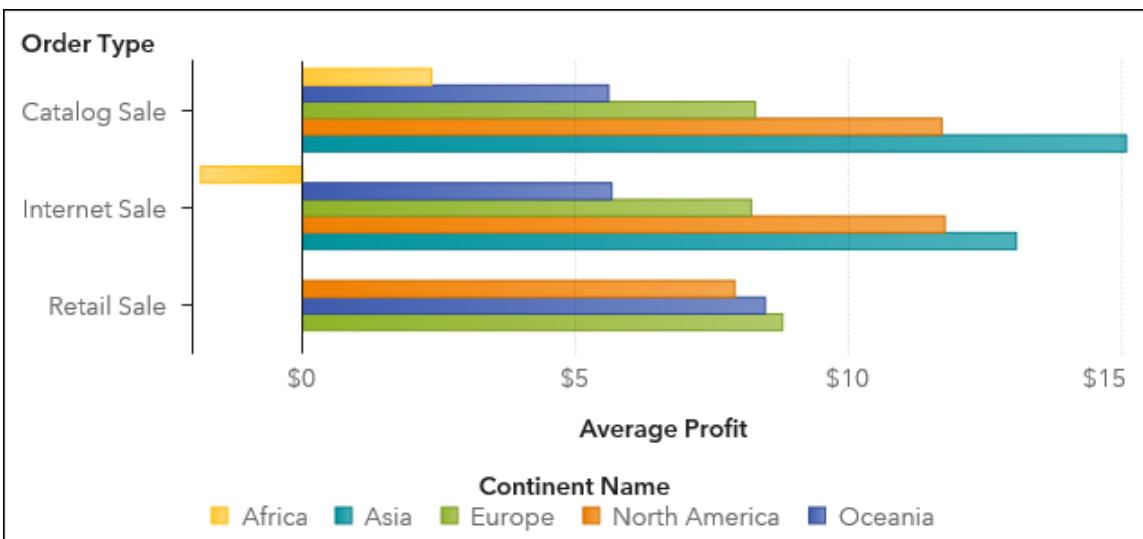
Total profit is lower in the internet and catalog channels because there are fewer customers that place orders through those channels. There are also significantly lower orders placed through those channels.

- 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.
8. 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.
9. 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 screenshot shows the 'Data Roles' pane with a dropdown menu 'Average Profits by Order Type and C...'. Below it, under 'Category', there is an item 'Order Type'. Under 'Measure', there are two items: 'Profit' (which is currently selected, indicated by a blue highlight) and 'Average Profit'. A cursor is pointing at the 'Average Profit' item.

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 are located 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. Then, if the marketing strategy is successful, it will be implemented in other locations.

10. 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.
 - Type **Male** and press Enter.

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

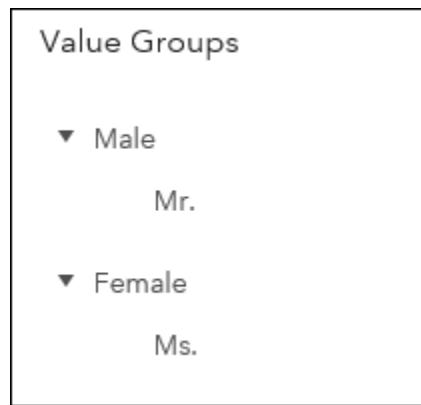
The screenshot shows the 'Values of Title' pane on the left and the 'Value Groups' pane on the right. In the 'Values of Title' pane, there is a 'Filter' search bar and two checkboxes: 'Mr.' and 'Ms.'. In the 'Value Groups' pane, there is a section titled 'Male' with a dropdown arrow. Below it is a blue rectangular area labeled 'Drag values here' with a small icon. A hand cursor is shown dragging the 'Mr.' checkbox from the left pane to this 'Drag values here' area. The 'Ms.' checkbox remains in the left pane.

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

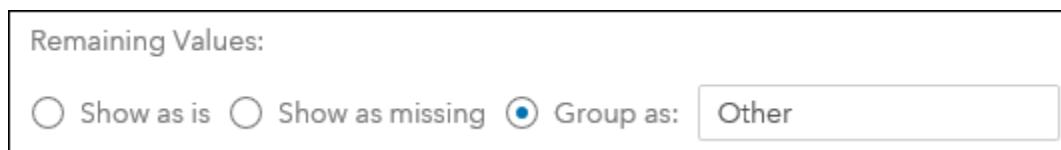
The screenshot shows the 'Values of Title' pane on the left and the 'Value Groups' pane on the right. In the 'Values of Title' pane, the 'Ms.' checkbox is now highlighted with a dashed border. In the 'Value Groups' pane, there is a section titled 'Male' with a dropdown arrow. Below it is a blue rectangular area labeled '+ Click or drag values here to add a value group'. A hand cursor is shown dragging the 'Ms.' checkbox from the left pane to this 'Click or drag values here to add a value group' area. The 'Mr.' checkbox remains in the left pane.

- 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.



- 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"
  
```

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

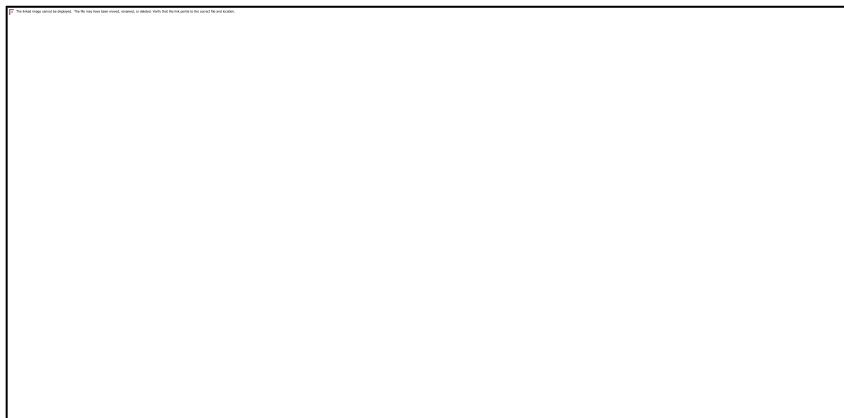
Category

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

11. 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 Profits 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:



Note: Since customer age is calculated using the NOW function, this chart will change over time.

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

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

13. Navigate to **My Folder**.

14. Click **Save**.

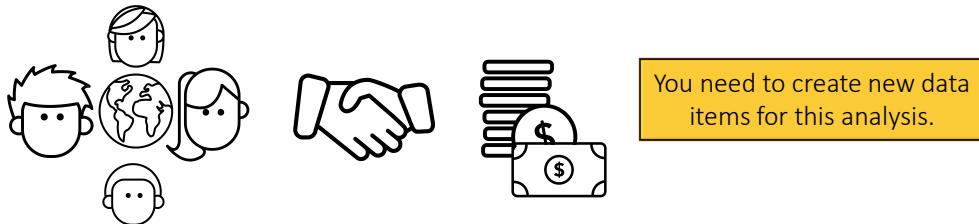
End of Demonstration

Business Scenario: Employees



In the previous analysis, you discovered higher salary costs for employees with the Sales Rep. I title despite having relatively low average salary costs. Why are total salary costs higher for this group?

In addition to the analysis of salaries by job title, you also need to analyze the type of employee (active versus retired) and years of service to determine which employees to target for the next round of promotions.



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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
01Jan2005	.
25Jan2005	.
01Feb2005	.
01Mar2005	28Feb2010
01Apr2005	.
01Apr2005	31Jan2010
01May2005	.
01Jun2005	31Jan2008
01Jul2005	.
01Sep2005	.
01Nov2005	.
11Dec2005	.
01Feb2006	31Aug2008
01Mar2006	.
01Mar2006	30Apr2008

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Practice

4. Creating Data Items

- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise3.3a** report from the **SAS Content/Courses/YVA183/Basics/Exercises (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:



Note: Since Years of Service is calculated using the NOW function, this chart will change over time.

- 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: _____

- h.** Save the report in **My Folder**.

End of Practices

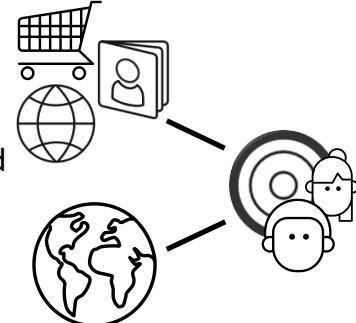
Business Scenario: Customers



Management has decided that our initial marketing strategy should focus on increasing sales among North American customers who order through catalog and internet. If successful, we can push the campaign to other locations.

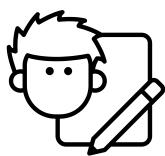
The Marketing team has asked how profits are distributed throughout the United States to see whether there are any clusters that can be identified and used for the campaign.

You need to create new data items, add a filter, and create a hierarchy for this analysis.



Filtering Data

Many different types of filters can be created to subset data in Visual Analytics:



Report Designer

Detail report filters

- Data source
- Basic
- Advanced

Post-aggregate report filters



Report Viewer

Prompts

- Report
- Page

Actions

- Filter
- Links



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 Visual Analytics. 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.
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 8.3* 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® Viya®: Advanced* course.

Objects: Graphs (Geography)

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

Bubbles



Coordinates



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

Contour



Use a *geo contour map* to show very dense data.

Regions



Geo map

A geo map overlays data on a geographic map. Data can be displayed as bubbles, coordinates, colored regions, or a contour. 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.

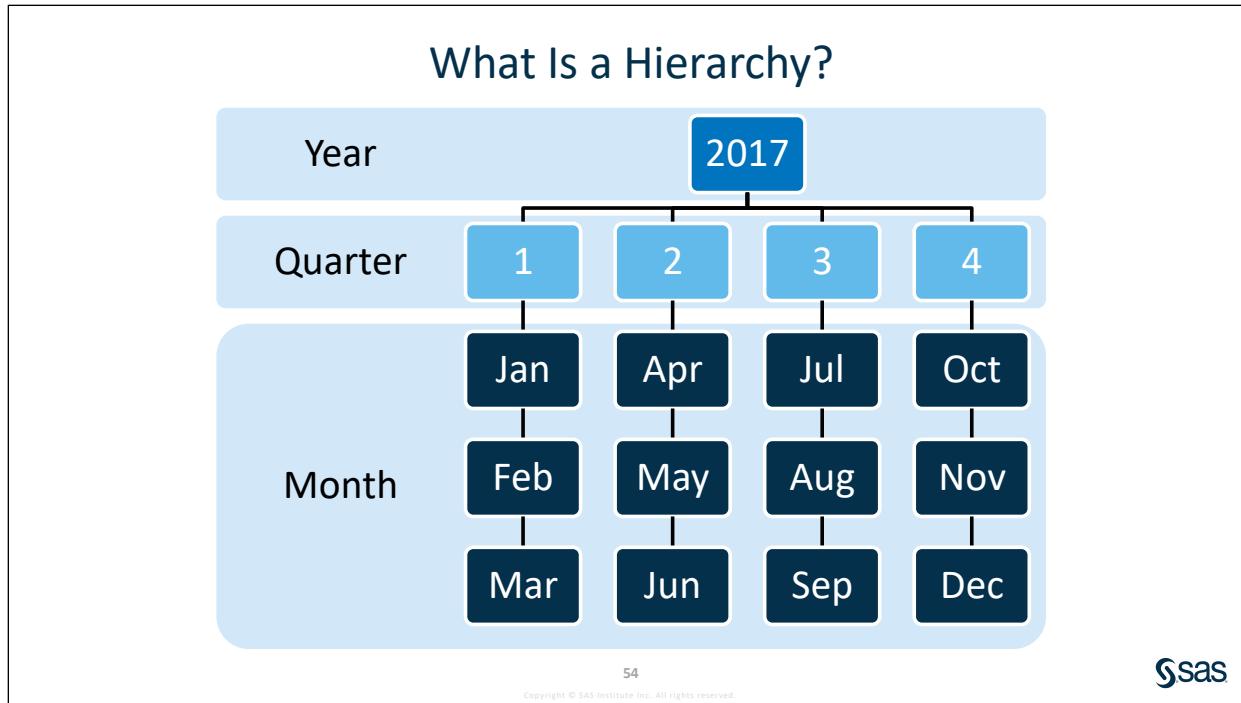
- **Coordinates** - A coordinates geo map (also known as a *dot distribution map* or a *dot density map*) helps with detecting spatial patterns and understanding the distribution of data over a geographical region, which can help reveal patterns using clustered points.
- **Regions** - A regions geo map (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.
- **Contour** - A contour geo map displays shaded regions over a geographical region. Contour maps are best used to show very dense data.

For more information about creating geography data items, see “Working with Geography Data Items” in the *SAS® Visual Analytics 8.3* documentation.

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



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 Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo3.3b** and select **Edit**.
4. In the upper left corner of the report, click the **Page 4** tab.
5. 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.

The map on the right shows that 19% of state names are mapped. Notice the unmapped values.

Edit Geography Item

<p>Name: <input type="text" value="State Name"/></p> <p>Based on: <input type="text" value="State Name"/></p> <p>Geography data type: <input type="text" value="Predefined geographic names and codes"/></p> <p>Name or code context: <input type="text" value="US State Names"/></p>	<p>19% mapped</p>  <p>5 of 220 unmapped values:</p> <p>Aberdeen City</p>
---	---

- 3) Click **OK**.

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

▼ Geography

 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:



- 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:

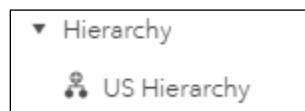
State Name

Postal code

A screenshot of the 'New Hierarchy' window. The 'Name:' field is filled with 'US Hierarchy'. Below it, the 'Available items (16):' list shows 'State Name - 272' and 'Postal code - 19K'. To the right, the 'Selected items (2):' list shows 'State Name - 272' and 'Postal code - 19K'. There is also a 'Filter' button and a scroll bar between the two lists.

- 3) Click **OK**.

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



- 6. Add a data source filter.

- a. 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 products ordered in the United States.

- b. On the left, verify that **Data Items** is selected.
- c. Expand the **Character** group.
- d. Select **Customer Country**.

- e. In the Conditions area, double-click **Customer Country In (x)** to add it to the expression area.

The screenshot shows the 'Customer Country' condition in the expression area. The condition is 'In {none selected}'.

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

The screenshot shows the 'Select Data Values' window. The 'Available items (46)' list contains 'Andorra' and 'Australia'. The 'Selected items (1)' list contains 'United States'.

- h. Click **OK**.

The expression should resemble the following:

The screenshot shows the 'Customer Country' condition in the expression area. The condition is 'In United States'.

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

The screenshot shows the bottom of the window with 'Returned observations: 232,258' and 'Total observations: 951,669'.

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

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

The Data pane should resemble the following:

The screenshot shows the Data pane with a expanded category 'Category'. Under 'Category', there are several data items listed with their respective counts: 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.

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.

7. 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** \Rightarrow **US Hierarchy**.
 - e. Verify that **Frequency** is specified for the Size role.
 - f. For the Color role, select **Add** \Rightarrow **Profit**.

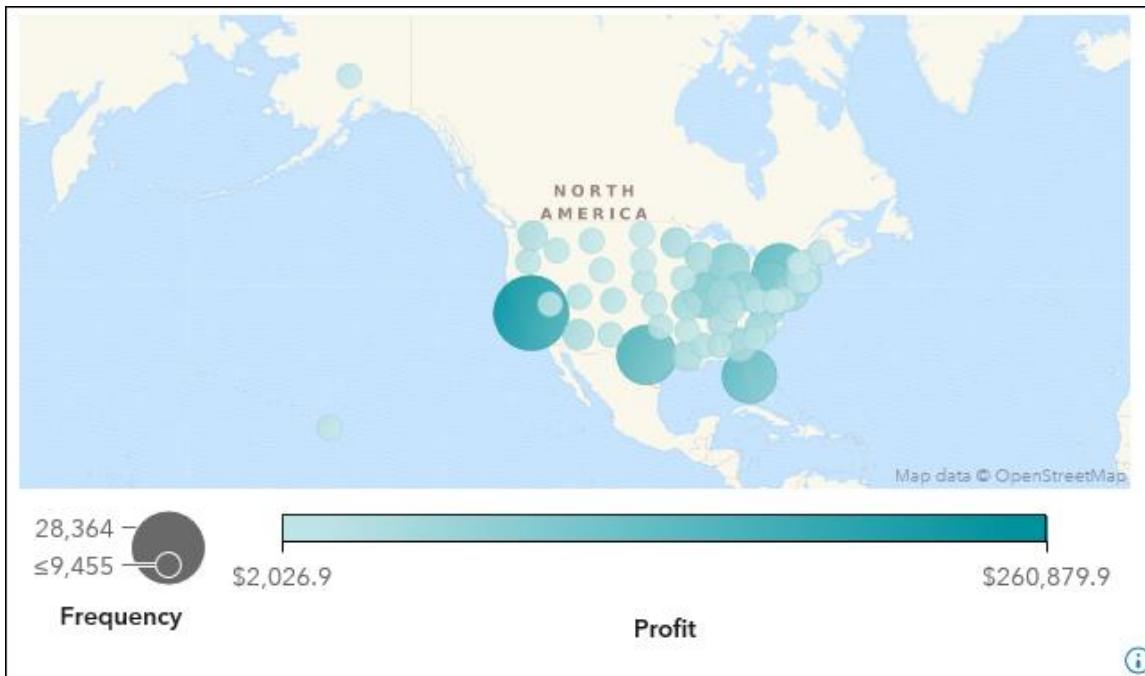
The Roles pane should resemble the following:

The screenshot shows the 'Data Roles' pane with the following configuration for a 'Geo Map - US Hierarchy 1':

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

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:



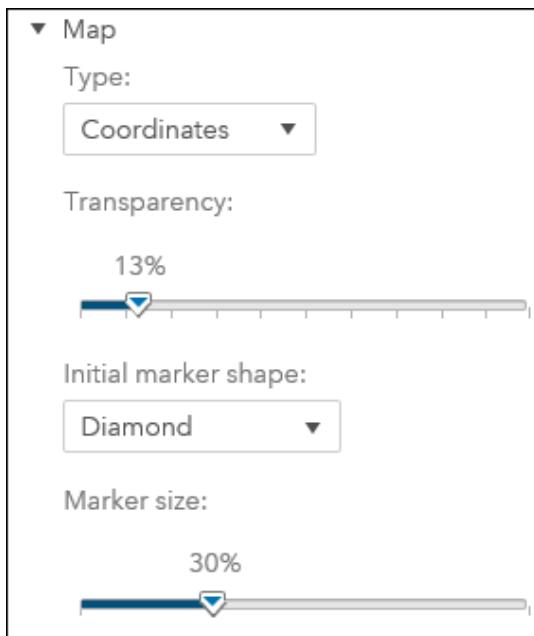
- g. Place your cursor over in the lower right corner of the geo map to view the warning.

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.

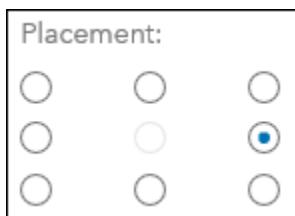
Note: PR is not found in the US State Names predefined geographic role. You can filter this value out if you do not want to see the warning.

- 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.

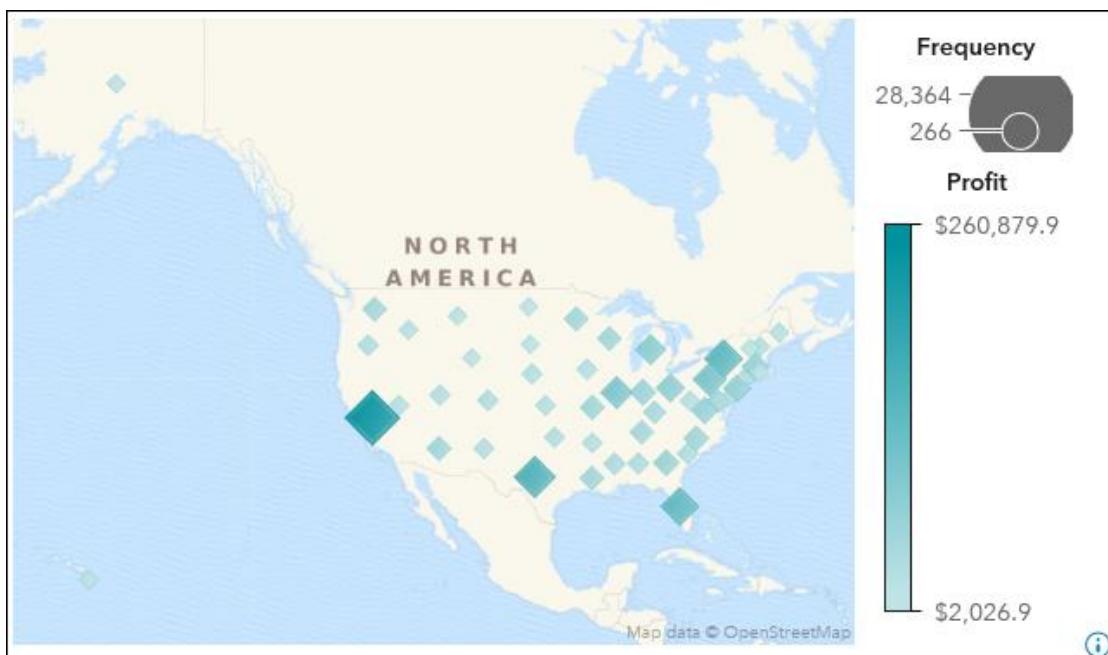
The Options pane should resemble the following:



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



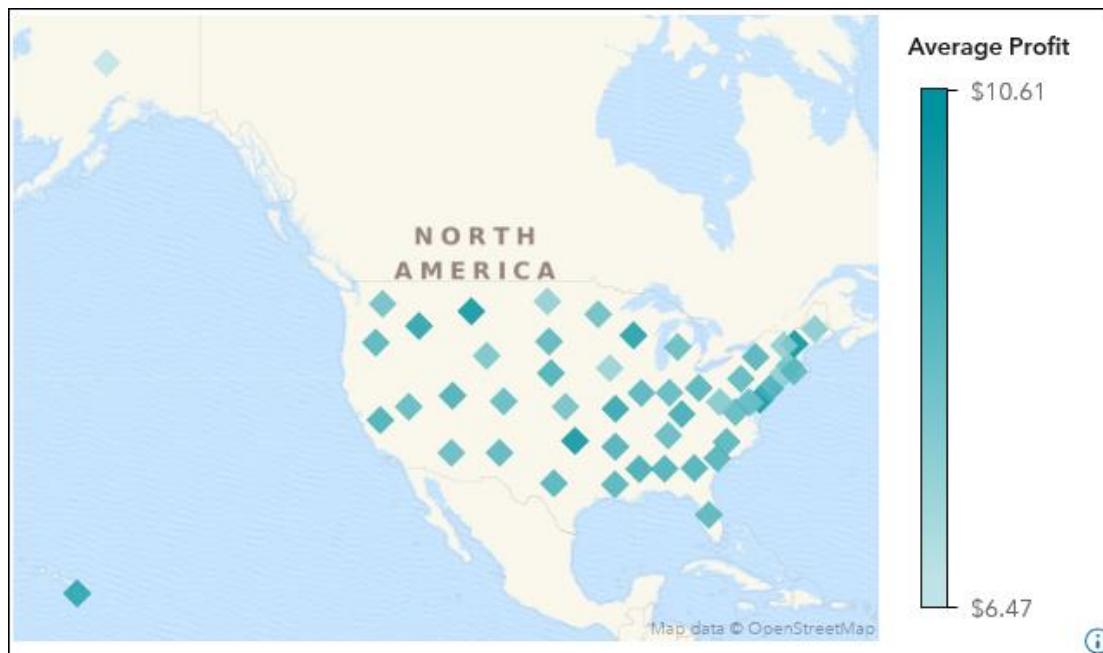
The updated geo map should resemble the following:



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**.

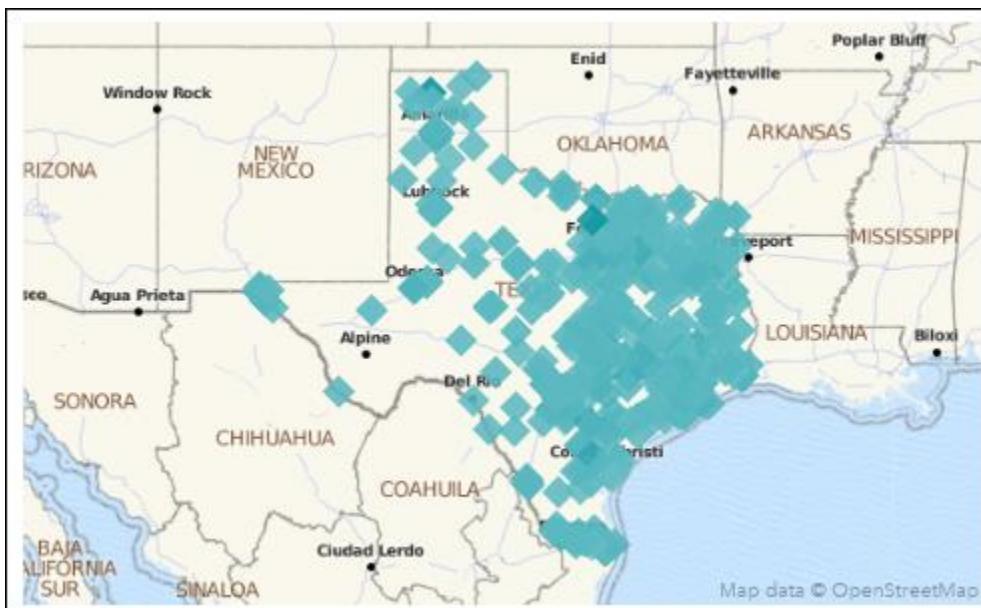
The updated geo map should resemble the following:



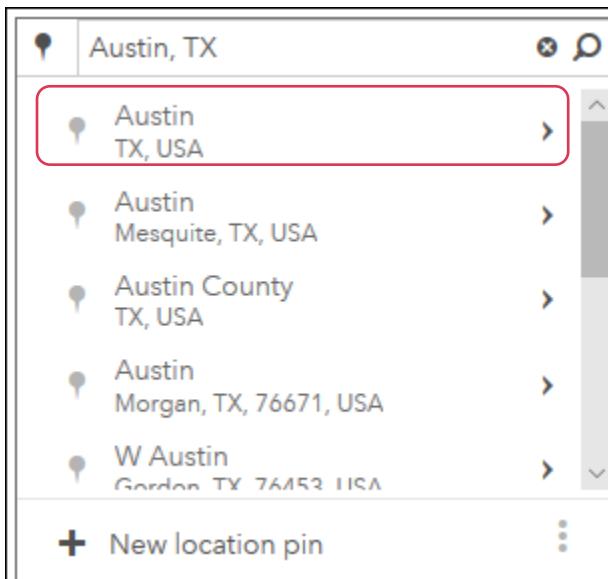
When looking at averages, there does not seem to be any clusters of higher average profits in any one location in the United States. High average profits seem to be evenly distributed across the United States.

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

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



- t. In the upper left corner, click  (Location).
- u. Enter **Austin, TX** in the **Search** field.
- v. Double-click the first value in the search list, **Austin TX, USA**.



All locations containing combinations of **Austin, TX** are listed in the search. The location of Austin, Texas is marked on the geo map with a 1.

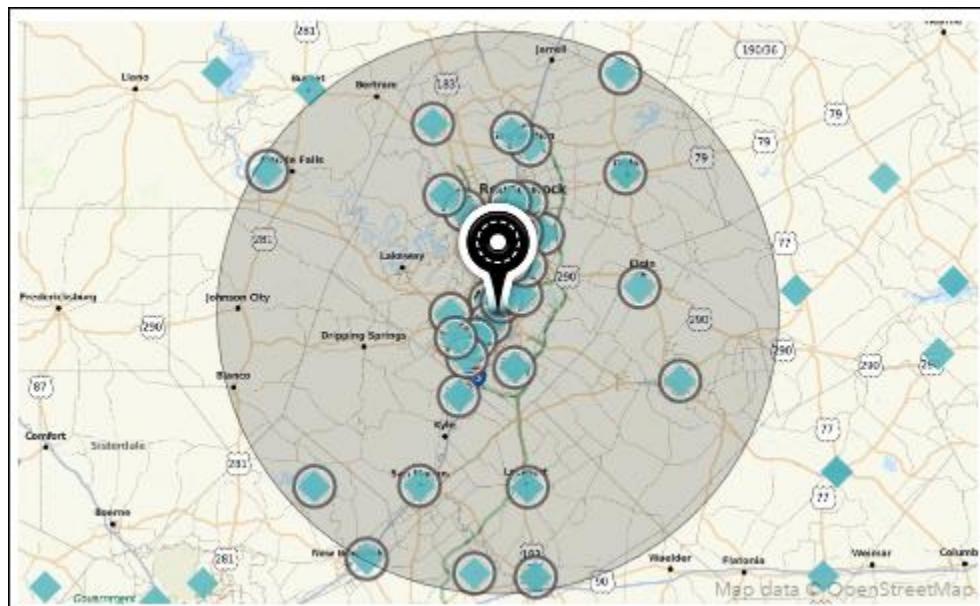
- w. Select **Geographic Selection**.
 - 1) Verify that **Distance** is selected for the **Type** field.
 - 2) Verify that **Miles** is selected for the **Unit** field.
 - 3) Enter **50** for the **Distance** field.

The Geographic Selection window should resemble the following:

The screenshot shows the 'Geographic Selection' dialog box. At the top, there is a search bar with 'Austin' and 'Austin, Texas' listed. Below it, a section labeled 'Type:' has a dropdown menu set to 'Distance'. Under 'Unit:', the dropdown is set to 'Miles'. In the 'Distance:' field, the value '50' is entered. A note below the input fields says 'Specify the radius of the circular region to select.' At the bottom right of the dialog is a button labeled 'Draw Selection'.

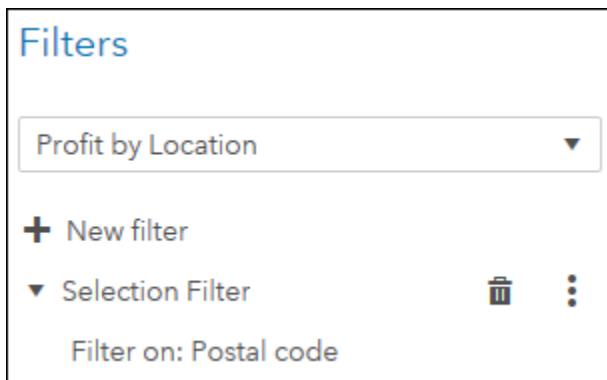
- 4) Click **Draw Selection**.

All customers within a 50-mile radius of Austin, TX, are highlighted.



- x. Right-click the map and select **New filter from selection** \Rightarrow **Include only selection**.

- y. Select the **Filters** icon in the right pane to show the applied filter.



8. In the upper right corner, click (**Menu**) and select **Save As**.
9. Navigate to **My Folder**.
10. Click **Save**.

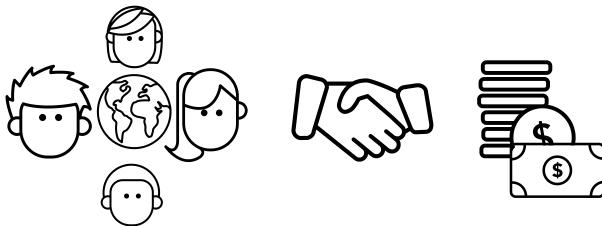
End of Demonstration

Business Scenario: Employees



Management has decided that your initial promotion analysis should focus on active employees in the Sales Department.

The amount of profit generated by each employee has been identified as one possible criterion for promotion. Given this criterion, you need to identify locations where initial promotions should begin.



Create new data items and add a filter for this analysis.



Practice

5. Applying Filters

- From the browser window, sign in to SAS Viya for Learners.
 - Open the **VA1- Exercise3.3b** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 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.
- Change the classification for **Employee Country** to **Geography** \Rightarrow **Country or Region ISO 2-Letter Codes**.
 - 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:



- 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.

- In the geo map, specify **Average Profit** for the Size role.
- 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 in **My Folder**.

End of Practices

3.4 Performing Data Analysis

Objectives

- Discuss when to use analysis graphs in Visual Analytics.
- Describe the types of fit lines that can be added to analysis graphs.
- Describe the forecasting capabilities available in Visual Analytics.

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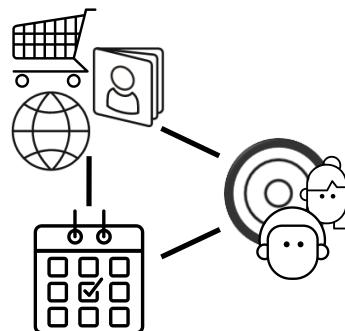


Business Scenario: Customers



The Shipping team has suggested that delivery times could be responsible for the lower profits in the internet and catalog channels. They have asked that you determine how delivery times, number of orders, and profits are related.

As you work on this analysis, the Marketing team has asked for help with determining the focus groups for the next marketing campaign by analyzing order types, genders, and age groups.

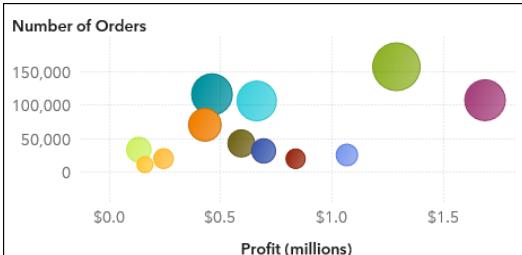


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Objects: Graphs (Analysis)



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.

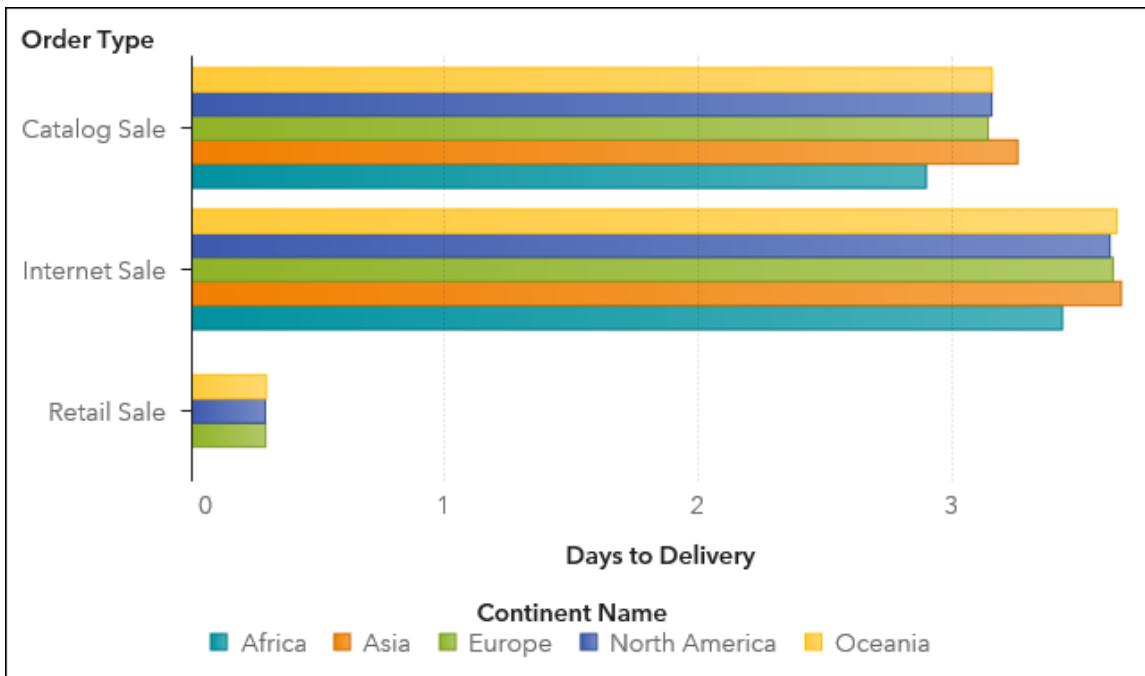
Note: The layout of the tiles in the treemap is dependent on the size of the display area because it uses a space-filling algorithm to lay the tiles out. This means that the same treemap might appear slightly different in Visual Analytics than it does in the Report Viewer or in the Visual Analytics app.



Analyzing Data

This demonstration illustrates how to analyze data with graphs in Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo3.4a** and select **Edit**.
4. In the upper left corner of the report, click the **Page 4** tab.
5. 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.

6. 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:

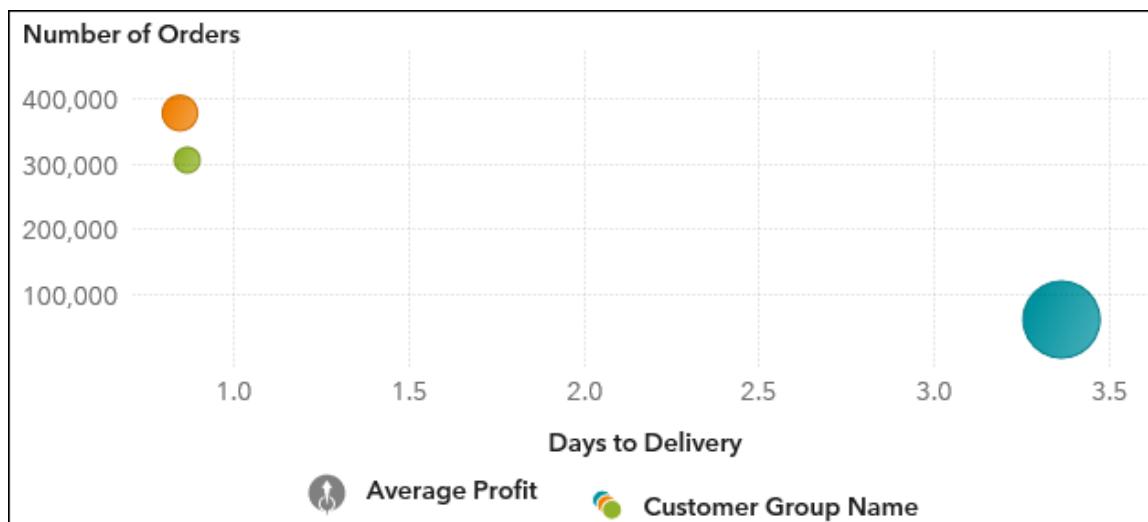
Data Roles

Bubble - Days to Delivery 1

- ▼ X axis
 - Days to Delivery
- ▼ Y axis
 - Number of Orders
- ▼ Size
 - Average Profit
- ▼ Group
 - Customer Hierarchy
- ▼ Color

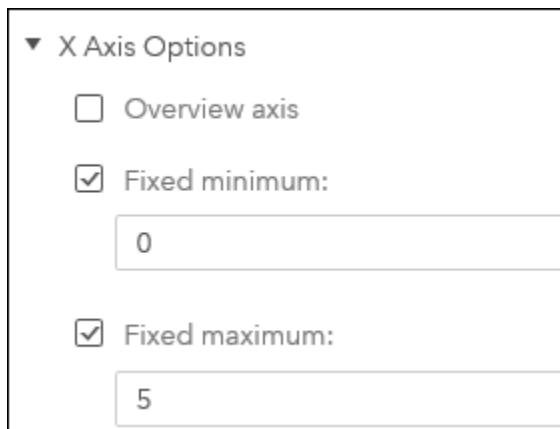
Measure data items can be added to the X axis and Y axis roles to determine the placement of the bubble. A measure data item can be added to the Size role to determine the size of the bubble.

The bubble plot should resemble the following:



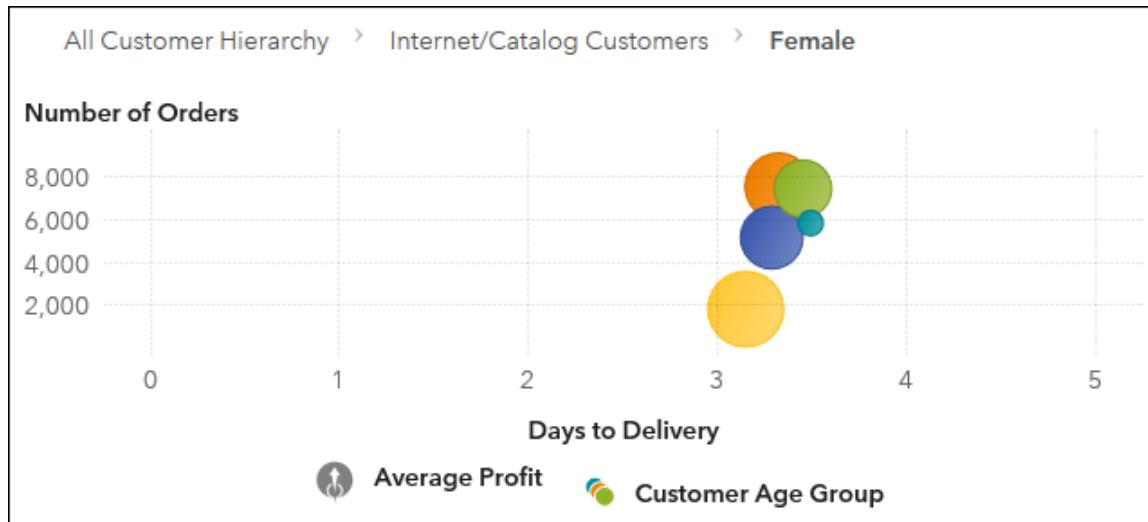
- In the right pane, click the **Options** icon.

- 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.

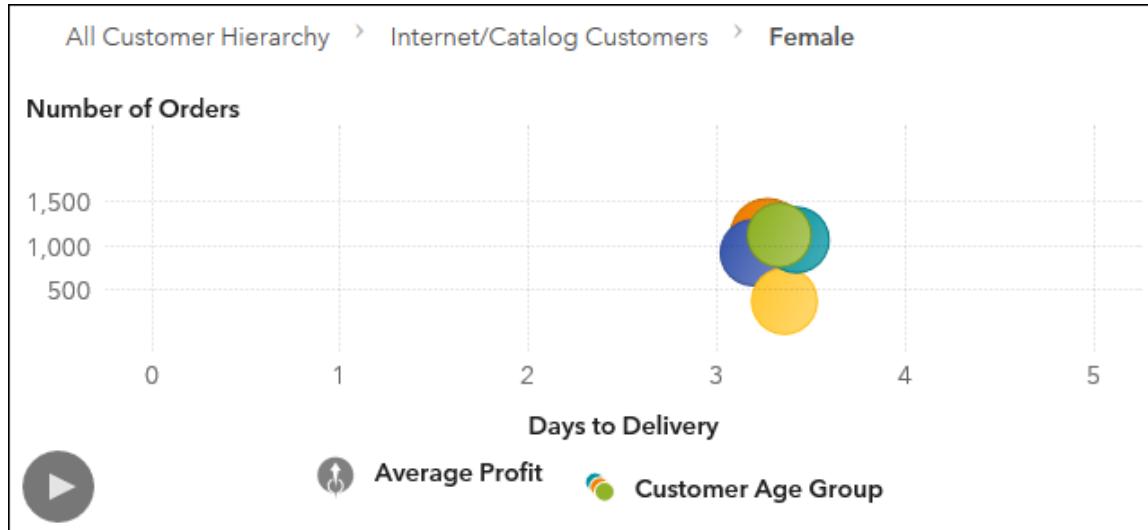
The bubble plot should resemble the following:



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.

7. 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:



- c. 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 fairly constant but average profit decreases over time.

8. In the upper right corner, click  (**Menu**) and select **Save As**.
9. Navigate to **My Folder**.
10. Click **Save**.

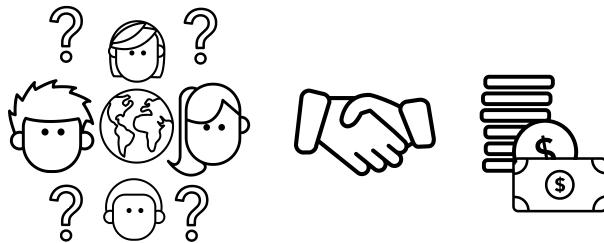
End of Demonstration

Business Scenario: Employees



The Human Resources team has suggested that employees who have been with the company longer and those who have generated higher profits should be promoted.

The team has asked you to identify the companies and job titles where they should begin promotions.





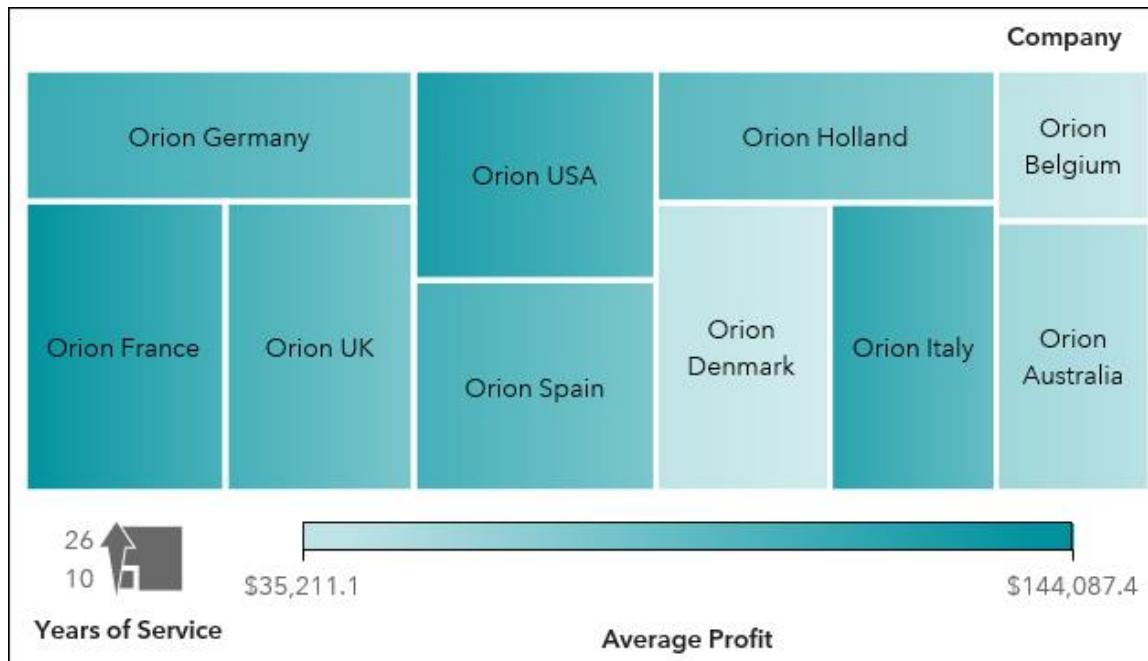
Practice

6. Analyzing Data

- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise3.4a** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
- On Page 5, create a treemap by assigning the following data items to the specified roles:

Tile	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: _____

- f. Save the report in **My Folder**.

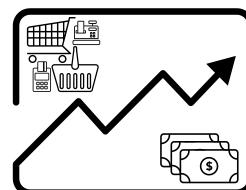
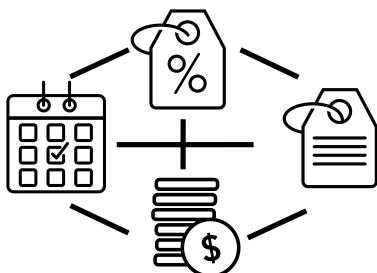
End of Practices

Business Scenario: Customers



To complete the analysis, the manager has asked that you analyze the relationship, if any, between delivery times, discounts, total revenue, and unit costs.

In addition, you need to determine the relationship between profits and number of orders and predict how these trends will continue in the future.



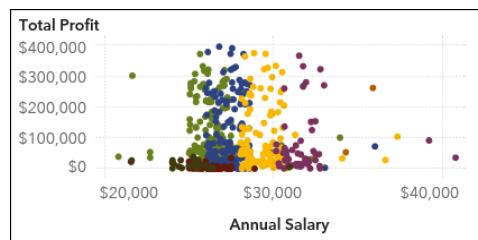
71

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Objects: Graphs (Analysis)



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 8.3 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?

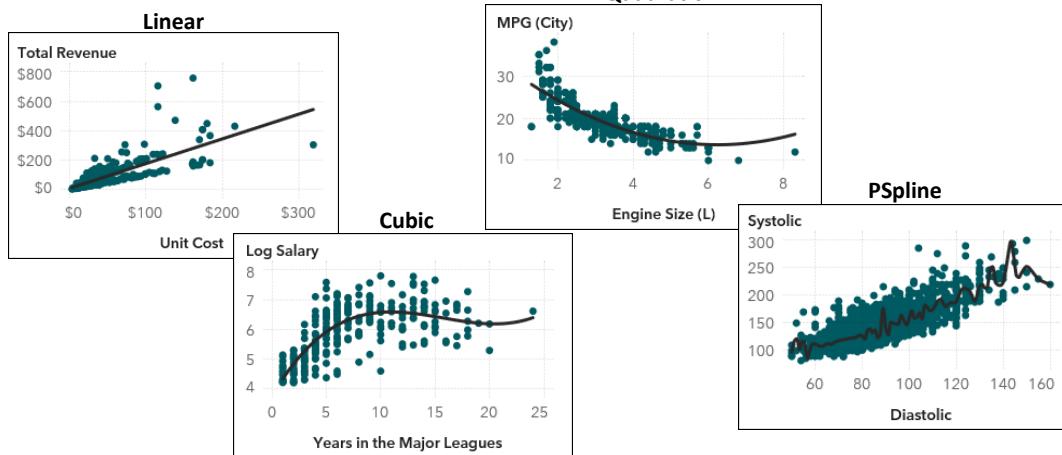
What are some examples of low-cardinality data items?

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Fit Lines

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



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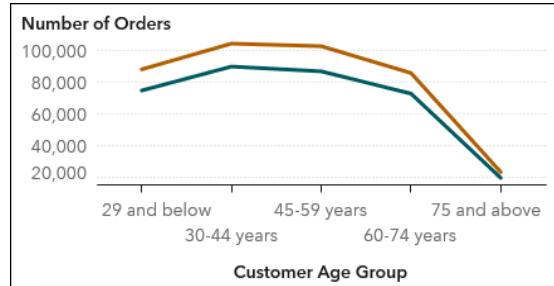
The following types of fit lines are available:

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 (Analysis)



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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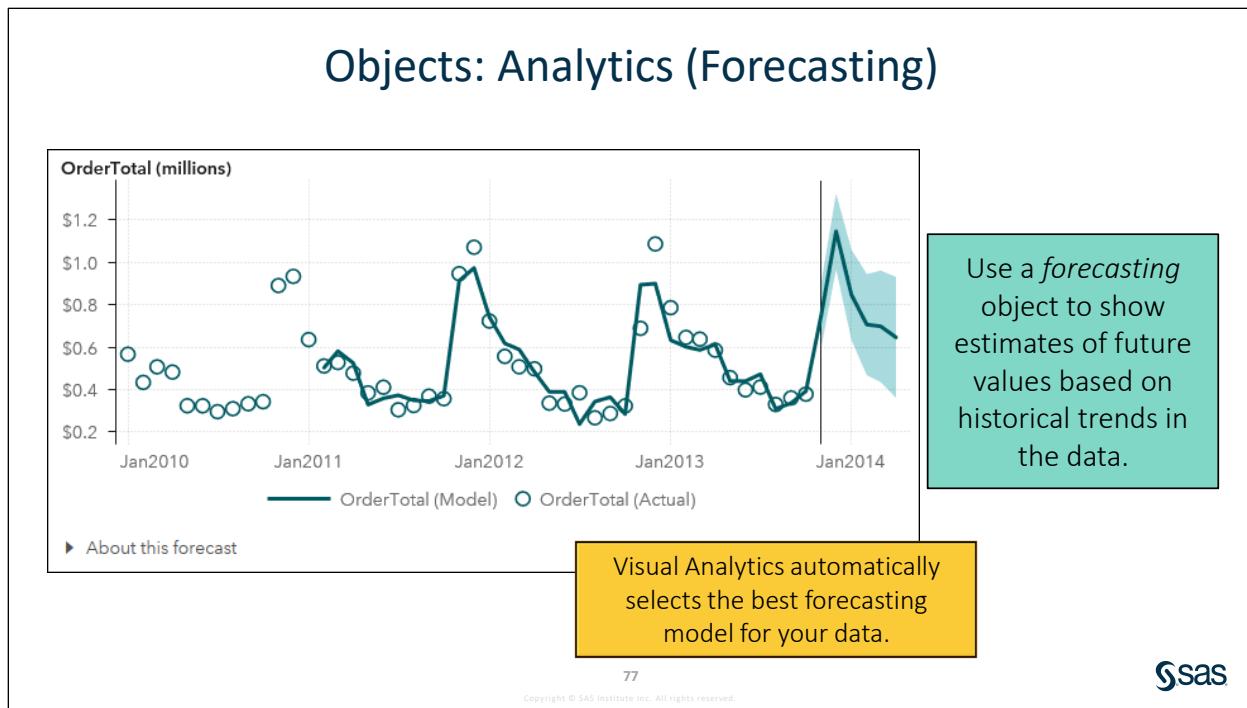


Line chart

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.



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 Visual Analytics 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 and SAS Visual Data Mining and Machine Learning are licensed at your site, you have the ability to create models instead of relying on the model automatically selected for forecasting.

Note: If SAS Visual Forecasting is licensed at your site, you have the ability to automatically produce large-scale time series analyses and hierarchical forecasts.



Adding Data Analysis

This demonstration illustrates how to add data analysis to graphs in Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo3.4b** and select **Edit**.
4. In the upper left corner of the report, click the **Page 5** tab.
5. 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**.

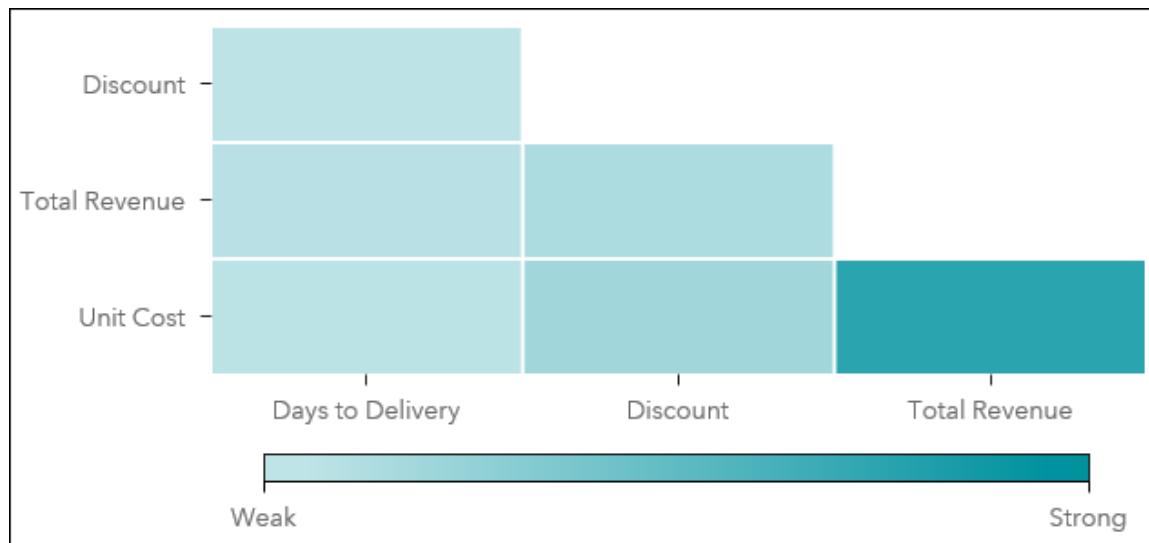
The Roles pane should resemble the following:

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

- Correlation - Days to Delivery 1
- Show correlations: Within one set of measures
- Measures:
 - Days to Delivery
 - Discount
 - Total Revenue
 - Unit Cost
- Add

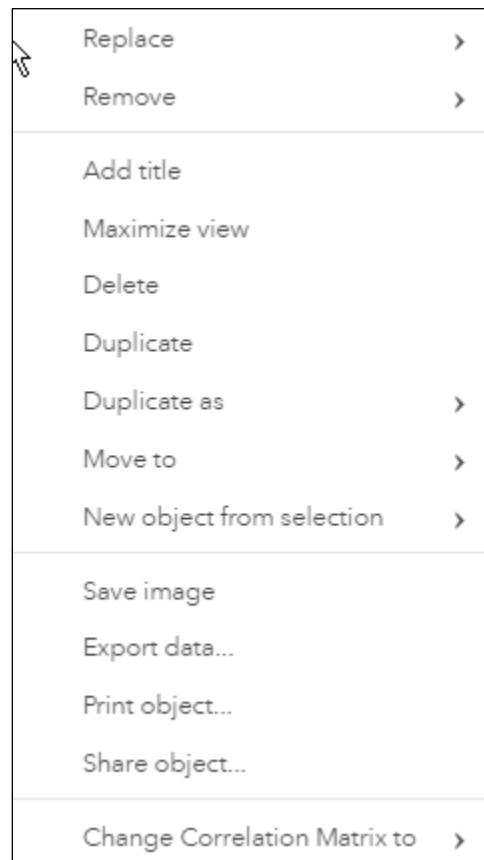
Only measure data items can be used for the correlation matrix.

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.

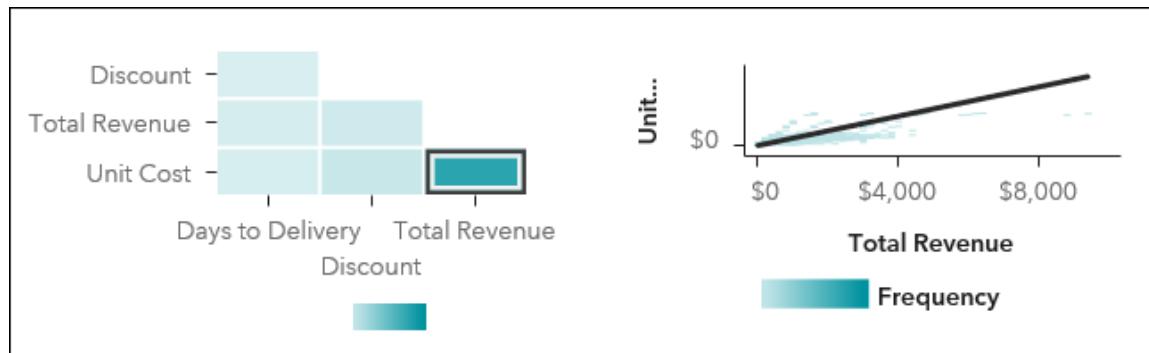
- g. Select the cell for **Unit Cost** and **Total Revenue**.
- h. Right-click in the cell. The following window is displayed:



- Select **New object from selection** ⇒ **Heat Map**.

A heat map is created below the correlation matrix.

- Drag the heat map to the right of the correlation matrix.



We want to move **Unit Cost** to the horizontal axis because we want to see how a unit change in cost affects **Total Revenue**.

- If necessary, click the heat map to select it.
- In the right pane, click the **Roles** icon.
- Select **Unit Cost** and drag it above **Total Revenue**.

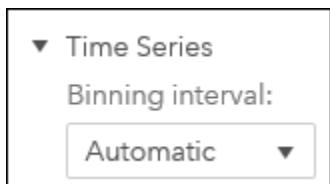
- In the upper right corner of the heat map, click (**Maximize**) to view additional details.

- o. 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.

- p. In the upper right corner, click  (**Restore**).
6. Modify the time series plot.
- Click the time series plot to make it active.
 - Click  (**More**) and select **Change Time Series Plot to ▷ Forecasting**.
 - In the right pane, click the **Options** icon.
 - In the Time Series group, select **Automatic** for the **Binning interval** field.



- e. 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.

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

Results Dependent Variables Results					
Order Date	Profit (Model)	Profit (Actual)	Lower Confidence Interval	Upper Confidence Interval	Number of Orders
Dec2016	\$273,803.86	\$284,648.43	.	.	16,409
Jan2017	\$184,241.94	.	\$157,588.93	\$210,894.95	15,466
Feb2017	\$160,011.07	.	\$122,318.02	\$197,704.12	13,551
Mar2017	\$139,309.78	.	\$93,145.41	\$185,474.15	14,609
Apr2017	\$141,069.26	.	\$87,763.24	\$194,375.29	16,465
May2017	\$190,606.43	.	\$131,008.48	\$250,204.37	17,154

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

- h. 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.

- i. In the upper left corner, click  (**Restore**).
7. In the upper right corner, click  (**Menu**) and select **Save As**.
8. Navigate to **My Folder**.
9. Click **Save**.

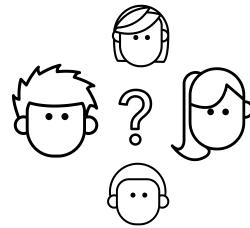
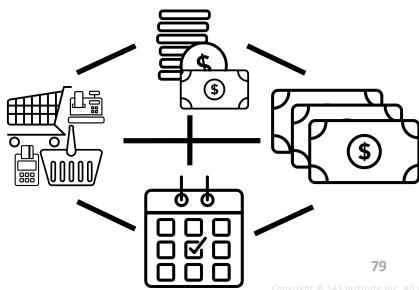
End of Demonstration

Business Scenario: Employees



To complete the analysis, your manager has asked that you analyze the relationship, if any, between salary, orders, profit, and years of service to determine alternate criteria for promotion.

In addition, you need to determine whether there are any job title differences between employees identified for promotion based on the criteria specified by management.



sas



Practice

7. Adding Data Analysis

- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise3.4b** report from the **SAS Content/Courses/YVA183/Basics/Exercises (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:

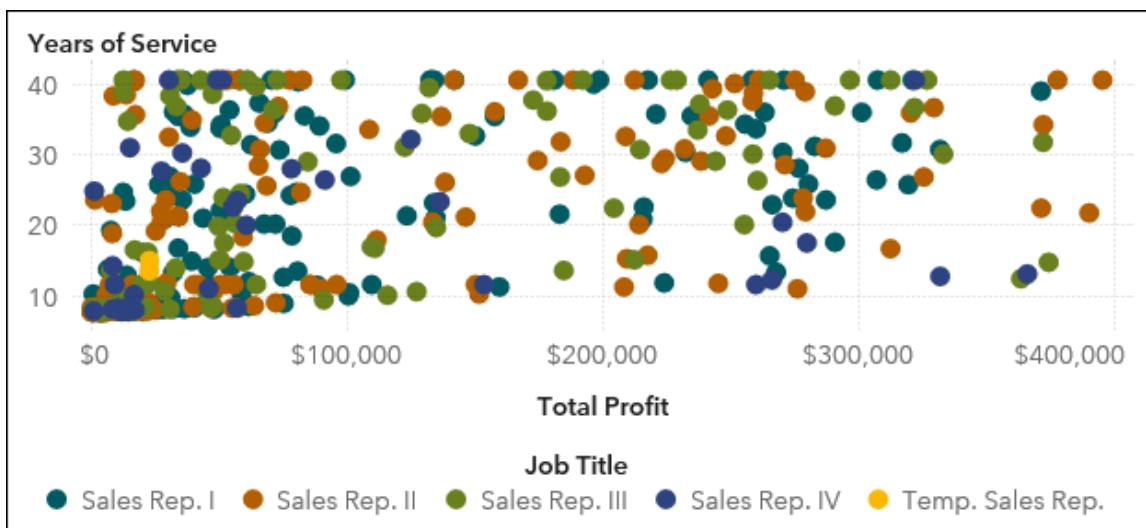
During a management meeting, it was mentioned that total orders might be a better criterion for promotion than profit generated. Do you agree?

Answer: _____

- e. 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:

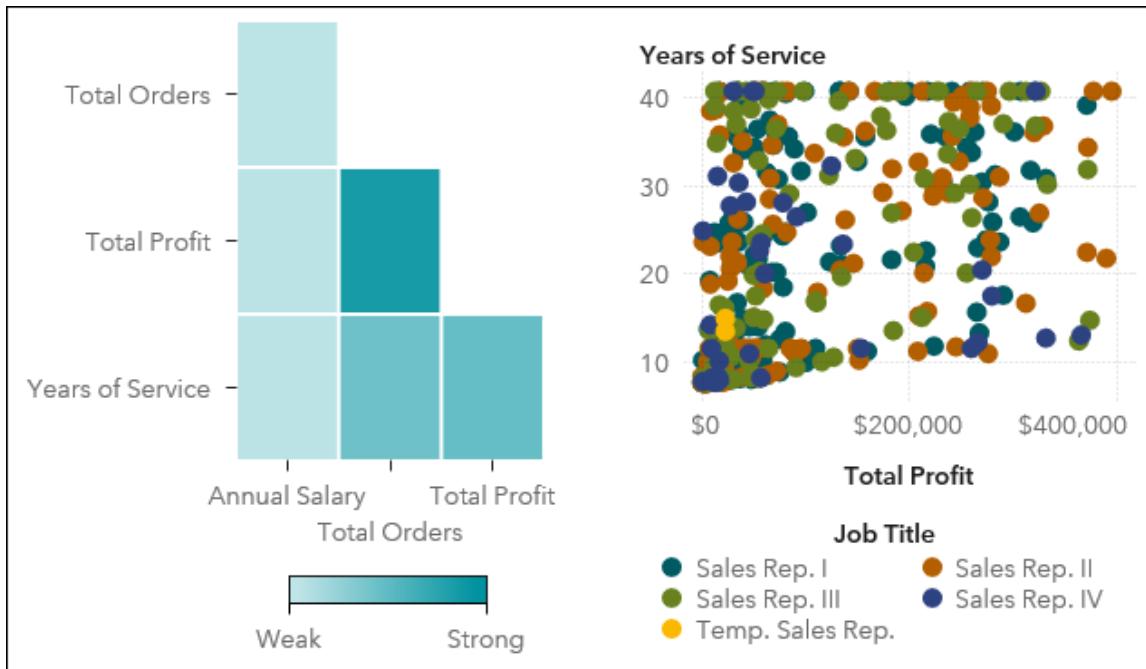


- f. Answer the following question:

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 in **My Folder**.

End of Practices

3.5 Solutions

Solutions to Practices

1. Working with Data Items

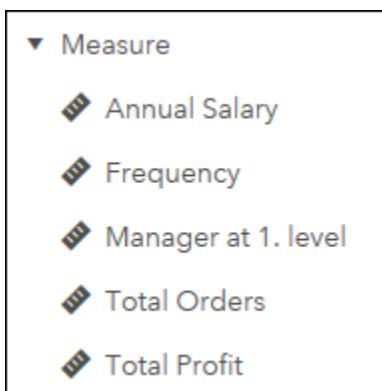
- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise3.1** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise3.1** and select **Edit**.
- 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**.

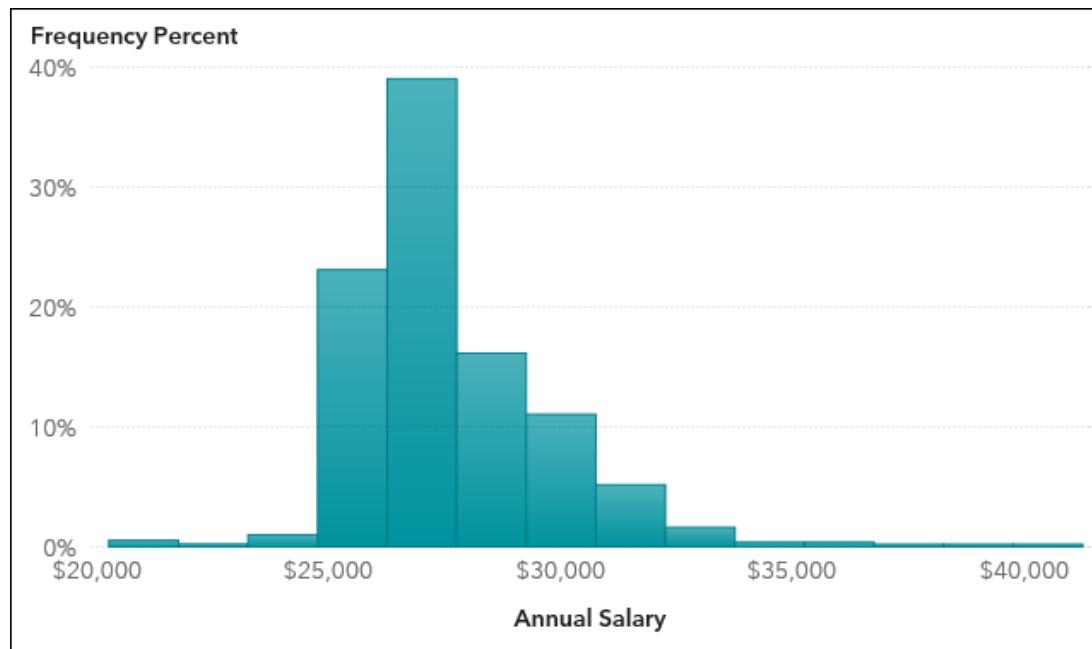
- 2) Select **Category** for the **Classification** field. **Manager at 1. level** should now appear in the Category group.
- e. Change the format for **Annual Salary** to **Dollar13.2**.
- 1) In the Measure group, click  (Edit properties) next to **Annual Salary**.
 - 2) Click  (Edit) for the **Format** 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. Save the report in **My Folder**.
- 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
 - 2) Navigate to **My Folder**.
 - 3) Click **Save**.
- 2. Exploring Data: Part 1**
- a. From the browser window, sign in to SAS Viya for Learners.
 - b. Open the **VA1- Exercise3.2a** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise3.2a** and select **Edit**.
 - 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

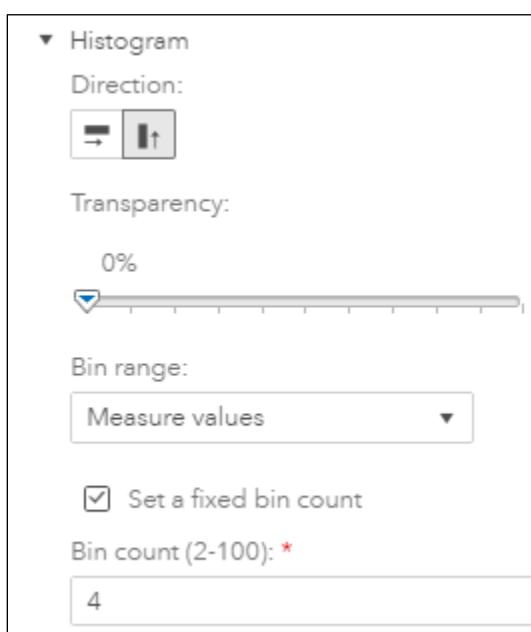
Frequency Percent

- 3) Drag the data items to the canvas.

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

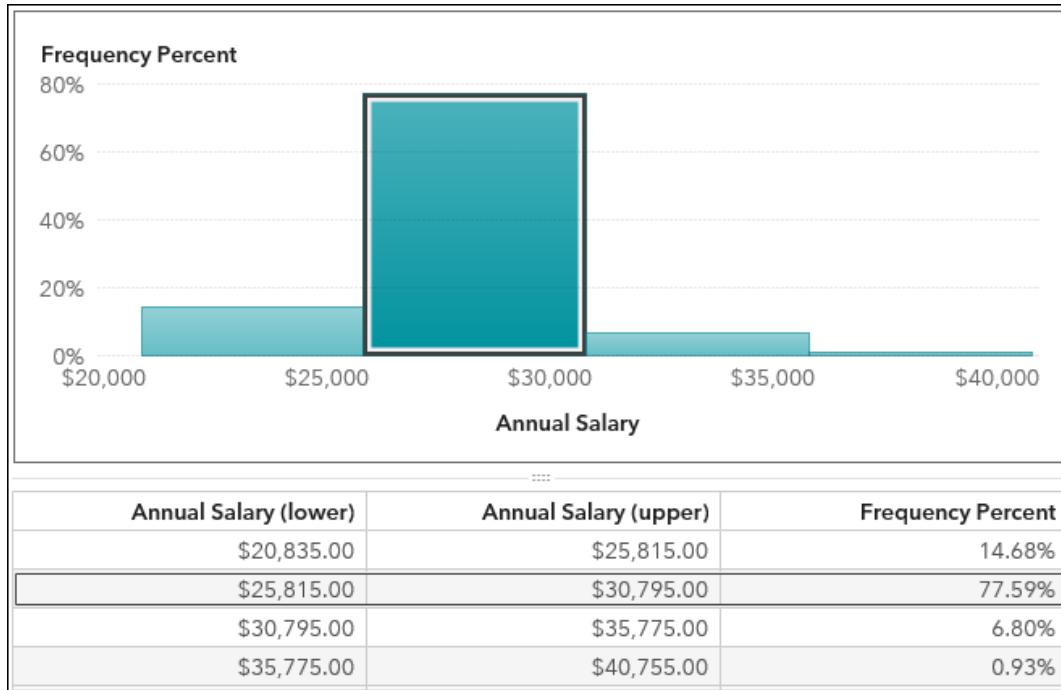


- d. Modify the options for the automatic chart.
- 1) In the right pane, click the **Options** icon.
 - 2) If necessary, expand the **Object** group.
 - 3) Enter **Distribution of Salary** in the **Name** field.
 - 4) In the Histogram group, select **Measure values** for the **Bin range** field.
 - 5) Select **Set a fixed bin count**.
 - 6) Enter **4** in the **Bin count** field and press Enter.



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.

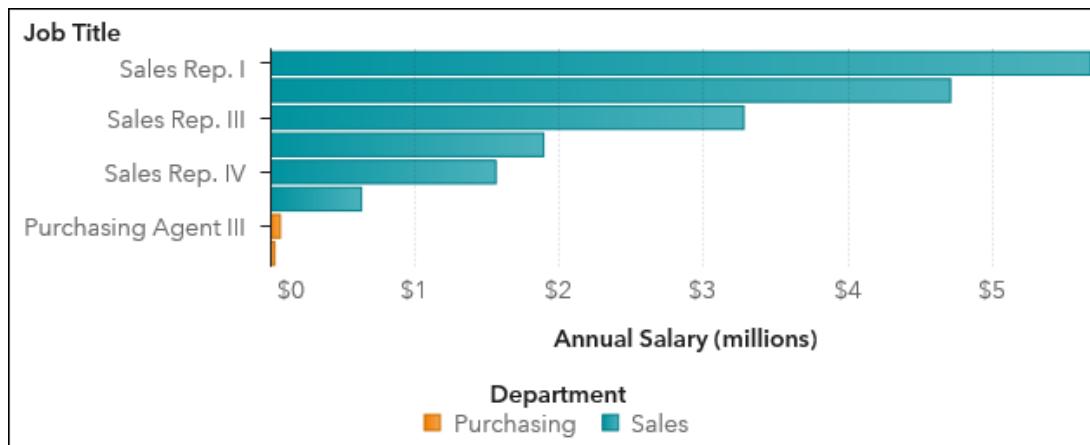


Into which range do a majority of salaries fall?

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 a majority 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.

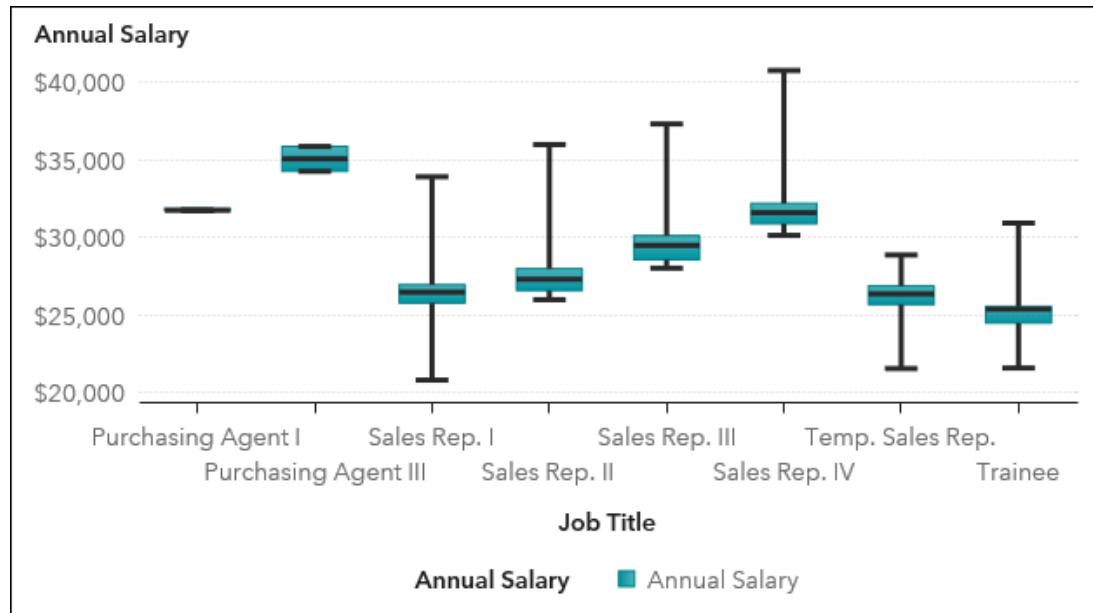
- i. Save the report in **My Folder**.
 - 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
 - 2) Navigate to **My Folder**.
 - 3) Click **Save**.

3. Exploring Data: Part 2

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise3.2b** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise3.2b** and select **Edit**.
- 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.

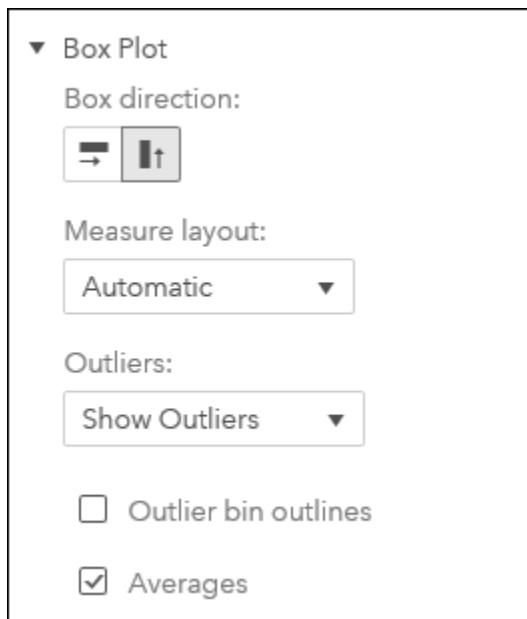
- 3) Drag the **Box Plot** object from the Graphs group to the canvas.
- 4) In the right pane, click the **Roles** icon.
- 5) For the Category role, select **Add** \Rightarrow **Job Title**.
- 6) For the Measures role, select **Add** \Rightarrow **Annual Salary** and click **OK**.

The box plot should resemble the following:

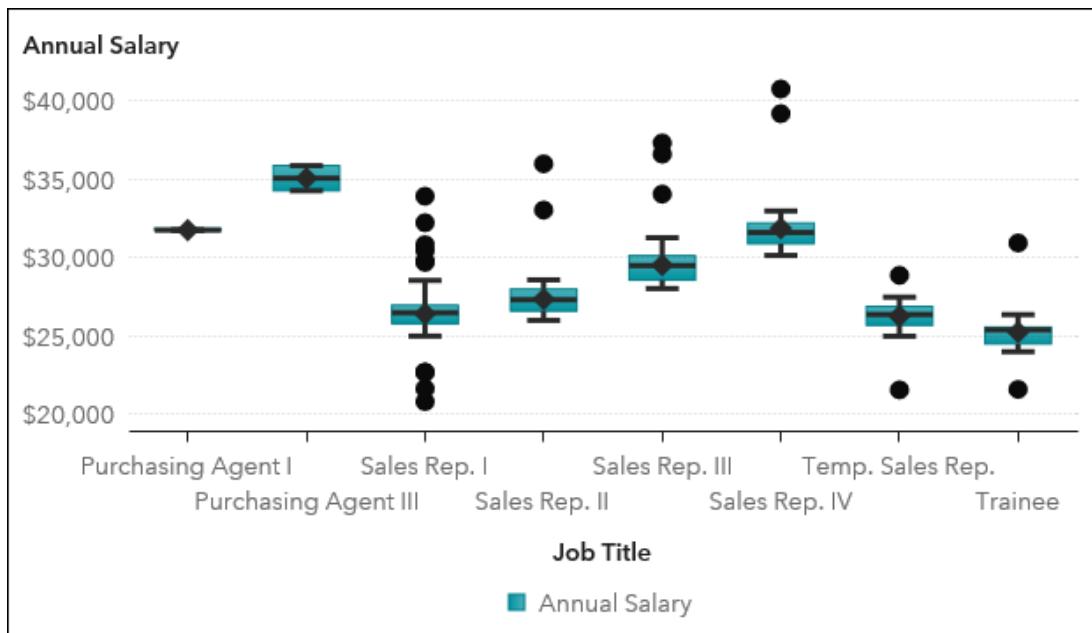


- d. Modify the options for the box plot.
 - 1) In the right pane, click the **Options** icon.
 - 2) If necessary, expand the **Object** section.
 - 3) Enter **Salary Analysis by Job Title** in the **Name** field.
 - 4) In the Box Plot group, select **Show Outliers** for the **Outliers** field.
 - 5) 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	Third
Trainee	\$21,615.00	\$24,015.00	\$24,515.00	\$25,260.80	\$25,405.00	\$2
Temp. Sales Rep.	\$21,580.00	\$25,005.00	\$25,695.00	\$26,287.57	\$26,387.50	\$2
Sales Rep. I	\$20,835.00	\$25,010.00	\$25,795.00	\$26,417.79	\$26,495.00	\$2
Sales Rep. II	\$26,015.00	\$26,015.00	\$26,600.00	\$27,373.58	\$27,325.00	\$2
Sales Rep. III	\$28,040.00	\$28,040.00	\$28,580.00	\$29,533.29	\$29,505.00	\$3
Purchasing Agent I	\$31,760.00	\$31,760.00	\$31,760.00	\$31,760.00	\$31,760.00	\$3
Sales Rep. IV	\$30,150.00	\$30,150.00	\$30,890.00	\$31,880.51	\$31,605.00	\$3
Purchasing Agent III	\$34,270.00	\$34,270.00	\$34,270.00	\$35,070.00	\$35,070.00	\$3

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. Save the report in **My Folder**.

- 1) To save the report, click  (**Menu**) in the upper right corner and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

4. Creating Data Items

- a. From the browser window, sign in to SAS Viya for Learners.

- b. Open the **VA1- Exercise3.3a** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.

- 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
- 2) Right-click **VA1- Exercise3.3a** and select **Edit**.

- 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.

The screenshot shows the 'Category' group in the left pane of the SAS Visual Analytics interface. A list of items is displayed, with 'Employee Status - 2' highlighted by a gray background. Other items include 'Anniversary Month - 12', 'Company - 11', 'Department - 2', 'Employee Country - 10', 'Employee Gender - 1', and 'Employee Hire Date - 239'. Each item has a small icon to its left.

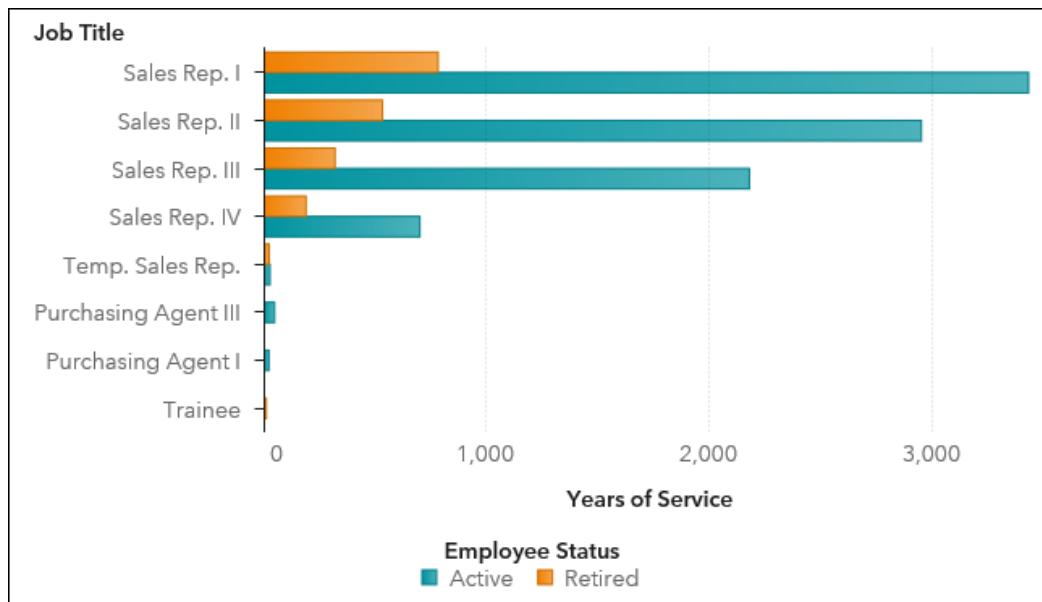
Note: As an alternative, you can also create a calculated data item with the following expression:

```

[ IF Employee Termination Date = Missing
  RETURN "Active"
  ELSE "Retired" ]
  
```

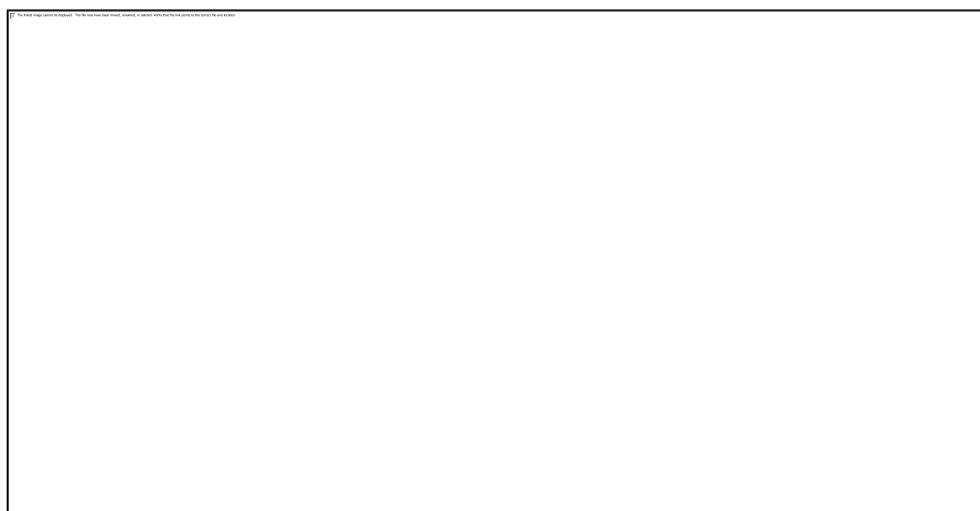
- d. On Page 3, create a bar chart.
- 1) In the upper left corner of the report, click the **Page 3** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Bar Chart** object, from the **Graphs** group, to the canvas.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the 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. Save the report in **My Folder**.

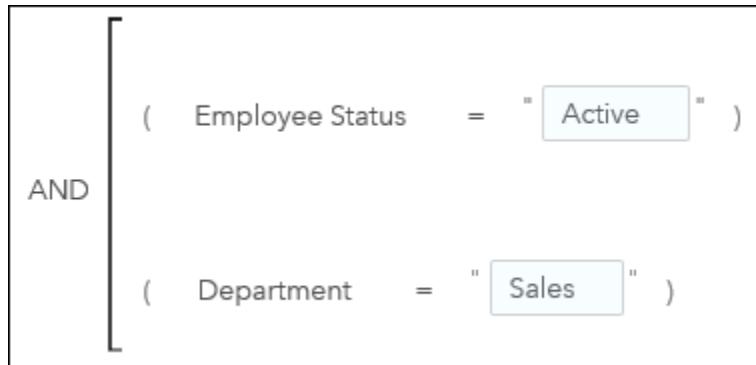
- 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

5. Applying Filters

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise3.3b** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise3.3b** and select **Edit**.
- 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
----------------------------	-------------------------

- l) In the upper right corner, click **(Preview result)**.
m) Scroll down to the bottom of the list.

Number of rows to show:	50	
Data Source Filter	Employee Status	Department
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:

The screenshot shows the Data pane with a category tree. The root node is 'Category' (indicated by a triangle icon). Under 'Category', there are several items listed with their respective icons and counts:

- Anniversary Month - 12
- Company - 10
- Department - 1
- Employee Country - 10
- Employee Gender - 1
- 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.

The screenshot shows the 'Edit Geography Item' dialog box. It contains the following fields:

- Name:** Employee Country
- Based on:** Employee Country
- Geography data type:** Predefined geographic names and codes
- Name or code context:** Country or Region ISO 2-Letter Codes

On the right side of the dialog, there is a map of the world with a cluster of dark green dots representing mapped countries. The text '100% mapped' is displayed above the map. A small note at the bottom right of the map area says 'Map data © OpenStreetMap'.

Notice 100% of countries are mapped for the geographic data item.

- 4) Click **OK**.

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

The screenshot shows the SAS Data pane. A group named "Geography" is expanded, revealing one item: "Employee Country - 10". There is a dropdown arrow next to the item name.

- 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.

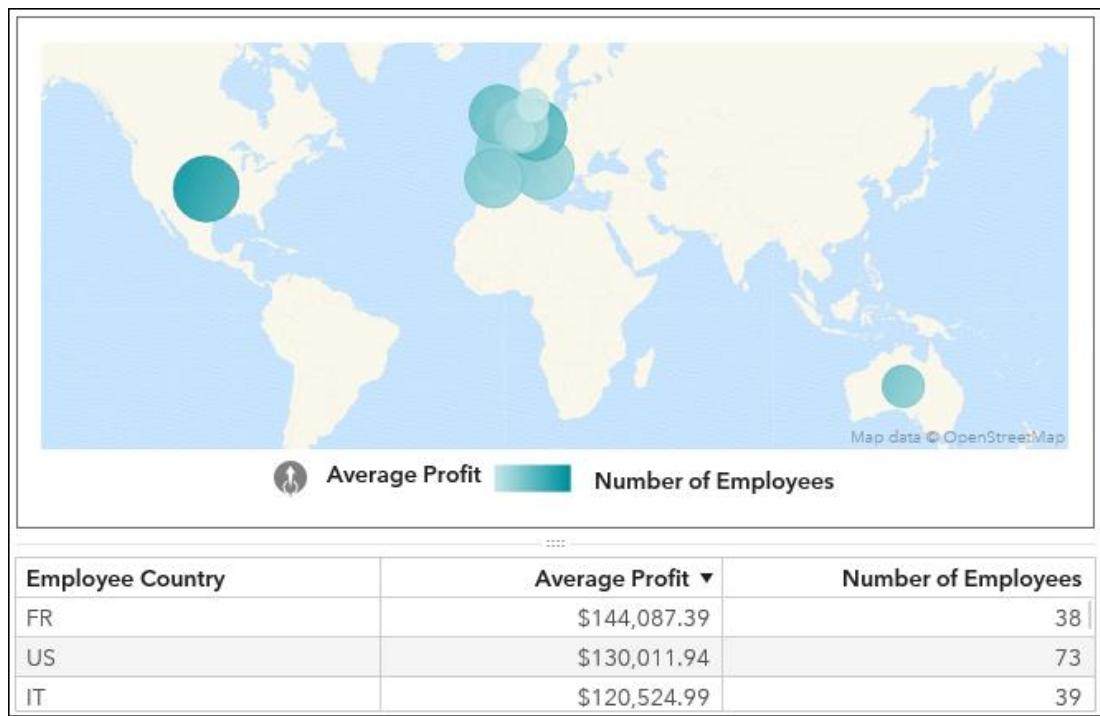


3) Answer the questions.

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** \Rightarrow **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).

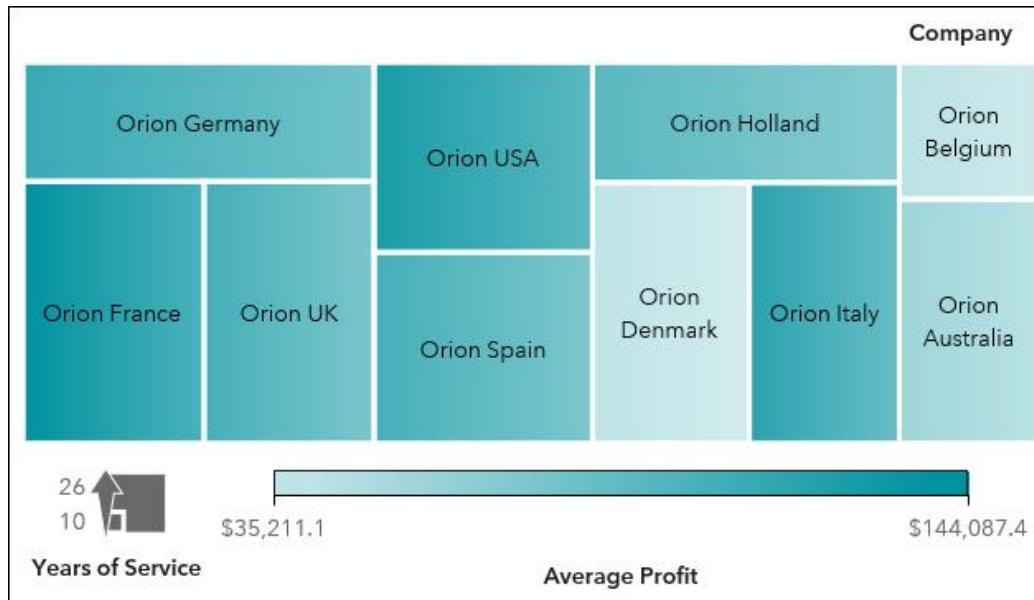
j. Save the report in **My Folder**.

- 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

6. Analyzing Data

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise3.4a** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise3.4a** and select **Edit**.
- 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**.

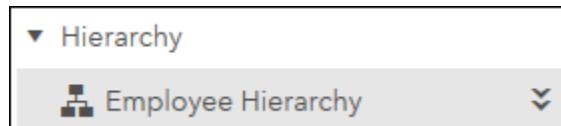
The treemap should resemble the following:



- 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)?

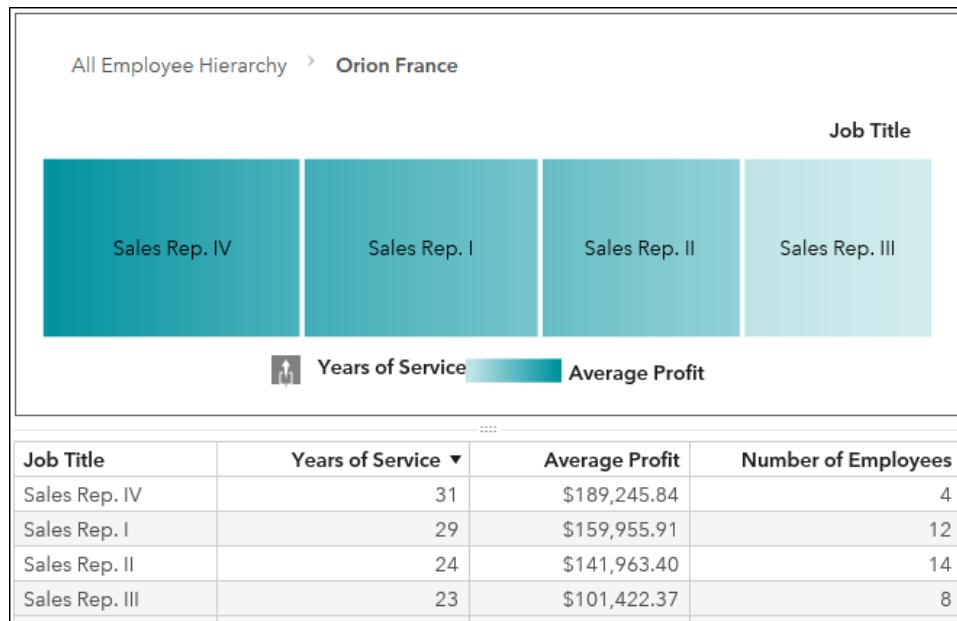
Answer: Orion France and Orion USA have the highest average profit generated.

Company	Years of Service	Average Profit ▾
Orion France	26	\$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).

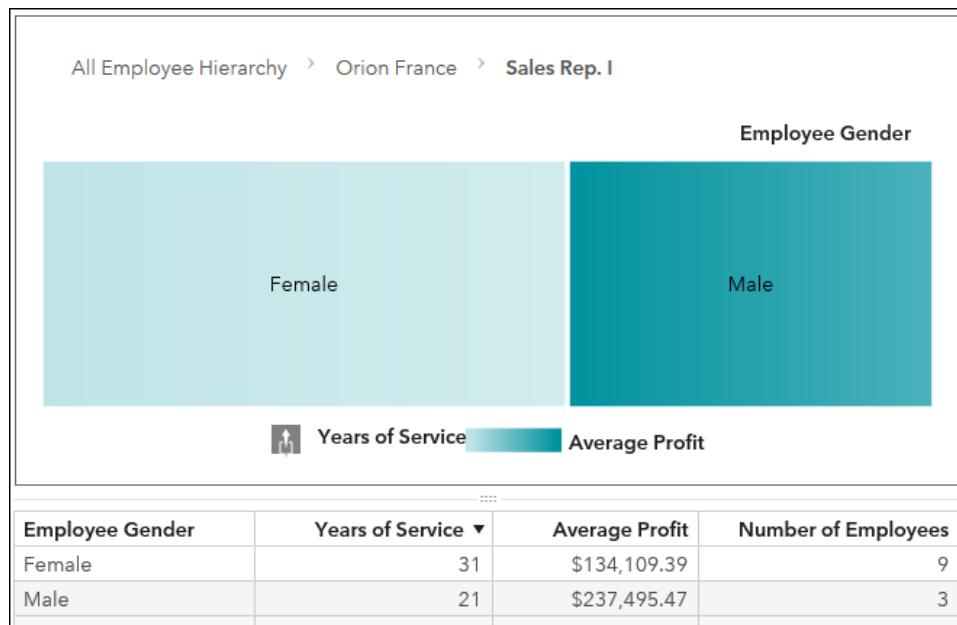
For these two companies, which job titles would you recommend for promotion (based on average years of service and average profit generated)?

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.



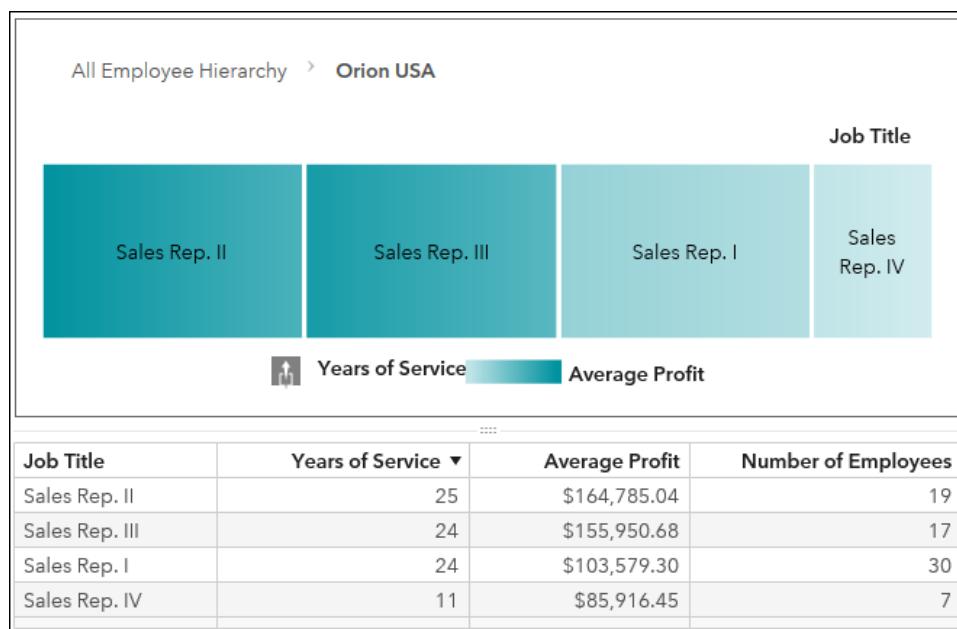
- In the treemap, double-click Orion France.
- In the upper right corner of the treemap, click  (Maximize) to view additional details.
- In the table below the treemap, click Years of Service twice to sort in descending order.
- In the upper right corner, click  (Restore).

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



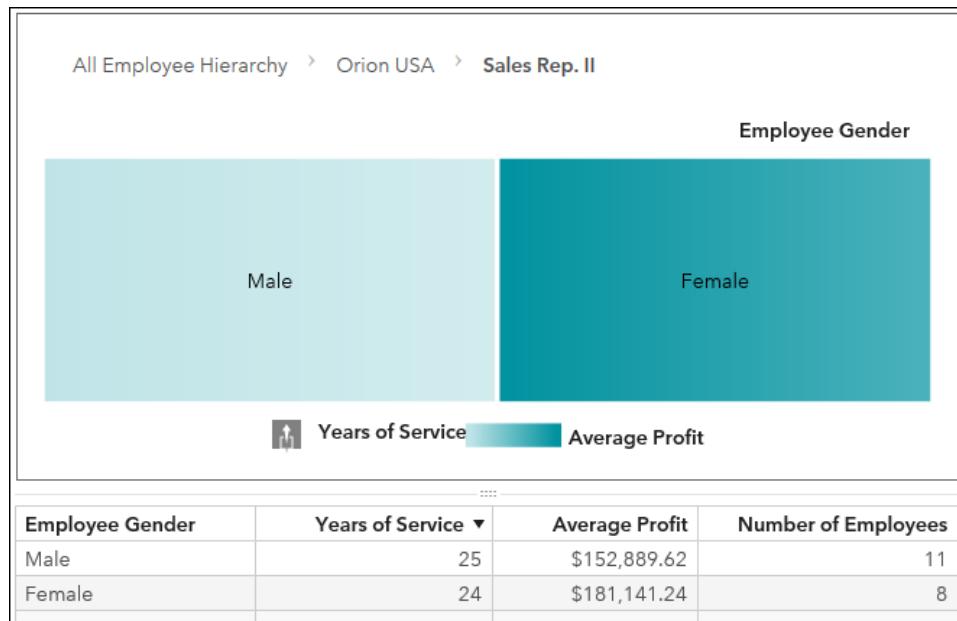
- In the treemap, double-click Sales Rep I.
- In the upper right corner of the treemap, click (Maximize) to view additional details.
- In the table below the treemap, click Years of Service twice to sort in descending order.
- In the upper right corner, click (Restore).

For 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. Save the report in **My Folder**.

- 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

7. Adding Data Analysis

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise3.4b** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise3.4b** and select **Edit**.
- 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.

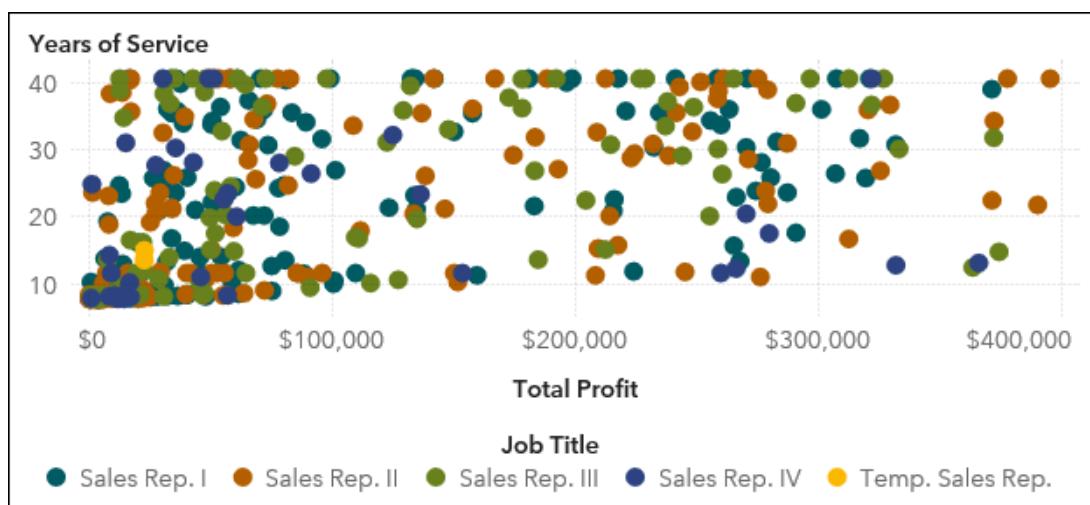
During a management meeting, it was mentioned that total orders might be a better criterion for promotion than profit generated. Do you agree?

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. Save the report in **My Folder**.

- 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

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 GDP Growth (year-over-year)

B Number of Employees (distinct count)

3.03 Activity – Correct Answer

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...
01Jan1938
02Jan1938
03Jan1938
04Jan1938
05Jan1938
06Jan1938
07Jan1938
08Jan1938
09Jan1938
10Jan1938
11Jan1938
12Jan1938



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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?

You would need two different calculations: one for active employees and one for retired employees.

Active employees:

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

Retired employees:

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

Employee Hire Date	Employee Termination Date
01Dec2004	28Feb2007
01Jan2005	.
25Jan2005	.
01Feb2005	.
01Mar2005	28Feb2010
01Apr2005	.
01Apr2005	31Jan2010
01May2005	.
01Jun2005	31Jan2008
01Jul2005	.
01Sep2005	.
01Nov2005	.
11Dec2005	.

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



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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
Anniversary Month - 12
Company - 11
Department - 2
Employee Country - 10
Employee Hire Date - 239
Employee ID - 647
Employee Name - 647
Employee Termination Date - 62
Employee_ID
EmployeeName - 647
Group - 14
Job Title - 8
Title - 2

Measure
Annual Salary
Frequency
Manager at 1. level
Total Orders
Total Profit

12

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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.

23

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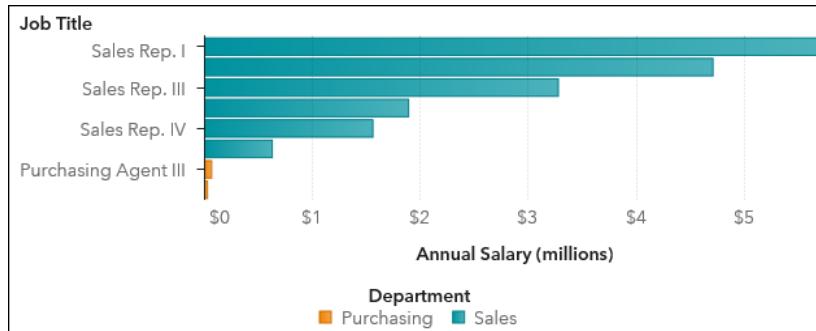
3.2 Exploring Data: Part 1 – Solution

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.



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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	Third
Trainee	\$21,615.00	\$24,015.00	\$24,515.00	\$25,260.80	\$25,405.00	\$2
Temp. Sales Rep.	\$21,580.00	\$25,005.00	\$25,695.00	\$26,287.57	\$26,387.50	\$2
Sales Rep. I	\$20,835.00	\$25,010.00	\$25,795.00	\$26,417.79	\$26,495.00	\$2
Sales Rep. II	\$26,015.00	\$26,015.00	\$26,600.00	\$27,373.58	\$27,325.00	\$2
Sales Rep. III	\$28,040.00	\$28,040.00	\$28,580.00	\$29,533.29	\$29,505.00	\$3
Purchasing Agent I	\$31,760.00	\$31,760.00	\$31,760.00	\$31,760.00	\$31,760.00	\$3
Sales Rep. IV	\$30,150.00	\$30,150.00	\$30,890.00	\$31,880.51	\$31,605.00	\$3
Purchasing Agent III	\$34,270.00	\$34,270.00	\$34,270.00	\$35,070.00	\$35,070.00	\$3

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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

Employee Status – Custom Category

Values of Employee Termination Date

31Jan2006 to 30Jun2011

Show missing values

31Jan2006

30Apr2006

31Jan2007

28Feb2007

31Mar2007

30Apr2007

31May2007

30Jun2007

Remaining Values:

Show as missing Group as: Retired

Value Groups

▼ Active

+ Click or drag values here to add a value group

Employee Status – Calculated Item

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

47

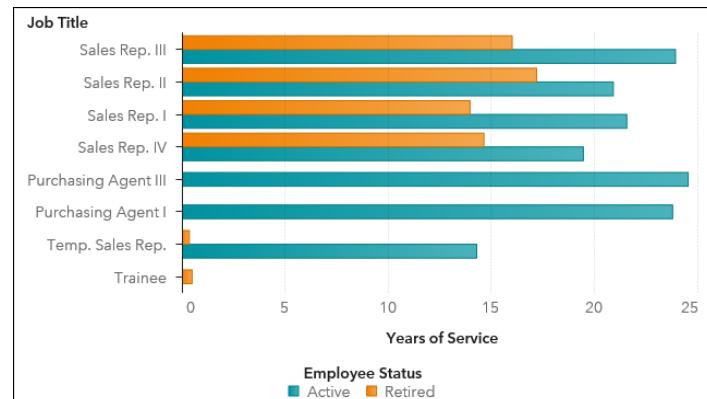


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3.4 Creating Data Items – Solution

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.



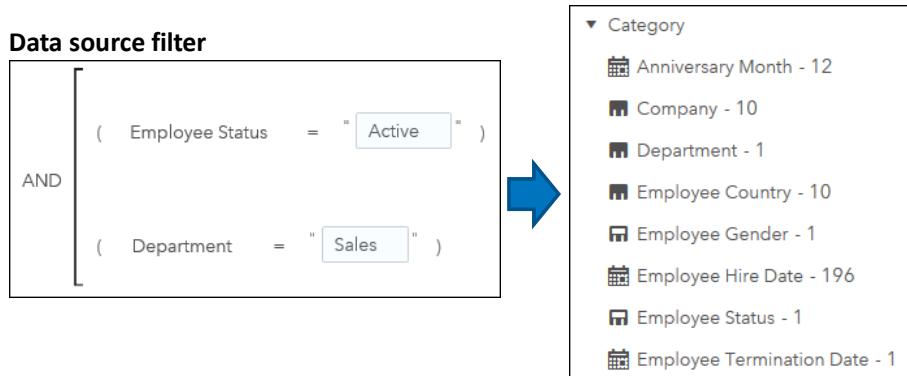
48



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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.



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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.



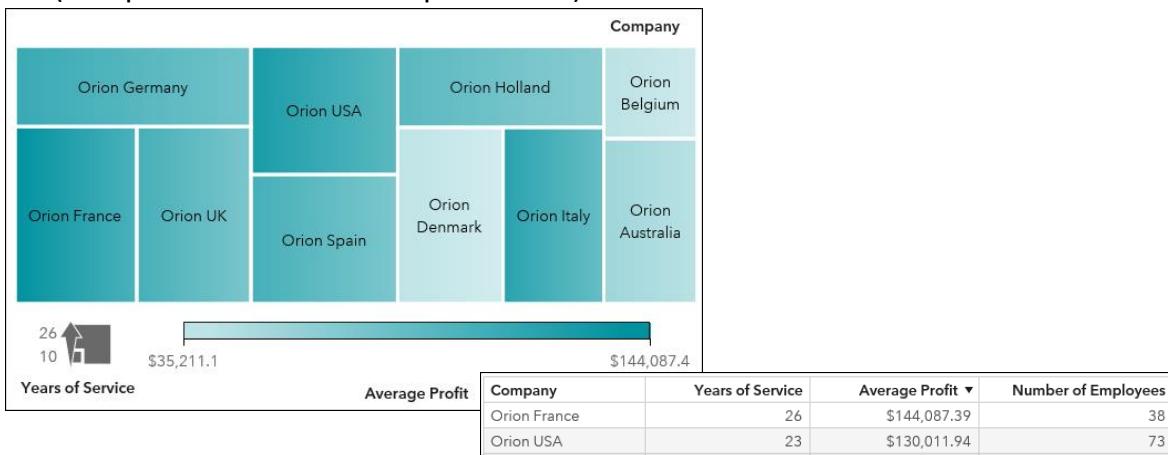
60



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3.6 Analyzing Data – Solution

Which two companies have the highest average profit generated (one possible criterion for promotion)? **Orion France and Orion USA**



68

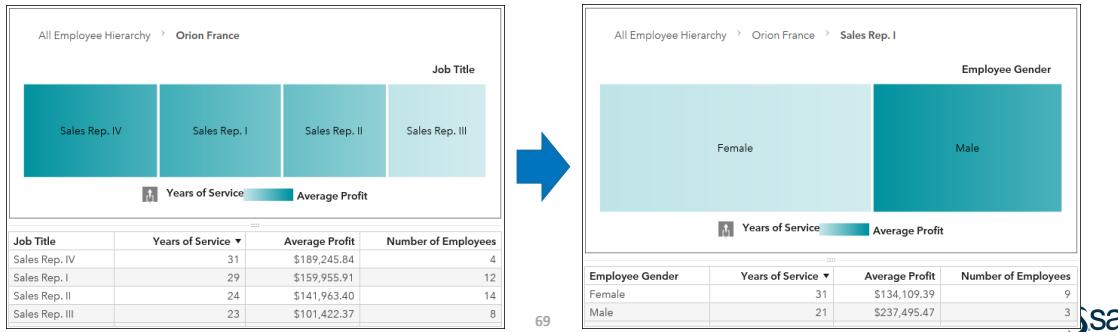


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3.6 Analyzing Data – Solution

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

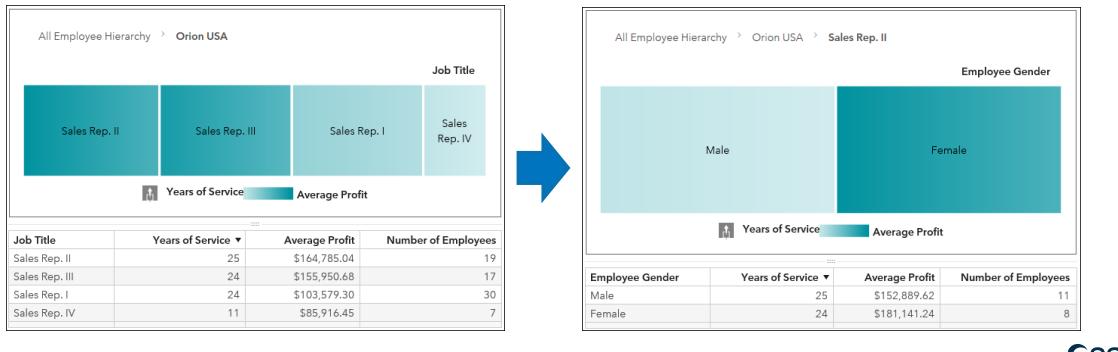
For Orion France, Sales Rep. I employees have the second highest average years of service and the highest profit per employee among the jobs with the most number of employees.



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.

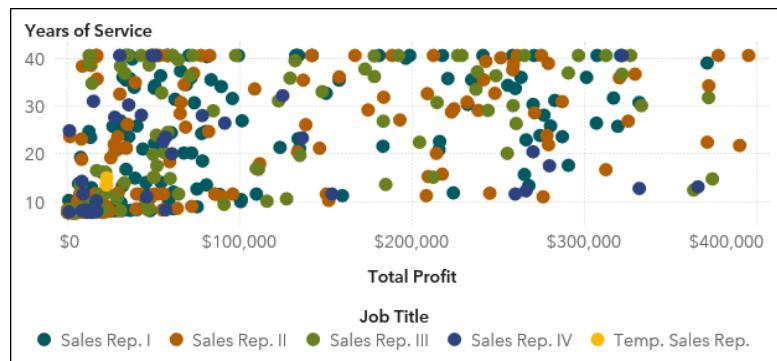
81



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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Lesson 4 Designing Reports with SAS® Visual Analytics

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4.1 Creating a Simple Report

Objectives

- Discuss the Report phase of the SAS Visual Analytics methodology.
- Discuss useful tips for designing reports.
- Describe when to use reporting graphs in Visual Analytics.
- Describe when to use dual axis graphs in Visual Analytics.

3



Visual Analytics Methodology: Report

In the **Report** phase, you need to develop reports using one (or more) of the following features:

- Multiple pages
- Animation
- Ranks
- Prompts, actions, and links
- Display rules



4



4.01 Activity

Sign in to SAS Viya for Learners. Open **Ugly Report** (in the **SAS Content/Courses/YVA183/Basics** folder).

What are your first impressions of this report?

Do you think it can be improved? How?



Tips for Designing Reports

- Understand the audience.
- Make accessible to all.
- Tell a single data story.
- Use visually appealing, easy to understand objects.
- Use the simplest graph.
- Use consistent fonts.
- Limit the number of objects.
- Limit the number of pages.

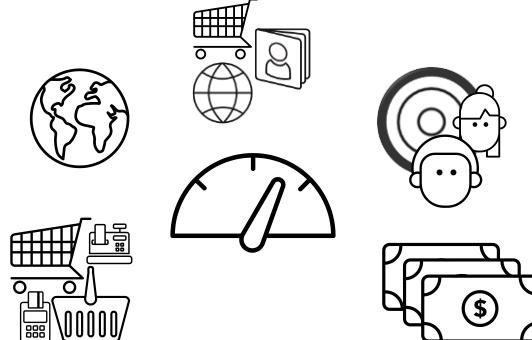
For more information about how to create effective reports, see www.sas.com/beautifulreports.

Business Scenario: Customers



For the next assignment, the Marketing team has asked for a report that can be used to identify specific groups of customers (by order type, location, gender, and age group).

Start by creating a simple report that analyzes profit and orders.



7

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Objects: Graphs (Reporting)



Use a word cloud to show summary information in an appealing fashion.



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 Visual Analytics, 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.

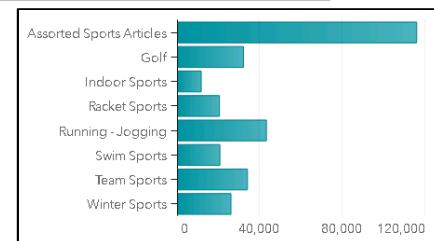
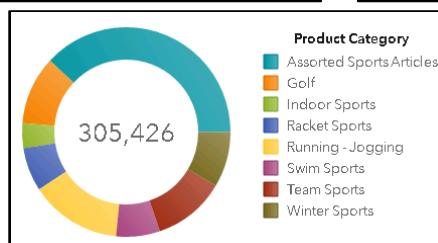
Note: Word clouds should not be used when analytical accuracy is desired because it is very difficult to compare the relative sizes of different words.

- 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.

4.02 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?



4.03 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	\$5,659,450.59
North America	\$2,121,645.56
Oceania	\$462,934.64

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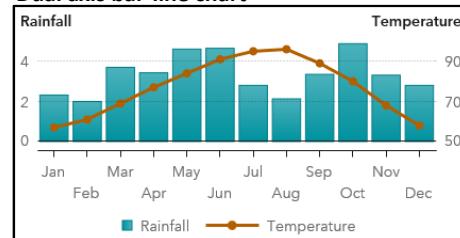
Objects: Graphs (Dual Axis)

Use *dual axis* charts and plots to compare two series with different ranges.

Dual axis bar chart



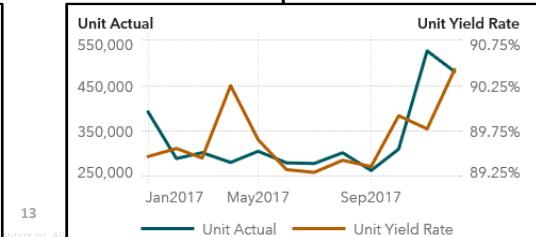
Dual axis bar-line chart



Dual axis line chart



Dual axis time series plot



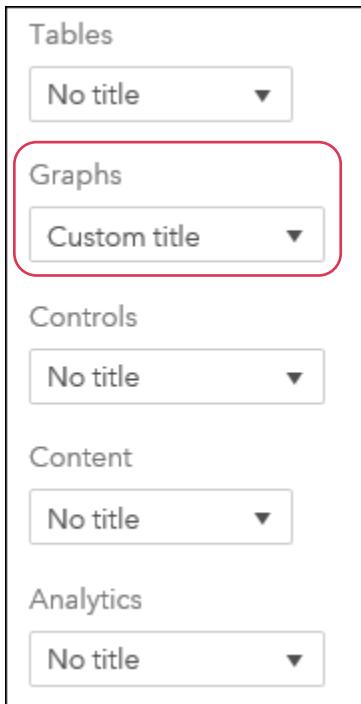
Dual axis bar chart	A dual axis bar chart displays two bar charts with a shared category axis and separate response axes. Use a dual axis bar chart when the value for both measures does not depend on the prior value. For example, in the chart above, the values of Customer Satisfaction and Sales Rep Customers 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 in Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo4.1** and select **Edit**.
4. Change the settings to add custom titles to all objects.
 - a. Select <**user name**> \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**.
5. Hide data items.
 - a. In the left pane, click the **Data** icon.
 - b. Click \vdots (**Actions**) and select **Show or hide data items**.
 - c. Select **City Name** in the Displayed items list.
 - d. Click  (**Remove all**) to move all data items to the Hidden items list.
 - e. 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:

Displayed items (5):

- Customer Age Group - 5
- Frequency
- Number of Orders
- Order Month - 12
- Profit

- f. 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

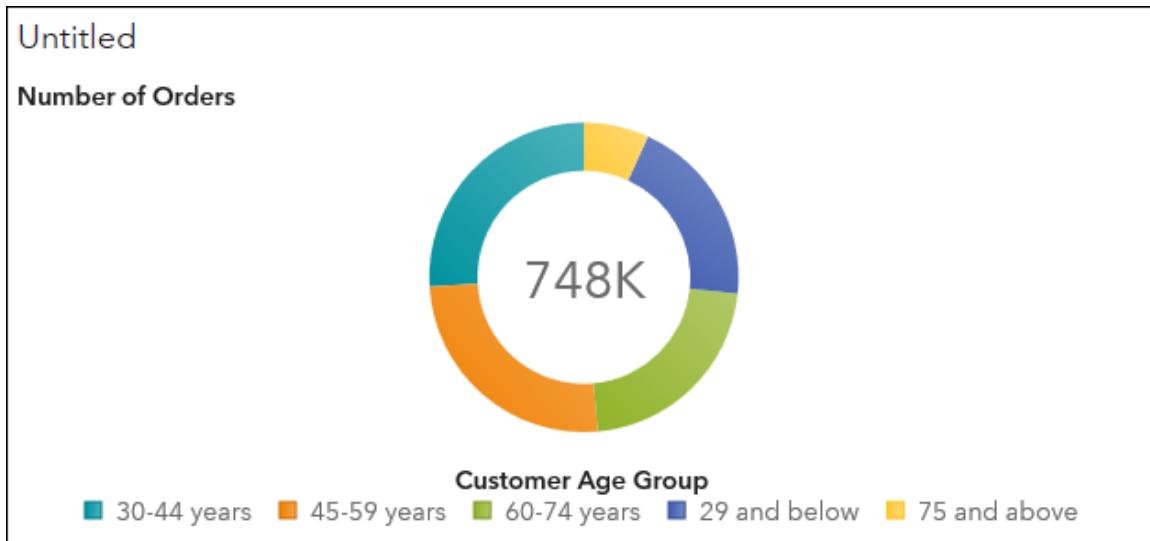
- Frequency
- Profit

▼ Aggregated Measure

- Number of Orders

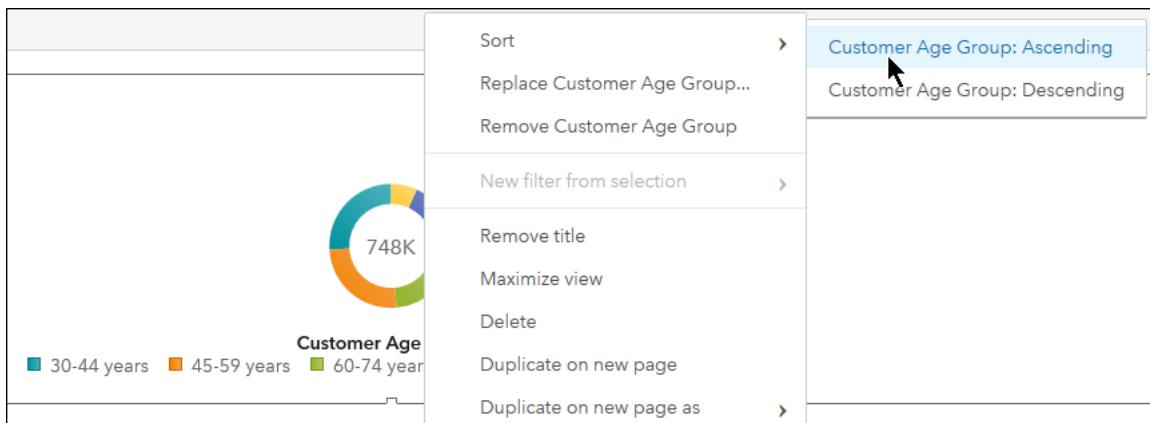
6. Create a pie chart.
- In the left pane, click the **Objects** icon.
 - Drag the **Pie Chart** object, from the Graphs group, to the top of the canvas.
 - In the right pane, click the **Roles** icon.
 - For the Category role, select **Add** ⇒ **Customer Age Group**.
 - For the Measure role, select **Frequency** ⇒ **Number of Orders**.

The pie chart should resemble the following:

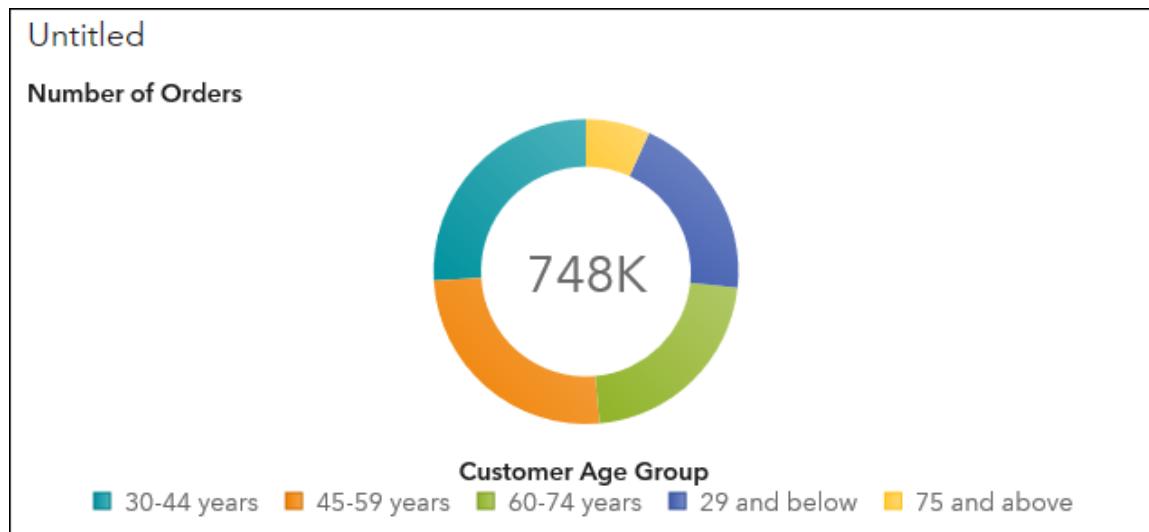


By default, the slices in a pie chart are sorted by the measure in descending order.

- 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:



- Double-click the title, **Untitled**.

A font formatting tool appears that you can use to format the title.



- Enter **Number of Orders by Customer Age Group** as the title.
- In the right pane, click the **Options** icon.
- If necessary, expand the Object group and enter **Orders by Age Group** in the Name field.

Options

Orders by Age Group

▼ Object

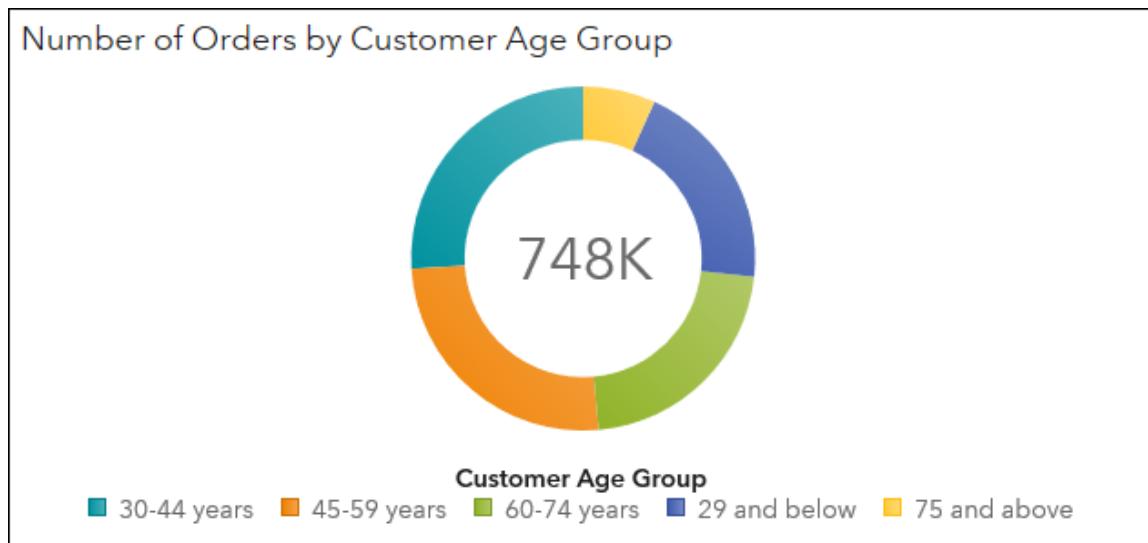
Name: Orders by Age Group

Title: Custom title

Number of Orders by Customer Age

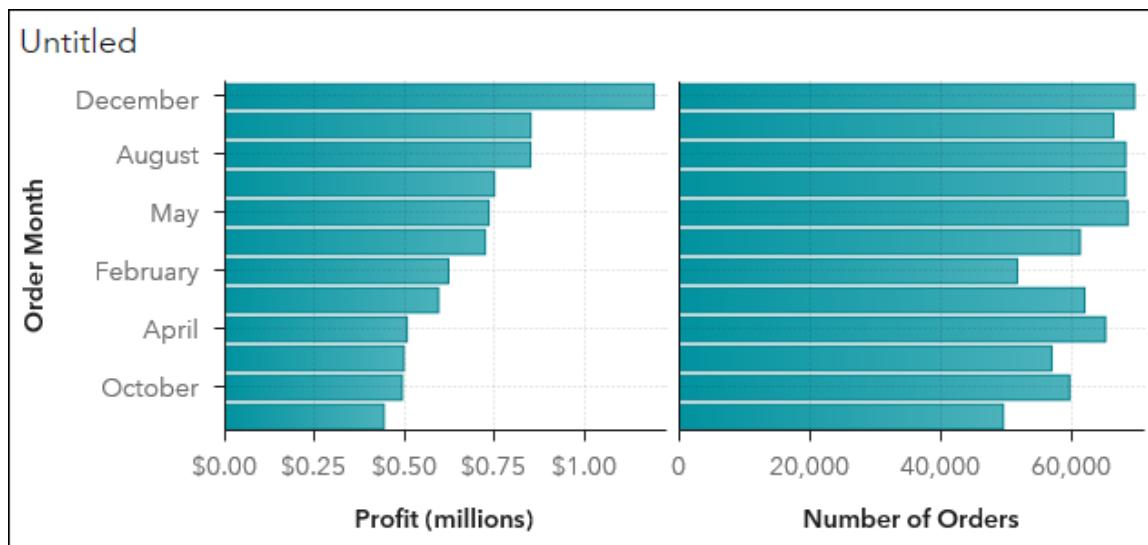
- In the Pie group, clear “Other” slice.
- Clear **Label**.

The updated pie chart should resemble the following:



7. Create a bar chart.
 - a. In the left pane, click the **Objects** tab.
 - b. Drag the **Bar Chart** object, from the Graphs group, to the drop zone on the right side of the pie chart.
 - c. In the right pane, click the **Roles** tab.
 - d. For the Category role, select **Add** \Rightarrow **Order Month**.
 - e. For the Measure role, select **Frequency** \Rightarrow **Profit**.
 - f. For the Measure role, select **Add** \Rightarrow **Number of Orders** and click **OK**.

The bar chart should resemble the following:



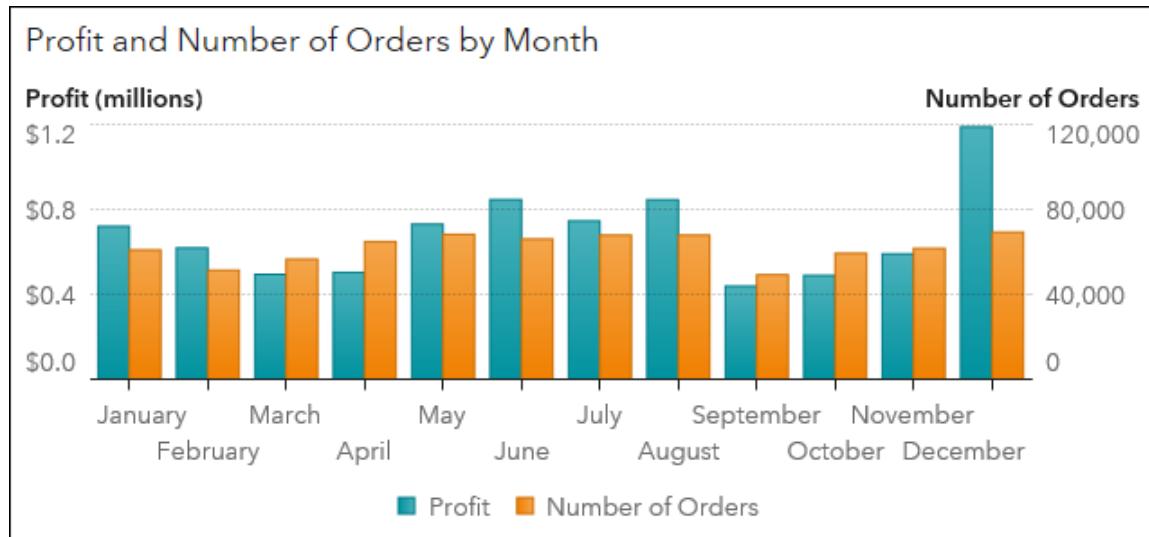
Because **Profit** and **Number of Orders** have different ranges, they are displayed in different bar charts. We can change to a dual axis bar chart to display both measures together.

- g. In the upper right corner of the chart, click  (More) and select **Change Bar Chart** to **Dual Axis Bar Chart**.

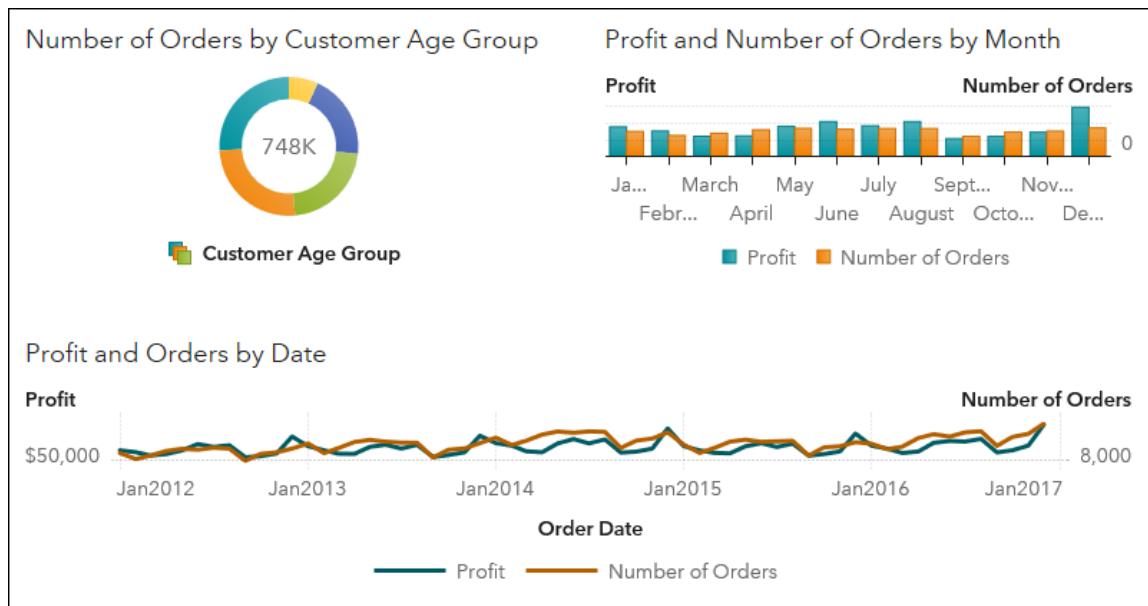
Note: This option is not available if the object is in  (Maximize) view.

- h. In the dual axis bar chart, right-click **Order Month** on the horizontal axis and select **Sort** **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:



8. In the upper right corner, click (Menu) and select **Save As**.
9. Navigate to **My Folder**.
10. Click **Save**.

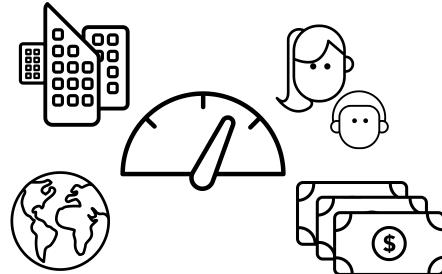
End of Demonstration

Business Scenario: Employees



For the next assignment, the Human Resources team has asked for a report to identify which employees can be promoted. They would like to get a list of employees by company, job title, and gender and evaluate the years of service and total profit generated to determine promotions. They would like to promote these employees during the month of their anniversary when they joined the company.

Start by creating a simple report that analyzes the number of employees and profit generated.





Practice

1. Creating a Simple Report

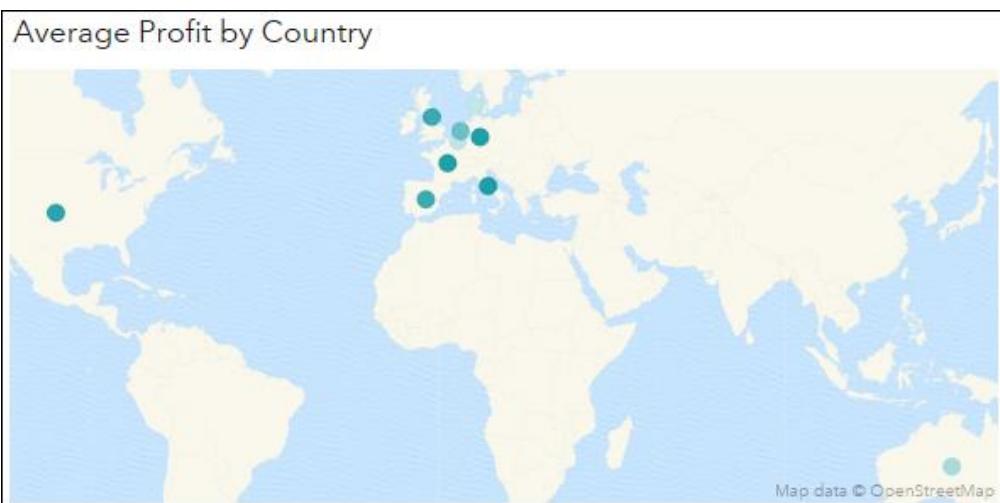
- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise4.1** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
- Create a geo map to the left of the bar chart. Modify the following options for the geo map:

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:



- Create a dual axis bar-line chart at the bottom of the canvas. Assign the following data items to the specified roles:

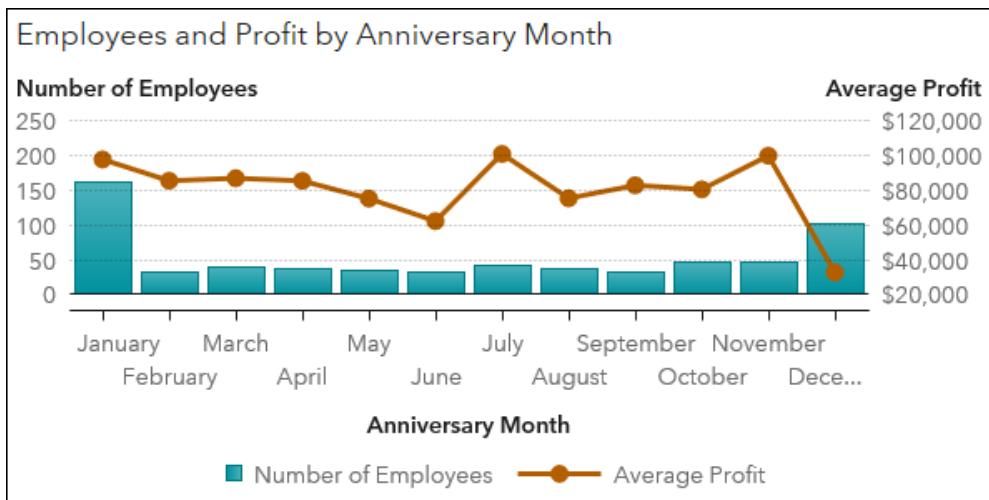
Category	Anniversary Month
Measure (bar)	Number of Employees
Measure (line)	Average Profit

- f. Modify the following options for the dual axis bar-line chart:

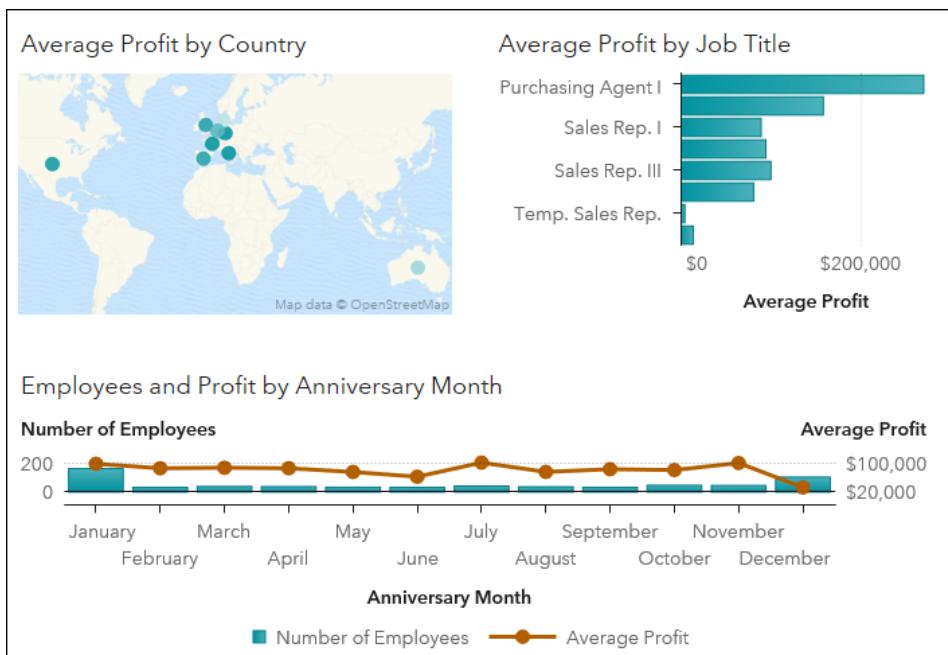
Object: Name	Employees and Profit by Anniversary Month
Object: Custom Title	Employees and Profit by Anniversary Month
Line: Markers	<selected>

- 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 to **My Folder**.

End of Practices

4.2 Creating Interactive Reports

Objectives

- Describe how to tell a data story using multiple pages.
- Discuss the various ways that data can be filtered in Visual Analytics.
- Describe how to use report and page prompts.
- Discuss when to use controls in Visual Analytics.
- Discuss the types of actions that are available in a report.
- Discuss the types of links that are available in a report.

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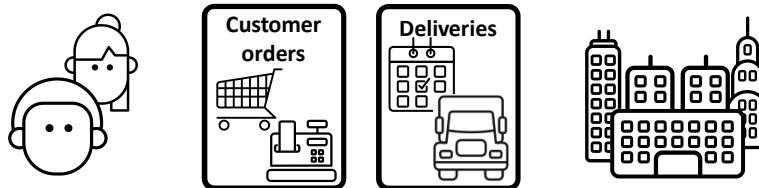


Business Scenario: Customers



After sharing the report with the Marketing team, they have asked for the following modifications:

- multiple pages: one for customer orders and one for deliveries
- an analysis of profit and orders by gender
- an analysis of the top 10 cities that shows delivery, order, and profit information over time



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Creating Reports with Multiple Pages

Reports can contain multiple pages to help you successfully tell your data story. When creating a multi-page report, each page should

- contain a limited number of objects
- focus on a single idea
- stand on its own
- communicate one point that advances the data story.

Hidden pages are pages that are not displayed to report viewers. However, linking from an object in a regular page can enable viewers to see additional details.

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.

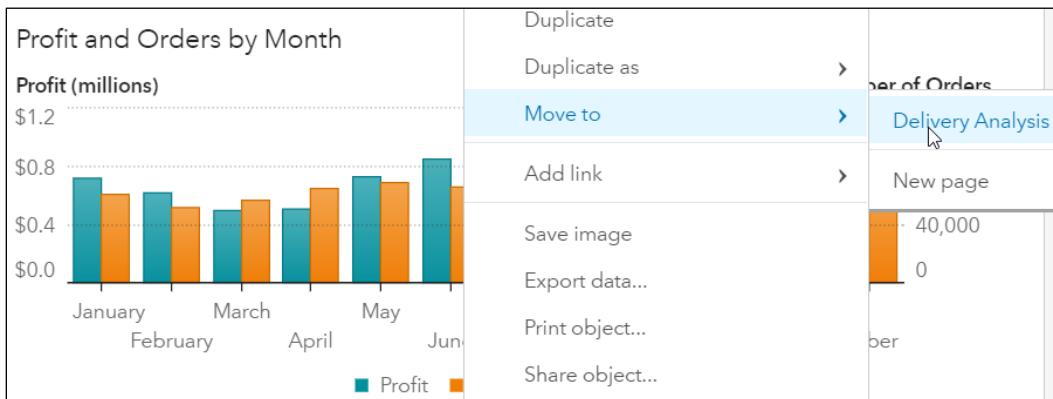
Note: Links are discussed in more detail in a later section.



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 in Visual Analytics.

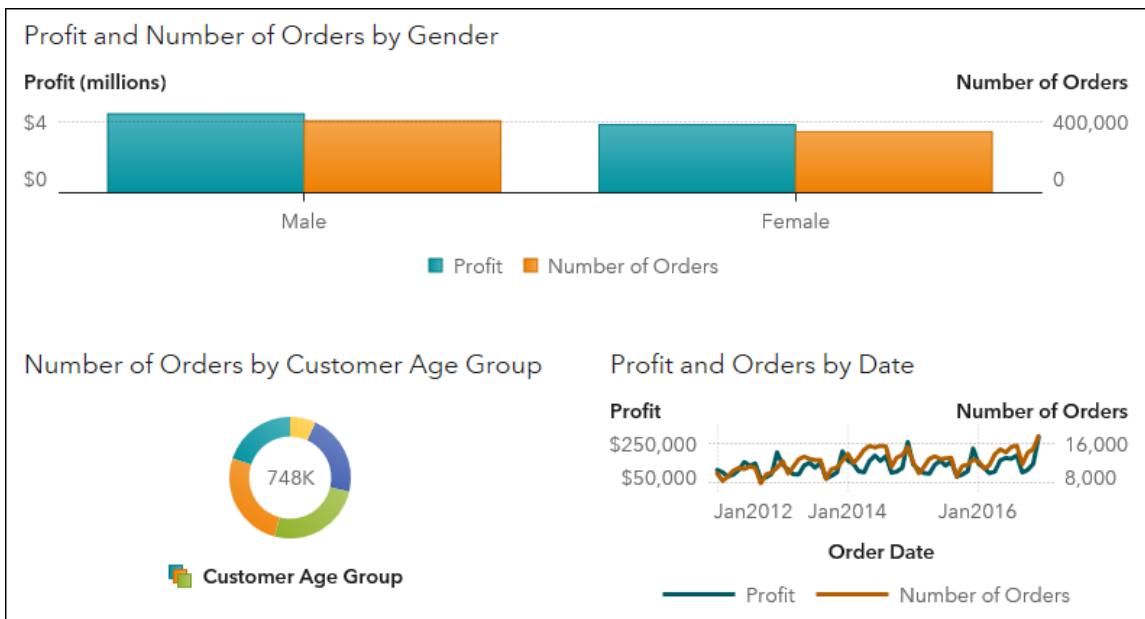
1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo4.2a** and select **Edit**.
4. Create a new page.
 - a. In the upper left corner of the report, click **+** (New page) next to **Page 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.
5. 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** \Rightarrow **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.

6. Click the **Customer Order Analysis** tab to make it active.

7. Rearrange the graphs on the Customer Order Analysis page so that it resembles the following:



8. Create a bubble plot.
- Click the **Delivery Analysis** tab to make it active.
 - In the left pane, click the **Objects** icon.
 - Drag the **Bubble Plot** object, from the Graphs group, to the left side of the canvas.
 - In the right pane, click the **Roles** icon.
 - For the Group role, select **Add** \Rightarrow **City Name**.
 - For the X axis role, select **Add** \Rightarrow **Days to Delivery**.
 - For the Y axis role, select **Add** \Rightarrow **Number of Orders**.
 - For the Size role, select **Add** \Rightarrow **Profit**.

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. Later, you add a rank to reduce the number of bubbles.

- For the Animation role, select **Add** \Rightarrow **Order Month**.
- In the right pane, click the **Options** icon.
- In the Object group, enter **Order Information by Month** in the **Name** field.
- Enter **Top 10 Cities by Number of Orders** in the **Title** field.
- In the right pane, click the **Ranks** icon.
- In the Ranks pane, select **New rank** \Rightarrow **City Name**.
- Verify that **Top count** is specified.
- Verify that **10** is specified for the **Count** field.

- q. Select **Number of Orders** for the **By** field.
- r. Select the box for **Ties**.

Ranks

Order Information by Month

+ New rank

▼ City Name Delete

Top count

Count:

10

By:

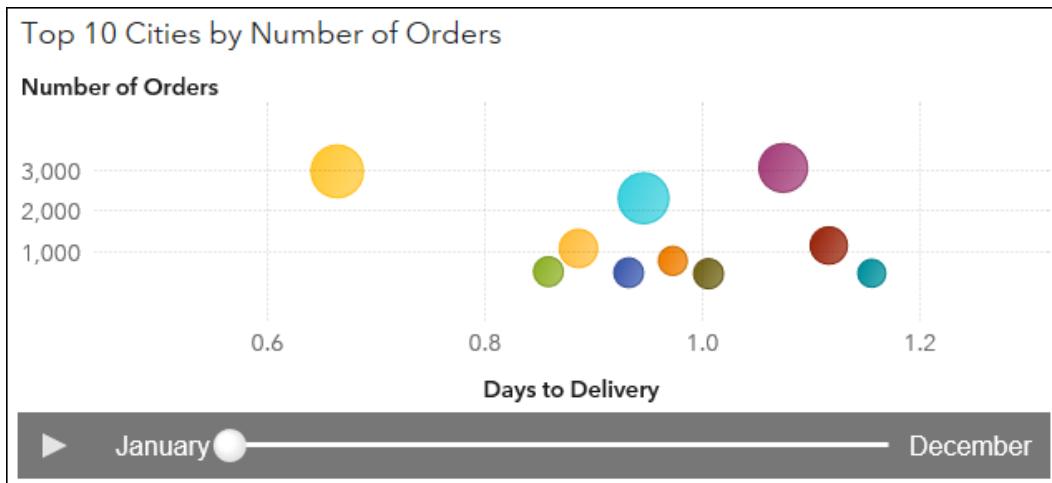
Number of Orders

Include:

Ties

All Other

The bubble plot should resemble the following:



- s. Click ► in the lower left corner of the bubble plot to play the animation.
- t. When you are finished viewing the animation, click ■.
9. In the upper right corner, click ☰ (Menu) and select **Save As**.
10. Navigate to **My Folder**.
11. Click **Save**.

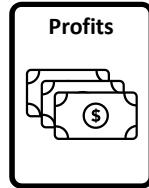
End of Demonstration

Business Scenario: Employees



After sharing the report with the Human Resources team, they have asked for the following modifications:

- multiple pages: one for employees and one for profits
- an analysis of profit by product group





Practice

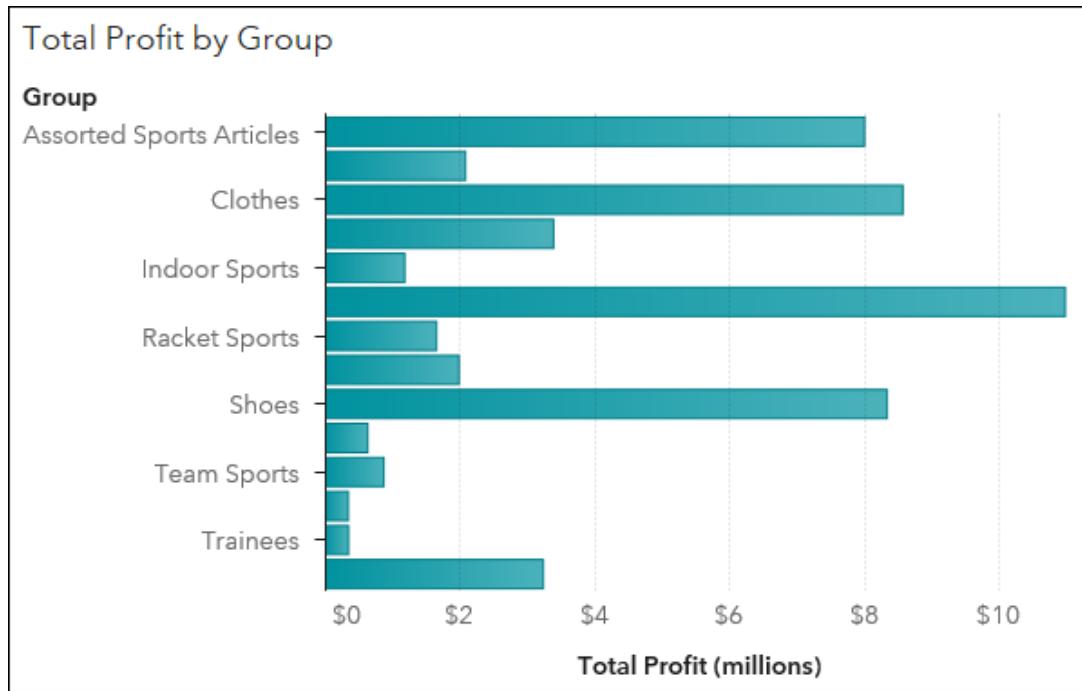
2. Working with Pages

- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise4.2a** report from the **SAS Content/Courses/YVA183/Basics/Exercises (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:



- Save the report in **My Folder**.

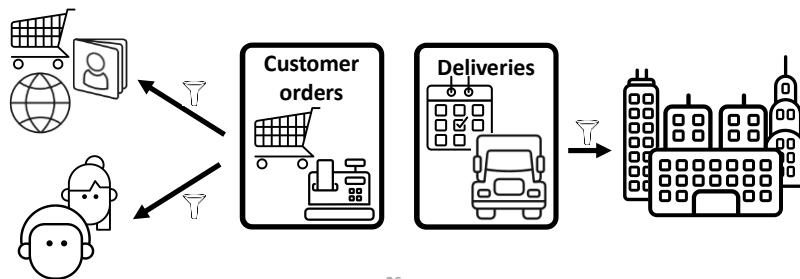
End of Practices

Business Scenario: Customers



After sharing the updated report with the Marketing team, they have asked for the following modifications:

- Customer orders page: add some way to filter by type of order.
- Customer orders page: view profit and order information for a specific gender and age group.
- Deliveries page: view profit and order information for a specific city.



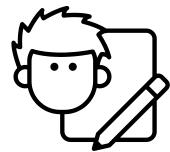
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Filtering Data

Many different types of filters can be created to subset data in Visual Analytics:

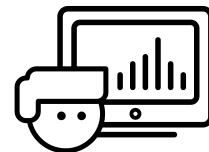


Report Designer

Detail report filters

- Data source
- Basic
- Advanced

Post-aggregate report filters



Report Viewer

Prompts

- Report
- Page

Actions

- Filter
- Links

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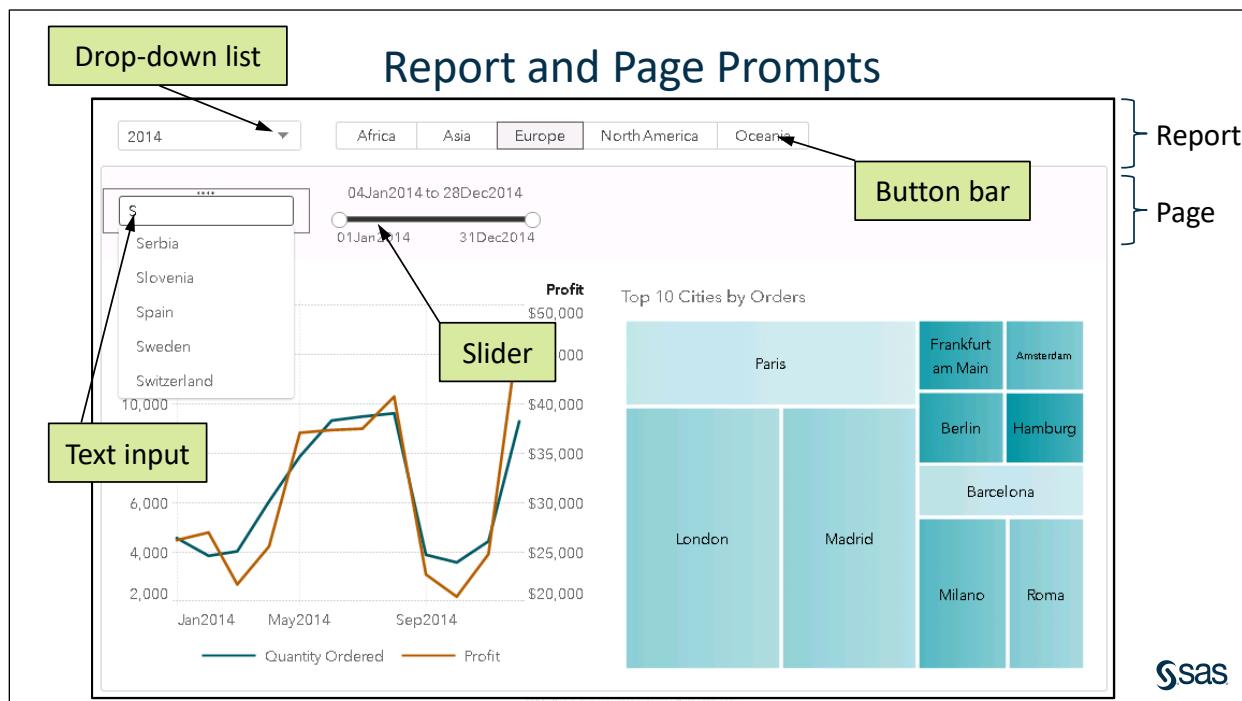


The following types of filters can be modified by report viewers:

Report prompt	Automatically subsets the data for all objects in the report if the report object uses the same data source as the prompt. If the report object uses a different data source, 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” in the SAS® Visual Analytics 8.3 documentation.
Page prompt	Automatically subsets the data for all objects on the page if 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 action	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 more information about prompts, see “Working with Controls” in the SAS® Visual Analytics 8.3 documentation.

For more information about actions and links, see “Working with Report Actions and Links” in the SAS® Visual Analytics 8.3 documentation.



Note: Report and page control areas are not displayed by default.

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

Objects: Controls

The screenshot shows a user interface for filtering products. At the top, there's a horizontal button bar with four categories: Children, Clothes & Shoes, Outdoors, and Sports. Below it, a vertical list of products is shown, starting with 'Gloves & Mittens' and including 'Golf', 'Golf Clothes', 'Green Tomato', and 'Gymnastic Clothing'. A search bar at the top of this list has 'G' typed into it. To the right, a dropdown menu titled 'Product Category' lists various categories: Clear filter, Assorted Sports Articles, Children Sports, Clothes, Golf, Indoor Sports, Outdoors, Racket Sports, Running - Jogging, Shoes, Swim Sports, Team Sports, and Winter Sports. A green callout box points to the dropdown menu with the text: 'In a drop-down list, use a category with a moderate number of distinct values.' A green callout box points to the product list with the text: 'In a text input, use a category with a lot of distinct values.' Another green callout box points to the button bar with the text: 'On a button bar, use a category with few distinct values.'

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: When multiple control objects are used to filter values, the AND operator is used for the filter.

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 8.3 documentation.

4.04 Quiz

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

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Objects: Controls

- Assorted Sports Articles
- Children Sports
- Clothes
- Golf
- Indoor Sports
- Outdoors
- Racket Sports
- Running - Jogging
- Shoes
- Swim Sports
- Team Sports
- Winter Sports

Use a *list control* to enable viewers to select multiple values.



Use a *slider control* to enable viewers to select a range of values.

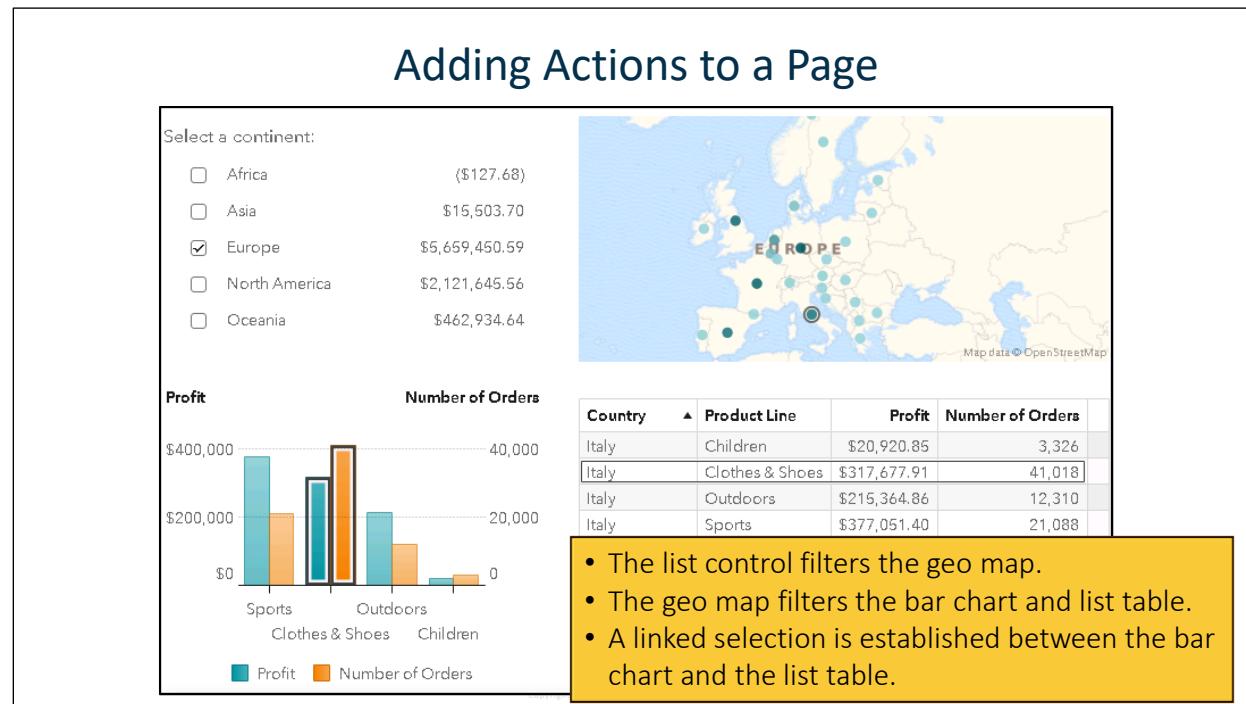
The list control can be used only as a report or page prompt inside a prompt container.

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List	A list control enables a viewer to select one or more category values from a list.
Slider	<p>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 accepts only date time or measure data items.</p> <p>Note: When a parameter is used with a slider control, the control is converted to a single-point slider.</p>



Actions are used to direct a report viewer's attention to specific results in a report. The following actions are available:

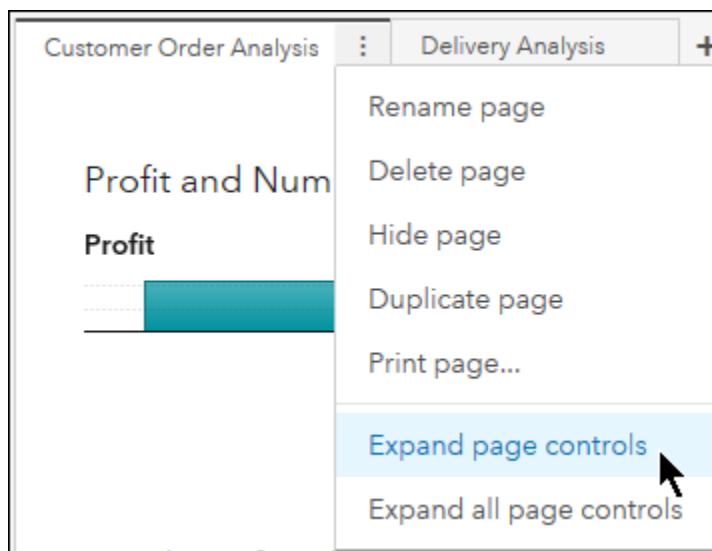
Linked selection	A linked selection enables you to show the same data highlighted simultaneously in two or more tables, graphs, or controls in the same page. The data for the linked selection has the same appearance in each object, which makes the data easily apparent to report viewers.
Filter	A filter action enables you to restrict the data displayed in other objects on the page. A viewer can select a subset of data in the source object and see the restricted data for any target objects.



Working with Prompts and Actions

This demonstration illustrates how to add page prompts and actions to create interactive reports in Visual Analytics.

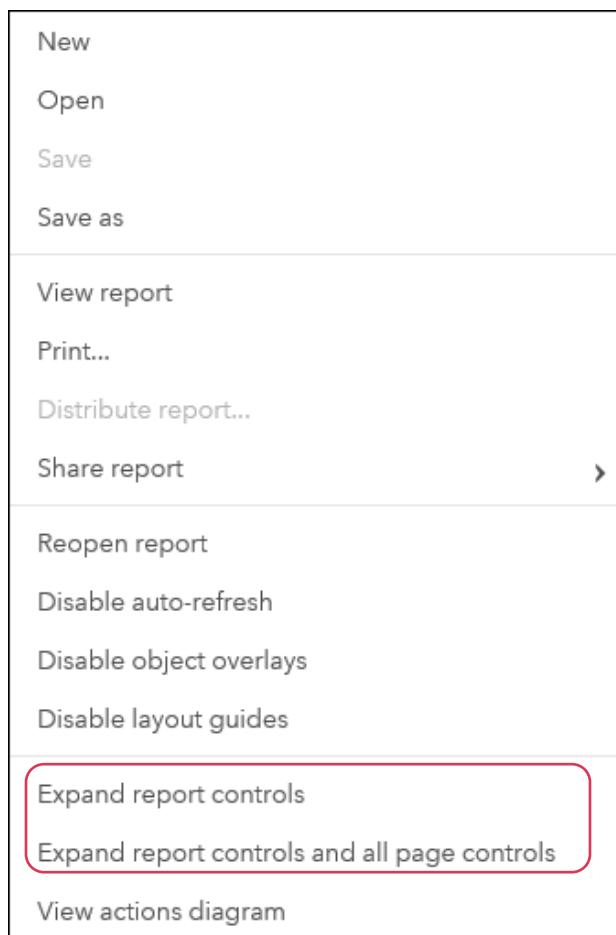
1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo4.2b** and select **Edit**.
4. Add a page prompt to Customer Order Analysis.
 - a. If necessary, click the **Customer Order Analysis** page to make it active.
 - b. Click (**Options**) and select **Expand page controls** on the Customer Order Analysis tab.



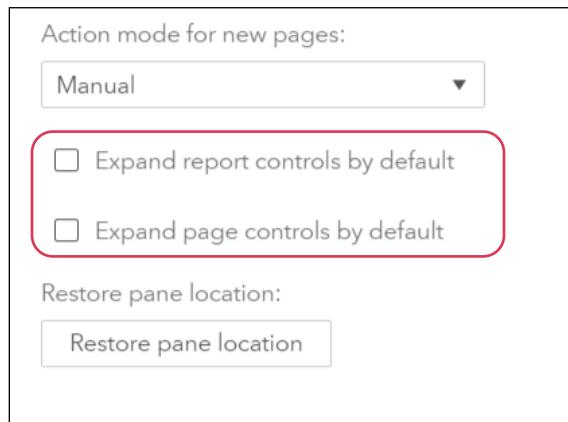
The page prompt area is shown on the page:



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 SAS Visual Analytics, you can specify whether to expand report and page controls by default for new pages.



- 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.



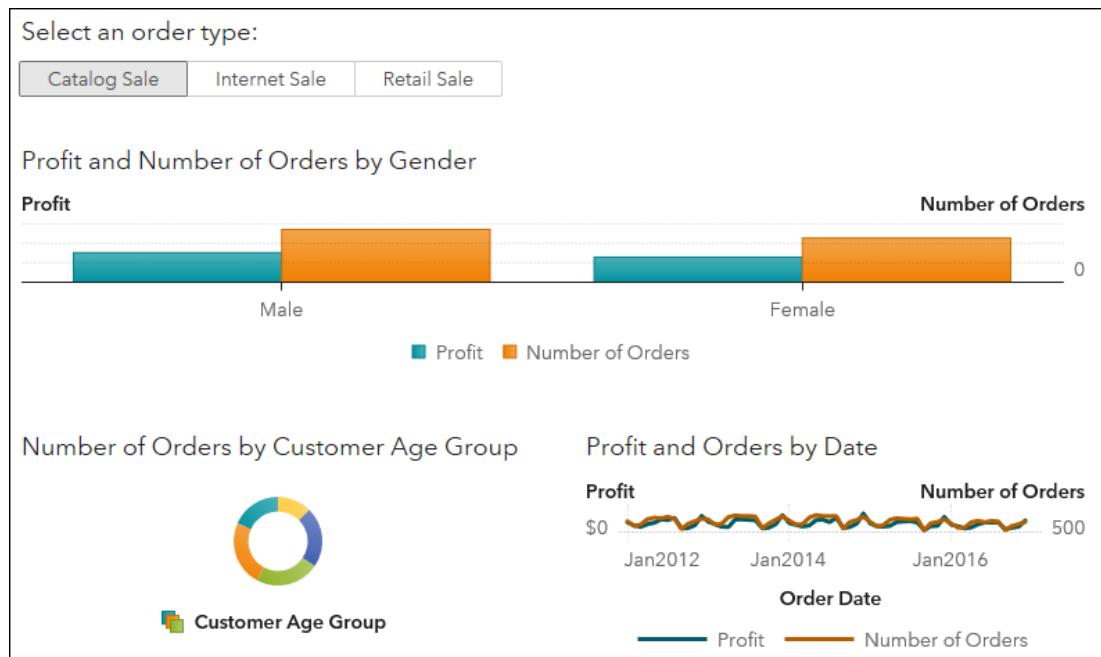
- e. In the right pane, click the **Options** icon.
- f. In the Object group, enter **Order Type Selector** in the **Name** field.
- g. Select **Custom Title** for the title.
- h. Enter **Select an order type:** in the **Title** field.

The auto control should resemble the following:



- i. Click **Catalog Sale** in the control to filter the objects on the page.

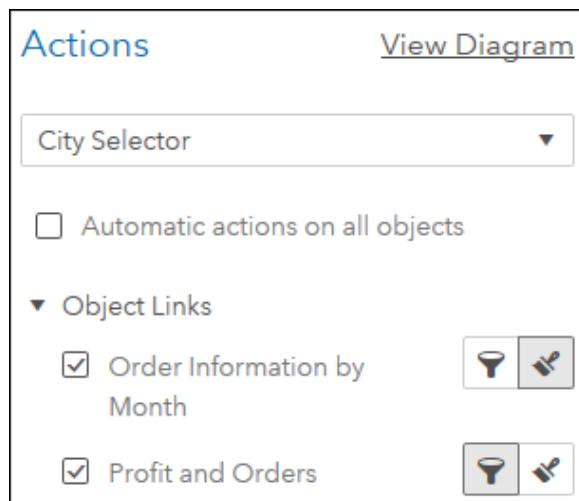
The Customer Order Analysis section should resemble the following:



- j. Click **Catalog Sale** in the control to deselect it.
5. Add actions between objects on the Delivery Analysis page.
 - a. Click the **Delivery Analysis** page to make it active.
 - b. Click the drop-down list control to select it.
 - c. In the right pane, click the **Actions** icon.
 - d. In the Actions pane, expand **Object Links** if necessary.
 - e. Select **Profit and Orders** (the dual axis bar chart).
 - f. Verify that (Filter) is selected.
 - g. Select **Order Information by Month** (the bubble plot).

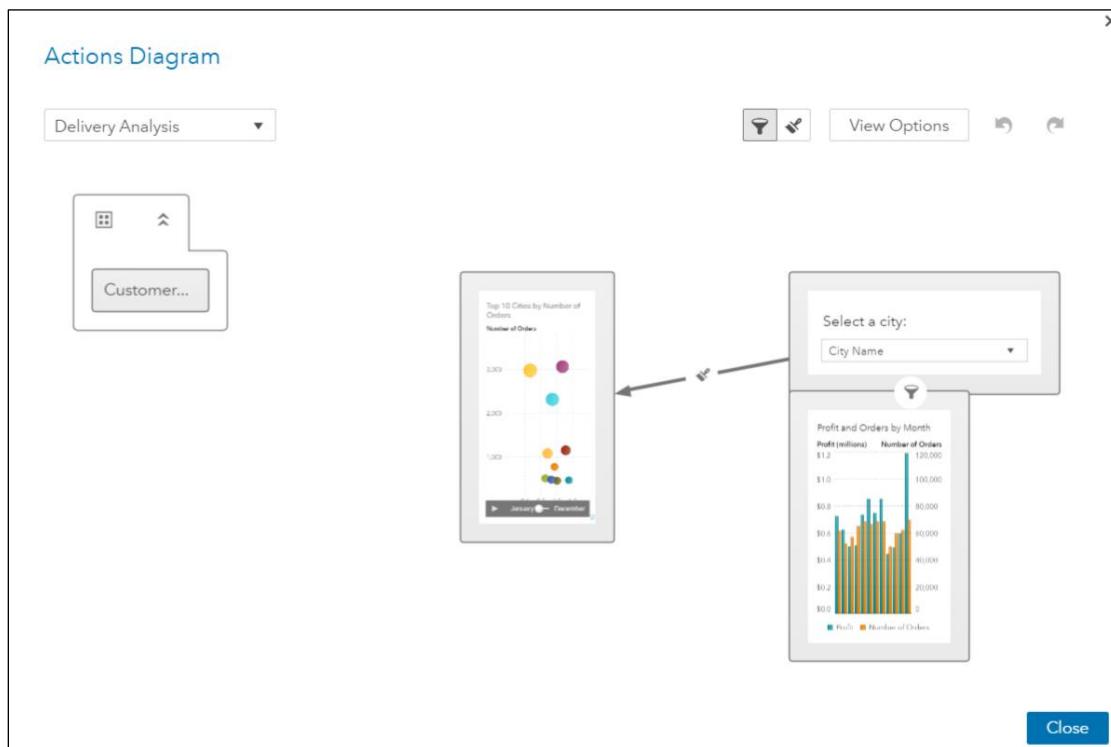
- h. Click  **(Linked selection)**.

The Actions pane should resemble the following:



6. 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.

7. Click **Close**.
8. In the upper right corner, click  **(Menu)** and select **Save As**.
9. Navigate to **My Folder**.

10. Click **Save**.

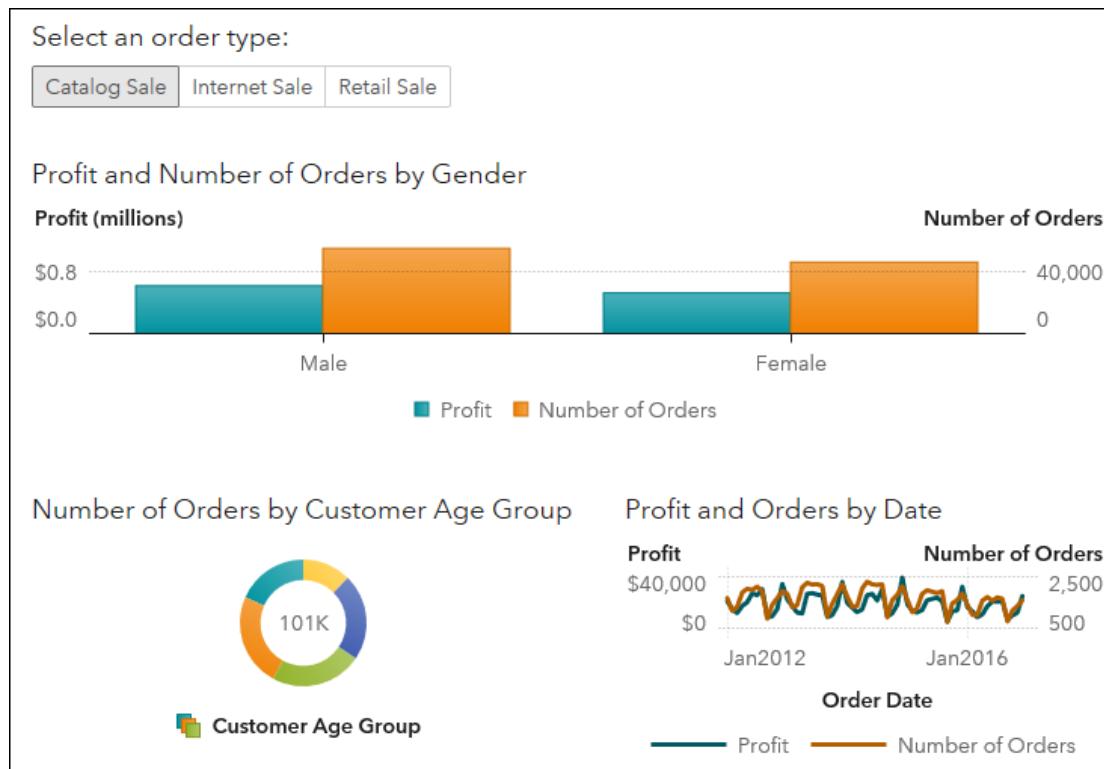
11. View the report.

- In the upper right corner, click  (Menu) and select **View report**.

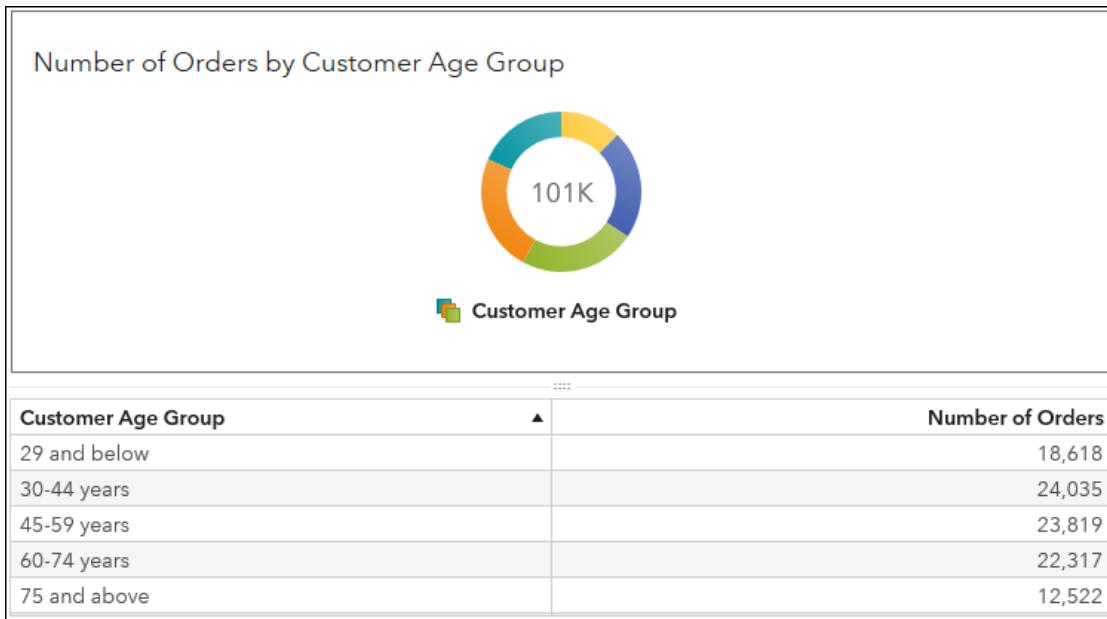
The report opens in the Report Viewer.

- Click **Catalog Sale** in the button bar.

The Customer Order Analysis page updates to show information about catalog products ordered.



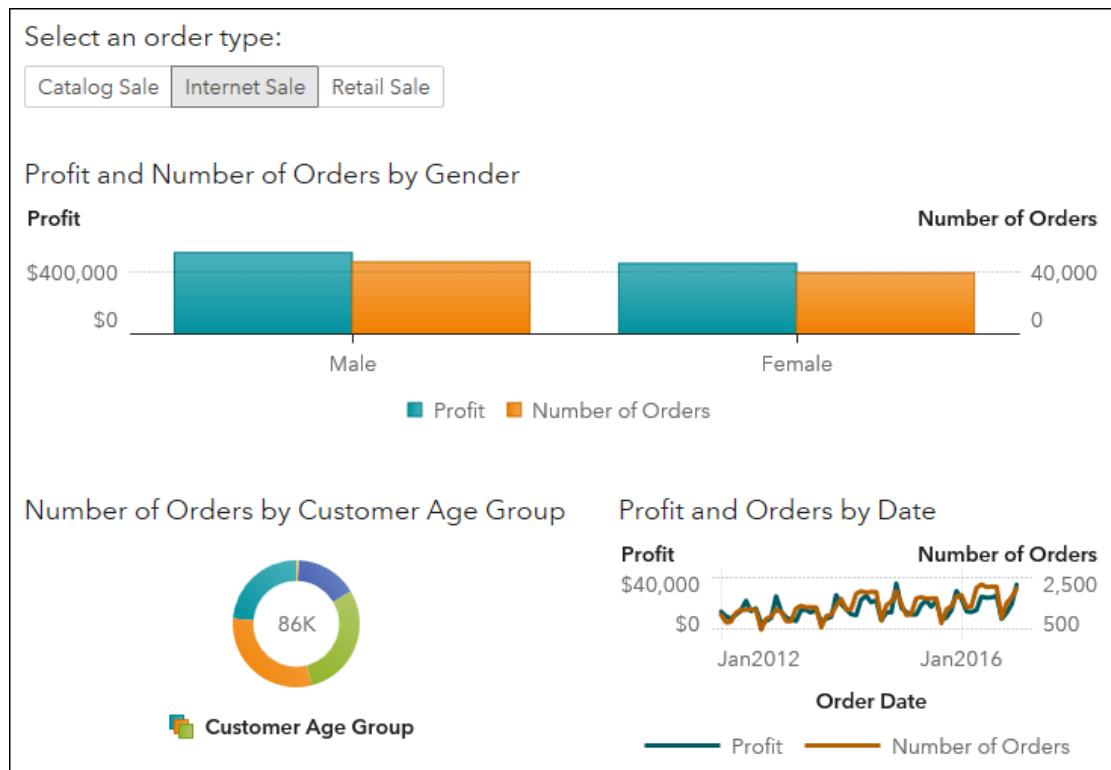
- c. In the upper right corner of the pie chart, click  (Maximize).



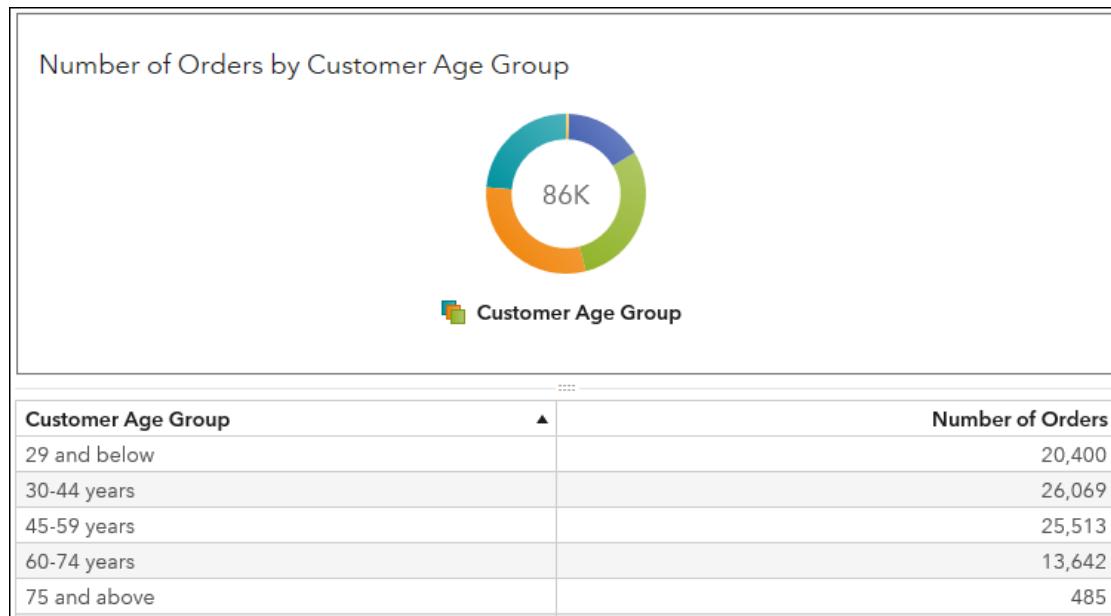
Note: Since the customer age is calculated using the NOW function, this chart will change over time.

- 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.



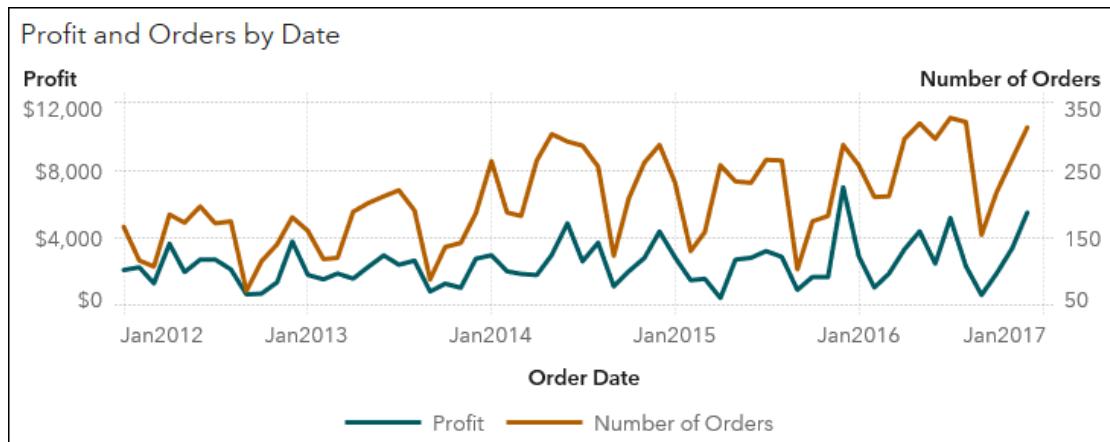
- f. In the upper right corner of the pie chart, click (Maximize).



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.

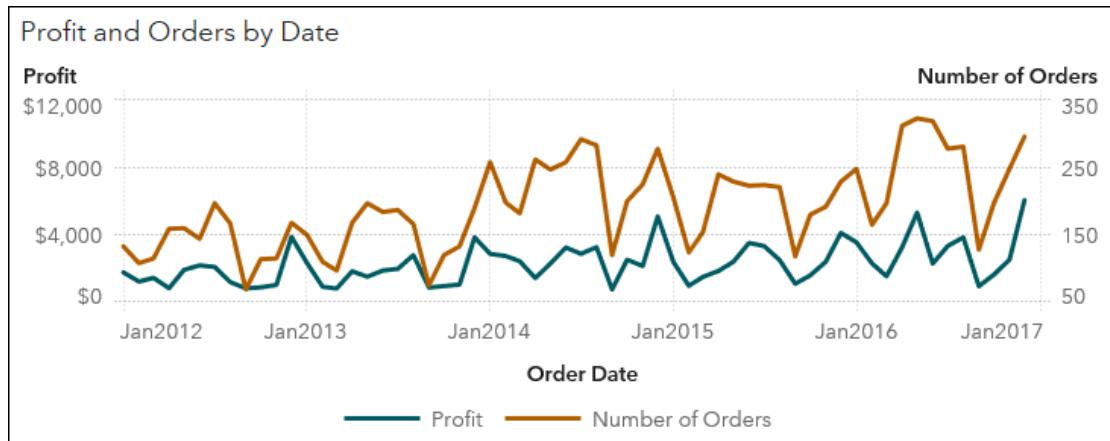
The dual axis time series plot should resemble the following:



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.

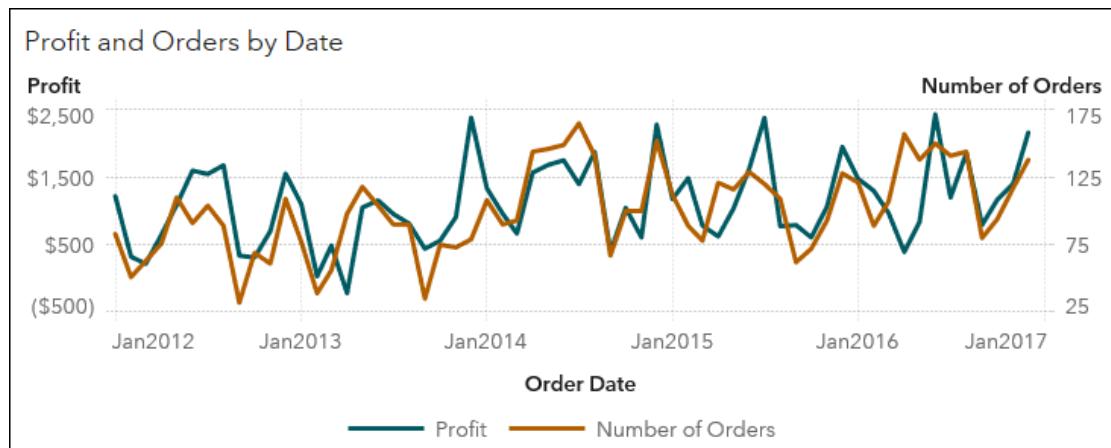
The dual axis time series plot should resemble the following:



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.

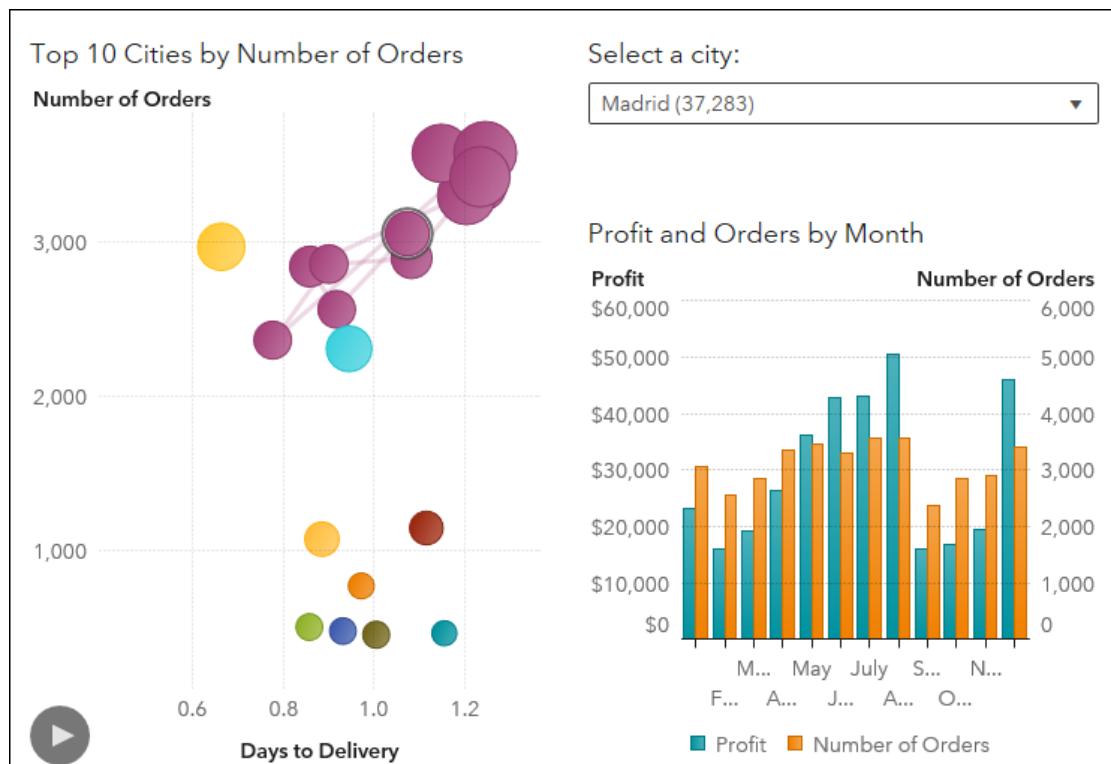
The dual axis time series plot should resemble the following:



For adults between 60–74 years, the **Profit** peaks have returned in December. This could indicate grandmothers buying presents for their grandchildren.

- I. 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.

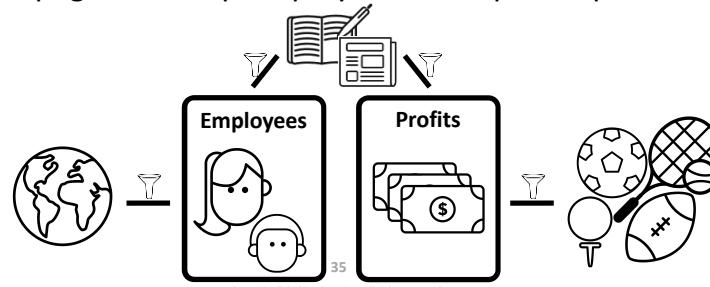
End of Demonstration

Business Scenario: Employees



After sharing the updated report with the Human Resources team, they have asked for the following modifications:

- For the report, add some way to filter by employee type.
- For the employees page, view profit information for a specific country.
- For the profits page, add some way to filter by company.
- For the profits page, view top employees for a specific product group.



sas



Practice

3. Working with Prompts and Actions

- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise4.2b** report from the **SAS Content/Courses/YVA183/Basics/Exercises (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
--------	---------

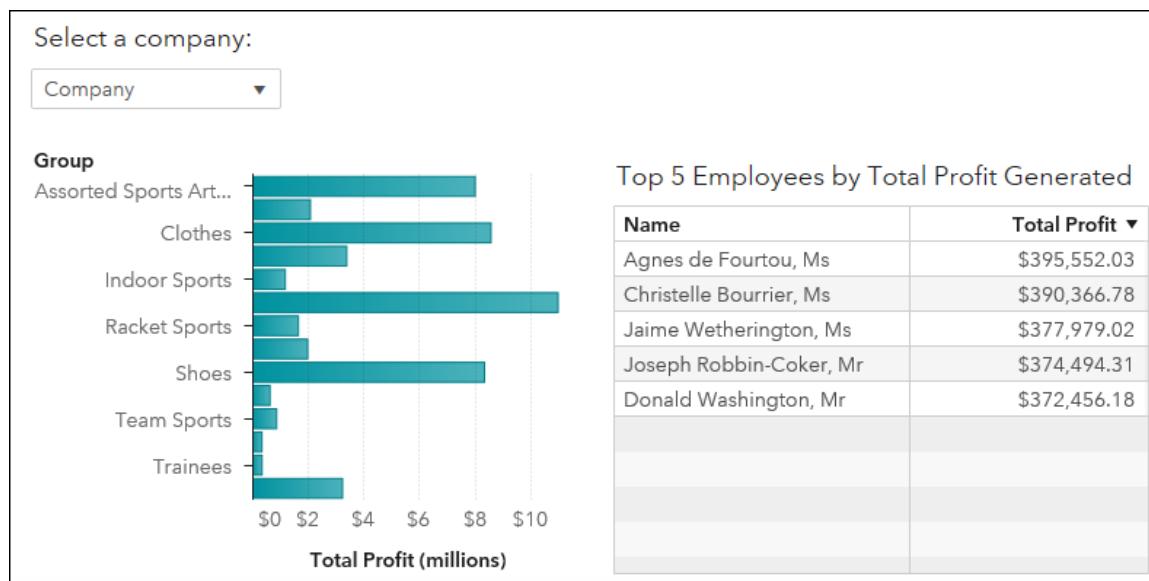
- Add the following actions between objects on the Employee Analysis page:
 - The geo map filters the bar chart and the dual axis bar-line chart.
 - The bar chart highlights the dual axis bar-line chart.
- On the Profit Analysis page, add a rank to the list table to show the top five employees by **Total 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, Ms	\$395,552.03
Christelle Bourrier, Ms	\$390,366.78
Jaime Wetherington, Ms	\$377,979.02
Joseph Robbin-Coker, Mr	\$374,494.31
Donald Washington, Mr	\$372,456.18

The Profit Analysis page should resemble the following:



- g. Save the report in **My Folder**.
- 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.

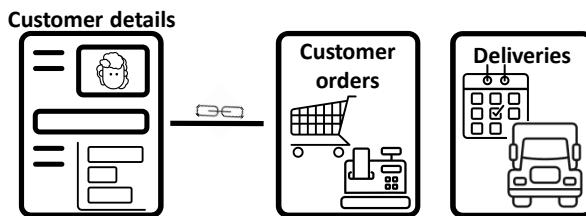
End of Practices

Business Scenario: Customers



After sharing the updated report with the Marketing team, they have asked for the following modifications:

- Add a new page with a list of target customers, details about each customer, and individual orders.

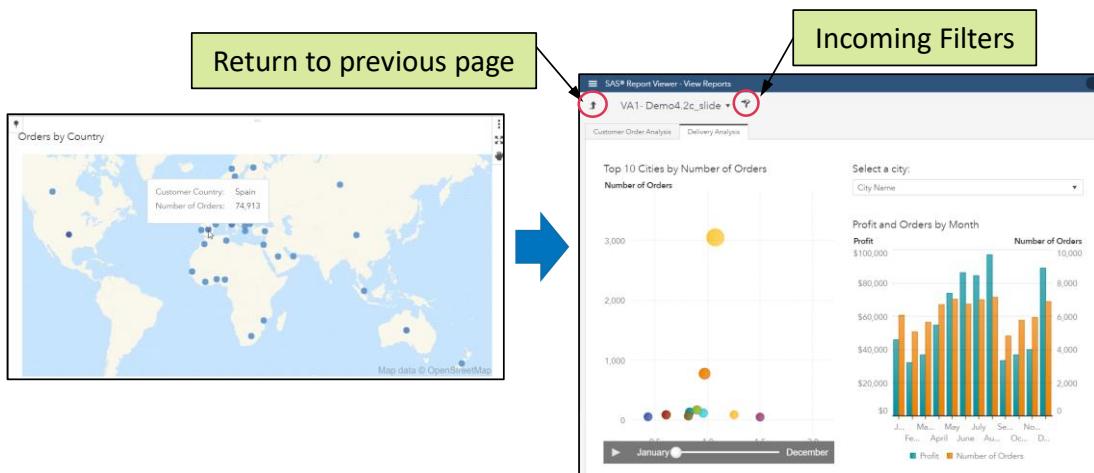


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Adding Page Links

Double-clicking a country in the geo map opens the Delivery Analysis page.



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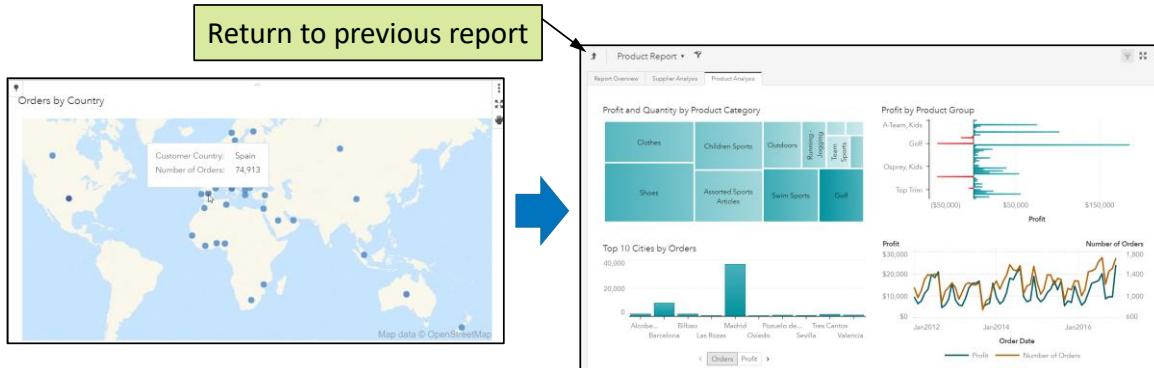


Linking has elements of both a filter and an action. A page that is the target of a link is filtered by the values selected in the linked report object.

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

Double-clicking a country in the geo map opens the Product Report.



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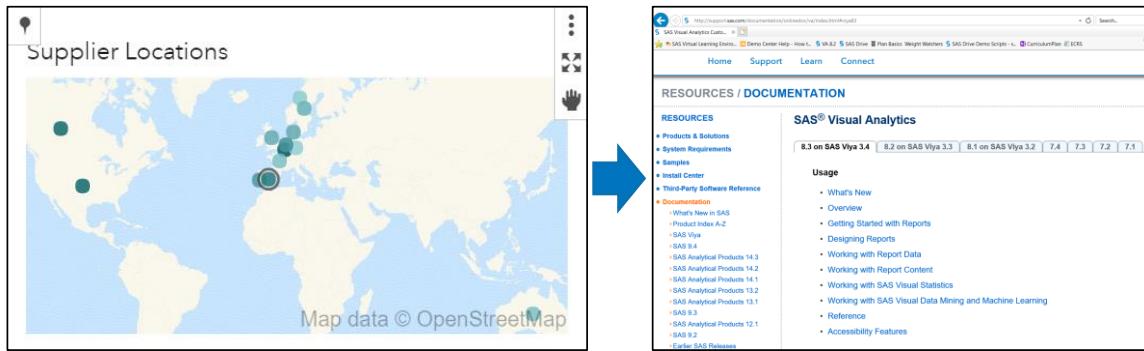


If the destination report contains multiple pages, then when you define the link, you can choose the initial page of the destination report that opens first.

Note: You cannot test report links from within Visual Analytics. You must save the report and then switch to the SAS Report Viewer to test report links.

Adding URL Links

Double-clicking a country in the geo map opens the SAS Visual Analytics product page.



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Note: You can specify additional parameters to pass a data item value to the URL.

Add URL Link Action

Source: Bar Chart 1

Name: External URL

URL: http://www.mycompany.com

Parameters +

Source:	Target:
<input checked="" type="checkbox"/> Format Continent Name	Continent
<input checked="" type="checkbox"/> Format Order Type	Order



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 in Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo4.2c** and select **Edit**.
4. 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.
5. 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**.

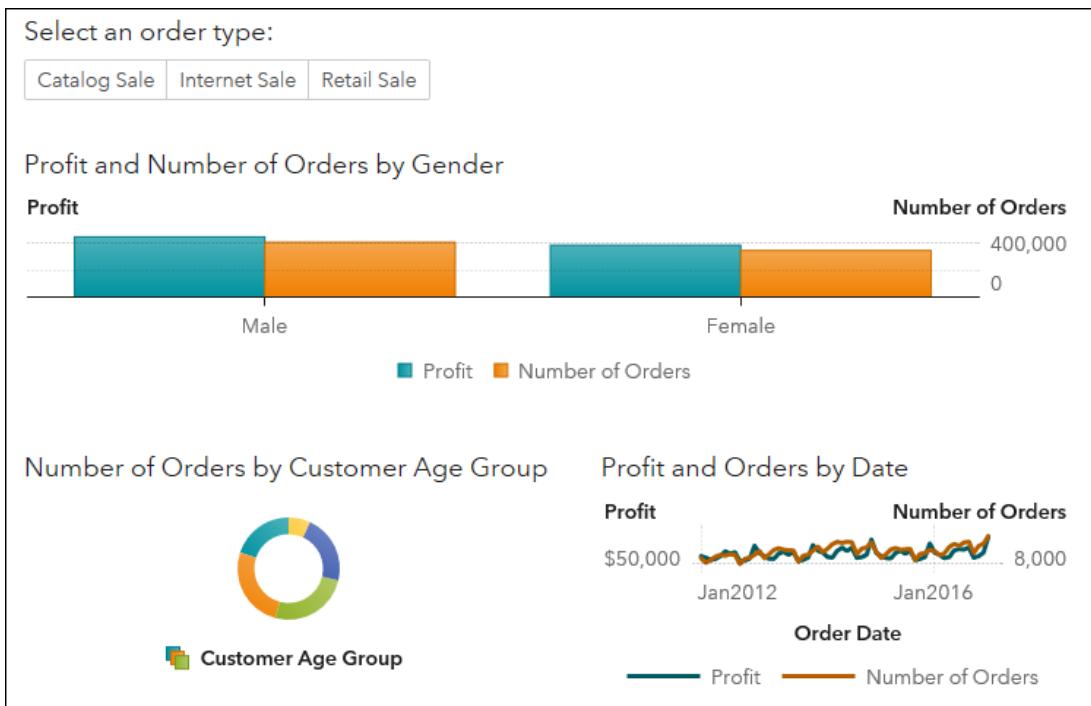
The Actions pane should resemble the following:

The screenshot shows the Actions pane with the following configuration:

- Actions** button and [View Diagram](#) link.
- A dropdown menu set to **Orders by Age Group**.
- Automatic actions on all objects
- Object Links** section:
 - Profit and Orders by Date (with edit icons)
- Page Links** section:
 - Delivery Analysis
 - Customer Details (selected, indicated by a checkmark and a vertical ellipsis :)
- Report Links**
- URL Links**

6. In the upper right corner, click  (Menu) and select **Save As**.
7. Navigate to **My Folder**.
8. Click **Save**.
9. 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.

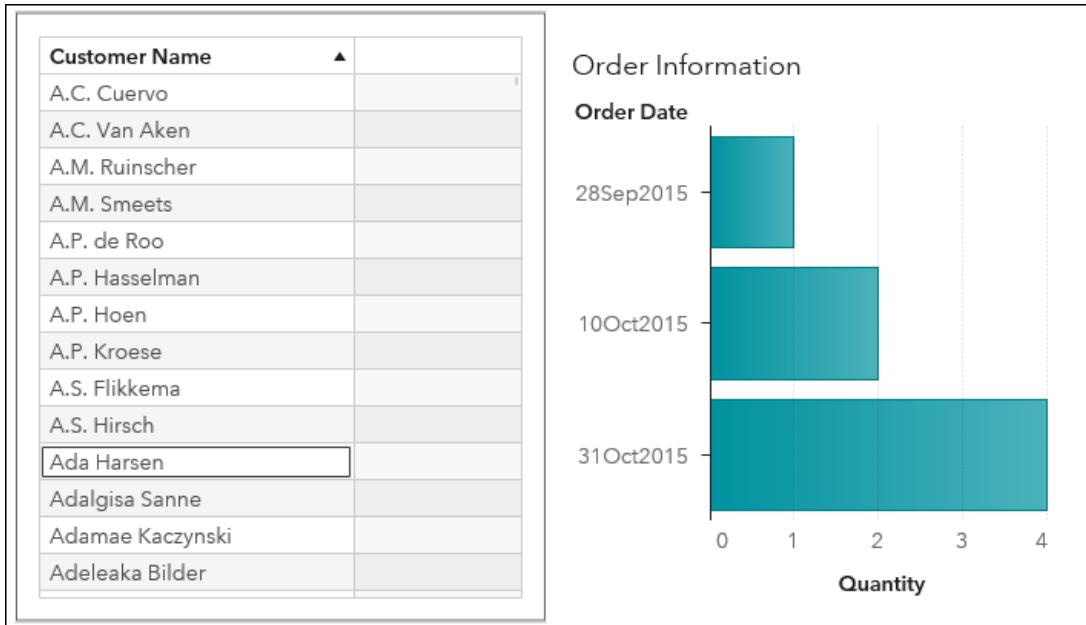
The Customer Details info window appears and shows details about female customers in the 45-59 age group who placed orders via the internet.

- e. Click  (Maximize view) in the upper right corner.



- f. 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.

- g. Click **Close**.

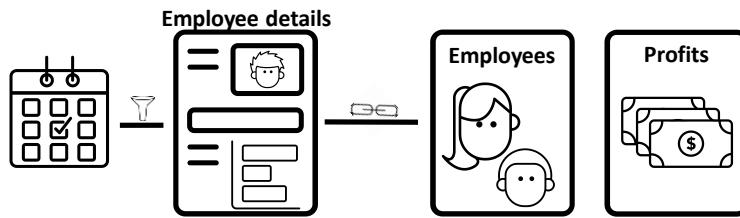
End of Demonstration

Business Scenario: Employees



After sharing the updated report with the Human Resources team, they have asked for the following modifications:

- Add a new page with a list of employees identified for promotion, details about each employee, and order information.
- Add some way to filter by years of service for the new page.



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Practice

4. Working with Hidden Pages and Links

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise4.2c** report from the **SAS Content/Courses/YVA183/Basics/Exercises (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:

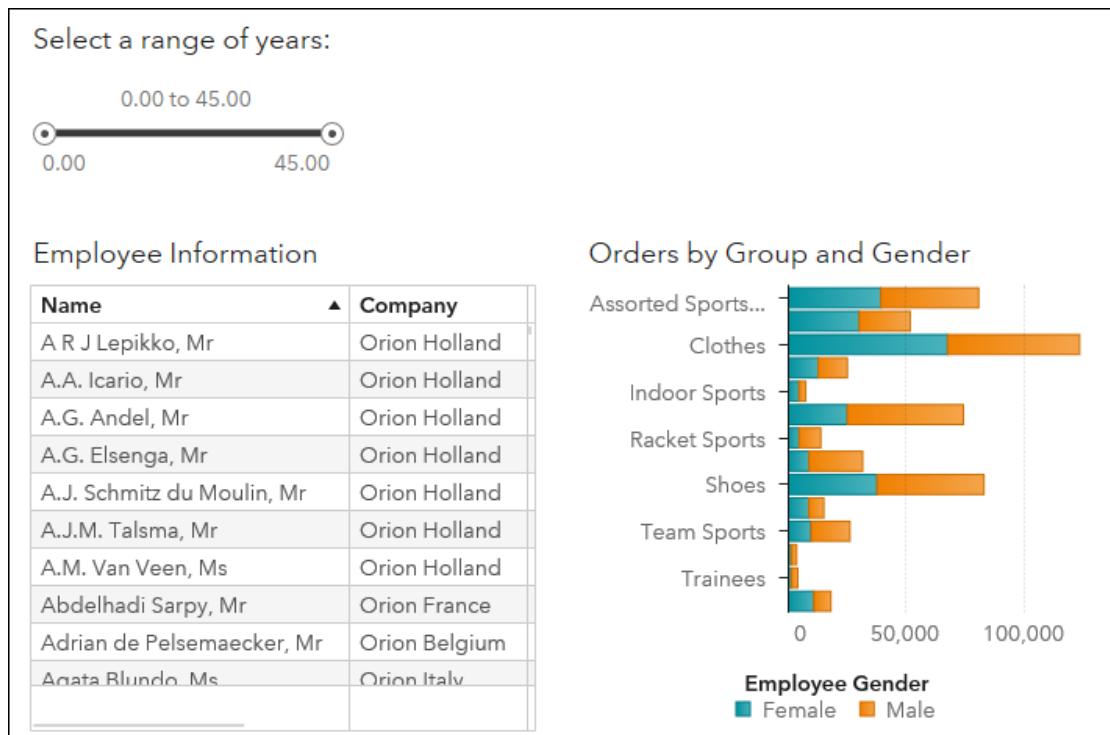
Object: Name	Years of Service Selector
Object: Custom Title	Select a range of years:
Slider: Set fixed range	<selected>
Slider: Minimum	0
Slider: Maximum	45

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
0.00 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 in **My Folder**.
- 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.

End of Practices

4.3 Working with Display Rules

Objectives

- Describe graph-level display rules.
- Describe table-level display rules.
- Describe report-level display rules.

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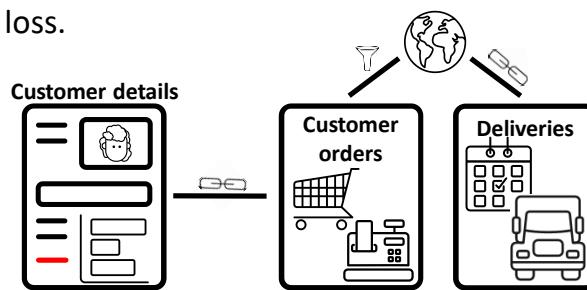


Business Scenario: Customers



After sharing the updated report with the Marketing team, they have asked for the following modifications:

- For the customer orders page, view target groups for a specific country.
- View delivery information by country.
- For the customer details page, add some way to distinguish customers who generate a loss.



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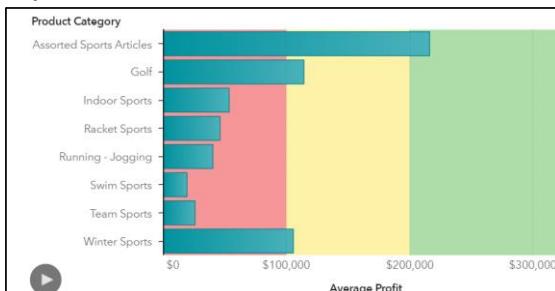
Copyright © SAS Institute Inc. All rights reserved.



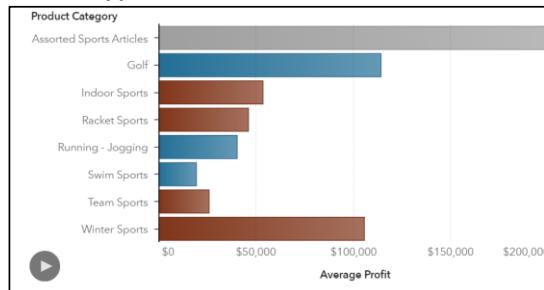
Graph-Level Display Rules

Display rules enable you to highlight specific values in a graph using colors.

Expression



Color-mapped values



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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 on the left) 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 (shown above on the right) but cannot be applied to date or datetime data items.

continued...

Table-Level Display Rules

Display rules enable you to highlight specific values in a list table using colors.

Use the Ctrl key to sort by multiple columns.

Product Line	Order Type	Profit	Number of Orders
Outdoors	Catalog Sale	\$6,324.44	380
Outdoors	Internet Sale	\$10,980.77	533
Outdoors	Retail Sale	\$83,808.41	5,276
Sports	Catalog Sale	\$50,931.45	3,324
Sports	Internet Sale	\$71,842.97	4,803
Sports	Retail Sale	\$114,969.76	9,324

Product Line	Order Type	Profit	Number of Orders
Outdoors	Catalog Sale	\$6,324.44	380
Outdoors	Internet Sale	\$10,980.77	533
Outdoors	Retail Sale	\$83,808.41	5,276
Sports	Catalog Sale	\$50,931.45	3,324
Sports	Internet Sale	\$71,842.97	4,803
Sports	Retail Sale	\$114,969.76	9,324

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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. The display rule can be displayed to the left or to the right of the value, or it can replace the value.

Table-Level Display Rules

In the crosstab object, you can define an expression to highlight values.

Order Type	Catalog Sale	Internet Sale	Retail Sale
Order Year	Profit	Profit	Profit
2012	\$140,363.91	\$88,294.94	\$520,769.33
2013	\$137,699.33	\$80,387.69	\$552,563.33
2014	\$134,667.86	\$122,209.10	\$682,896.88
2015	\$113,563.29	\$98,423.76	\$589,974.29
2016	\$96,793.67	\$128,960.72	\$703,063.45

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Report-Level Display Rules

Report-level display rules enable you to define color-mapped values to easily identify the same value in multiple report objects.



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 in Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA183/Basics/Demos (Marketing)** folder.
3. Right-click **VA1- Demo4.3** and select **Edit**.
4. 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

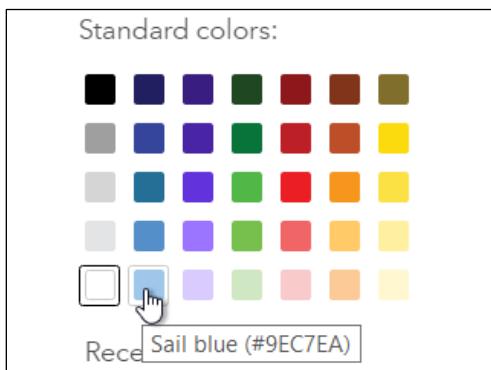
- 2) Click **OK**.

The Button bar is updated to reflect the custom sort.

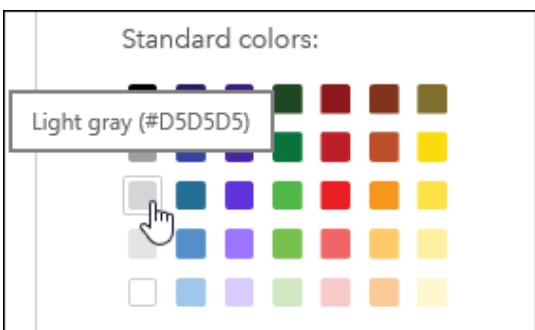
Select an order type:

5. 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 **Sail blue**.



- e. Click (Select a color) below **Background selection color**.
f. Select **Light gray**.

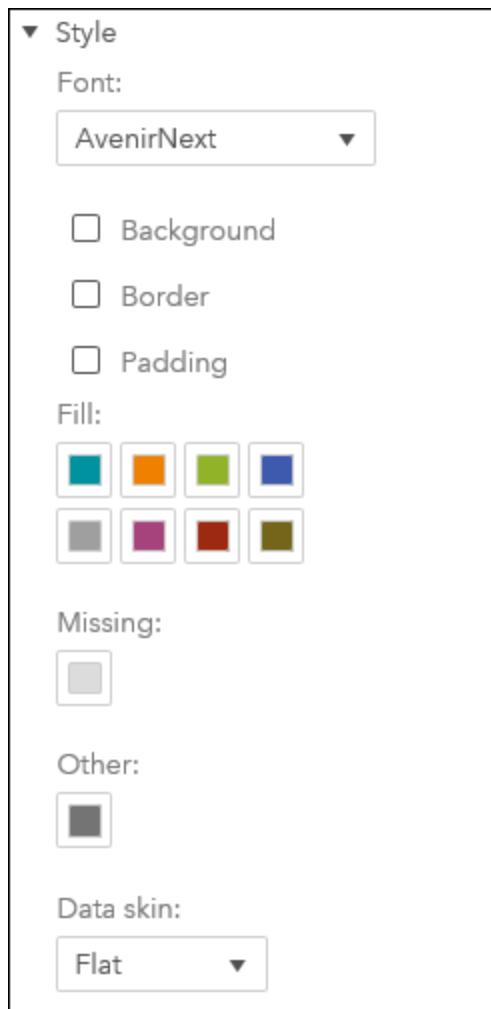


The button bar should resemble the following:

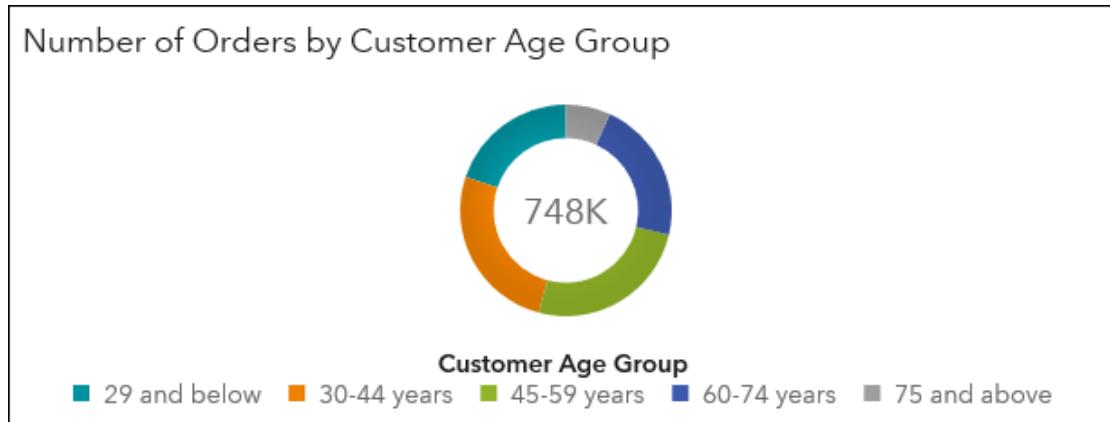


6. Change the color of a slice in the pie chart.
- Select the **Number of Orders by Age Group** pie chart to make it active.
 - If necessary, click the **Options** icon.
 - Expand the **Style** group.
 - In the Fill section, select the yellow box and change the color to **Dark gray**.

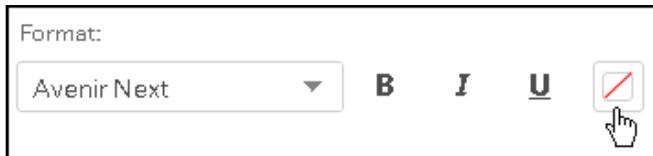


e. Select **Flat** for **Data skin**.

The pie chart should resemble the following:



7. 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 ⇒ 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 **Alizarin red** as the color.



- i. For the Background color, click  (**Select a background color**).
- j. Choose **Dark 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 **B** *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	▲
©ime Rituper	
©tefka Tertnik	
A Amanda Mitchell	
A R J Swart Rc	
A.A. Broekhuisen	
A.A. Busselaar	
A.A. Duim	
A.A. Hautvast	
A.A. Hilhorst	
A.A. Hoekstra Mba	

8. In the upper right corner, click  (**Menu**) and select **Save As**.
9. Navigate to **My Folder**.
10. Click **Save**.
11. View the report.
 - a. In the upper right corner, click  (**Menu**) and select **View report**.
The report opens in the Report Viewer.
 - b. Select **Retail Sale** in 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:

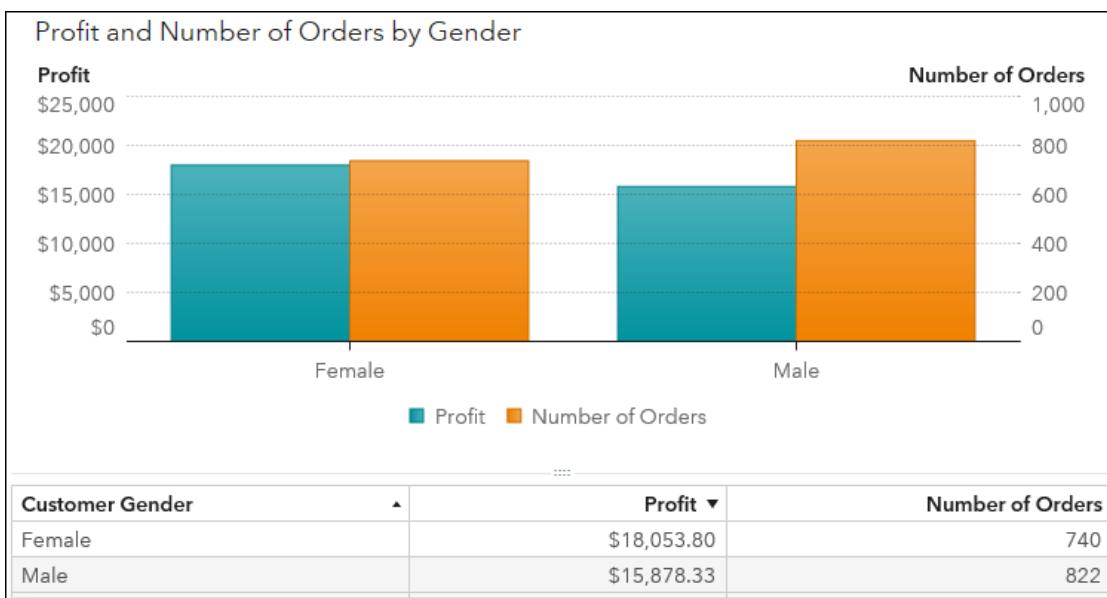


Through the internet, we can reach more countries and more customers. Perhaps we can start marketing campaigns in South America as we currently have no customers in that continent.

- 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**).

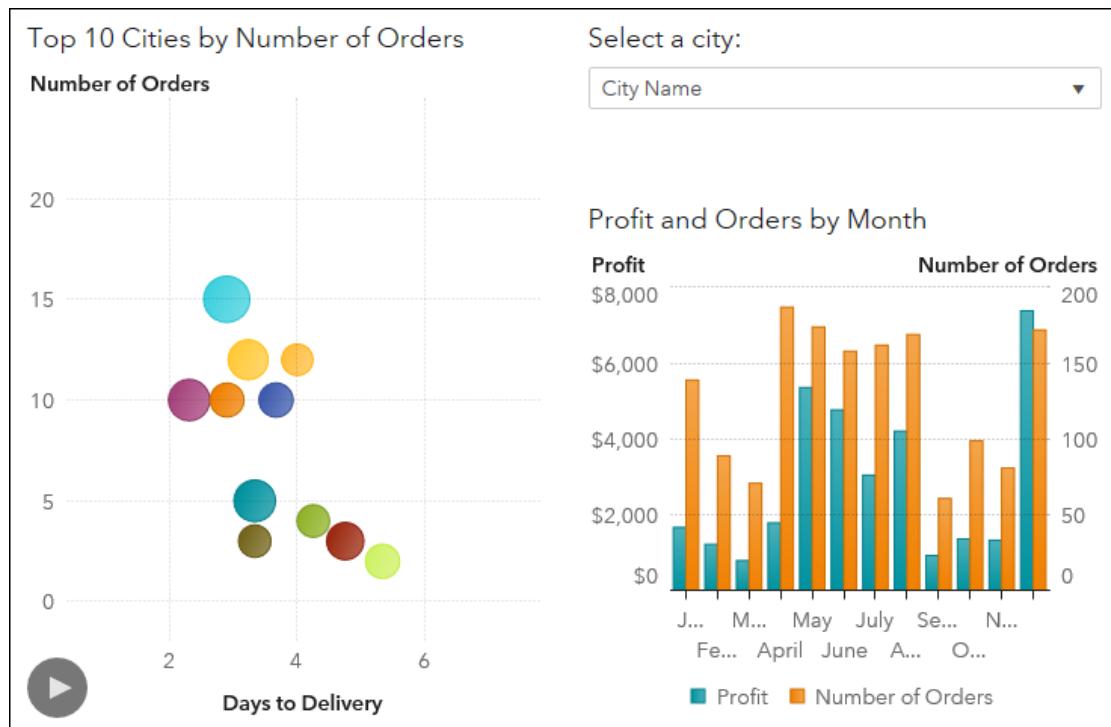


In Canada, profits are higher for females even though the number of orders placed by females is lower. This is one of the only countries where orders placed by females are more profitable than males. What is Canada doing to generate this behavior? Are they targeting their marketing campaigns toward females? 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.

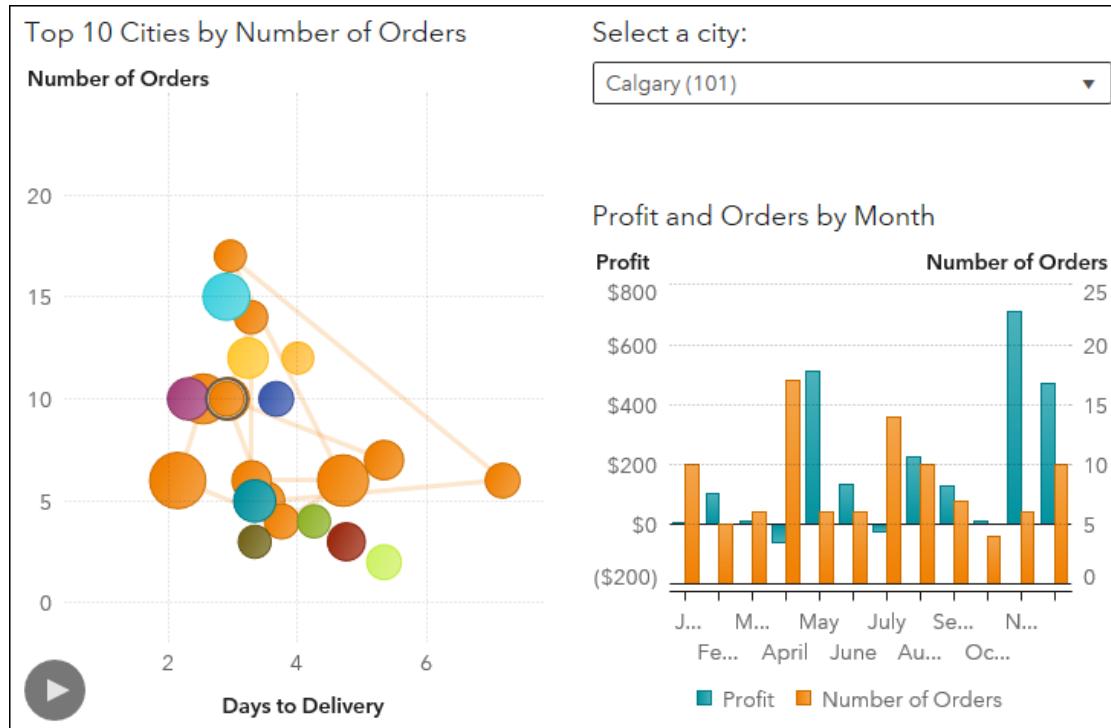
The Delivery Analysis page is displayed and filtered to show information about Canada.



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?

- h. Select **Calgary** in the drop-down list control.

The page is updated to resemble the following:

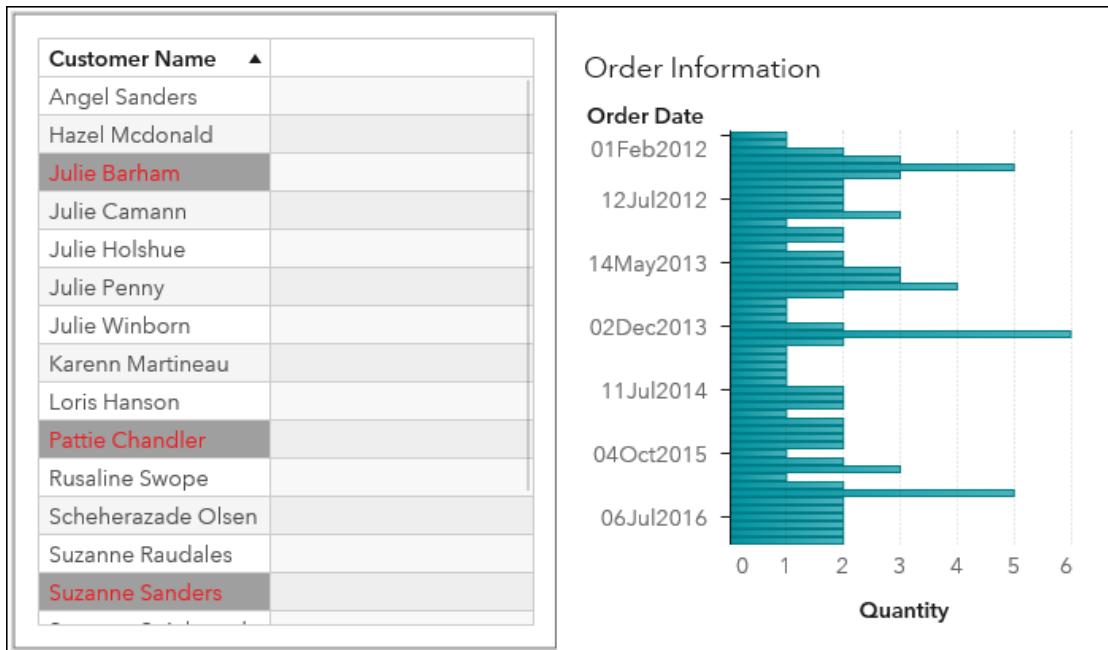


Internet orders placed in Calgary do not always produce a profit. Most notable is the negative profits in both April and July, even though orders are quite high for those months. Conversely, profits in November and December are high even though the number of orders are pretty low. Is it the types of 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.

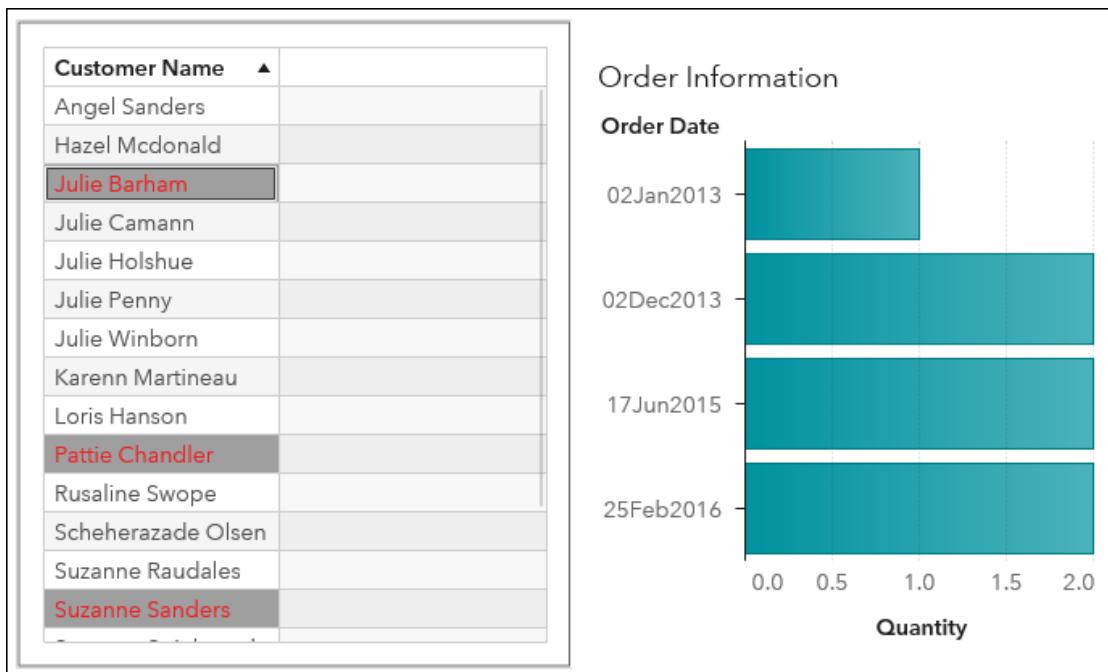
The Customer Details info window appears and shows details about female Canadian customers in the 75 and above age group who placed orders via the internet.

- I. Click  (Maximize view) in the upper 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**.

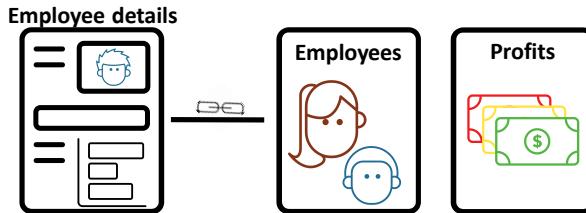
End of Demonstration

Business Scenario: Employees



After sharing the updated report with the Human Resources team, they have asked for the following modifications:

- For the report, add some way to identify genders.
- For the profits page, add some way to distinguish low, medium, and high profits.





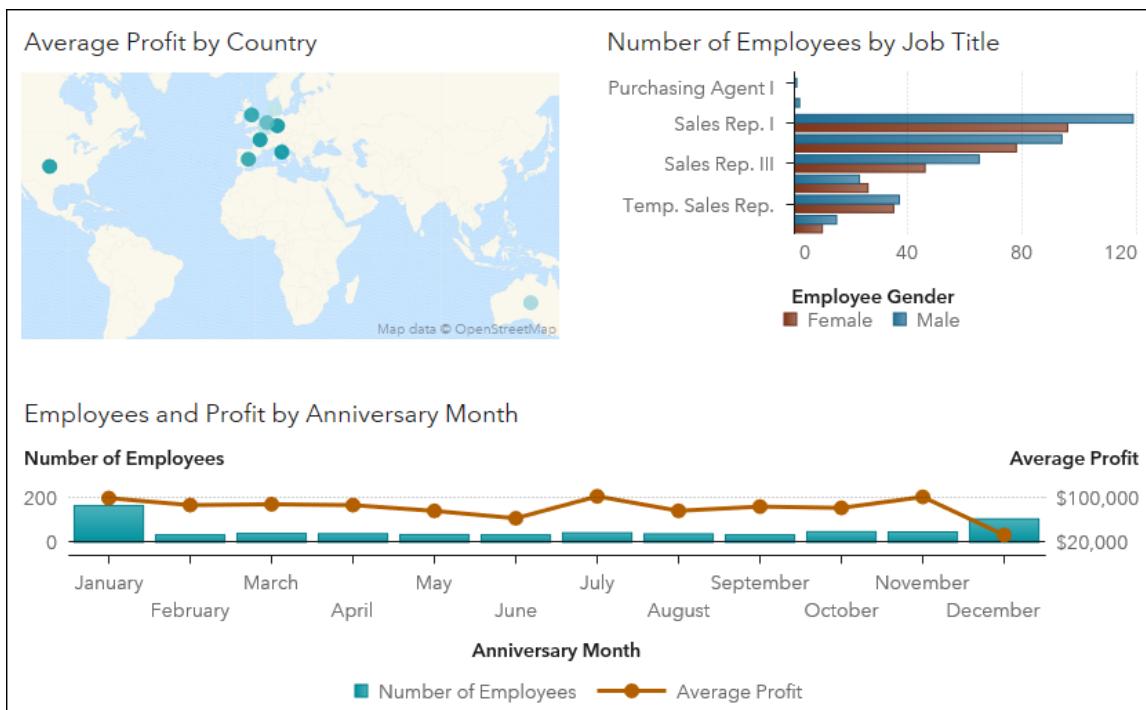
Practice

5. Working with Report-Level and Graph-Level Display Rules

- From the browser window, sign in to SAS Viya for Learners.
- Open the **VA1- Exercise4.3** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
- Add a report-level display rule for gender by assigning the following colors to the values:

Employee Gender	Color
Male	Allports blue
Female	Russet brown

The Employee Analysis page should resemble the following:

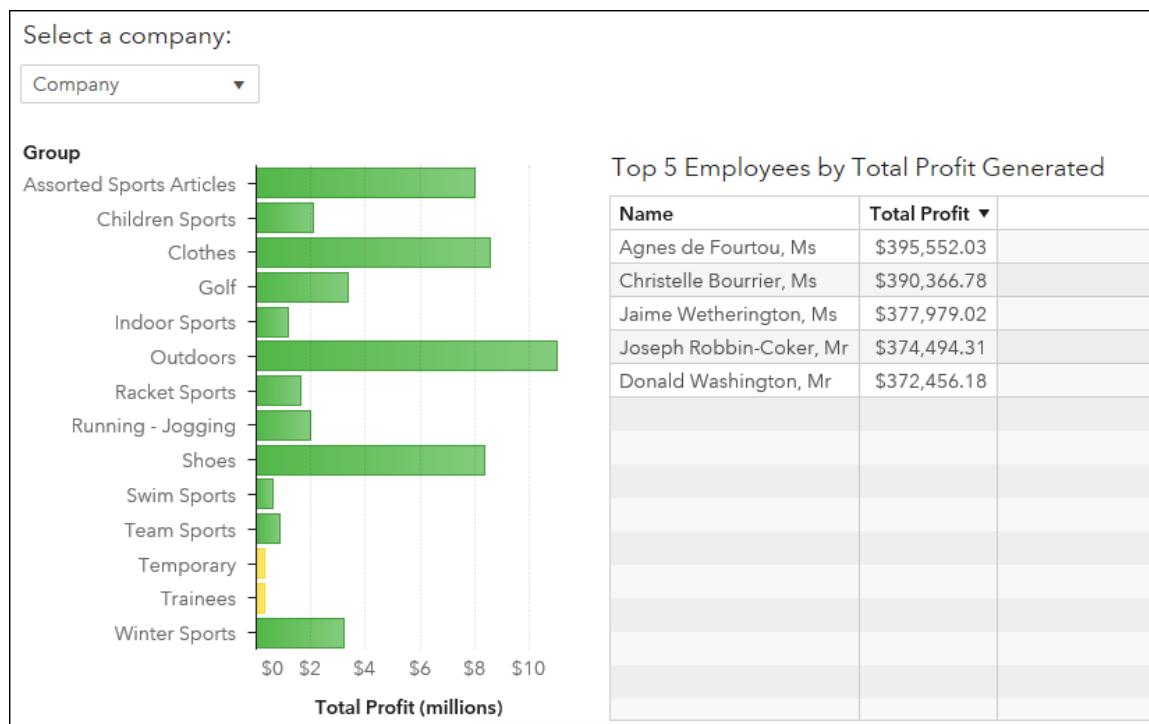


- Add three expression display rules to the bar chart on the Profit Analysis page by assigning the following colors to the ranges of **Total Profit**:

Total Profit Ranges	Color
Total Profit < 200,000	Alizarin red
200,000 <= Total Profit <= 500,000	Paris daisy yellow
Total Profit > 500,000	Apple green

Note: Apply the display rule to the bars of the chart.

The Profit Analysis page should resemble the following:



- e. Save the report in **My Folder**.
- 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: _____

End of Practices

4.4 Solutions

Solutions to Practices

1. Creating a Simple Report

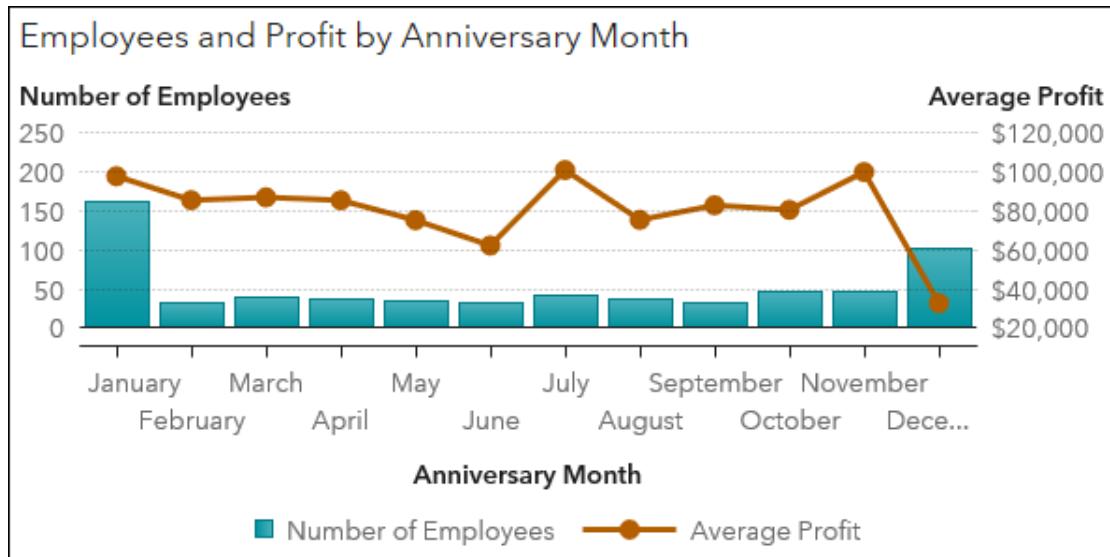
- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise4.1** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise4.1** and select **Edit**.
- 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** \Rightarrow **Anniversary Month: Ascending**.

The dual axis bar-line chart should resemble the following:



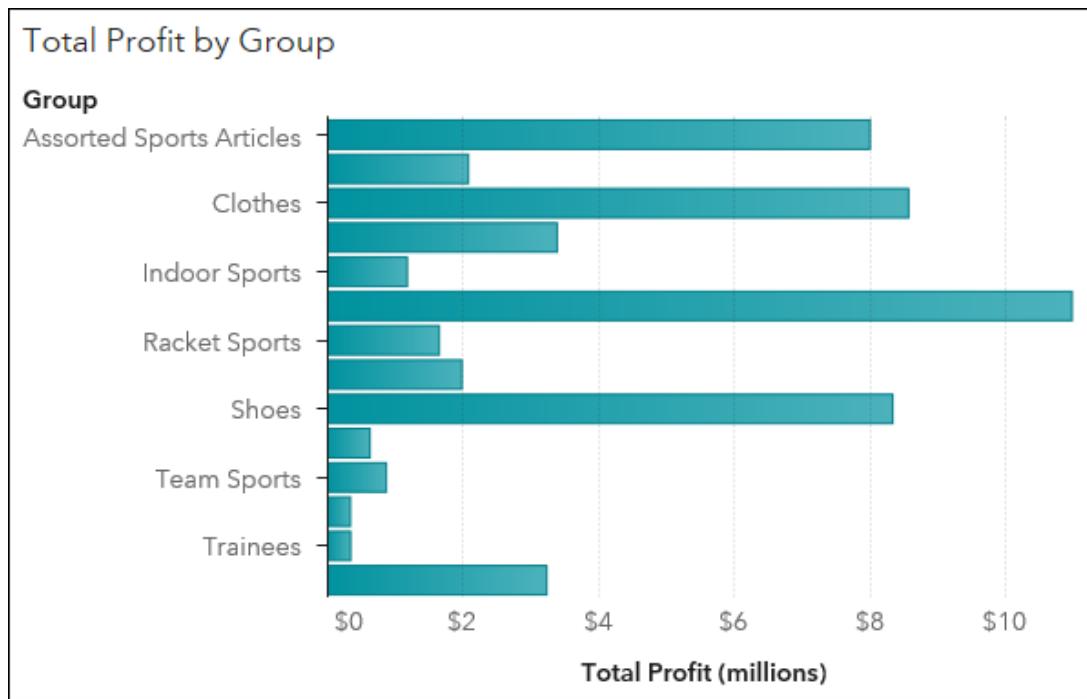
- h. Save the report in **My Folder**.
 - 1) To save the report, click  (**Menu**) in the upper right corner and select **Save As**.
 - 2) Navigate to **My Folder**.
 - 3) Click **Save**.

2. Working with Pages

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise4.2a** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise4.2a** and select **Edit**.
- 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. Save the report in **My Folder**.

- 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

3. Working with Prompts and Actions

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise4.2b** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise4.2b** and select **Edit**.
- 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:

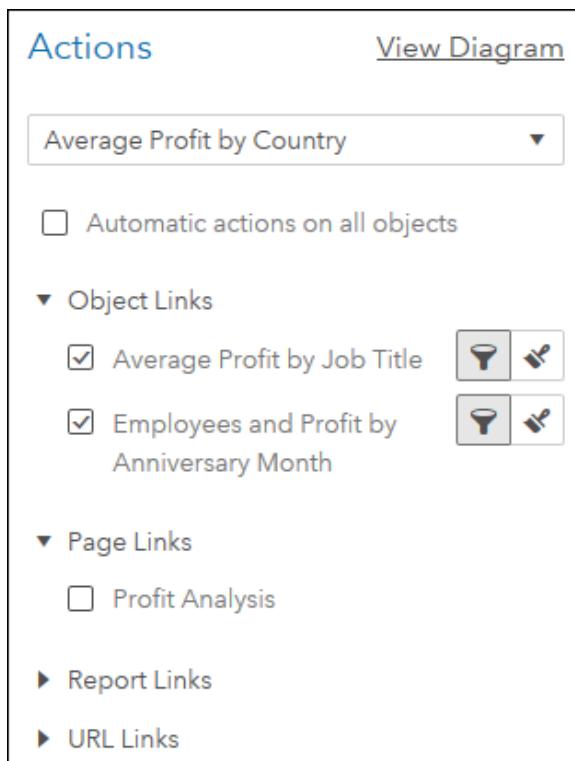


e. Add actions between objects on the Employee Analysis page.

- 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).

- 8) Verify that  (Filter) is selected.

The Actions pane should resemble the following:



The Actions pane displays the following configuration:

- A dropdown menu at the top shows "Average Profit by Country".
- An unchecked checkbox for "Automatic actions on all objects".
- The "Object Links" section is expanded, showing:
 - A checked checkbox for "Average Profit by Job Title" with a filter icon.
 - A checked checkbox for "Employees and Profit by Anniversary Month" with a filter icon.
- The "Page Links" section is collapsed.
- The "Report Links" section is collapsed.
- The "URL Links" section is collapsed.

- 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) Click  (Linked selection).

The Actions pane should resemble the following:

The Actions pane is displayed with the following configuration:

- A dropdown menu at the top shows "Average Profit by Job Title".
- An unchecked checkbox for "Automatic actions on all objects".
- A section titled "Object Links" with a checked checkbox for "Employees and Profit by Anniversary Month". To the right of this checkbox are two small icons: a funnel and a pencil.
- A section titled "Page Links" with an unchecked checkbox for "Profit Analysis".
- Two additional sections, "Report Links" and "URL Links", are shown with right-pointing arrows.

- 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:

Top 5 Employees by Total Profit Generated	
Name	Total Profit ▾
Agnes de Fourtou, Ms	\$395,552.03
Christelle Bourrier, Ms	\$390,366.78
Jaime Wetherington, Ms	\$377,979.02
Joseph Robbin-Coker, Mr	\$374,494.31
Donald Washington, Mr	\$372,456.18

g. Save the report in **My Folder.**

- 1) To save the report, click (Menu) in the upper right corner and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

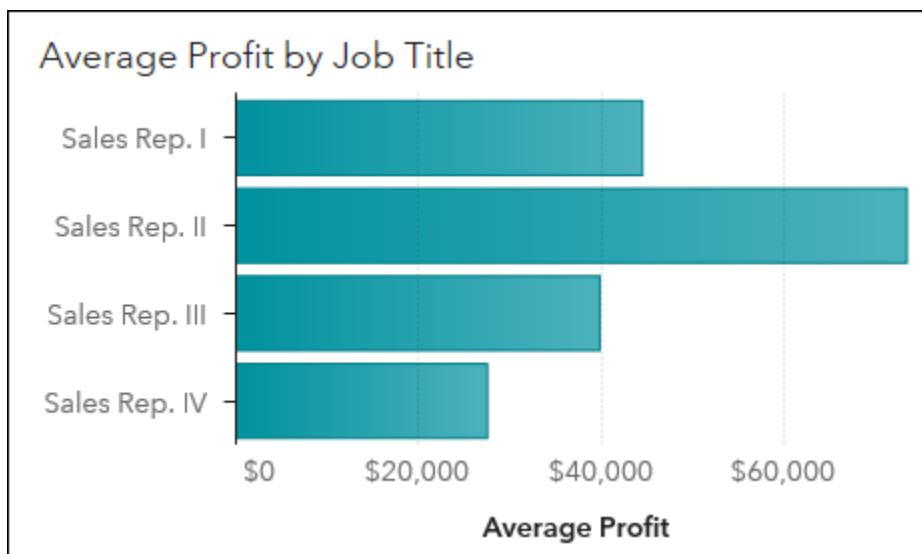
h. View the report and answer the questions.

- 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, Ms	\$178,299.60
Daniel Pulliam, Mr	\$172,949.97
Clement Davis, Mr	\$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.

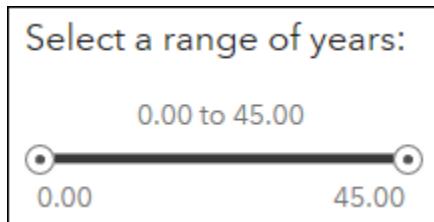
Top 5 Employees by Total Profit Generated	
Name	Total Profit ▾
Marc Zampa, Mr	\$66,109.84

- i. Close the report.

4. Working with Hidden Pages and Links

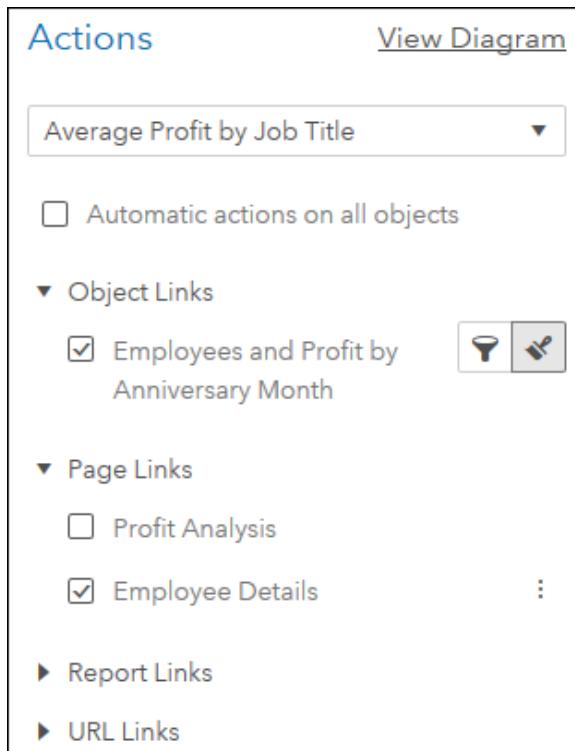
- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise4.2c** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise4.2c** and select **Edit**.
- 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 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 **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.

The Actions pane should resemble the following:



- g. Save the report in **My Folder**.
 - 1) To save the report, click (Menu) in the upper right corner and select **Save As**.
 - 2) Navigate to **My Folder**.
 - 3) Click **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, Ms	Orion Italy	Sales Rep. III	\$29,555.00	\$51,603.44	
Giuseppe Franco Scoditti, Mr	Orion Italy	Sales Rep. III	\$30,460.00	\$44,768.20	
			Sum: \$60,015.00	Sum: \$96,371.64	

- 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  (Maximize view) in the upper right corner of the info 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, Mr	Orion USA	Sales Rep. I	\$25,660.00	\$371,506.09	
Eric Michonski, Mr	Orion USA	Sales Rep. I	\$26,990.00	\$280,590.08	
Donald Court, Mr	Orion USA	Sales Rep. I	\$27,100.00	\$271,089.42	
Tachaun Voron, Mr	Orion USA	Sales Rep. I	\$25,125.00	\$260,146.86	
Glorina Myers, Ms	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  (Maximize view) in the upper right corner of the info 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.

5. Working with Report-Level and Graph-Level Display Rules

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open the **VA1- Exercise4.3** report from the **SAS Content/Courses/YVA183/Basics/Exercises (HR)** folder.
 - 1) Navigate to **SAS Content/Courses/YVA183/Basics/Exercises (HR)**.
 - 2) Right-click **VA1- Exercise4.3** and select **Edit**.
- 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 **Allports blue** as the color.



- 6) Click (**Add**).
- 7) Enter **Female**.
- 8) Click (**Select a style**) on the left of the value.
- 9) Choose **Russet brown** as the color.



- 10) Click **OK**.

The Display Rules pane should resemble the following:

Display Rules

Employee Analysis ▾

+ New rule

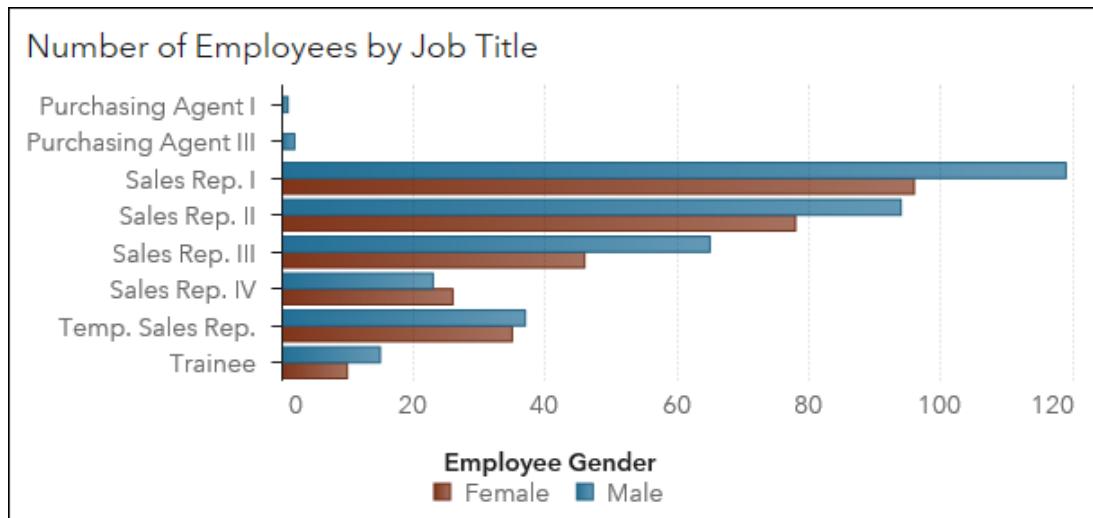
Report

Any Category

Male

Female

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 **Alizarin red** as the color.



- f) Click **OK**.

- 5) In the Display Rules pane, select **New rule** \Rightarrow **Total Profit**.

- Select **BetweenInclusive** 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 **Paris daisy yellow** as the color.

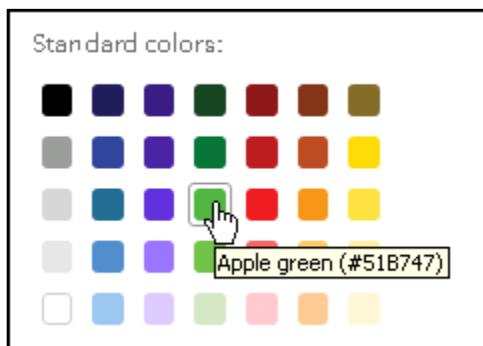


- g) Click **OK**.

- 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**).

- e) Choose **Apple green** as the color.



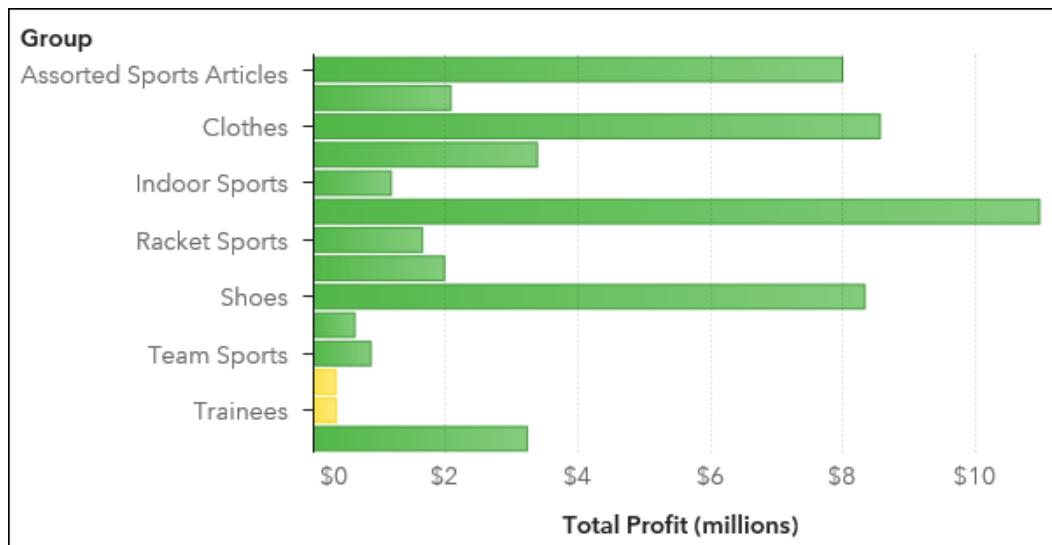
- f) Click **OK**.

The Display Rules pane should resemble the following:

A screenshot of the "Display Rules" pane. At the top, there is a dropdown menu set to "Total Profit per Group". Below it is a "+ New rule" button. The pane is divided into sections: "Object" and "Report".

- Object**
 - Total Profit
 - Total Profit > 500000 (Apple green)
 - Total Profit BetweenInclusive(2000...
 - Total Profit < 200000 (Red)
- Report**
 - Any Category
 - Male (Blue)
 - Female (Brown)

The bar chart should resemble the following:



e. Save the report in My Folder.

- 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

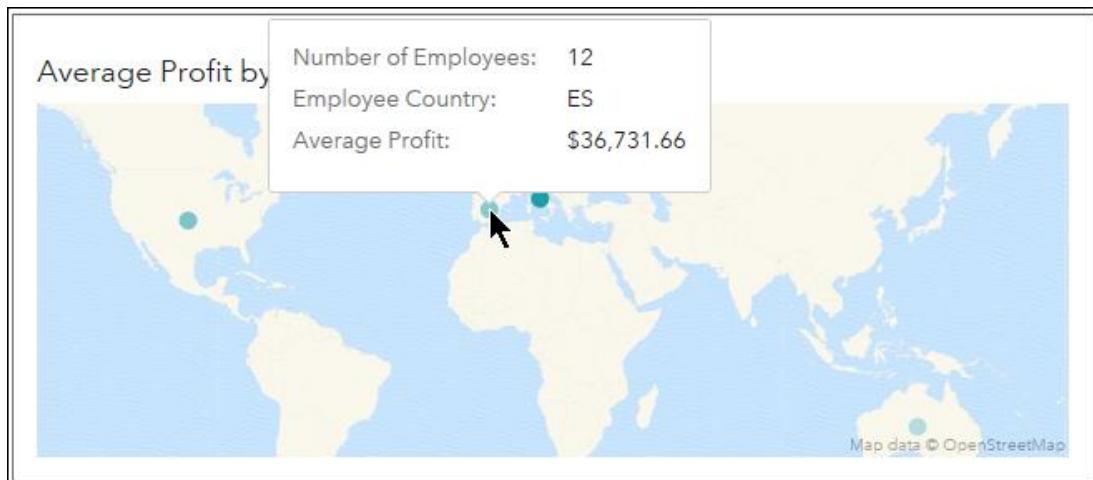
f. View the report and answer the questions.

- 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	
Temp. Sales Rep.		3	Female	
Temp. Sales Rep.		2	Male	
Trainee		1	Male	

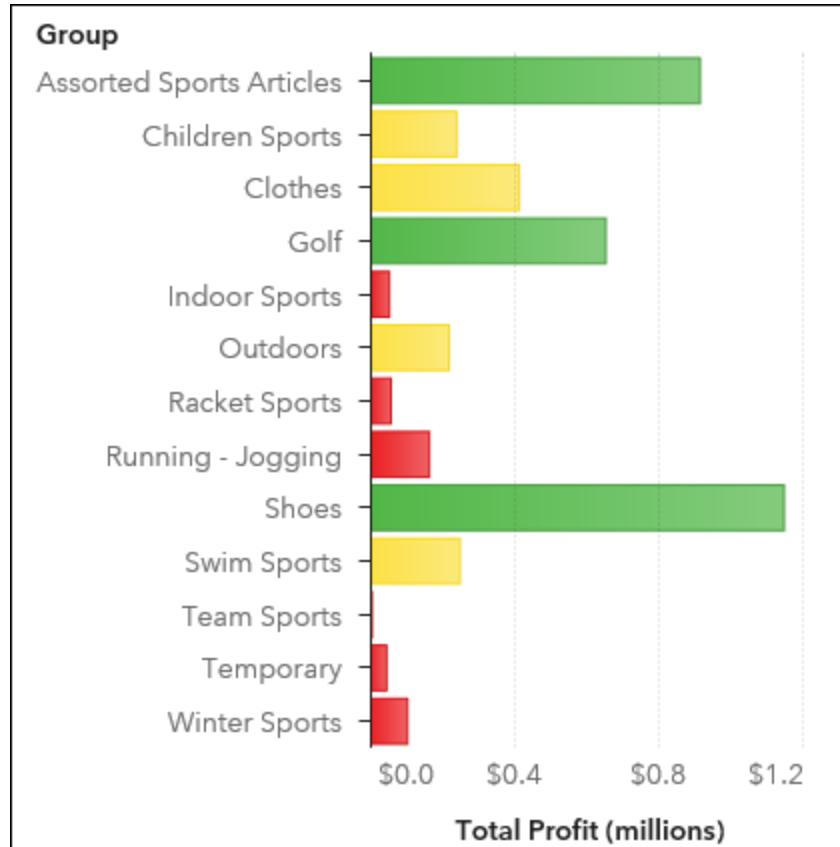
- In the upper right corner of the bar chart, click (Restore).

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:



End of Solutions

Solutions to Activities and Questions

4.02 Activity – Correct Answer

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? Team

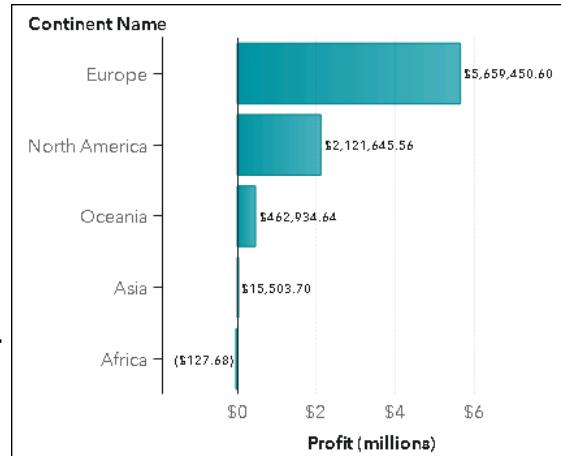


4.03 Multiple Choice Question – Correct Answer

What type of chart would you use to show profit information by continent?

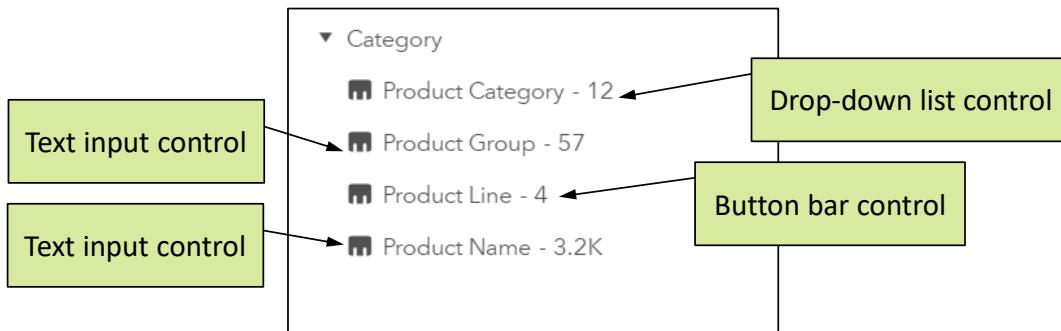
- bubble plot
- pie chart
- bar chart
- treemap

- Bubble plots require three measures.
- Pie charts and treemaps cannot display negative values.



4.04 Quiz – Correct Answer

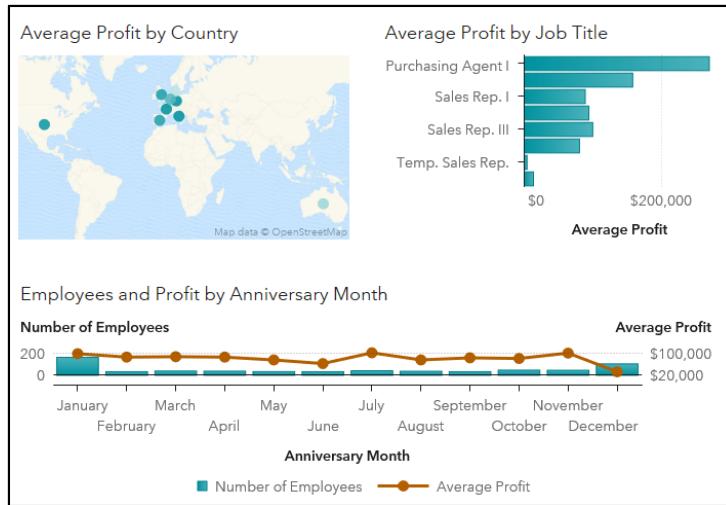
Given the distinct values, which control object would you use to filter for each category displayed below?



Practice Review

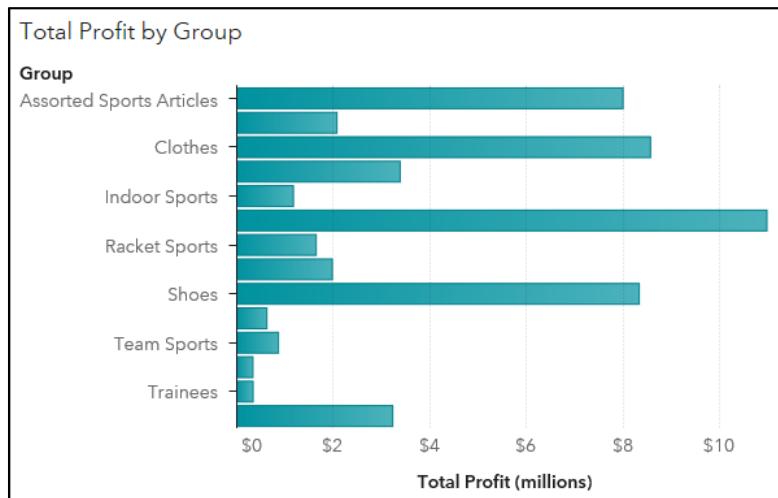
4.1 Creating a Simple Report – Solution

The report should resemble the following:



4.2 Working with Pages – Solution

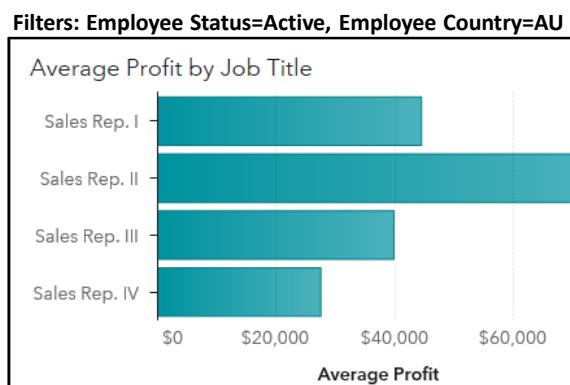
The Profit Analysis page should resemble the following:



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)



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, Ms	\$178,299.60
Daniel Pulliam, Mr	\$172,949.97
Clement Davis, Mr	\$17,429.24

For Orion France, how many active sales representatives sold items for the Racket Sports group?

One employee (Marc Zampa)

**Filters: Employee Status=Active,
Company=Orion France,
Group=Racket Sports**

Top 5 Employees by Total Profit Generated

Name	Total Profit ▾
Marc Zampa, Mr	\$66,109.84

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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, Ms	Orion Italy	Sales Rep. III	\$29,555.00	\$51,603.44
Giuseppe Franco Scoditti, Mr	Orion Italy	Sales Rep. III	\$30,460.00	\$44,768.20
			Sum:	\$60,015.00 Sum: \$96,371.64

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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, Mr	Orion USA	Sales Rep. I	\$25,660.00	\$371,506.09
Eric Michonski, Mr	Orion USA	Sales Rep. I	\$26,990.00	\$280,590.08
Donald Court, Mr	Orion USA	Sales Rep. I	\$27,100.00	\$271,089.42
Tachaun Voron, Mr	Orion USA	Sales Rep. I	\$25,125.00	\$260,146.86
Glorina Myers, Ms	Orion USA	Sales Rep. I	\$26,025.00	\$220,995.63

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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



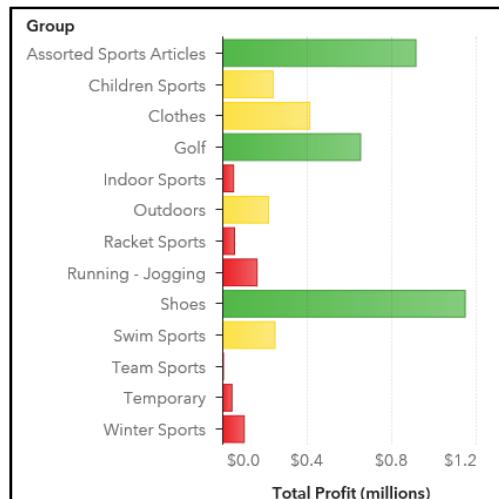
Filters: Employee Status=Retired, Employee Country=ES

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
Temp. Sales Rep.	3	Female
Temp. Sales Rep.	2	Male
Trainee	1	Male

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



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