



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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Chapter 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 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.

The highly visual, drag-and-drop data interface of SAS Visual Analytics, combined with the speed of the SAS Cloud Analytic Services (CAS), accelerates analytic computations and enables organizations to derive value from massive amounts of data. This creates an unprecedented ability to solve difficult problems, improve business performance, predict future performance, and mitigate risk rapidly and confidently. Users can quickly create reports or dashboards, which can be viewed on a mobile device or on the web.

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 data, based on a variety of measures
- quickly create reports or dashboards using standard tables, graphs, and gauges
- 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 new data sources, investigate them, 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:

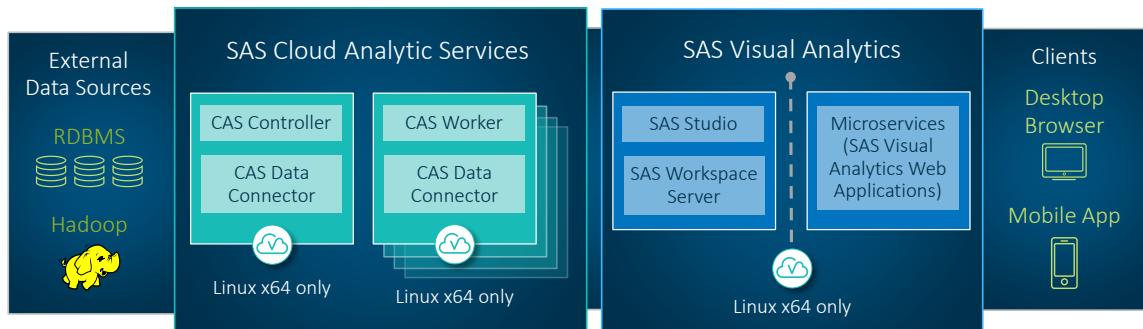
- fast
- resilient
- scalable
- node-to-node communication
- worker node fault tolerance

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SAS Viya Architecture



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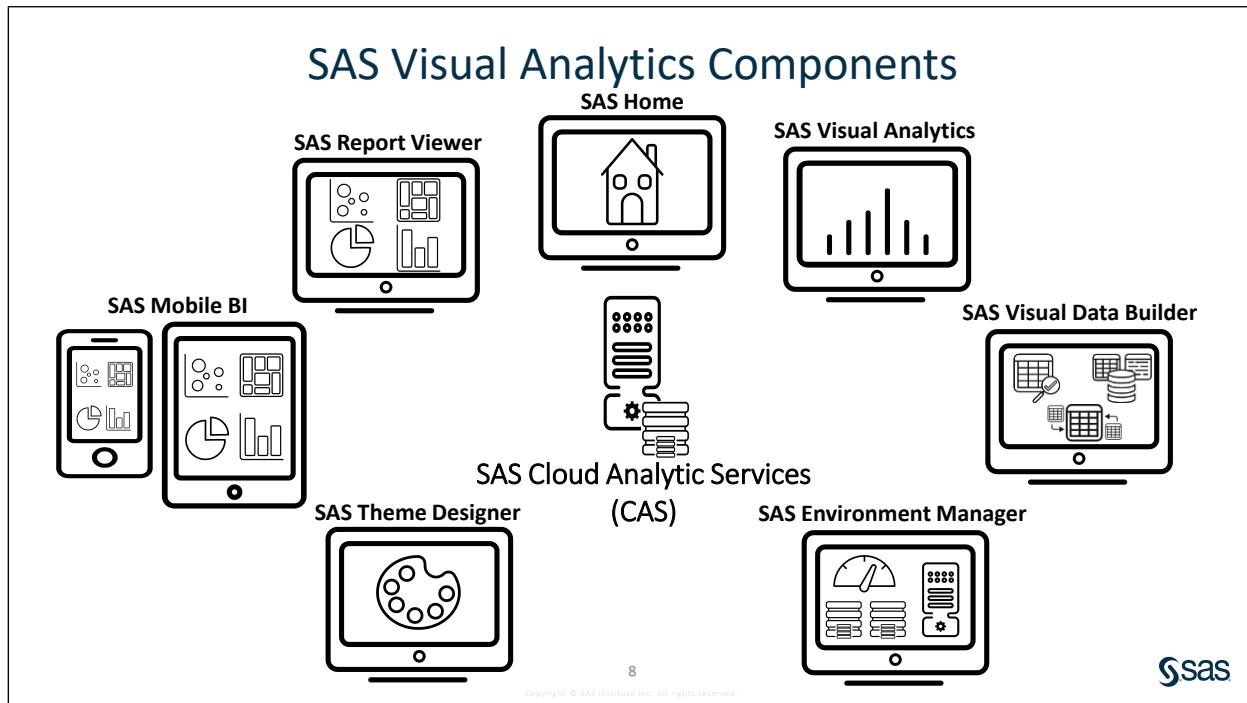
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At the heart of the SAS Viya platform is Cloud Analytic Services, an in-memory, distributed analytics engine. It uses scalable, high-performance, multi-threaded algorithms to rapidly perform analytical processing on in-memory data of any size. CAS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

CAS 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 Home	Organize content and access applications
Report Viewer	View reports in a browser
Visual Analytics	Visualize data interactively and create interactive reports
Mobile BI	View reports on a tablet or mobile device
Cloud Analytic Services (CAS)	Cloud-based, run-time environment server for data management and analytics
Visual Data Builder	Build new data sources
Theme Designer	Create custom themes for the application or reports
Environment Manager	Manage the environment

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 Home.
- Manage content (add favorites, add collections, add application shortcuts, add links, search for content, modify settings, view the object inspector) on SAS Home.

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SAS Visual Analytics Methodology



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

 <p>747,953 orders</p>	 <p>68,300 customers</p>	 <p>64 suppliers</p>
 <p>3,151 products</p>	 <p>648 employees</p>	



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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.



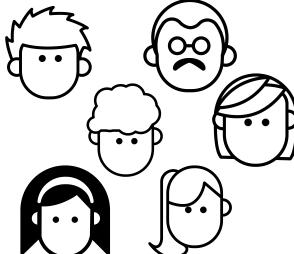
Home



Demos (Marketing)

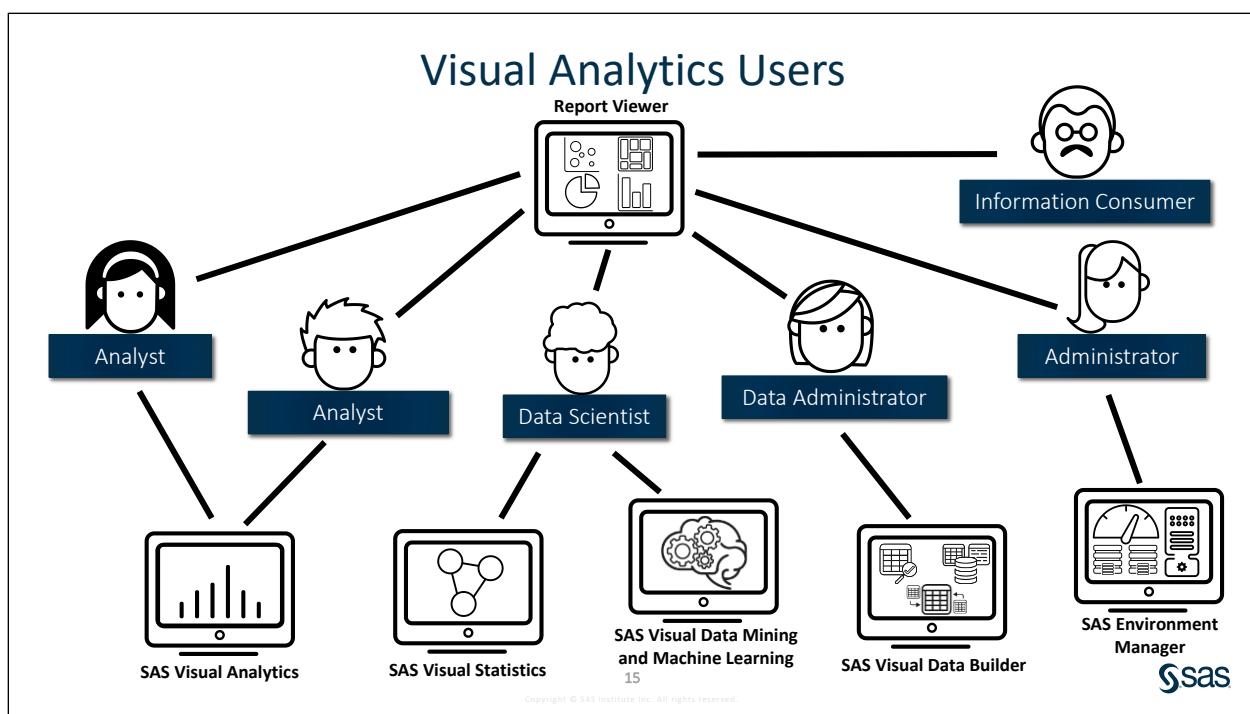


Exercises (HR)





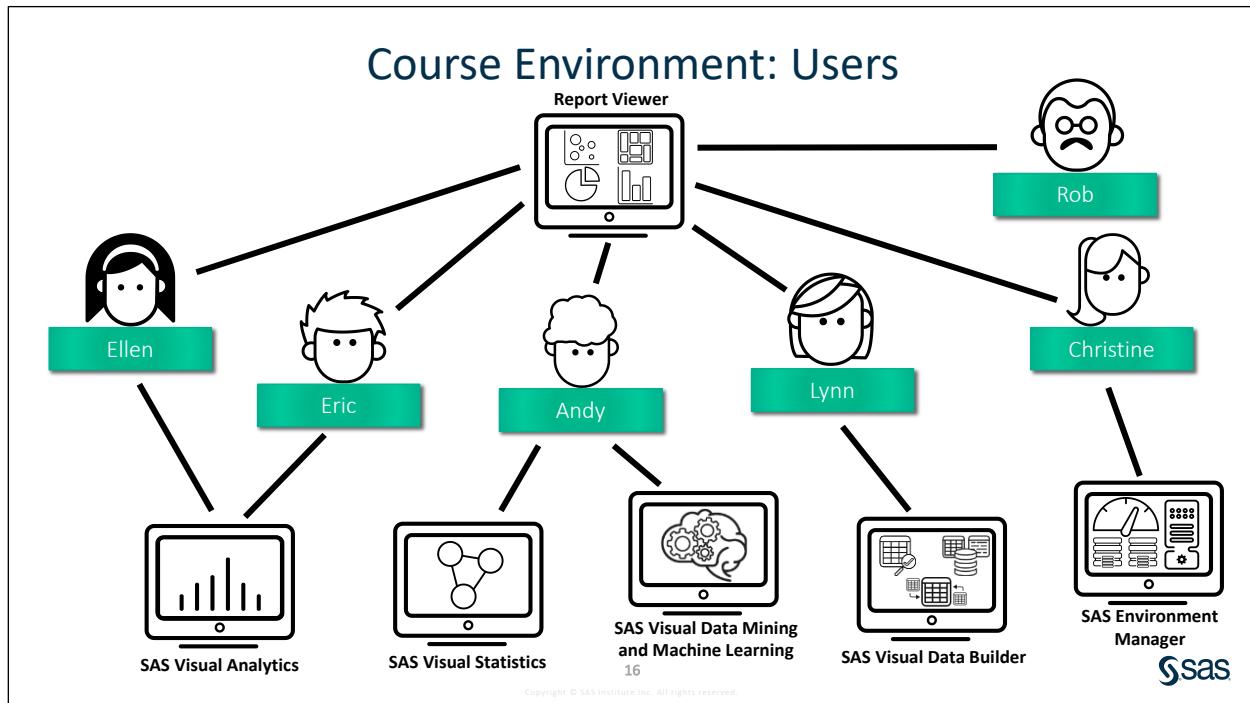
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SAS provides an initial set of rules to control your users' access to functionality. By default, initial rules are created at installation for the following users:

- **All authenticated users-** Users can access selected functions within applications such as the Dashboard, Data, and Content pages in SAS Environment Manager and functionality in SAS Visual Analytics. Users can also perform operations on folders and on the objects the folders contain.

- **SAS administrators-** Users can access everything that is under the control of the general authorization system.



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

Note: Andy, Lynn, and Christine can also access Visual Analytics.

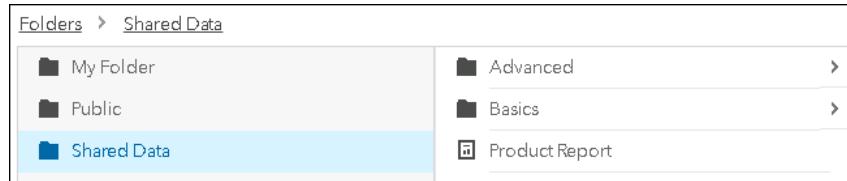
1.01 Multiple Answer Poll

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

- information consumer
- analyst
- data scientist
- data administrator/ data quality steward
- administrator

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

Classroom Environment

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

Caution: SAS Visual Analytics times out after 30 minutes of inactivity.
Be sure to save work often.

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1.02 Multiple Choice Poll

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 Home Interface

The screenshot shows the SAS Home interface with several annotated components:

- Welcome banner**: A yellow box highlights the "Welcome!" banner at the top.
- Menu bar**: A yellow box highlights the menu bar icon in the top-left corner.
- Welcome message**: A callout points to the text: "Click the icon beside 'SAS® Home' in the banner to access your applications using the side menu."
- Application shortcuts**: A yellow box highlights the "Recent" section under the "Application shortcuts" heading, which includes icons for SAS Visual Analytics, SAS Environment Manager, and Report Viewer.
- Content tiles**: A yellow box highlights a content tile titled "Tiles" under the "Favorites" section.
- Links**: A yellow box highlights the "Links" section on the right, which includes links to "Visual Analytics Documentation", "Visual Analytics Videos *FREE*", and "SAS Viya Training".
- Community link**: A callout points to the text: "Join a SAS community for great discussions on tips and best practices: [https://communities.sas.com/...](https://communities.sas.com/)"
- Information banner**: A yellow box contains the text: "The applications available depend on your assigned permissions and the products licensed by your site."

SAS Home provides access to SAS Viya applications and other available resources.

Welcome banner	The Welcome banner gives you information about how to interact with the home page, how to add application shortcuts and content tiles, and how to access the SAS community. This banner can be hidden.
Menu bar	The menu bar enables you to browse for content, add an application shortcut, and add a new tile. Administrators have additional tools for publishing or managing content tiles for other users.
Application shortcuts	The Application shortcuts area contains buttons that enable you to access various applications.
Tiles	<p>The Tiles area contains tiles with recent content, favorites, links, and any content tiles that have been added by the user or an administrator.</p> <p>Note: The position of the tiles varies depending on the resolution of the computer, the size of the browser window, and the content included in the tile.</p>



Exploring SAS Home

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

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

The SAS Visual Analytics sign-in page appears.

The screenshot shows a sign-in form titled "Sign In to SAS®". It has two input fields: "User ID:" and "Password:", each with a corresponding text input box. Below these fields is a large blue "Sign In" button. At the bottom left is the SAS logo with the tagline "THE POWER TO KNOW.". At the bottom right is a link labeled "About".

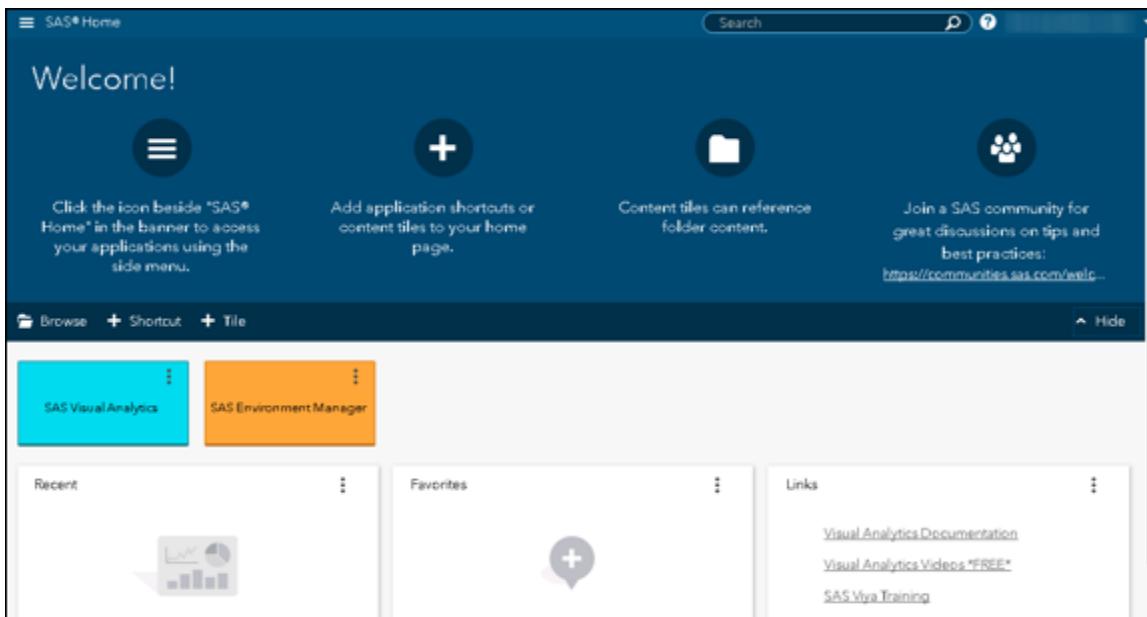
Note: The URL that is used to access SAS Visual Analytics on the classroom machines is specific to the classroom configuration. The URL used at your site will be different.

2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.

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

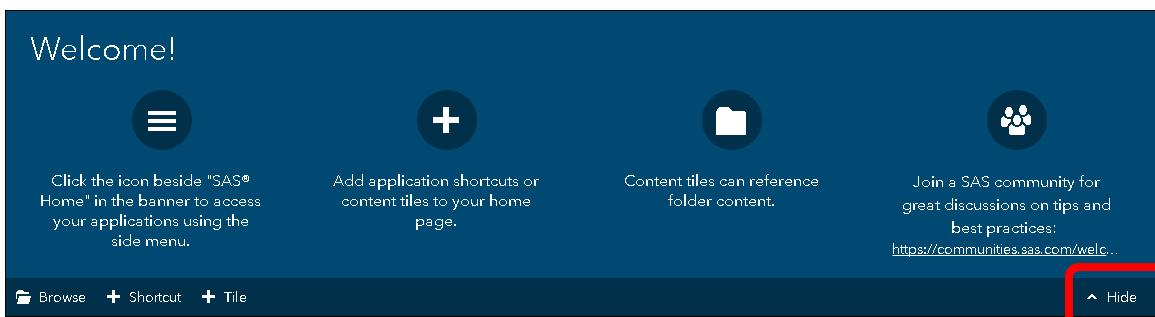
4. Click **Sign In**.

SAS Visual Analytics appears and SAS Home is displayed by default.

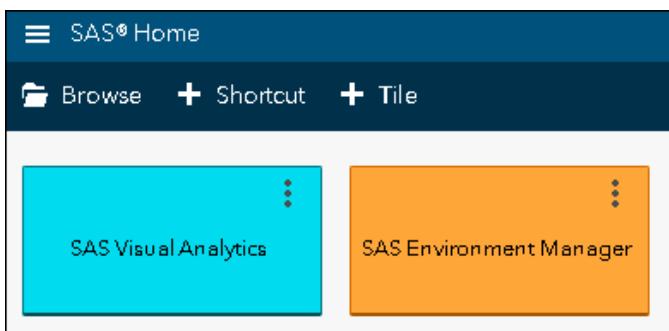


The Welcome banner contains details about interacting with SAS Home.

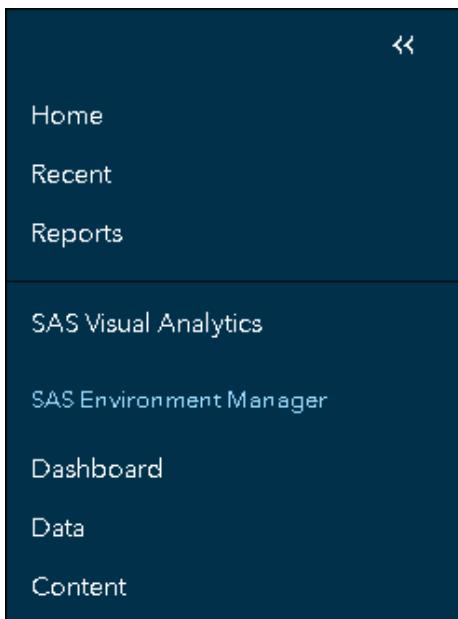
5. Click **Hide** on the lower right side of the Welcome banner to hide it.



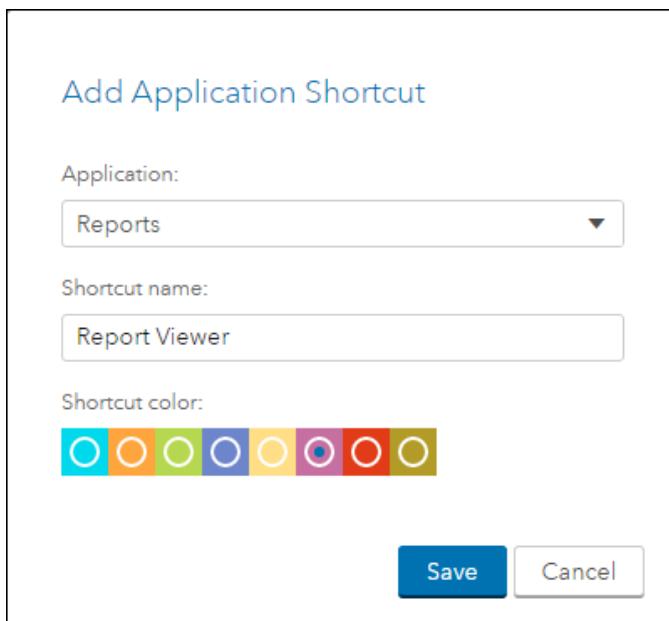
A selection of applications that Eric can access appears in the main content area.



6. Click  (Side menu) in the upper left corner to view the available applications.



7. Click  (Pin side menu) in the lower right corner of the side menu to make it visible at all times.
8. Add an application shortcut for reports.
- Click **Shortcut** on the menu bar.
 - Select **Reports** for the **Application** field.
 - Enter **Report Viewer** in the **Shortcut name** field.
 - Choose  (purple) as the **Shortcut color**.



Add Application Shortcut

Application:

Reports

Shortcut name:

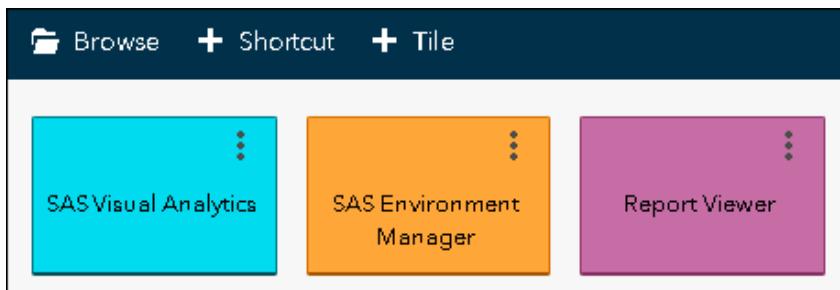
Report Viewer

Shortcut color:

Save Cancel

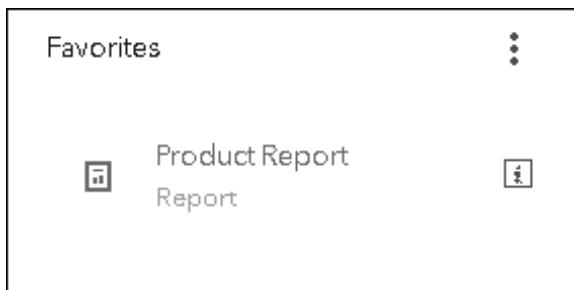
- e. Click **Save** to close the Add Application Shortcut window.

The application shortcut is added to the Action button area.

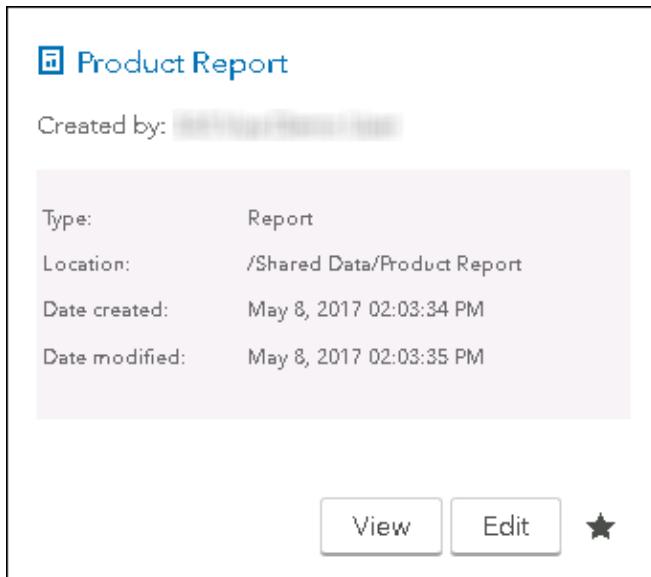


9. Add an item to the Favorites tile.
 - a. On the Favorites tile, click **Add Favorites**.
 - b. Navigate to the **Shared Data** folder.
 - c. Select **Product Report**.
 - d. Click **Open**.
 - e. Click **Save** on the Favorites tile.

The Product Report is added to the Favorites tile.



- f. Click  (Open object inspector) next to the **Product Report** to view the object inspector.



Product Report

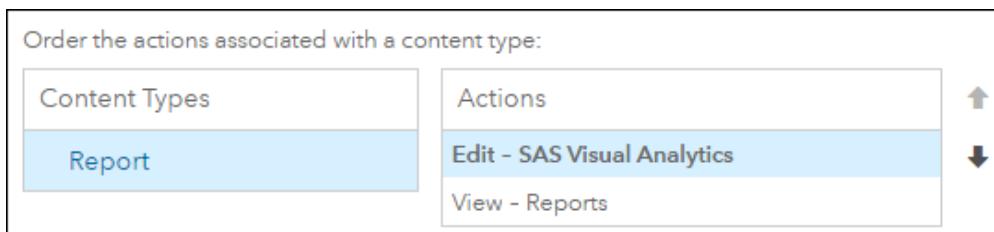
Created by: [redacted]

Type: Report
Location: /Shared Data/Product Report
Date created: May 8, 2017 02:03:34 PM
Date modified: May 8, 2017 02:03:35 PM

View **Edit** 

Because Eric has the ability to create reports, two actions are available in the object inspector, View and Edit. Clicking the name of the report in the Favorites tile is the equivalent of selecting the first action, View, which opens the report in the SAS Report Viewer.

- g. Click outside the object inspector to close it.
10. View settings and reorder the actions associated with a report.
- In the upper right corner, select **Eric** \Rightarrow **Settings**.
 - Select **Initial Screen** in the **SAS Home** section.
 - In the Order the actions associated with a content type area, verify that **Report** is selected for the **Content Types**.
 - Select **Edit – SAS Visual Analytics** under **Actions**.
 - Click  (Move up) to move the action up in the list.



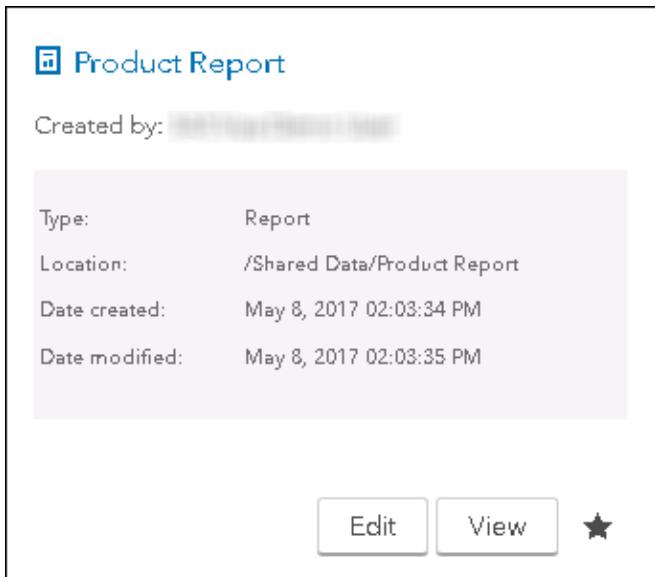
Order the actions associated with a content type:

Content Types	Actions
Report	Edit - SAS Visual Analytics
	View - Reports

Note: The first item specified in the Actions section is the default action.

- f. Click **Close** to save the changes.

- g. On the Favorites tile, click  (Open object inspector) next to the **Product Report** to view the object inspector.



The screenshot shows the object inspector for a 'Product Report'. At the top, it says 'Created by: [redacted]'. Below that is a light gray box containing the following information:

Type:	Report
Location:	/Shared Data/Product Report
Date created:	May 8, 2017 02:03:34 PM
Date modified:	May 8, 2017 02:03:35 PM

At the bottom of the inspector are three buttons: 'Edit' (highlighted in blue), 'View', and a star icon.

The Edit action is now listed first in the object inspector, so the report will open by default in SAS Visual Analytics.

11. Select **Eric** ⇒ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

End of Demonstration

1.03 Multiple Answer Poll

Sign in to Visual Analytics using Eric's credentials. Which of the following statements are true about the tiles on SAS Home?

- a. You can add content to all tiles.
- b. You can delete all tiles.
- c. You can edit all tiles.
- d. You can hide all tiles.

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1.04 Quiz

Which links are available in the Links tile?

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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.



64 suppliers



3,151 products

31

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Viewing SAS Visual Analytics Reports

Report Viewer

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

Click on the details icon found on the report pages to see detailed instructions about actions and links for that page.

Mobile BI

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

Click on the details icon found on the report pages to see detailed instructions about actions and links for that page.

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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 is dependent on the size of the display area, so the same treemap can appear different in the different applications.

SAS Report Viewer Interface

Page tabs

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

Click on the details icon found on the report pages to see detailed instructions about actions and links for that page.

Supplier Analysis

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

More options

Open... Edit report Refresh report Print... Email...

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 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.

1.05 Poll

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

- True
- False

SAS Report Viewer Interface

The screenshot shows the SAS Report Viewer interface with a dashboard. On the left, there's a map titled "Supplier Locations" with a few dots. Below it is a table titled "Supplier Name" with a list of companies. To the right of the table are two charts: one showing "Quantity" over time and another showing "Profit" difference. The right side of the interface features a vertical sidebar with several icons and sections. Two specific areas are highlighted with green boxes: one at the top right labeled "Expand/collapse" pointing to the top right corner, and another on the sidebar labeled "Right pane" pointing to the "Information" section.

The right pane contains the following icons:

Report Properties	The Report Properties pane displays details about the report, including the name, the metadata location, the user who created it, the date created, the user who last modified it, and the date on which the report was last modified.
Information	The Information pane displays details about the report or the selected object. For selected objects, any display rules and/or incoming filters are also displayed.
Comments	The Comments pane displays any comments that have been added to the report or selected object. Note: You must have the Add and View Comments capability to add or view comments and be in the Comments: Administrator predefined role to edit or delete other users' comments.
Filters	The Incoming Filters pane displays filters that are applied to the report and the report page as a result of report or page prompts, report links, or page links. You can also use this pane to show or hide report or page prompts.



Using SAS Report Viewer

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

1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.

SAS Visual Analytics appears and SAS Home is displayed by default.

5. View and interact with the Product Report.
 - a. Click (Open object inspector) next to the **Product Report** to view the object inspector.
 - b. Click **View** to open the report.

The Product Report appears in the 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.

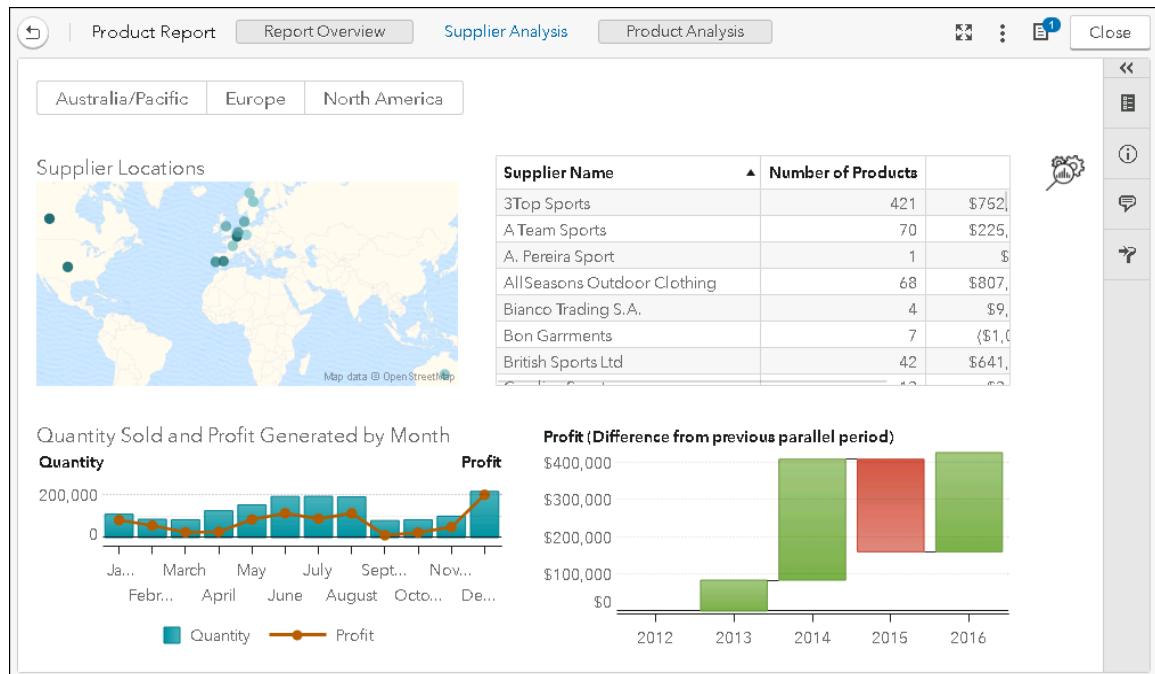
Product Analysis
View details about the products sold by Orion Star Sports and Outdoors, including information about product categories and groups, the top 10 cities by orders and profits, and historical details.

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

- c. 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 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, where 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.

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



- 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 (info window). This icon is used through the course to link to information about the page.

An info window displays information about the page, including information about the report objects, actions, and links.

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

Instructions- Supplier for Instructions- Supplier ✖️ ✖️

The Supplier Analysis page 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.

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

6. View information about objects and work with interactions and links.

- a. Move the cursor to the upper right corner of the geo map and select  **(Maximize view)**.



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**.



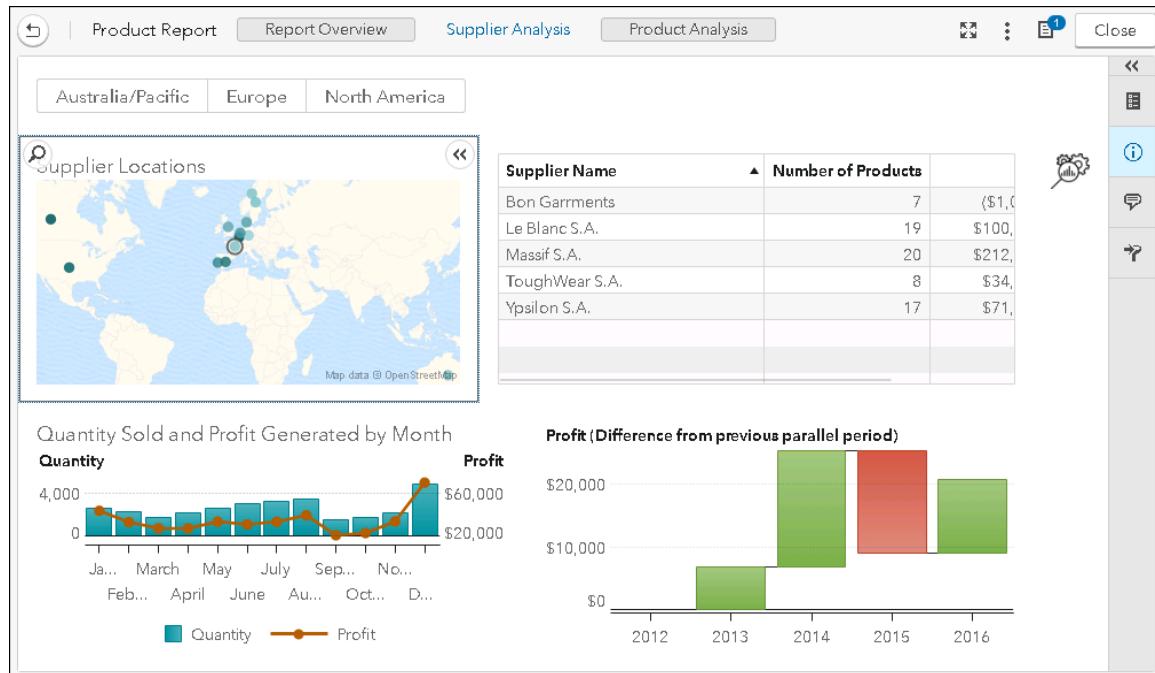
The country is highlighted in the geo map.



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 select (Exit maximized view).

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



- Select the list table.
- In the right pane, click **(Information)**.

Information

Name
Supplier Details

Display Rules

Table Level

Profit

[Color Scale]	to the right of text, with Profit as x (\$600,000.00) ≤ x < \$0.00
[Color Scale]	\$0.00 ≤ x < \$400,000.00
[Color Scale]	\$400,000.00 ≤ x ≤ \$900,000.00

Incoming Filters
Supplier Country = [France]

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

- Click **(Information)** on the right to hide the Information pane.

- g. In the list table, double-click **Bon Garments**.

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

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

Because the list table and the objects on 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 display details about each product along with total quantity sold, total profit generated, and total number of orders for each product.

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

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.

- j. Click **Close** to close the info window.
 - k. In the list table, double-click **Massif S.A.**

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

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

Number of Products by Product Line						
Clothes & Shoes		Outdoors		Sports		
Supplier Name	Product Group	Product Name	Quantity	Profit		
				Sum:		
				9,996		
				Sum: \$212,147		
				\$4,540		
				\$3,093,600		
				\$1,181,400		
				\$1,471,800		
				\$35,371,000		
				\$49,900,000		

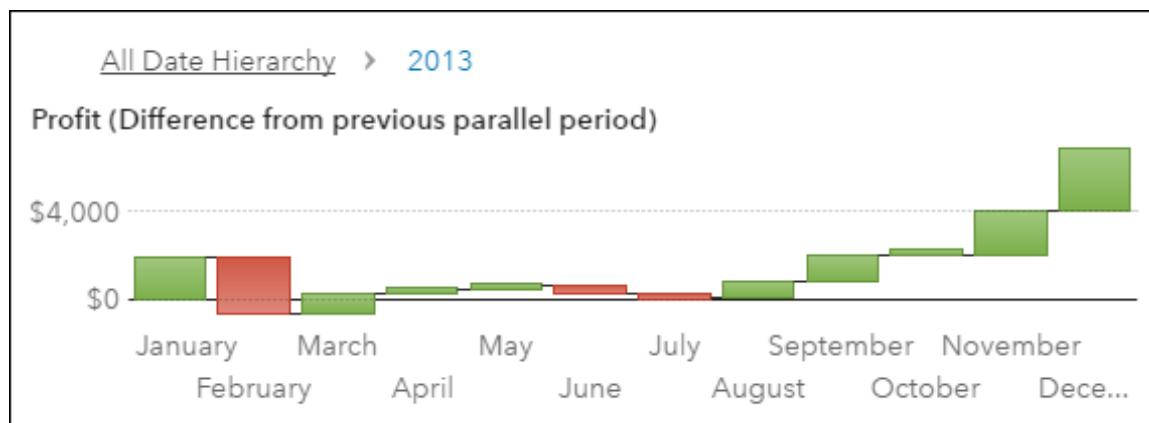
- m. Enter **Jacket** in the **Enter a string to search by product name** field.

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

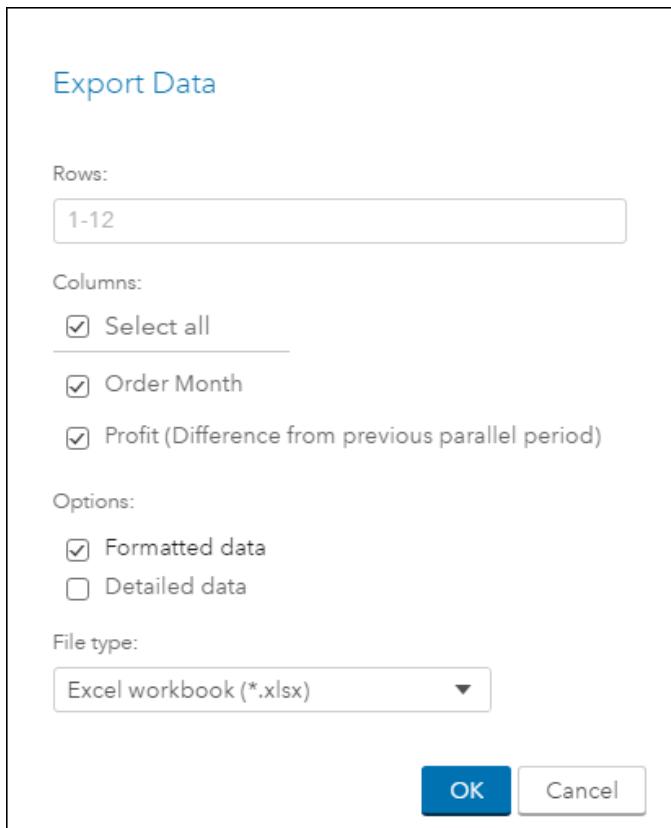
Note: Parameters are used to update the list table. The parameter is updated with the input value, and the list table is filtered for product names that contain that value.

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



- p. On the upper right corner of the waterfall chart, select  (Export data).
- q. Accept the default selections in the Export Data window.



- r. 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.

- s. 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	\$994.32
April	\$166.23
May	\$169.22
June	(\$359.11)
July	(\$178.26)
August	\$732.85
September	\$1,154.75
October	\$26.03
November	\$1,946.35
December	\$2,898.20

- t. Select **File** ⇒ **Save As** to save a copy.
- u. Navigate to the Desktop.
- v. Enter **Supplier Profit Analysis 2013.xlsx** in the **File name** field.
- w. Click **Save**.
- x. Select **File** ⇒ **Exit** to close the Excel file.

7. 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.

8. Select  (**Side menu**) ⇒ **Home** in the upper left corner to return to SAS Home.

The Product Report should appear in the Recent tile.



9. Select **Eric** ⇒ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

End of Demonstration



Exercises

1. Viewing a Report in the Report Viewer

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
- b. Open and interact with the Product Report in the Report Viewer.

Note: If necessary, click **Browse** on the menu bar and open the report in the Shared Data folder.

- 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.
- 4) Enter the following comment for the dual axis time series plot.

Why do fitness profits plunge in recent months when orders seem to be ticking up?

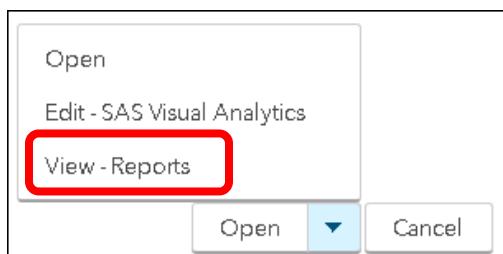
- d. Close the report and return to the home page.
- e. Sign out of Visual Analytics.

1.4 Solutions

Solutions to Exercises

1. Viewing a Report in the Report Viewer

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
- Enter **Eric** in the **User ID** field.
- Enter **Student1** in the **Password** field.
- Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- Open and interact with the Product Report in the Report Viewer.
- Click **Browse** on the menu bar.
- Navigate to the **Shared Data** folder.
- Select **Product Report**.
- If necessary, click next to **Open** and select **View – Reports**.



The Product Report opens in the Report Viewer.

Supplier Analysis

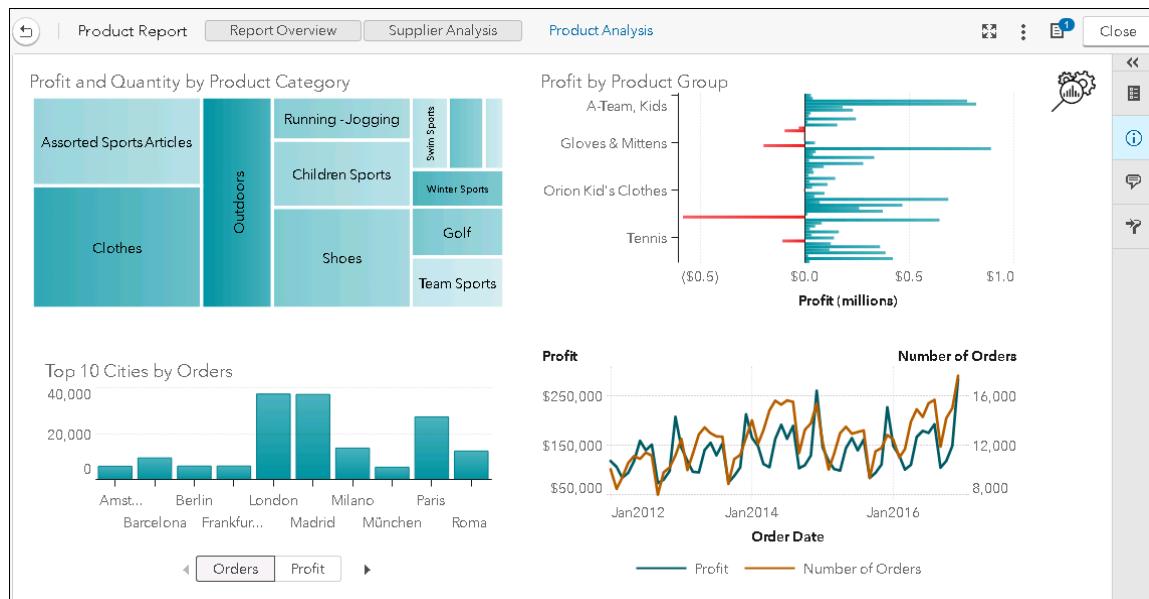
View details about the suppliers for Orion Star Sports and Outdoors, including details about locations, the products manufactured, and the quantity sold and profit generated by each of our suppliers.

Supplier Name	Number of Products	Profit (million)
Top Sports	421	\$782
A Team Sports	70	\$253
A Peoria Sport	1	\$5
AllSeasons Outdoor Clothing	68	\$887
Bravo Trading S.A.	4	\$91
Bon Garments	7	(\$1,1)
British SportsLtd	42	\$641

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.

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



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

An info window displays information about the page, including information about the report objects, actions, and links.

Instructions- Product for Instructions- Product

The Product Analysis page 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 will show details about products in that group.

- 1) 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.

- 2) 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).

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

Product Category	Quantity	Profit	Number of Orders
Indoor Sports	23,245	\$160,689.61	11,755
Outdoors	239,583	\$1,687,084.95	107,616

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

Product Category	Quantity	Profit	Number of Orders
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

- 4) In the upper right corner of the treemap, select  (Exit maximized view).

Which product groups are included in the Indoor Sports category?

Answer: Fitness, Gymnastic Clothing, and Top Trim

- 1) Click the tile for Indoor Sports in the treemap.
- 2) 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.

Number of Products:	45
Product Group:	Fitness
Profit:	(\$2,335.96)

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.

- 1) Double-click the Fitness bar in the bar chart.
- 2) Click (Maximize view) in the upper right corner of the info window.
- 3) In the list table, scroll to the right to view the Profit column.
- 4) Click the Profit column to sort the list table in ascending order by Profit.

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

5) 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.

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



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

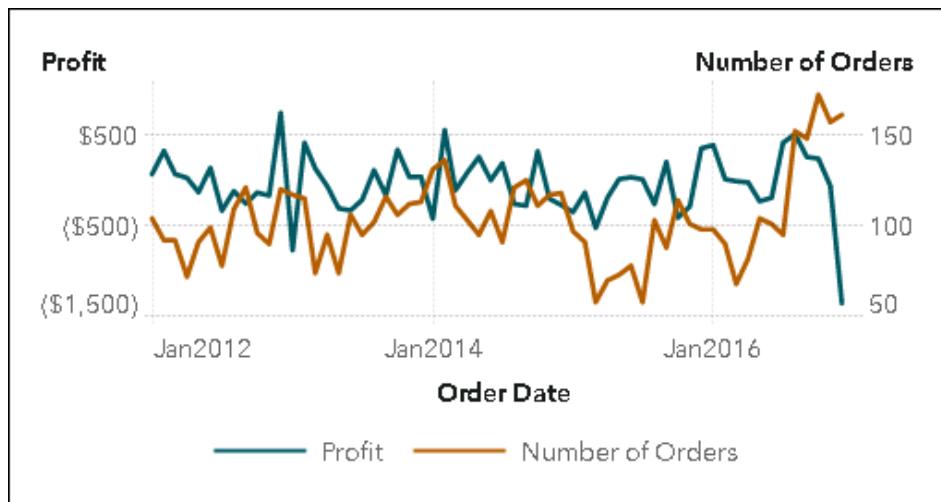


- 3) Save an image of the dual axis time series plot filtered by Indoor Sports and Fitness.

- a) In the upper right corner of the dual axis time series plot, select (Save image).

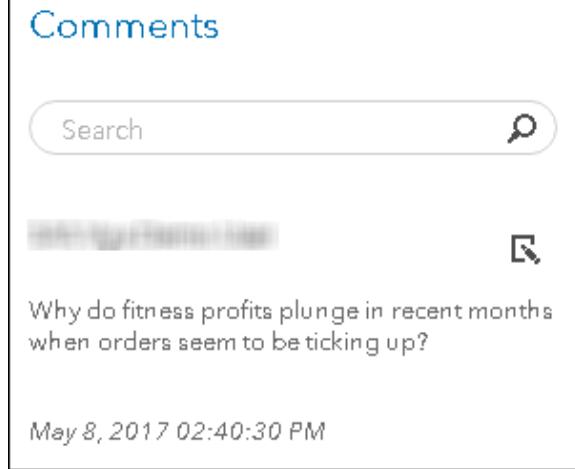
An image file with the name snapshot is created using the current view of the dual axis time series plot.

- b) Click **snapshot.png** in the bottom of the browser to view it.



- c) Close the image.
- 4) Enter a comment for the dual axis time series plot.
- Verify that the dual axis time series plot is selected.
 - In the right pane, click **(Comments)**.
 - In the **Enter a comment** field, enter the following:
Why do fitness profits plunge in recent months when orders seem to be ticking up?
 - Click **Post**.

The Comments pane should resemble the following:



- d. Close the report and return to the home page.
- Click in the upper right corner to close the report.
 - Select **(Side menu)** ⇒ **Home** to return to the home page.
- e. Select **Eric** ⇒ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

End of Solutions

Solutions to Student Activities (Polls/Quizzes)

1.02 Multiple Choice Poll – 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.

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1.03 Multiple Answer Poll – Correct Answer

Sign in to Visual Analytics using Eric's credentials. Which of the following statements are true about the tiles on SAS Home?

- a. You can add content to all tiles.
- b. You can delete all tiles.
- c. You can edit all tiles.
- d. You can hide all tiles.

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1.04 Quiz – Correct Answer

Which links are available in the Links tile?

Links

⋮

[Visual Analytics Documentation](#)

[Visual Analytics Videos *FREE*](#)

[SAS Viya Training](#)

1.05 Poll – Correct Answer

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

- True
- False

Exercise Review

1.1 Viewing a Report in the Report Viewer – Solution

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

What links are available for the Product Analysis page?



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

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1.1 Viewing a Report in the Report Viewer – Solution

Which product category has the fewest number of orders? The lowest total profit?
Indoor Sports has the fewest number of orders (11,755).
Team Sports has the lowest total profit (\$133,185.52).



Product Category	Quantity	Profit	Number of Orders
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
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40

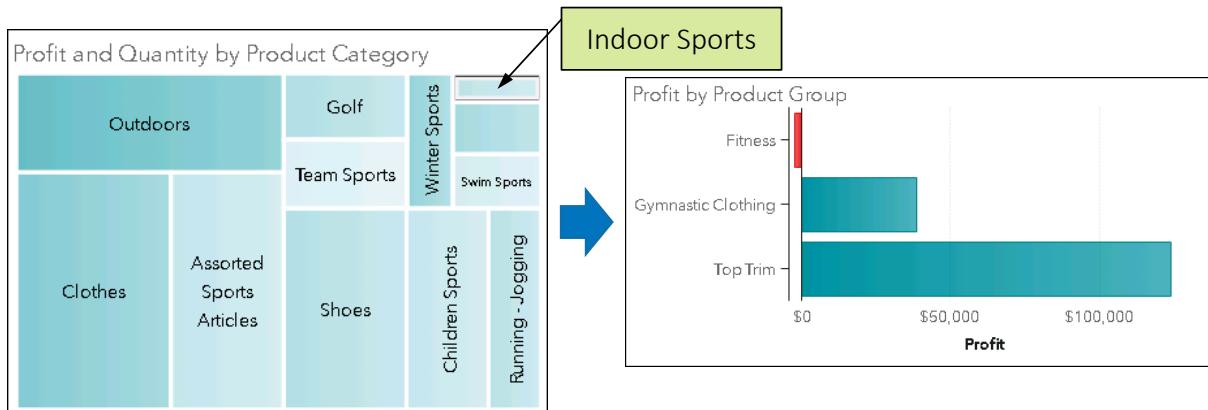
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1.1 Viewing a Report in the Report Viewer – Solution

Which product groups are included in the Indoor Sports category?

Fitness, Gymnastic Clothing, and Top Trim



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1.1 Viewing a Report in the Report Viewer – Solution

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



42



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

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1.1 Viewing a Report in the Report Viewer – Solution

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

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



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** and **Sports**.

Comments



[REDACTED]



Why do fitness profits plunge in recent months when orders seem to be ticking up?

May 8, 2017 02:40:30 PM



Enter a comment for the dual axis time series plot.

Chapter 2 Preparing Data in SAS® Visual Analytics

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2.1 Investigating Data in 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 to 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.

For your first assignment, the Marketing team has asked for an analysis of profits and the Shipping team has asked for an analysis of delivery times. You need to access and investigate the data to determine which modifications need to be made to satisfy their requirements.



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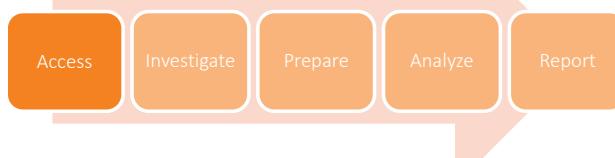
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Visual Analytics Methodology: Access

In the **Access** phase, you 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:
 - self-service import
 - creating plans in Visual Data Builder
 - Data area in SAS Environment Manager
 - Upload to CAS task in SAS Enterprise Guide
 - SAS code
 - supported open languages: Python, Lua, Java



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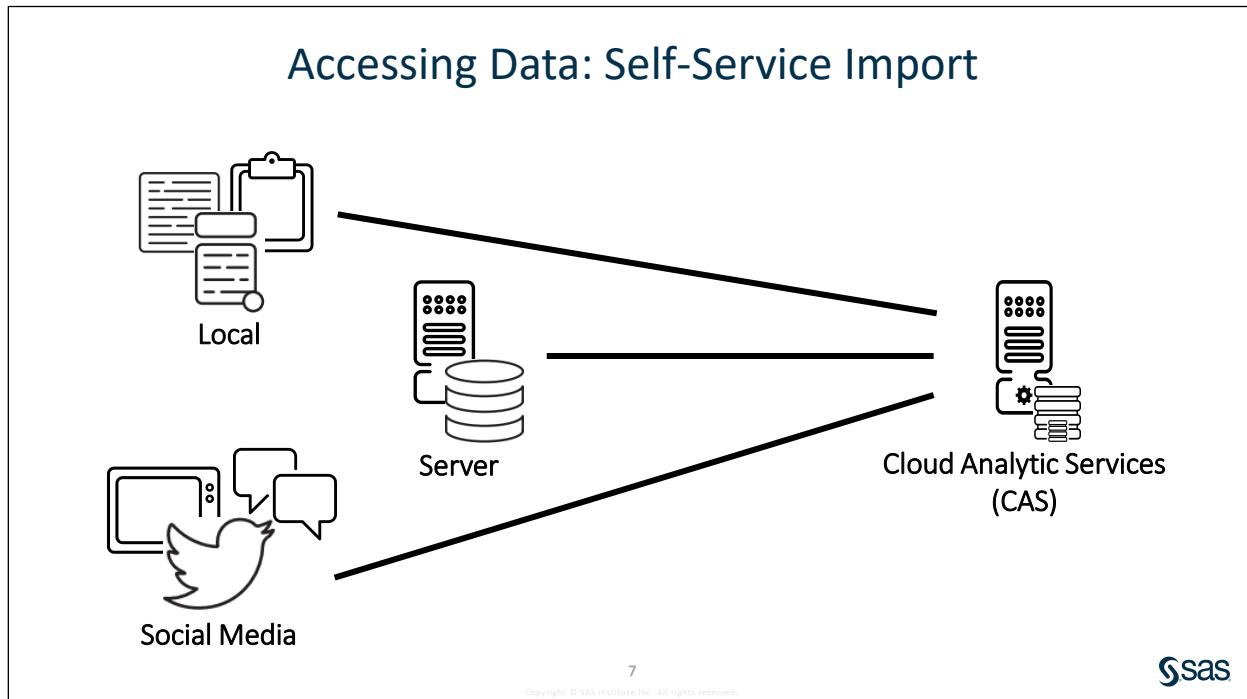


An analysis table is any table that is arranged in a specific way to facilitate analytics. Creating an analysis table may consist of the following:

- restructuring data across multiple columns into a single column (for example, to facilitate forecasting)
- using a single column to create multiple columns with different properties (for example, creating multiple measures with different aggregations)
- extracting information from a column (for example, extracting vendor ID from product codes)

Note: An analysis table is not a special table. It is a term for data that is arranged in a specific way to facilitate analysis in SAS Visual Analytics. If the table is not already arranged to support analytics, creating an analysis table can be accomplished using SAS Visual Data Builder, SAS Data Integration Studio, SAS Enterprise Guide, SAS Studio, or any data manipulation tool.

Note: These steps are performed prior to class and are not covered in this course.



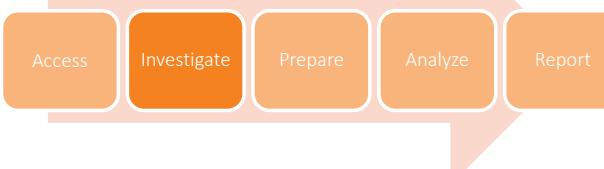
The following types of data can be imported to CAS using self-service import:

Local	You can import data from a Microsoft Excel spreadsheet (XLS or XLSX), a text file (CSV or TXT), a SAS data set (SASHDAT or SAS7BDAT), or data from the clipboard.
Server	After providing connection information, you can import a table to the CAS server from a database (Teradata, Oracle, Hadoop, PostgreSQL, Impala) or from the SAS LASR Analytic Server.
Social Media	After authenticating with Facebook, Google Analytics, Twitter, or YouTube and providing search criteria, you can import data to the CAS server. 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.

Visual Analytics Methodology: Investigate

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

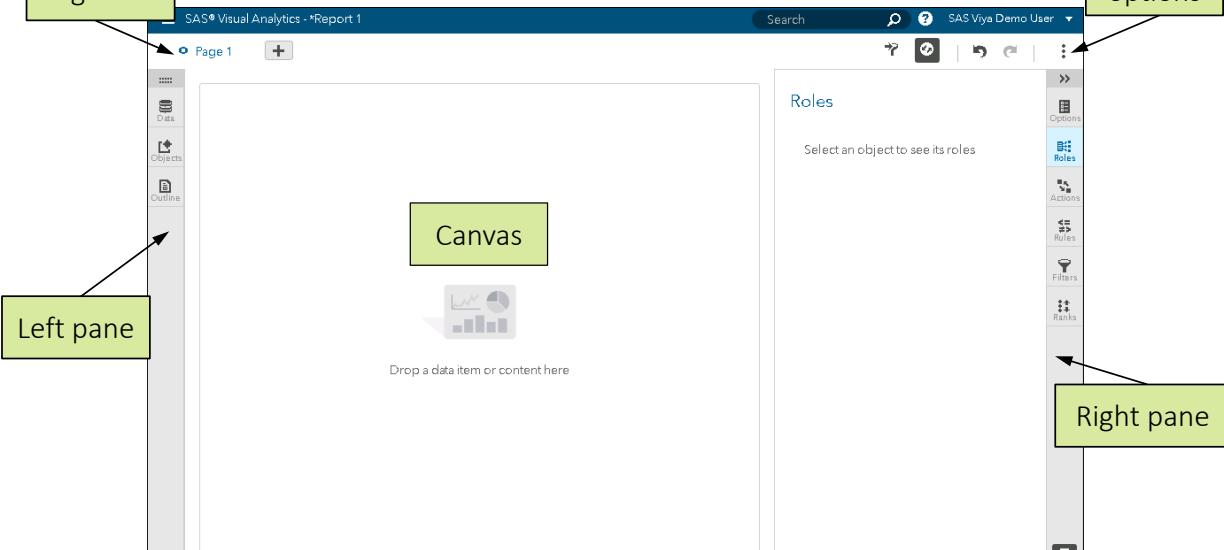
- How big is the data?
- How is the data shaped?
- Are there any data quality issues? Missing values?
- Are there any data items that need to be calculated for the analysis?



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SAS Visual Analytics Interface



The SAS Visual Analytics interface is divided into several sections:

- Page tabs:** Located at the top left, showing "Page 1".
- Left pane:** A vertical sidebar on the left containing icons for Data, Objects, and Outline.
- Canvas:** The central workspace where you can drop data items or content.
- Right pane:** A vertical sidebar on the right containing sections for Roles, Options, Rules, Actions, Filters, and Blanks.
- More options:** A button located in the top right corner of the interface.

Drop a data item or content here

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The left pane contains the following icons:

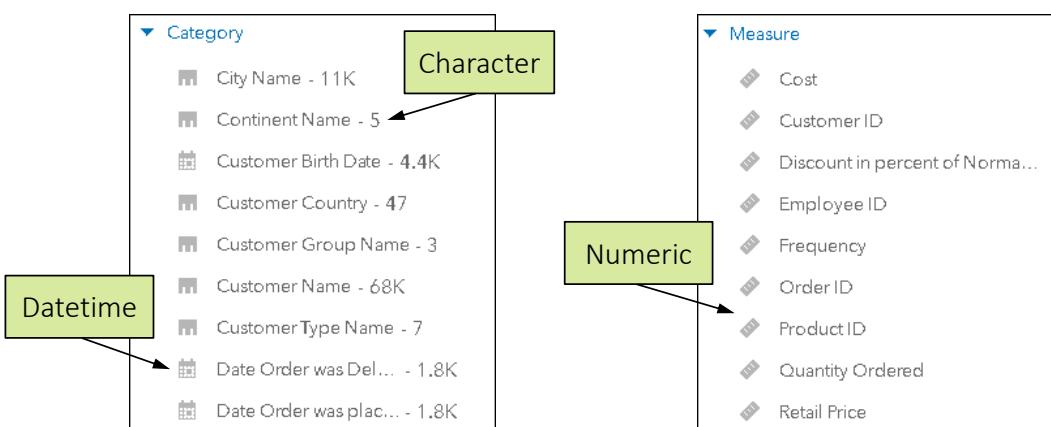
Data	The Data pane enables you to work with data sources, create new data items (hierarchy, calculated item, aggregated measure), add a data source filter, and view and modify properties for data items.
Objects	The Objects pane provides a list of tables, graphs, gauges, controls, containers, and other 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 types in Visual Analytics:



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

Objects: Tables

Click to sort

Customer Name	Quantity Ordered
Zyryi, Mr. Christopher	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.

OrderType	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



List table

By default, the list table contains aggregated data with one row for each distinct combination of category values. If the Show detail data option has been selected, then every row of the data source is displayed.

Note: By default, the list table is sorted in ascending order by the first column and the first 5,000 sorted rows are displayed.

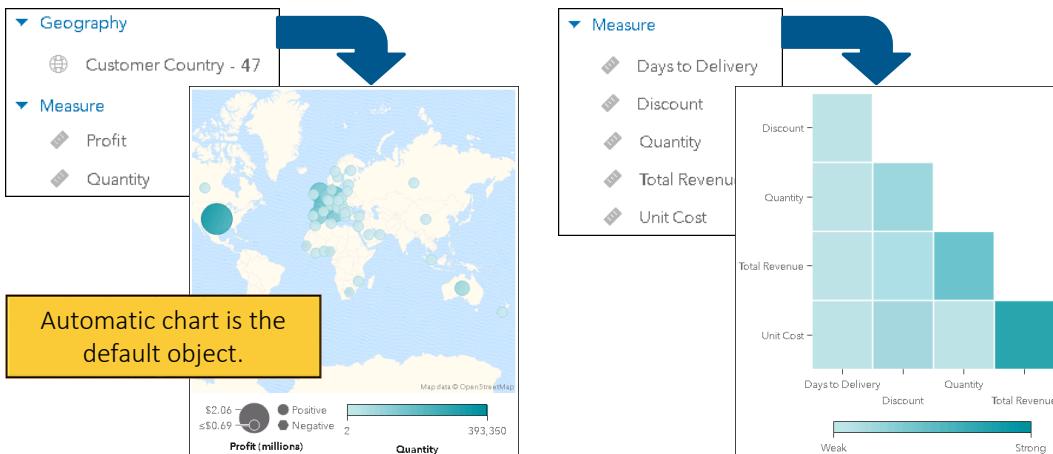
Note: To change the sorting, click the heading for the column on which you want to sort. An arrow appears in the column heading to indicate the sorting. If the arrow points up, then the sort is ascending. If the arrow points down, then the sort is descending.

Crosstab

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.

Objects: Automatic Chart

An *automatic chart* selects the chart type based on the assigned data. Automatic charts provide a quick view of the data.



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Data Items	Chart Type
One measure	Histogram
One category	Bar chart
One datetime category and any number of other categories or measures	Time series plot
One geography and up to two measures	Geo map
One geography and three or more measures	Bar chart
Two measures	Scatter plot or heat map*
Three or more measures	Scatter plot matrix or correlation matrix*
One or more categories and any number of measures or geographies	Bar chart

* 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 through self-service import and how to investigate data for the business scenario.

1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Lynn** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.

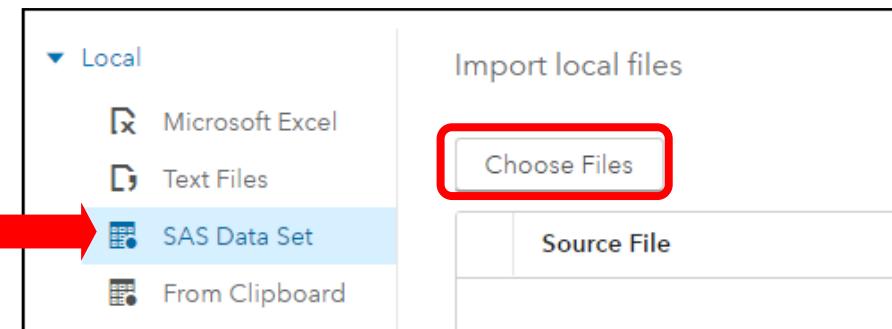
The Welcome to SAS Visual Analytics window appears.

The screenshot shows the 'Welcome to SAS Visual Analytics' interface. At the top, it says 'Welcome to SAS Visual Analytics'. Below that, a message reads 'Select an option to get started:'. There are three main options: 'Data' (represented by a grid icon), 'New' (represented by a chart icon), and 'Open' (represented by a folder icon). Each option has a corresponding button below it. At the bottom left, there is a checkbox labeled 'Make this selection the default.'.

6. Import a SAS data set to CAS.
 - a. Click **Data**.
 - b. In the Open Data Source window, click **Import**.

The screenshot shows the 'Open Data Source' window. At the top, it says 'Open Data Source'. Below that, there are three tabs: 'All' (selected), 'Recent', and 'Import'. The 'Import' tab is highlighted with a red rectangle. At the bottom, there is a search bar with a magnifying glass icon.

- c. In the Local area, select **SAS Data Set**.
- d. In the Import local files area, click **Choose Files**.



- e. Navigate to **D:/Workshop/data**.
- f. Select the **customers.sas7bdat** table and click **Open**.

Note: By default, all imported files are accessible by everyone as they are imported to the Public caslib.

- g. Click the check box in front of the table and click **OK**.

The table is imported into the CAS server and is available to use with Visual Analytics. When the import is complete, the Data pane is displayed and lists the data items from the **CUSTOMERS** table.

The screenshot shows the SAS Visual Analytics interface. The main area is the Data pane, which displays the 'CUSTOMERS' table. Under 'Category', there are several data items: City Name - 11K, Continent Name - 5, Customer Birth Date - 4.4K, Customer Country - 47, Customer Group Name - 3, Customer Name - 68K, CustomerType Name - 7, Date Order was Del... - 1.8K, Date Order was plac... - 1.8K, Name of Street - 21K, and OrderType - 3. To the right of the Data pane is the Roles pane, which displays the message 'Select an object to see its roles'. The interface also includes a toolbar at the top and a sidebar on the left with sections for Objects, Outline, and other data management tools.

7. 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 Del... - 1.8K
- Date Order was pla... - 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.

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

The screenshot shows the Data pane with a section titled "Measure" expanded. Inside, there is a list of data items, each preceded by a small icon:

- Cost
- Customer ID
- Discount in percent of Norm...
- Employee ID
- Frequency
- Order ID
- Product ID
- Quantity Ordered
- Retail Price
- Street ID
- xyContinentLat
- xyContinentLon

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

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

- In the left pane, click the **Objects** icon.
- Drag the **List Table** object from the Objects pane to the canvas.
- In the right pane, click the **Roles** icon.
- Under the **Columns** role, click **Add**.
- Select all data items except **Frequency** and **Frequency Percent**.

Note: Click the first column, hold down the Shift key, and click the last column to multi-select.

- Click **OK**.

The list table should resemble the following:

City Name	▲	Continent Name	Customer Birth Date	Customer Country	Customer Group Name
		Europe	08May1953	United Kingdom	Orion Club Gold members
		Europe	08May1953	United Kingdom	Orion Club Gold members
		Europe	08May1953	United Kingdom	Orion Club Gold members
		Europe	07Oct1938	United Kingdom	Orion Club members
		Europe	08May1953	United Kingdom	Orion Club Gold members
		Europe	08May1953	United Kingdom	Orion Club Gold members
		Europe	12Dec1988	Austria	Orion Club members
		Europe	08May1953	United Kingdom	Orion Club Gold members

- 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 (<i>Pedder, Ms. Natalie or Finster, Mr. Richard</i>)
Days to Delivery	Date Order was Delivered , Date Order was placed by Customer

10. Click (**Add a page**) in the upper left corner next to **Page 1**.

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

- a. In the left pane, click the **Objects** icon.
- b. Drag the **Crosstab** object from the Objects pane to the canvas.
- c. If necessary, click the **Roles** icon in the right pane.
- d. For the **Rows** role, select **Add** \Rightarrow **Order Type**.
- e. 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.

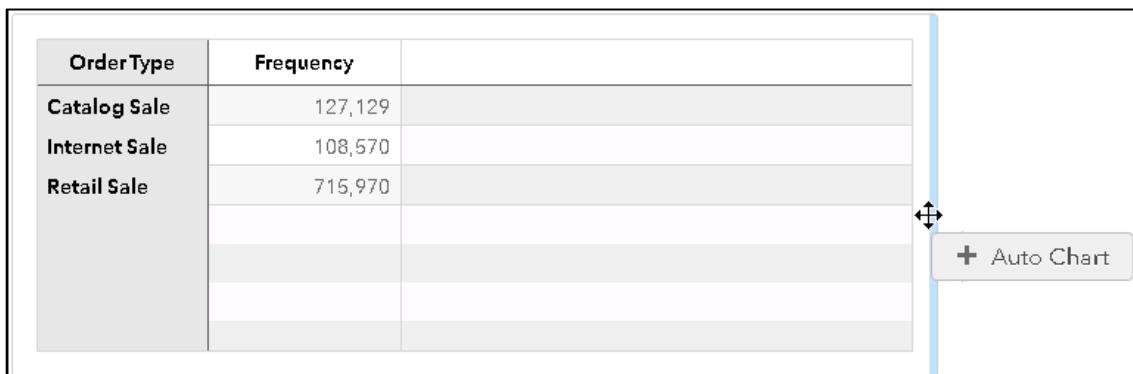
12. Use the automatic chart to view quantity ordered by customer.

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

Customer ID

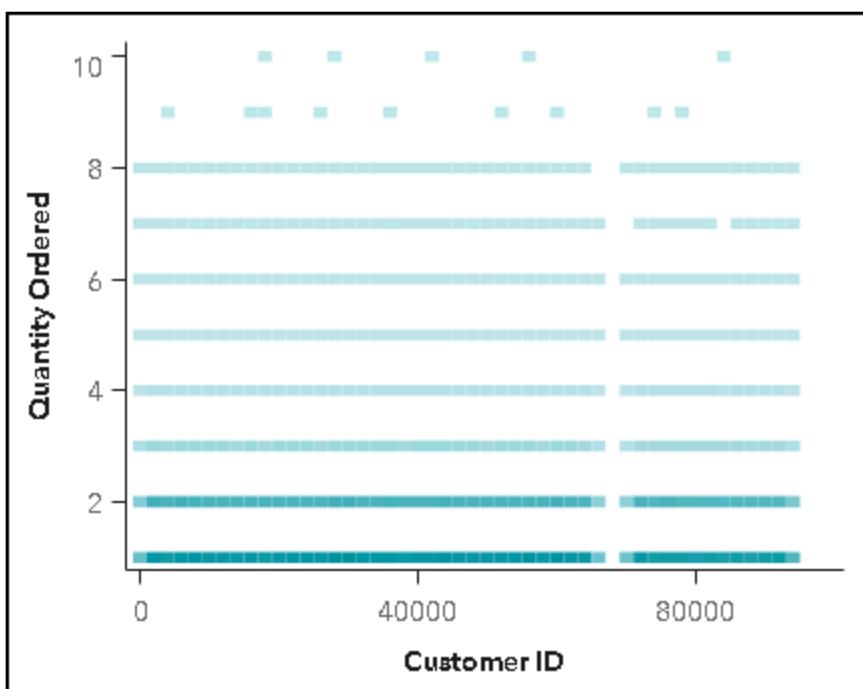
Quantity Ordered

- c. Use  to drag the selected items to the right of the crosstab.



The screenshot shows a crosstab with columns for Order Type and Frequency. The rows list Catalog Sale (127,129), Internet Sale (108,570), and Retail Sale (715,970). To the right of the crosstab is a vertical blue bar with a double-headed arrow at the top. Next to the arrow is a button labeled '+ Auto Chart'.

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.

13. View descriptive information for the measure data items.

- In the left pane, click the **Data** icon.
- Click  (**Measure details**).

The Measure Details window displays descriptive statistics for each measure.

Measure Details			
Name	Minimum	Maximum	Average
Cost	0.40	1,583.60	77.76
Customer ID	1.00	94,254.00	45,440.60
Discount in percent of Normal Total Retail Price	0.30	0.60	0.38
Employee ID	120,121.00	99,999,999.00	24,857,697.64
Order ID	1,230,000,033.00	1,244,337,638.00	1,236,943,348.18
Product ID	210,200,100,001.00	240,800,200,065.00	229,015,748,353.31

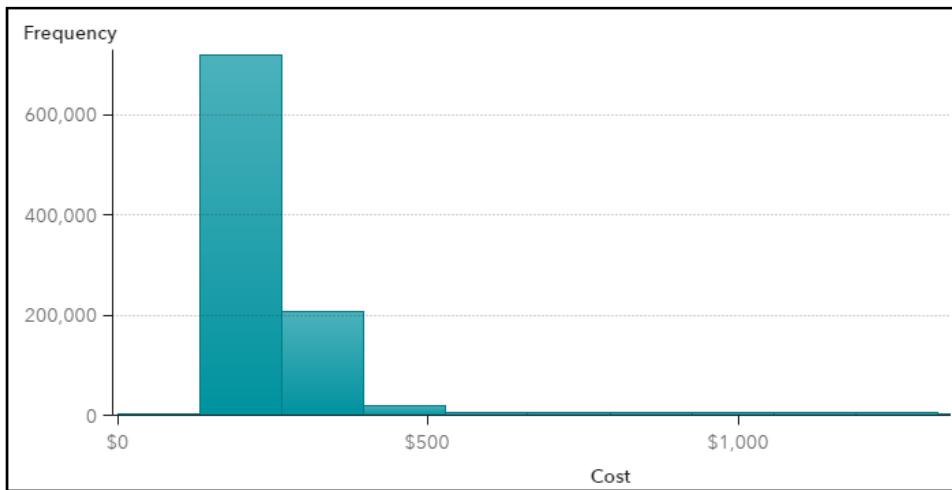
Note: **Customer ID**, **Employee ID**, **Order ID**, and **Product ID** are numeric values and are classified as measures by default. They should be classified as categories, as they should not be used in calculations. The results of summing or averaging these data items returns meaningless information.

- c. 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.

14. In the upper right corner, select (**More options**) \Rightarrow **Save as**.
15. Navigate to the **Shared Data/Marketing** folder.
16. Enter **VA1- Demo2.1** in the **Name** field.
17. Click **Save**.
18. Select **Lynn** \Rightarrow **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

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



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Exercises

1. Accessing and Investigating Data

- Open the browser and sign in to Visual Analytics using Lynn's credentials.
- Access SAS Visual Analytics.
- Open the **VA1- Exercise2.1** report in the **Shared Data/Basics/Exercises (HR)** folder.
- View the Data pane and answer the following questions:

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

Answer: _____

What is the type/classification of **Employee ID**?

Answer: _____

- 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 if an employee is active (currently employed) or retired (formerly employed)?

Answer: _____

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

Which department contains the missing job title?

Answer: _____

- Create an autochart of **Company** (on the right side of the crosstab) and answer the following questions:

What is the largest company? The smallest?

Answer: _____

- 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: _____

- Save the report.
- Sign out of Visual Analytics.

End of Exercises

2.2 Cleaning Data Using Visual Data Builder

Objectives

- Discuss the Prepare phase of the Visual Analytics Methodology.
- Describe the Visual Data Builder 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 Visual Data Builder.
- Create new columns (splitting, calculated) in Visual Data Builder.

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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

Change Type
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 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 order was delivered to customer	1,840	
Date Order was placed by Customer	Date 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/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:

- Split **Customer Name** into **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 Visual Data Builder. **Customer Age** is calculated in Visual Analytics using the Now operator, so the age updates every time the report is opened. **Customer Age Group** and **Customer Gender** are calculated in Visual Analytics because Boolean operators (IF...ELSE) are not supported in Visual Data Builder.

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 was placed by 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 will be discussed in more detail in later sections.

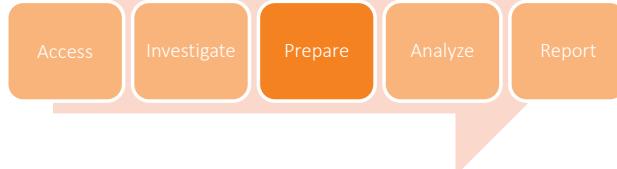
Visual Analytics Methodology: Prepare

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

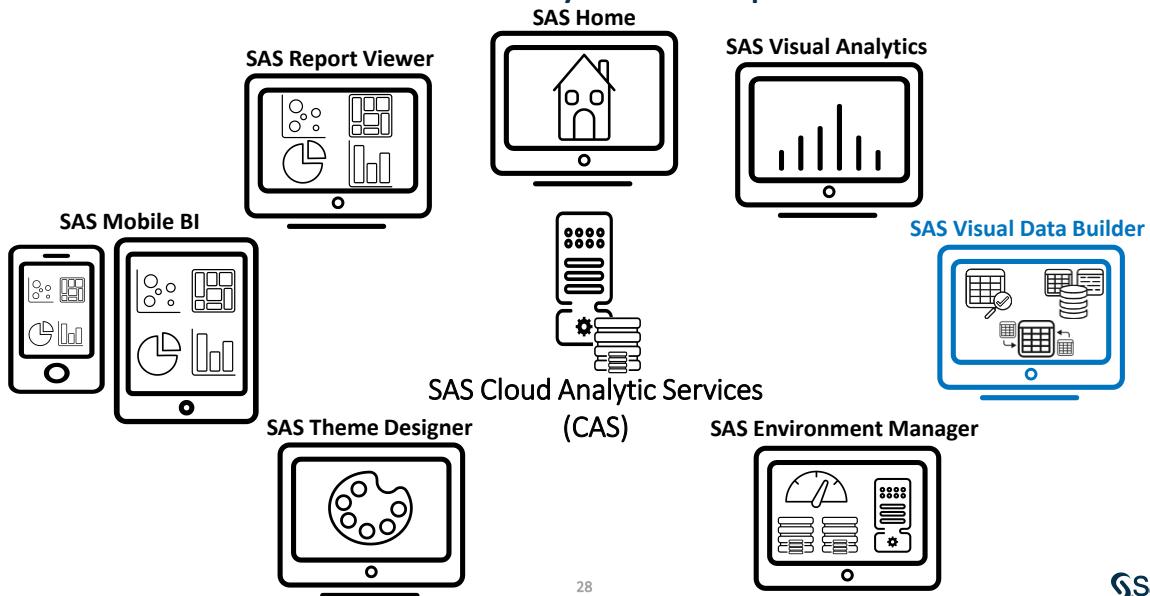
Correct any data issues discovered.

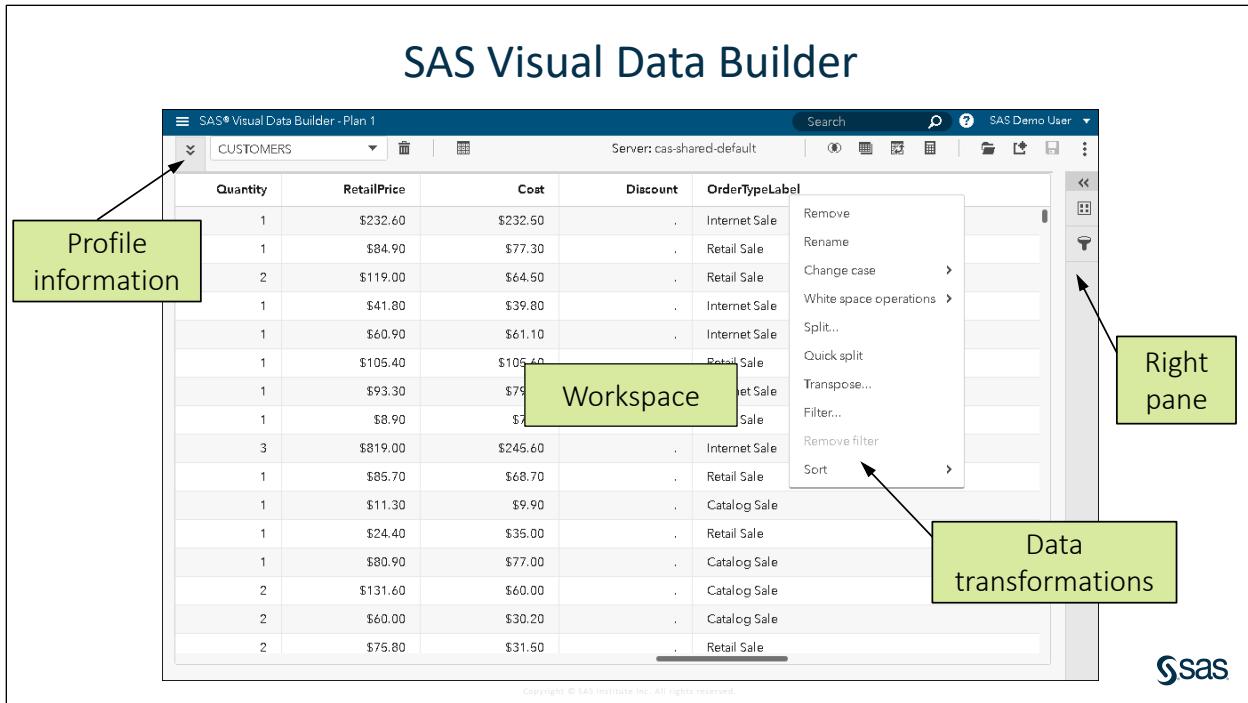
- split columns
- change case
- change data type or format (or both)
- remove white space
- delete or rename columns
- sort columns

Create new calculated items needed for analysis.



SAS Visual Analytics Components





In SAS Visual Data Builder, 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 Visual Data Builder. If you open a table that is not loaded, it is automatically loaded on the CAS server.

Note: Only the first 300 columns are displayed in the workspace. This, however, does not affect your ability to work with all of the data in the table; any changes made will apply to the entire table, not just the columns that are displayed.

The right pane contains the following icons:

Plan	The Plan pane displays a list of all actions associated with the plan.
Filter	The Incoming Filters pane can be used to show or hide report or page prompts.

Profile Information: Table

The Table Profile window shows information about the table, including the number of columns and rows.

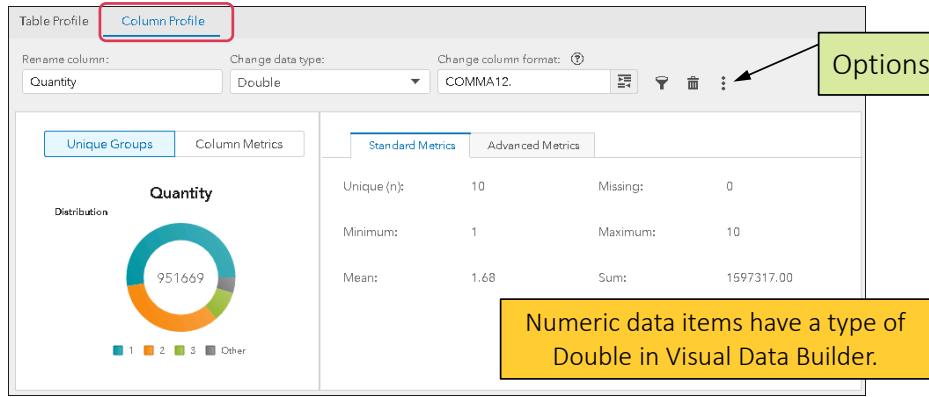


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Profile Information: Column

The Column Profile window shows metrics for the selected column in the workspace. You can also use this window to rename the column, change the data type or format, add a filter, or delete the column.



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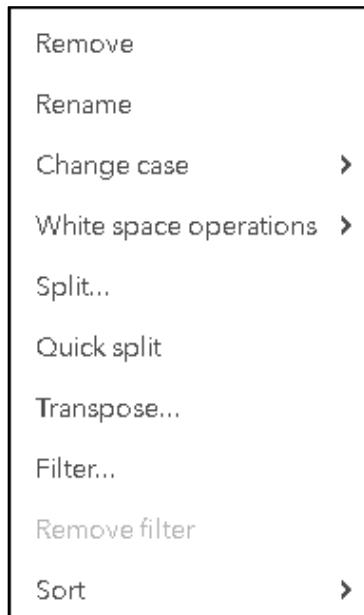
Note: For columns that contain character data, only the **Unique (n)** metric is displayed. All metrics are available for double (numeric) data.

The following data transformations are available from the Column Profile window:

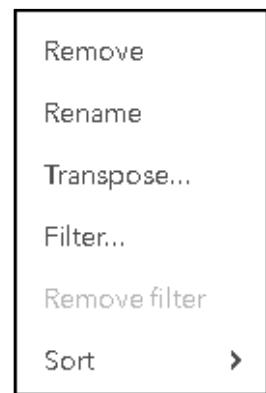
Rename column	Renaming the column in Visual Data Builder changes the name of the data item, not the label. In Visual Analytics, labels are displayed in the Data pane.
Change data type	The data type options for a column include Character, Double, or Variable character. The Variable character data type is only available for tables that were imported using the Variable length character strings option. This format is useful for columns that contain character data of various lengths.
Change column format	Changing the format for a column in Visual Data Builder alters how the data is displayed in Visual Analytics. For more information about valid column formats, see “Dictionary of SAS Formats” in <i>SAS Viya Formats and Informats: Reference</i> .
Filter 	Filtering by a column in Visual Data Builder 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 amount of characters, it is recommended that you break the filter into smaller filters as creating a filter with more than 1,000 characters will prevent you from saving the plan.
Delete column 	Deleting a column in Visual Data Builder removes it from the CAS table created by the plan.

The options available from the Column Profile window depend on the type of column.

For character columns, the following options are available:



For double (numeric) columns, the following options are available:



2.01 Quiz

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

Quantity	Total Revenue	Unit Cost
2	\$119.40	\$59.90
2	\$4.80	\$2.20
1	\$44.70	\$44.90
1	\$63.10	\$57.40
2	\$132.20	\$55.20
2	\$11.80	\$6.50
1	\$93.30	\$79.90

2.02 Quiz

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

Order_Date	Delivery_Date
02JAN2012	07JAN2012
01MAR2012	01MAR2012
01MAR2012	01MAR2012
02APR2012	06APR2012
02APR2012	06APR2012
27MAR2012	27MAR2012
13MAR2012	16MAR2012

Calculated Columns: Days to Delivery

In Visual Data Builder, dates need to be converted to numbers before numeric operations can be performed.

The *TreatAs* operator enables a numeric or datetime value to be used as a different type for the calculation.



You can hold your mouse pointer over an operator in the Add Calculated Item window to view a description of that operator.

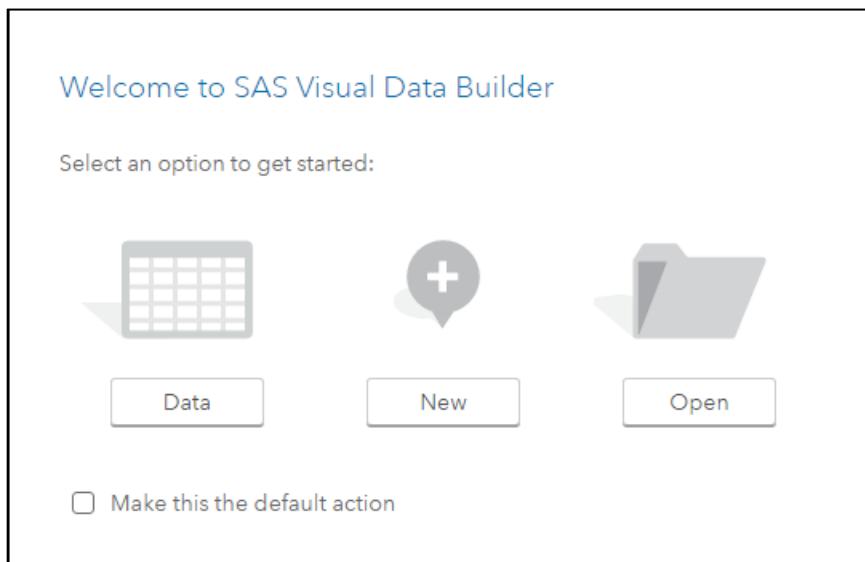


Preparing Data

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

1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Lynn** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Data Builder** in the application shortcut area.

The Welcome to SAS Visual Data Builder window appears.



6. Click **Open**.
 - a. In the Open window, navigate to the **Shared Data/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.



7. View profile information.

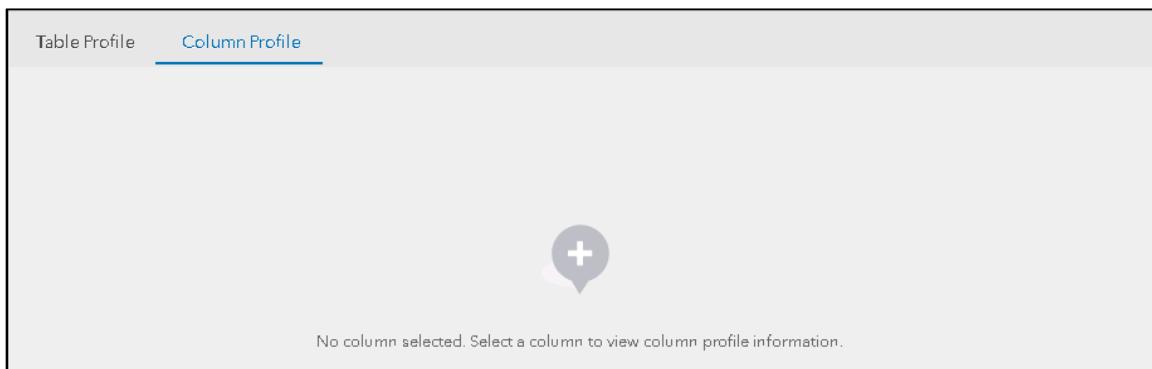
- In the upper left corner, click  (View profiles).

The Table Profile displays details about the table.



Note: The Modified Date value will not be the same as shown above.

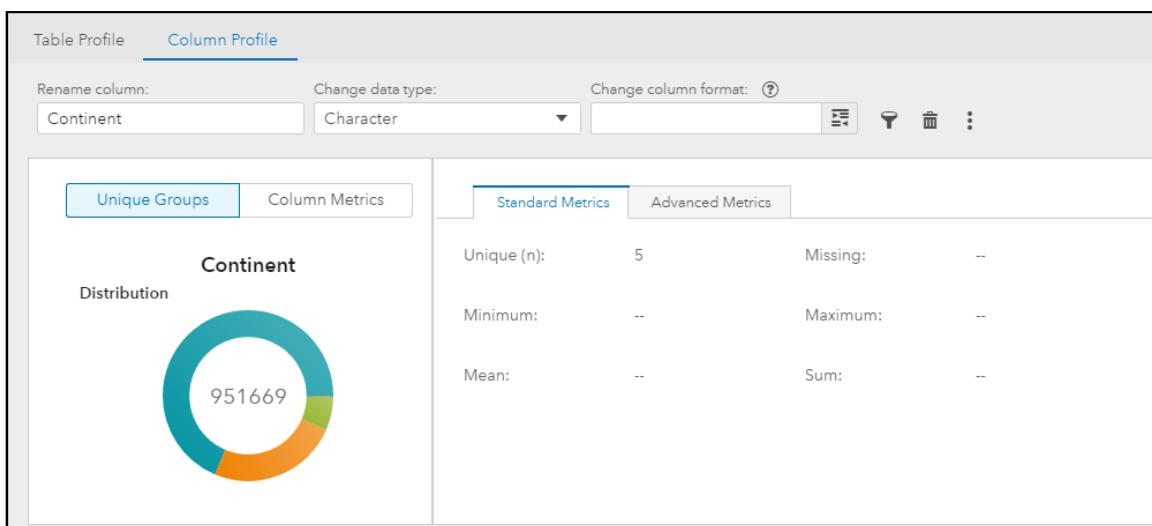
- Click Column Profile.



A column needs to be selected in the table to display column details.

- In the table, click **Continent**.

The Column Profile displays details about the selected column in the table.



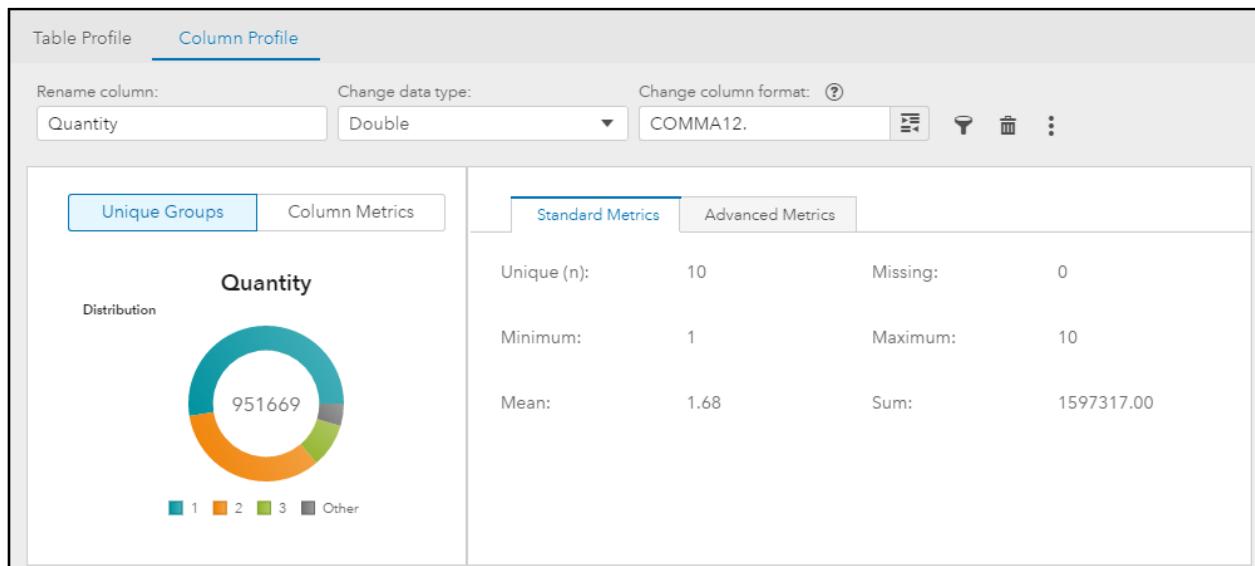
For character (category) columns, a pie chart is displayed on the left and the number of unique values is displayed on the right under Standard Metrics.

Note: The Column Profile view can also be used to rename a column, change the data type, change the format, apply a filter based on the column, and remove the column.

- d. Using the scroll bar at the bottom of the table, scroll to the right to find the Quantity column.

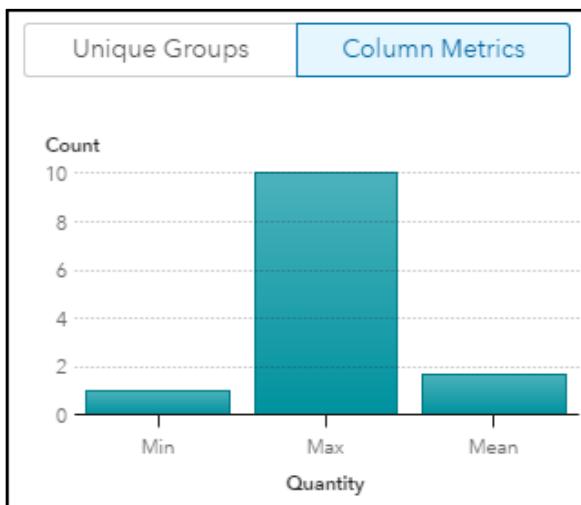
City	Continent	Postal_Code
	Europe	BS12 3QF
	Europe	BS12 3QF
	Europe	BS12 3QF

- e. In the table, click **Quantity**.



For double (numeric) columns a pie chart is displayed on the left and additional metrics are displayed on the right under Standard Metrics.

- f. Click **Column Metrics** on the left.



Descriptive statistics (min, max, and mean) are displayed in a bar chart.

- g. Click **Advanced Metrics** on the right.

Standard Metrics		Advanced Metrics	
Standard deviation:	0.90	Standard error:	0.00
Variance:	0.81	CV:	53.62
USS:	3451701.00	CSS:	770704.14

Advanced descriptive statistics (standard deviation, variance, uncorrected sum of squares, standard error, coefficient of variation, and corrected sum of squares) are displayed in a table.

8. View details about the steps performed in Visual Data Builder.

- In the right pane, click (**Plan**).
- Expand the first **Rename** action to view additional details.

▼ Rename

Inputtable:

CUSTOMERS

Input column:

RetailPrice

Output column:

Total Revenue

In the plan, **RetailPrice** was renamed to **Total Revenue**. **Cost** was also renamed (to **Unit Cost**).

- c. Expand the first **Change data type** action to view additional details.

▼ Change data type

Inputtable:

CUSTOMERS

Output table:

CUSTOMERS

Input column:

Customer_ID

Output column:

Customer_ID

In the plan, **Customer_ID** was changed to a character data type. When the data type was changed, leading spaces (white space characters) were added to the values. The Trim operation was then used to remove leading and trailing blanks from the column.

Order_ID was also changed to a character data type and white space characters were trimmed from the resulting value.

- d. Expand the first **Split** action to view additional details.

The screenshot shows a configuration dialog for a 'Split' action. The title bar says '▼ Split'. The configuration fields are as follows:

- Input table: CUSTOMERS
- Input column: Customer_Name
- Split type: SPLIT
- Delimiters: (empty)

In the **CUSTOMERS** table, **Customer_Name** is formatted as **Last Name, Title First Name**. The Split action was used to first split the column by the comma, resulting in two new columns (one for **Customer_LastName** and one with the values for **Title** and **First Name**). The Split action was used a second time to split the values for **Title** and **First Name** by the space, resulting in two new columns (one for **Title** and one for **Customer_FirstName**). Each column was renamed appropriately.

- e. Expand the first **Add calculated item** action to view additional details.

▼ Add calculated column

Input table:
CUSTOMERS

Output table:
CUSTOMERS

expression:
\"Total Revenue\"n - ...

Output column:
Profit

inColumns:
["Total Revenue", "(U...

Column format:
DOLLAR12.2

A new calculated column, **Profit**, was calculated as **Total Revenue – (Unit Cost*Quantity)**.

- f. Expand the second **Add calculated item** action to view additional details.

▼ Add calculated column

Input table:
CUSTOMERS

Output table:
CUSTOMERS

expression:
`floor (\"Delivery_D...`

Output column:
Days to Delivery

inColumns:
["TreatAs(_Number_...]

Column format:
COMMA6.

A new calculated column, **Days to Delivery**, was calculated as **Delivery Date – Order Date**.

- g. Expand the **Save table** action to view additional details.

▼ Save table

Input table:
CUSTOMERS

Output table:
CUSTOMERS_CLEAN

A new table (**CUSTOMERS_CLEAN**) is created as output for the plan.

Note: Click  (Undo) to undo the last action of the plan.

9. Select **Lynn** ⇒ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

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 **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:

- Split **Employee Name** into **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**, **Manager at 6. level**.

Note: **Anniversary Month** is calculated in Visual Data Builder. **Employee Tenure** is calculated in Visual Analytics using the Now operator, so the years of service updates every time the report is opened. **Employee Type** is calculated in Visual Analytics because Boolean operators (IF...ELSE) are not supported in Visual Data Builder.

Anniversary Month is calculated as the name of the month when 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 will be discussed in more detail in later sections.



Exercises

2. Preparing Data: Part 1

- Open the browser and sign in to Visual Analytics using Lynn's credentials.
- Open the **VA1- Exercise2.2** plan in the **Shared Data/Basics/Exercises (HR)** folder.
- View table profile information and answer the following question:

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

Answer: _____

- View column profile information for **Department** and answer the following questions:

How many unique values exist for **Department**?

Answer: _____

Which department has the most number of employees?

Answer: _____

- View column profile information for **Salary** and answer the following questions:

What is the total salary paid to all employees?

Answer: _____

Looking at the minimum, maximum, and mean salaries, does it seem that most employees are paid lower salaries or higher salaries?

Answer: _____

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

How many change data type actions were performed? On which column(s)?

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?

Answer: _____

- Sign out of Visual Analytics.

End of Exercises

2.3 Solutions

Solutions to Exercises

1. Accessing and Investigating Data

- a. Open the browser and sign in to Visual Analytics using Lynn's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Lynn** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- b. Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
- c. Open the **VA1- Exercise2.1** report in the folder.
 - 1) Click **Open**.
 - 2) In the Open window, navigate to the **Shared Data/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... - 62
■	Group - 15
■	Job Title - 9
■	Section - 3

What is the type/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	06Dec1958	au	01Mar1983
Orion Australia	Sales	23Nov1958	au	01Apr1978
Orion Australia	Sales	09Sep1958	au	01Oct1978
Orion Australia	Sales	08Aug1958	au	01Jan2007
Orion Australia	Sales	27Jul1958	au	01Jul1982
Orion Australia	Sales	09Jul1958	au	01Aug1986
Orion Australia	Sales	27Jun1958	au	01Dec1982
Orion Australia	Sales	04May1958	au	01Feb1978
Orion Australia	Sales	01Mar1958	au	01Dec2010

- 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
Fong Hofmeister, Mr
Billy Plested, Mr
Chuck Segrave, Mr
Kerrin Dillin, Ms
Christina Ngan, Ms
John Filo, Mr
Vino George, Mr
Kimiko Tilley, Ms
Shanmuganathan Baran, Ms

Which data item can be used to determine if 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
.
31Jul2008
.
30Jun2007
.
30Apr2008
.

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

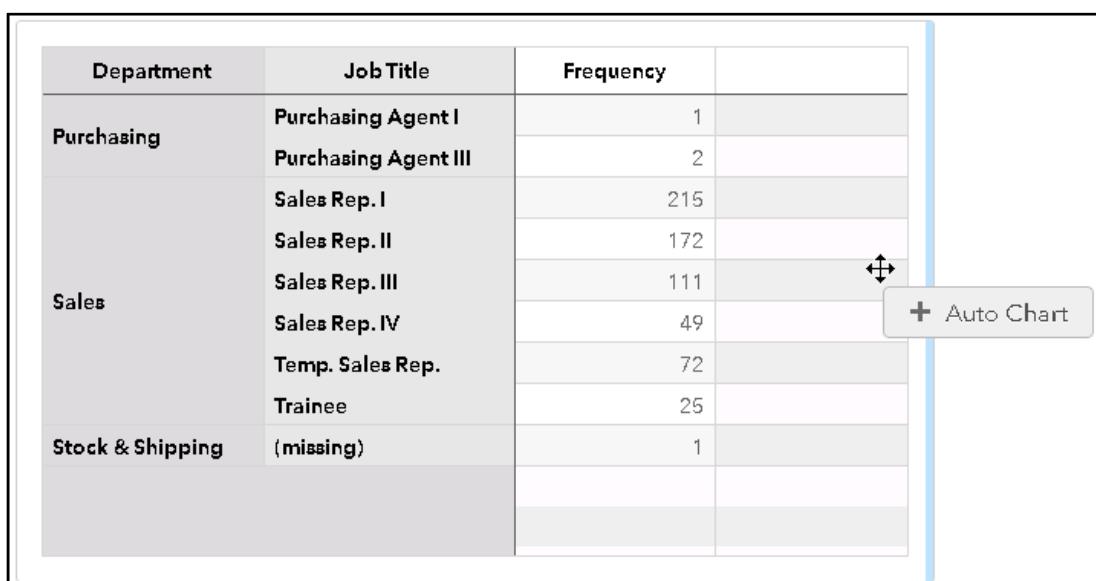
- 1) Click the **Page 2** tab at the top of the canvas.
- 2) View the crosstab and answer the question.

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)

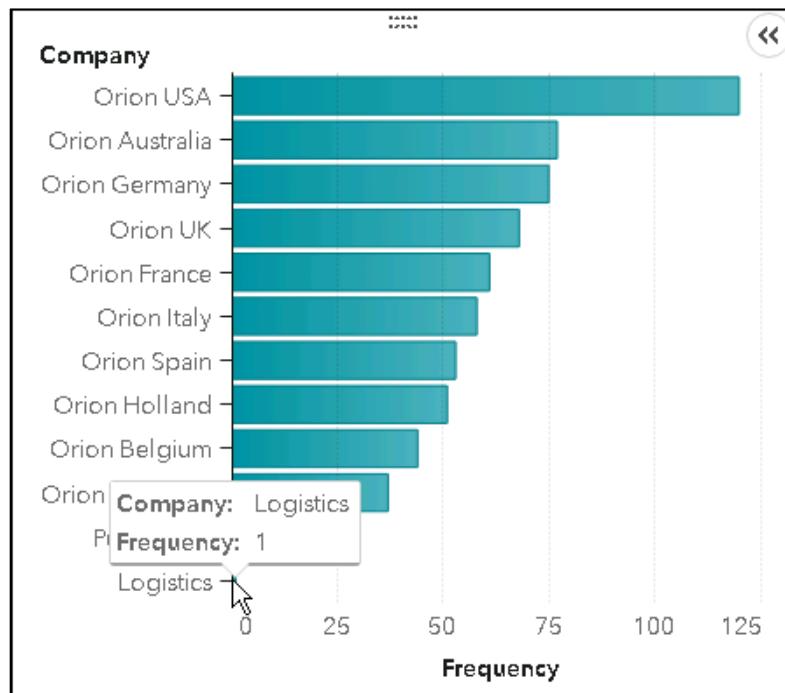
- g. Create an autochart of **Company** (on the right side of the crosstab) and answer the questions.
- 1) In the left pane, click the **Data** icon.
 - 2) Drag **Company** from the Data pane to the right side of the canvas.



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 least 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 (**Measure details**).

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

Measure Details				
Name	Minimum	Maximum	Average	Sum
Annual Salary	20,835.00	40,755.00	27,595.90	17,854,545.00
Employee ID	120,121.00	99,999,999.00	274,748.73	178,037,176.00
Levels of Management	0.00	5.00	4.17	2,705.00
Manager at 1. level	120,102.00	121,145.00	120,642.77	78,055,869.00
Manager at 2. level	120,101.00	121,142.00	120,639.28	78,053,611.00
Manager at 3. level	120,259.00	121,141.00	120,424.21	77,914,461.00

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.

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

- i. Select  (More options) \Rightarrow Save in the upper right corner of the report.
- j. Select Lynn \Rightarrow Sign Out in the upper right corner to sign out of SAS Visual Analytics.

2. Preparing Data: Part 1

- a. Open the browser and sign in to Visual Analytics using Lynn's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Lynn** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- b. Open the **VA1- Exercise2.2** plan in the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Data Builder** in the application shortcut area. The Welcome to SAS Visual Data Builder window appears.
 - 2) Click **Open**.
 - 3) In the Open window, navigate to the **Shared Data/Basics/Exercises (HR)** folder.
 - 4) Double-click **VA1- Exercise2.2** to open the plan. The steps of the plan are executed when the plan is opened.
- c. View table profile information and answer the following question:

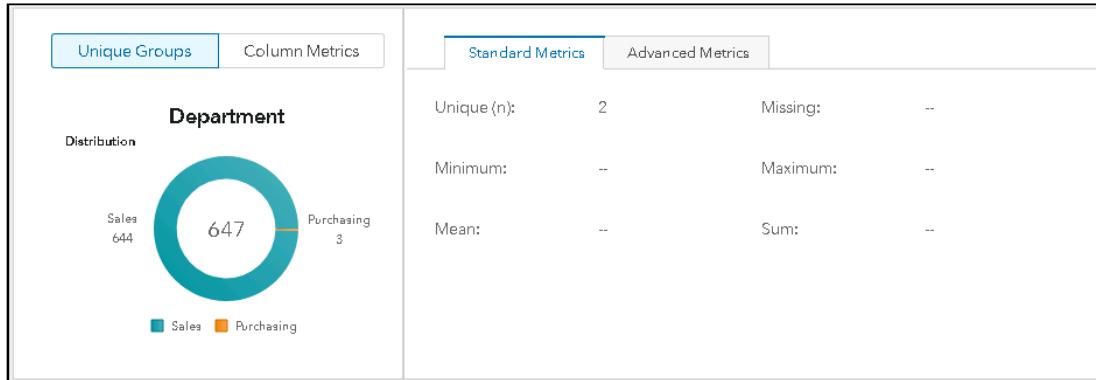
In the upper left corner, click  (View profiles).

Table Profile	Column Profile
EMPLOYEES*	
Created date: May 9, 2017 05:25:02 PM	
 May 9, 2017 05:25:02 PM Modified Date	 15 Columns
 647 Rows	

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 column profile information for **Department** and answer the questions.
- 1) Click **Column Profile**.
 - 2) In the table, click **Department**.



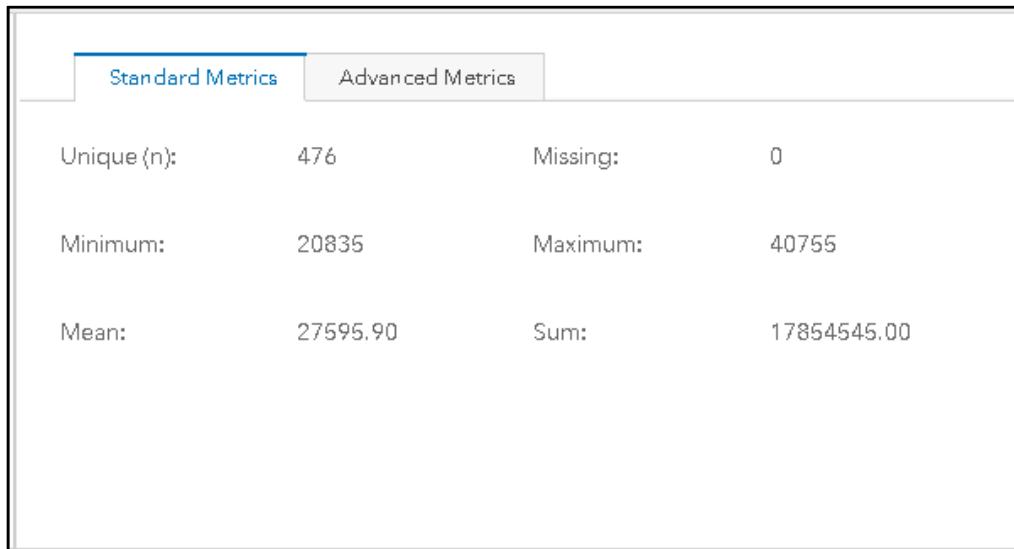
How many unique values exist for Department?

Answer: 2

Which department has the most number of employees?

Answer: Sales

- e. View column profile information for **Salary** and answer the questions.
- 1) If necessary, click **Column Profile**.
 - 2) In the table, click **Salary**.



What is the total salary paid to all employees?

Answer: The total salary paid to all employees is 17,854,545.

Looking at the minimum, maximum, and mean salaries, does it seem that most employees are paid lower salaries or higher salaries?

Answer: The mean salary (27,595.90) is closer to the minimum, so it seems that most employees are paid lower salaries.

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

- 1) In the right pane, click  (Plan).

How many change data type actions were performed? On which column(s)?

Answer: One change data type action was performed on the Employee_ID column.

Plan

- ▶ Rename
- ▶ Change data type
- ▶ Trim whitespace
- ▶ Change to uppercase
- ▶ Apply filter
- ▶ Split

Expand the Change data type action to view additional details.

▼ **Change data type**

Input table:
EMPLOYEES

Output table:
EMPLOYEES

Input column:
Employee_ID

Output column:
Employee_ID

Which column was changed to uppercase?

Answer: Employee_Country

Expand the Change to uppercase action to view additional details.

▼ Change to uppercase

Input table:

EMPLOYEES

Input column:

Employee_Country

Which column was split? What was the delimiter?

Answer: Employee_Name was split using a comma delimiter.

Expand the Split action to view additional details.

▼ Split

Input table:

C344F9B2972548119..

Input column:

Employee_Name

Split type:

SPLIT

Delimiters:

.

What filter was applied to the table?

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

Expand the Apply filter action to view additional details.

▼ **Apply filter**

Input table:
EMPLOYEES

Output table:
C344f9b2972548119...

Where string:
\"Department\" in ('Pu..

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

Answer: EMPLOYEES_CLEAN

Expand the Save table action to view additional details.

▼ **Save table** ↺

Input table:
C344F9B2972548119..

Output table:
EMPLOYEES_CLEAN

- g. Select **Lynn** ⇒ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

End of Solutions

Solutions to Student Activities (Polls/Quizzes)

2.01 Quiz – Correct Answer

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

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

Quantity	Total Revenue	Unit Cost
2	\$119.40	\$59.90
2	\$4.80	\$2.20
1	\$44.70	\$44.90
1	\$63.10	\$57.40
2	\$132.20	\$55.20
2	\$11.80	\$5.50
1	\$93.30	\$79.90



2.02 Quiz – Correct Answer

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

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

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

Order_Date	Delivery_Date
02JAN2012	07JAN2012
01MAR2012	01MAR2012
01MAR2012	01MAR2012
02APR2012	06APR2012
02APR2012	06APR2012
27MAR2012	27MAR2012
13MAR2012	16MAR2012



Exercise 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 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... - 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
Fong Hofmeister, Mr
Billy Plested, Mr
Chuck Segrave, Mr
Kerrin Dillin, Ms
Christina Ngan, Ms
John Filo, Mr
Vino George, Mr
Kimiko Tilley, Ms
Shanmuganathan Baran, 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).

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

Employee Termination Date
.
31Jul2008
.
30Jun2007
.
30Apr2008
.

Active

Retired

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

We will filter the table to include only employees in the Purchasing and Sales departments.

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

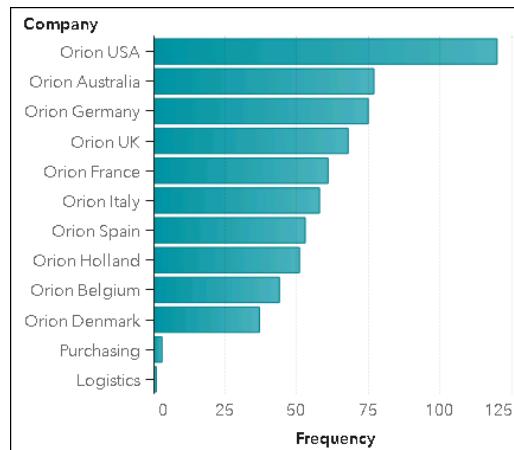
2.1 Accessing and Investigating Data – Solution

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 least 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

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2.2 Preparing Data: Part 1 – Solution

View the table profile information 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



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2.2 Preparing Data: Part 1 – Solution

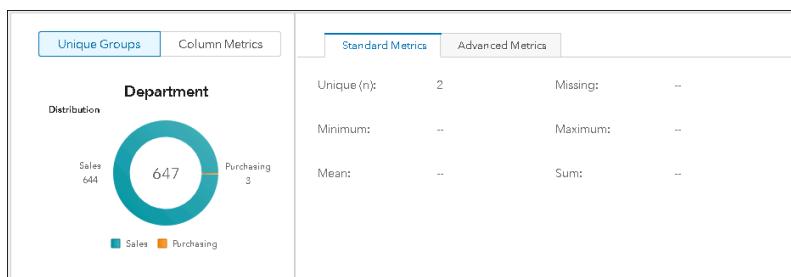
View the column profile information for **Department** and answer the following questions:

How many unique values exist for **Department**?

Two

Which department has the most number of employees?

Sales



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2.2 Preparing Data: Part 1 – Solution

View the column profile information for **Salary** and answer the following questions:

What is the total salary paid to all employees?

\$17,854,545

Standard Metrics		Advanced Metrics	
Unique (n):	476	Missing:	0
Minimum:	20835	Maximum:	40755
Mean:	27595.90	Sum:	17854545.00

Looking at the minimum, maximum, and mean salaries, does it seem that most employees are paid lower salaries or higher salaries?

The mean salary (27,595.90) is closer to the minimum, so it seems that most employees are paid lower salaries.

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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 change data type actions were performed? On which column(s)?

One change data type action (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

Chapter 3 Analyzing Data Using SAS® Visual Analytics

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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 need to 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*

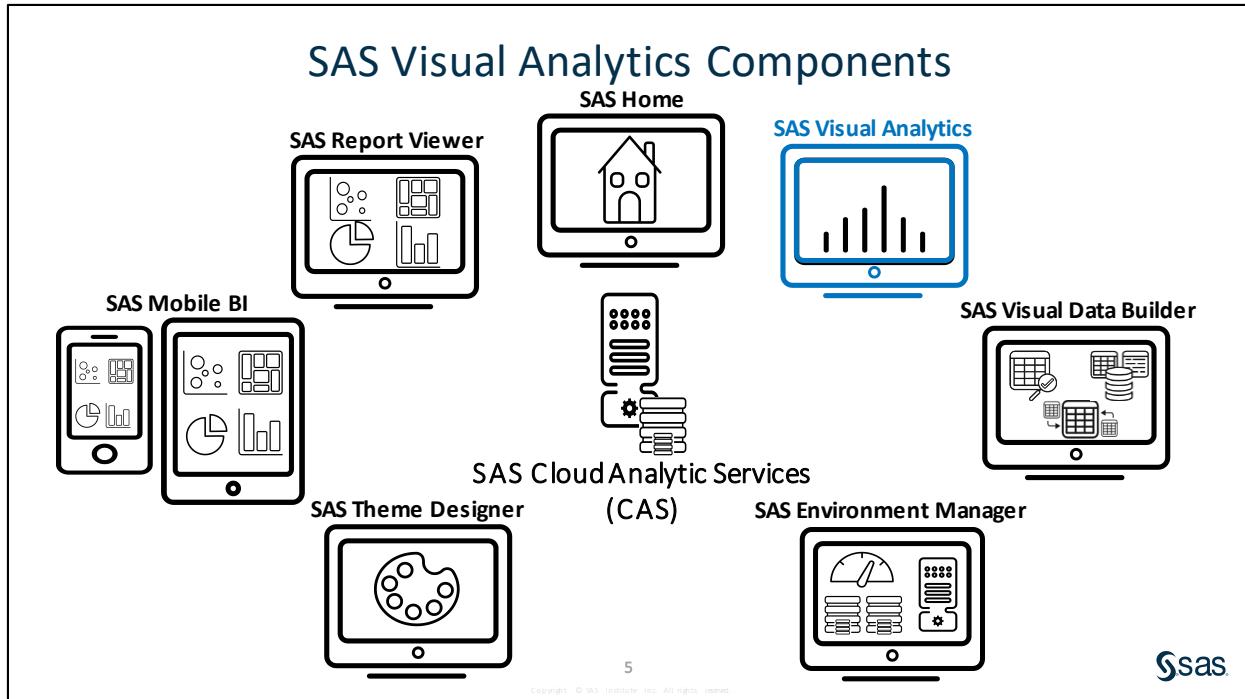


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* Creating, testing, and comparing models can be accomplished with SAS Visual Statistics and SAS Visual Data Mining and Machine Learning.



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.

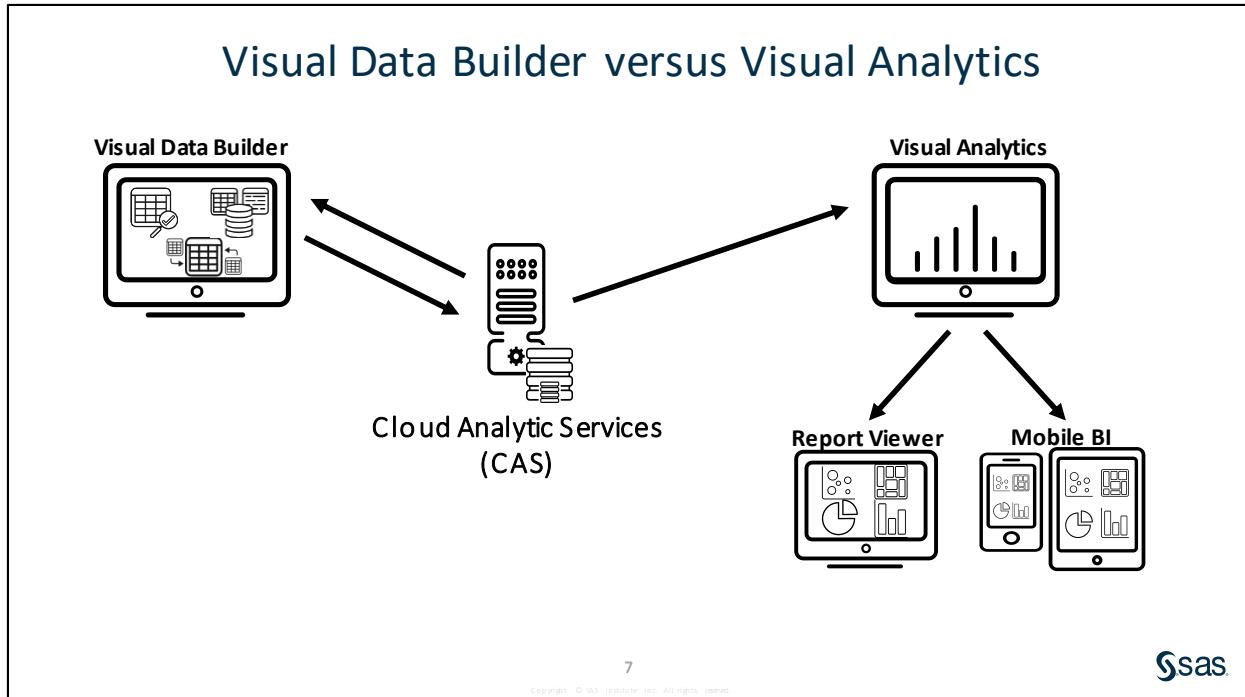
Modify Formats Aggregations

Rename Data Items

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sas.



SAS Visual Data Builder 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.

Data Item Properties

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

Category

<input checked="" type="checkbox"/> Continent Name - 5	⋮
Name:	
<input type="text" value="Continent Name"/>	
Classification:	
<input type="button" value="Category"/>	⋮

Datetime

Customer Birth D... - 4.4K	⋮
Name:	
<input type="text" value="Customer Birth Date"/>	
Format:	
<input type="text" value="Date with Month Name"/>	

Measure

<input checked="" type="checkbox"/> Cost	⋮
Name:	
<input type="text" value="Cost"/>	
Classification:	
<input type="button" value="Measure"/>	⋮
Format:	
<input type="text" value="Dollar"/>	
Aggregation:	
<input type="button" value="Default(Sum)"/>	

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Sas

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. There are five types of categories: alphanumeric, date, datetime, time, and numeric.
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 root 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 a one variable on a model changes as another variable changes. SAS Visual Statistics must be licensed 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 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 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, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.

5. Click **SAS Visual Analytics** in the application shortcut area.

The Welcome to SAS Visual Analytics window appears.

6. Click **Data**.
7. In the Open Data Source window, verify that **All** is selected.
8. In the All Data Sources list, double-click **CUSTOMERS_CLEAN**.

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

9. Verify that **Customer_ID** and **Order_ID** appear in the Category group, because the data type was changed to character in Visual Data Builder.

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

10. Verify that the new columns created in Visual Data Builder (**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 Type Name - 7	
Customer_FirstName - 16K	
Customer_ID - 68K	
Customer_LastName - 42K	
Date Order was De... - 1.8K	
Date Order was pla... - 1.8K	
Order Type - 3	
Order_ID - 748K	
Postal code - 19K	
State Name - 272	
Title - 2	

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

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

The screenshot shows the 'Measure' group in a data model. The 'Cost' category is expanded, revealing several data items: Days to Delivery, Discount in percent of Normal Total Retail Price, Frequency, Profit, Quantity Ordered, and Retail Price. The 'Days to Delivery' and 'Profit' items are highlighted with red boxes.

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

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

- In the Category group, click (Edit properties) next to **Date Order was Delivered**.

The screenshot shows the 'Category' group with two items: 'Date Order was Delivered - 61' and 'Date Order was placed by Customer - 1.8K'. A red arrow points to the edit properties icon (a gear icon) next to the first item.

- Click **Date with Month Name** for the **Format** field.
- In the Format window, select **MMMMYYYY**.
- Click **OK**.
- Enter **Delivery Date** in the **Name** field and press Enter.

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

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

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

- In the Measure group, click (Edit properties) next to **Days to Delivery**.
- Select **Average** for the **Aggregation** field.

15. Rename data items.

- In the Category group, click (Edit properties) next to **Date Order was placed by Customer**.
- Enter **Order Date** in the **Name** field and press Enter.

- c. In the Measure group, click  (Edit properties) next to **Cost**.
 - d. Enter **Unit Cost** in the **Name** field and press Enter.
 - e. In the Measure group, click  (Edit properties) next to **Quantity Ordered**.
 - f. Enter **Quantity** in the **Name** field and press Enter.
 - g. In the Measure group, click  (Edit properties) next to **Retail Price**.
 - h. Enter **Total Revenue** in the **Name** field and press Enter.
16. Save the report.
- a. In the upper right corner, select  (More options) \Rightarrow **Save as**.
 - b. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - c. Enter **VA1- Demo3.1** in the **Name** field.
 - d. Click **Save**.
17. Select **Eric** \Rightarrow **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

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

Classifications
Formats

Rename

Data Items

10

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Sas.



Exercises

1. Working with Data Items

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise3.1** report from the **Shared Data/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: If necessary, click (**Refresh data source**) at the top of the Data pane to apply the name change to Frequency.

- Save the report.
- Sign out of Visual Analytics.

End of Exercises

3.2 Exploring Data with Charts and Graphs

Objectives

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

15

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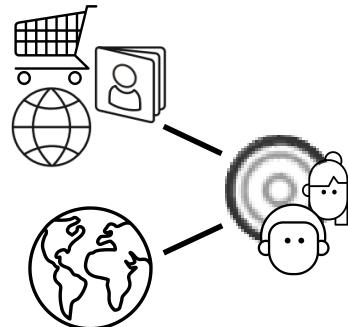


Business Scenario: Customers



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.

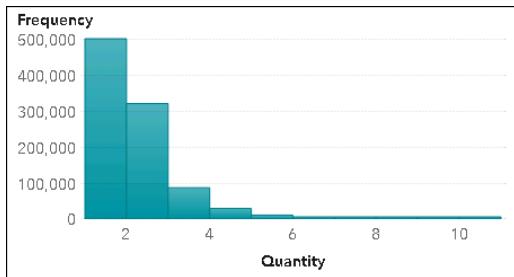


16

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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.

17

Histogram

The histogram contains a series of bars that represent the number of observations (or percentage of all observations) for that measure that fit in a specified value range (or bin).

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. If you specify the number of histogram bins, however, 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 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 is 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.

3.01 Multiple Choice Poll

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

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

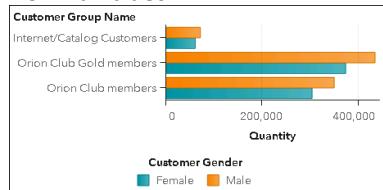
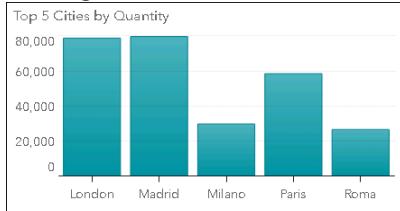
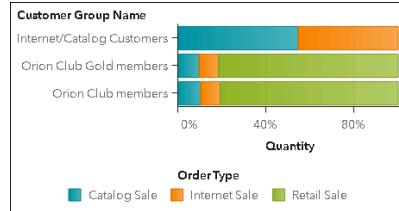
18



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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**

20



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Bar chart

A bar chart displays data aggregated by the distinct values of a category. By default, the bars are sorted by descending order by the value of the first measure. For grouped bars, the data is sorted by the category values in alphabetical order. For ranked bars, the data is sorted based on the values of the rank.

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

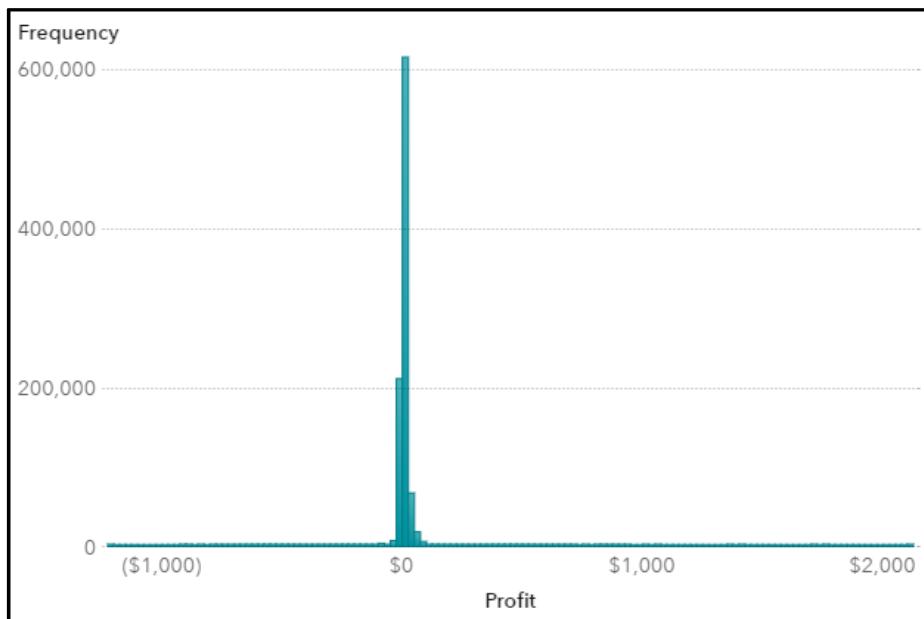


Exploring Data: Part 1

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

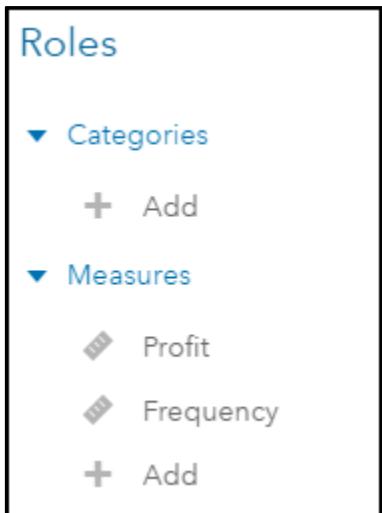
1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo3.2a** to open the report.
7. Create an automatic chart.
 - a. In the right pane, click the **Data** icon.
 - b. Drag **Profit** from the Data pane to the canvas.

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



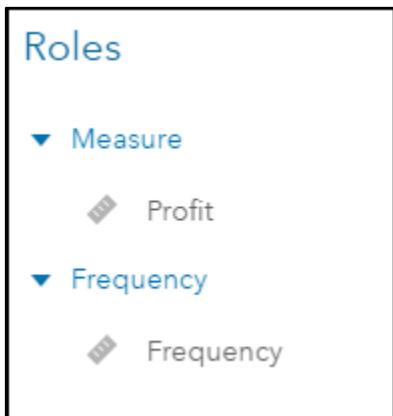
A histogram is used to display the distribution of profits.

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



An automatic chart has two roles, Categories and Measures. Changing the type of chart can enable you to use other roles that are valid for that chart type.

- d. In the upper right corner of the chart, select (Change Auto Chart to) \Rightarrow **Use Histogram**.
e. View the **Roles** pane on the right.



A histogram visualization accepts two roles, Measure and Frequency.

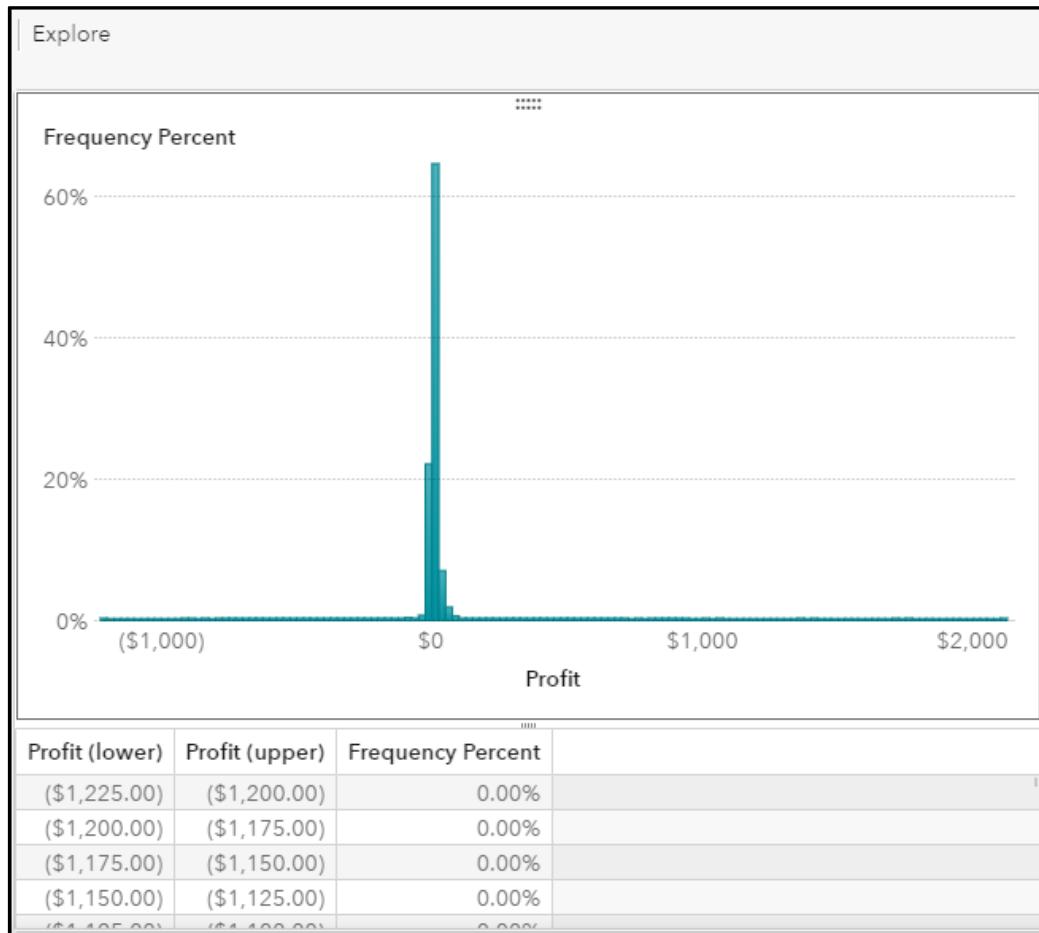
- f. For the **Frequency** role, select **Frequency** \Rightarrow **Frequency Percent**.

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

- g. In the right pane, click the **Options** icon.
- 1) Expand the **General** group.
 - 2) Enter **Distribution of Profit** in the **Name** field.



- h. In the upper right corner of the chart, select to view additional details.
In Explore mode, a table of data values is displayed at the bottom of the chart.



- i. Click the highest bar in the graph.
- j. Scroll through the table to find the highlighted row.

Profit (lower)	Profit (upper)	Frequency Percent
(\$50.00)	(\$25.00)	0.88%
(\$25.00)	\$0.00	22.23%
\$0.00	\$25.00	64.65%
\$25.00	\$50.00	7.16%
...



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?

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

The Roles pane should resemble the following:

Roles

- ▼ Columns
 - + Add
- ▼ Rows
 - OrderType
 - + Add
- ▼ Measures
 - ◆ Profit
 - + Add

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

The crosstab should resemble the following:

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



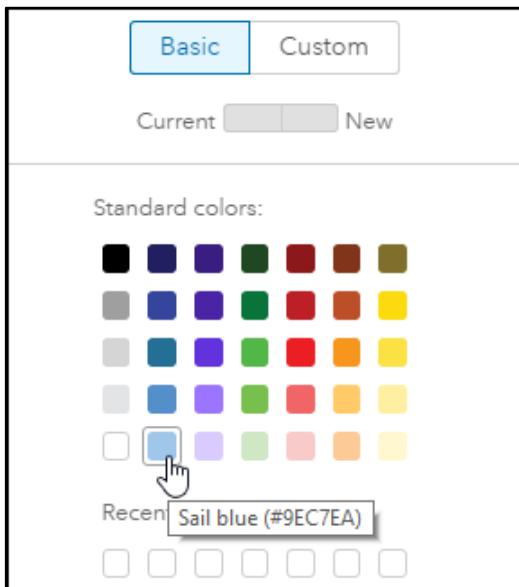
Profits are much lower in the Internet and catalog channels. A company-wide policy mandates that we need to try to improve profits for orders through these channels.

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

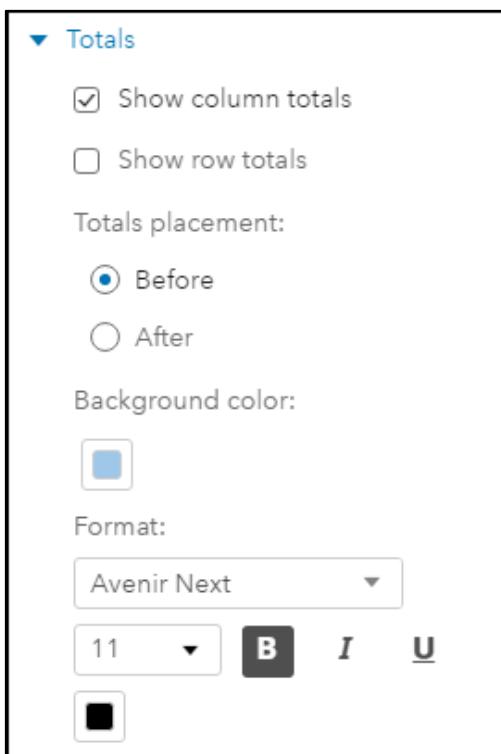
The updated crosstab should resemble the following:

Continent Name	Africa	Asia	Europe	North America	Oceania
Order Type	Profit	Profit	Profit	Profit	Profit
Catalog Sale	\$730.57	\$7,564.99	\$670,252.82	\$423,428.89	\$51,403.52
Internet Sale	(\$858.24)	\$7,938.71	\$559,663.83	\$370,621.44	\$43,804.76
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** section.
 i. Select **Show column totals**.
 j. Click (Select a color) for the **Background color** field.
 k. Select **Sail blue**.



- I. For the **Format** field, click **B** (**Bold**).



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	\$43,804.76
Retail Sale	.	.	\$4,429,533.94	\$1,327,595.24	\$367,726.36

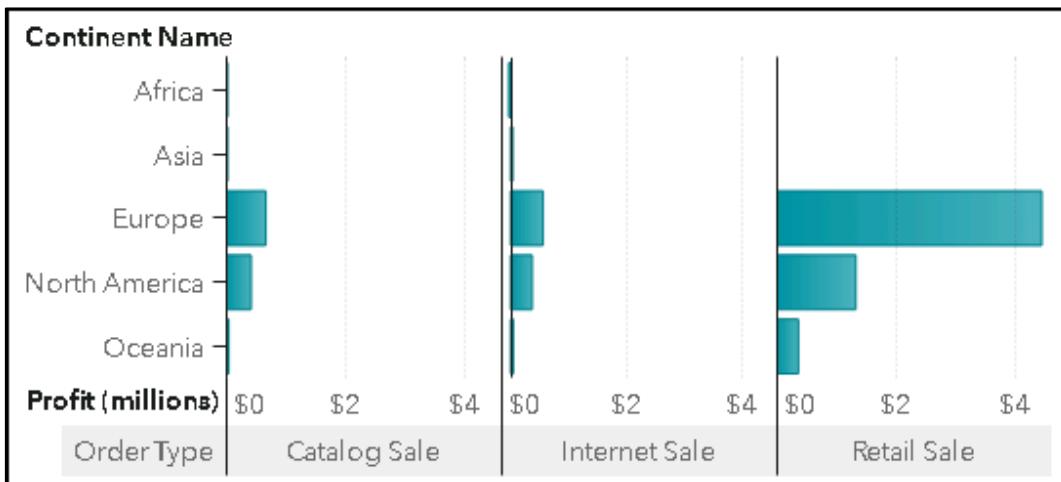


Profits are much lower in North America than in Europe. Because our corporate office is located in North America, we would expect higher profits. Also notice the loss in Africa for Internet sales. Why is this loss occurring? Is this due to start-up operations (for example, building distribution facilities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

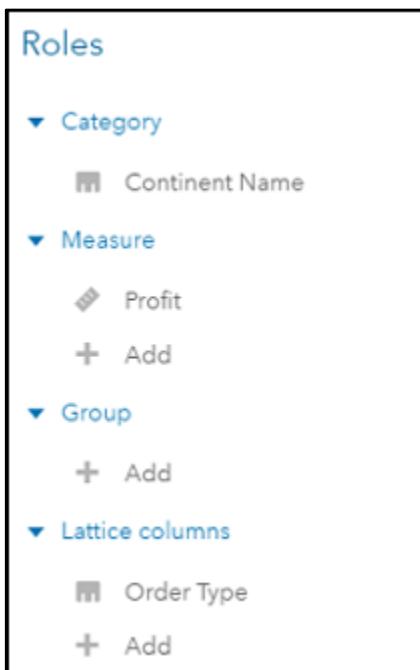
9. Change the crosstab to a bar chart.

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

The bar chart should resemble the following:



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

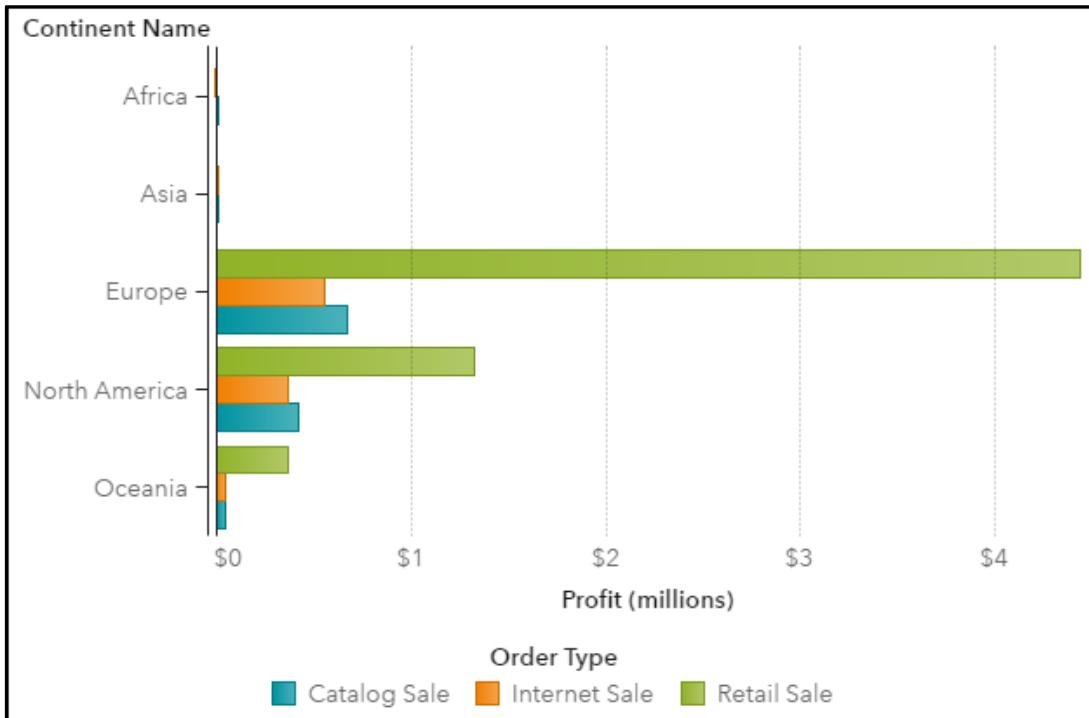


The bar chart has many more roles available.

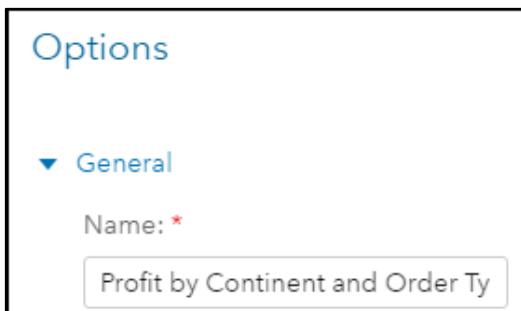
- Category data items can be added to the Group role to show additional bars for each Category, or to the Lattice columns and Lattice rows roles to add additional bar charts for each distinct category.
- Measure data items can be added to the Data tip values role to show additional information when a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

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

The bar chart should resemble the following:

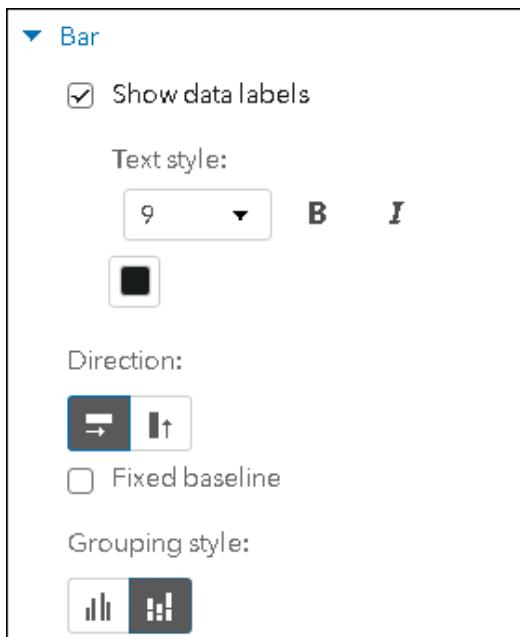


- d. In the right pane, click the **Options** icon.
e. Expand the **General** group.
f. Enter **Profit by Continent and Order Type** in the **Name** field.

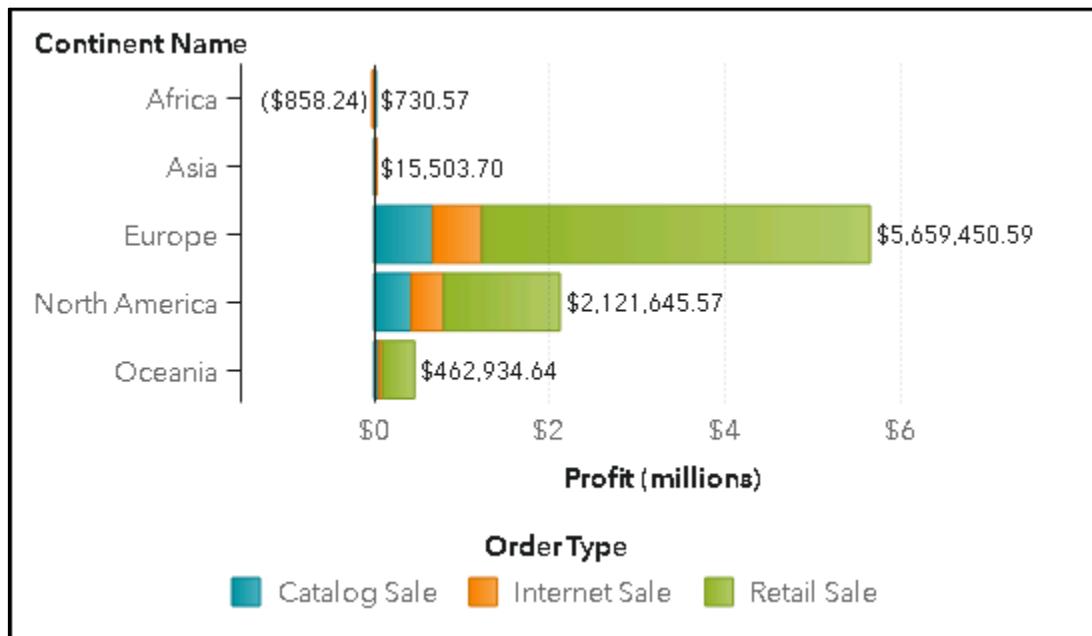


- g. In the Bar group, select **Show data labels**.
h. Select **9** for the **Text style** field.

- i. For the **Grouping style** field, select  (Stacked).

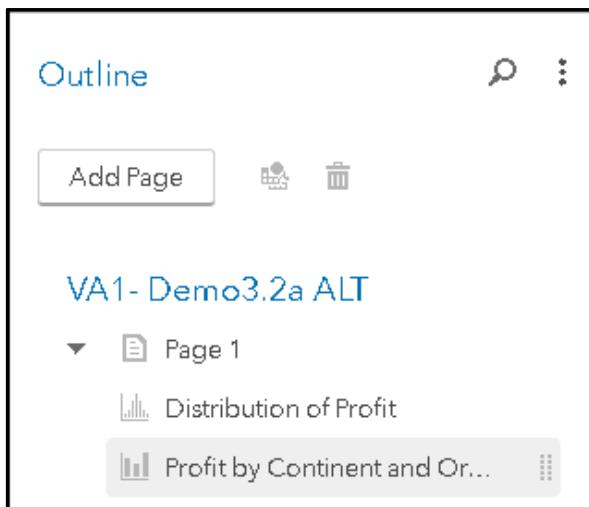


The updated bar chart should resemble the following:



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.

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



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

11. In the upper right corner, select (More options) ⇒ **Save**.
12. Select **Eric** ⇒ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

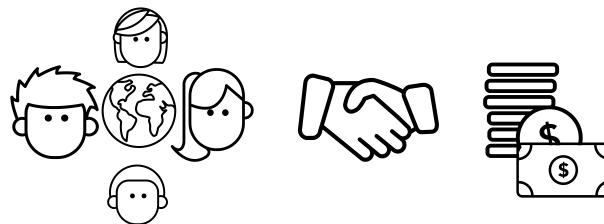
End of Demonstration

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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Exercises

2. Exploring Data: Part 1

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise3.2a** report from the **Shared Data/Basics/Exercises (HR)** folder.
- Create an automatic chart using the following data items:

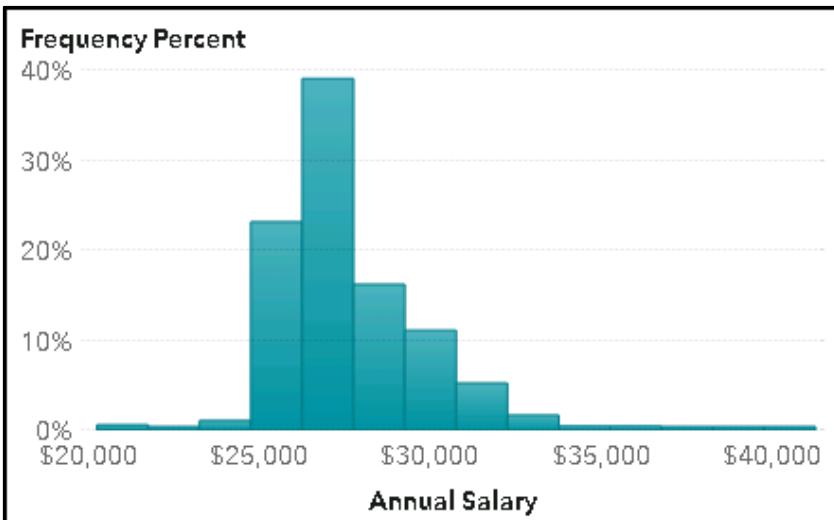
Annual Salary

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:



- Use Explore mode to answer the following question:

Into which range do a majority of salaries fall?

Answer: _____

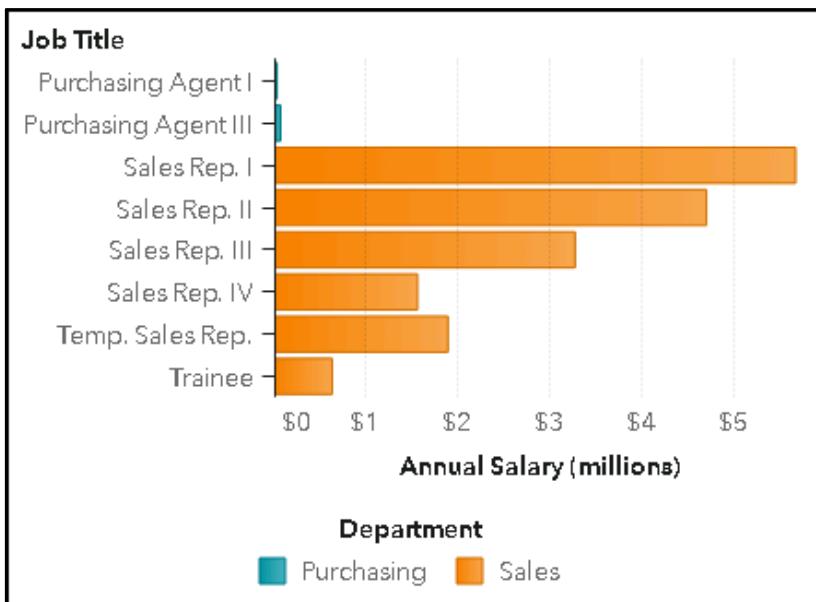
Hint: After answering the question, click (**Return to report**) in the upper left corner.

- 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:

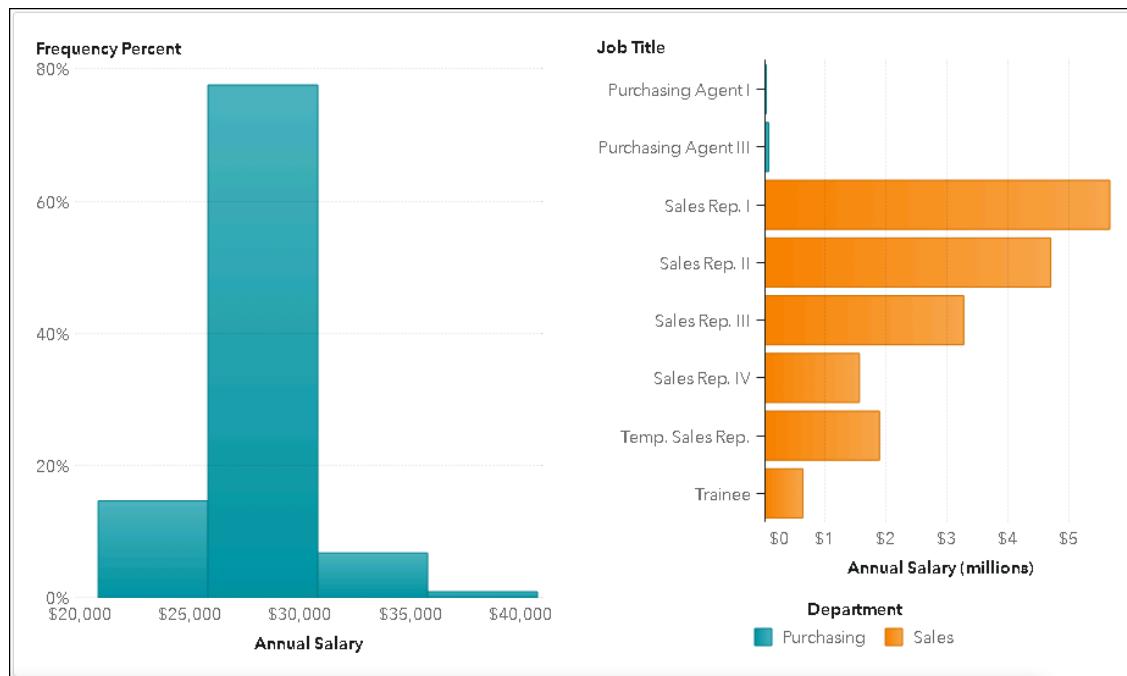
In which department are a majority of our salary costs spent? For which job title?

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.
- j. Sign out of Visual Analytics.

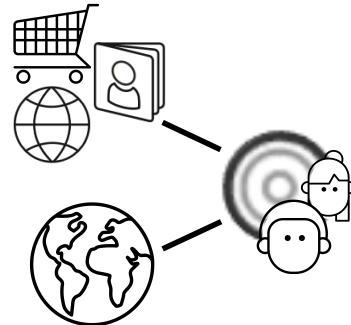
End of Exercises

Business Scenario: Customers



In the previous analysis, you discovered that profits were lower in the Internet and catalog channels. You will 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. You will continue to analyze profits by location to understand why this discrepancy exists and determine ways to improve profits in non-European countries.



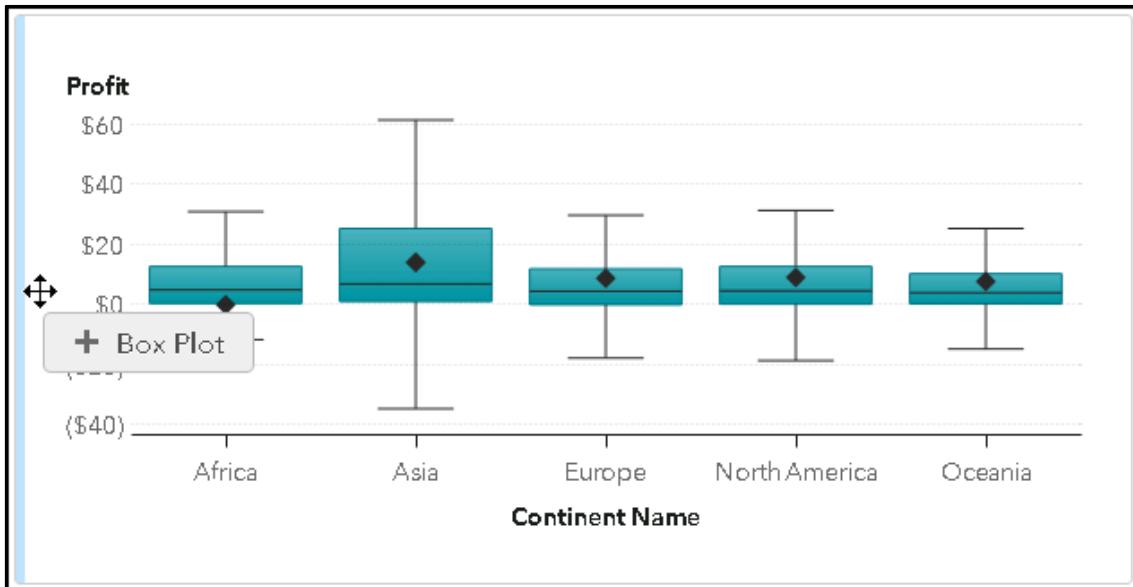
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Exploring Data: Part 2

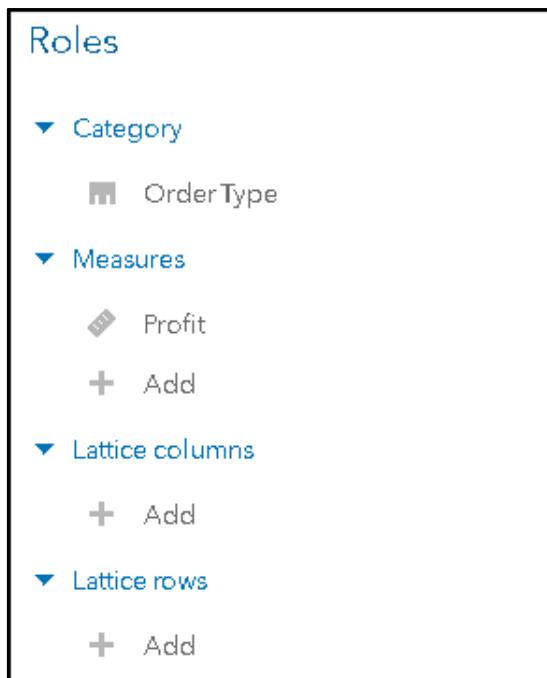
This demonstration illustrates how to use box plots to explore data in Visual Analytics.

1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1-Demo3.2b** to open the report.
7. In the upper left corner of the report, click the **Page 2** tab.
8. 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.

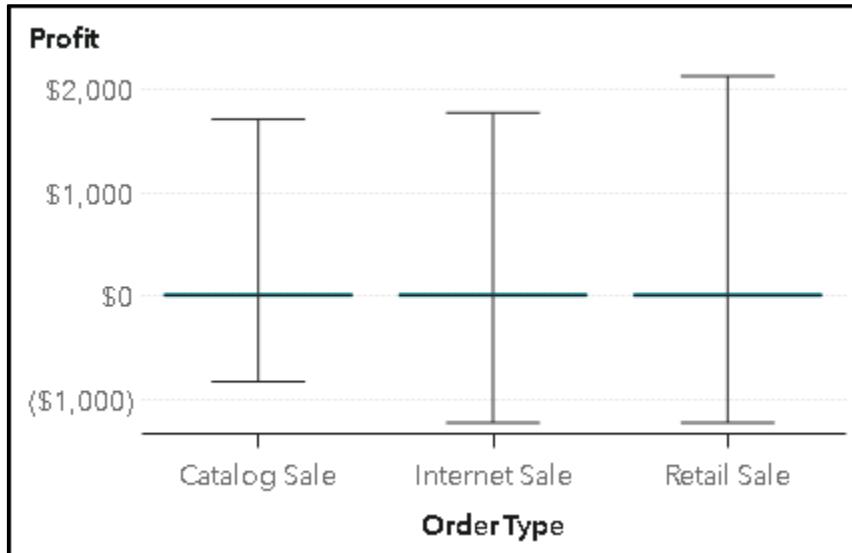


- c. In the right pane, click the **Roles** icon.
- d. For the **Category** role, select **Add** \Rightarrow **Order Type**.
- e. For the **Measures** role, select **Add** \Rightarrow **Profit** and click **OK**.

The Roles pane should resemble the following:

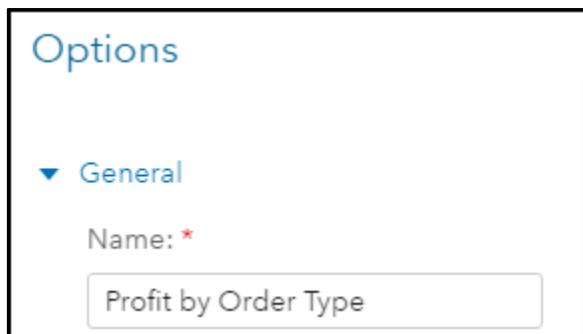


The box plot should resemble the following:

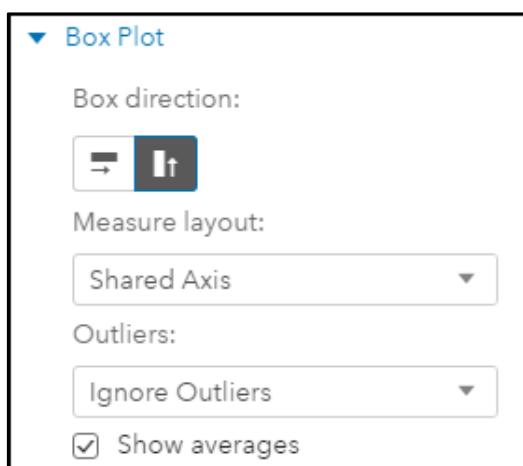


- f. In the right pane, click the **Options** icon.
- g. If necessary, expand the **General** section.
- h. Enter **Profit by Order Type** in the **Name** field.

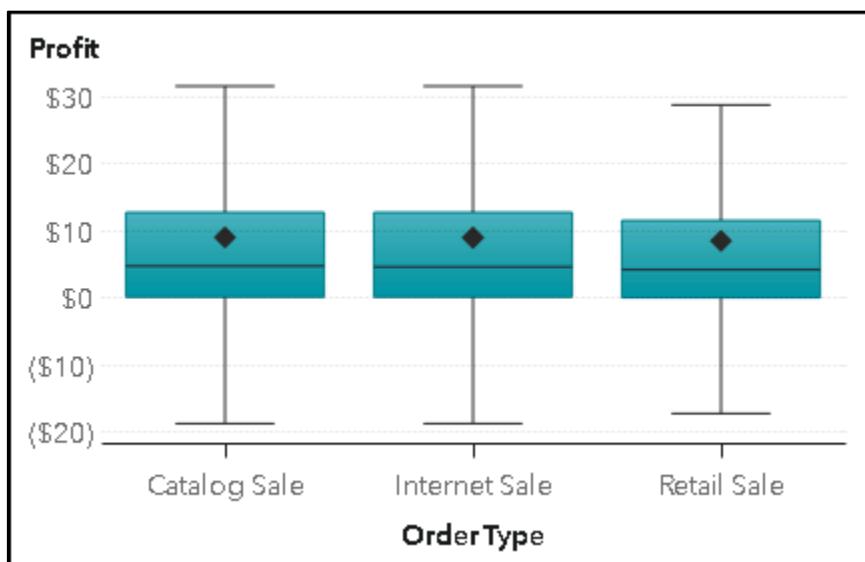
The Options pane should resemble the following:



- i. In the Box Plot group, select **Ignore Outliers** for the **Outliers** field.
- j. Select **Show averages**.



The box plot should resemble the following:



- k. In the upper right corner of the box plot, select **(Explore)** 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
Catalog Sale	(\$826.26)	(\$18.63)	\$0.20	\$9.07	\$4.80
Internet Sale	(\$1,222.48)	(\$18.63)	\$0.20	\$9.04	\$4.70
Retail Sale	(\$1,222.48)	(\$17.13)	\$0.10	\$8.55	\$4.25



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 could be higher in retail because there are more customers or more orders for that channel.

- l. In the upper left corner, click **(Return to report)**.

- m. In the upper right corner of the Profit by Continent box plot, select **(Explore)** 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
Africa	(\$374.42)	(\$11.70)	\$0.30	(\$0.17)	\$4.80
Asia	(\$258.84)	(\$34.62)	\$1.00	\$13.97	\$6.80
Europe	(\$1,222.48)	(\$17.82)	(\$0.10)	\$8.66	\$4.40
North America	(\$1,222.48)	(\$18.63)	\$0.10	\$9.00	\$4.50
Oceania	(\$646.40)	(\$14.80)	\$0.20	\$7.66	\$3.90



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 could 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 left corner, click **(Return to report)**.

9. In the upper right corner, select **(More options)** \Rightarrow **Save**.

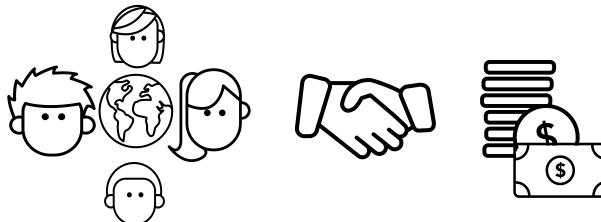
10. Select **Eric** \Rightarrow **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

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. You will continue to analyze salary costs by job title to determine possible jobs that might qualify for promotion.



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Exercises

3. Exploring Data: Part 2

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise3.2b** report from the **Shared Data/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:



- Use Explore mode 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 (Return to report) in the upper left corner.

- Save the report.
- Sign out of Visual Analytics.

End of Exercises

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 data can be filtered in Visual Analytics.
- Discuss when to use geographic graphs in Visual Analytics.

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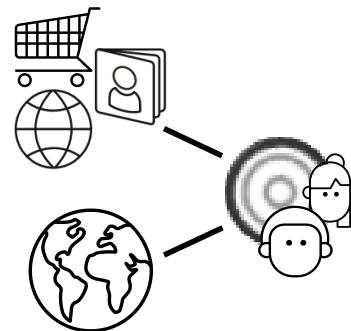
Business Scenario: Customers



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.



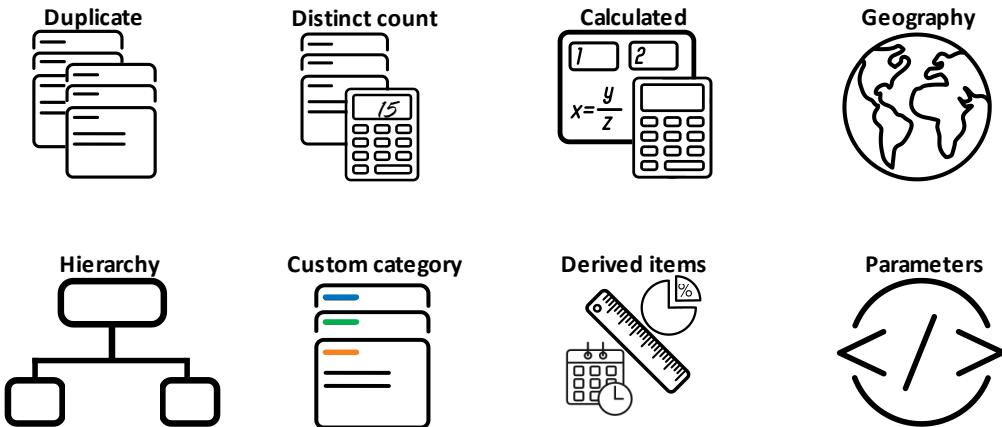
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Creating Data Items

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 SAS Visual Analytics 8.1 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 SAS Visual Analytics 8.1 documentation. NOTE: If the category contains missing values, the distinct count is increased by one.
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 SAS Visual Analytics 8.1 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) or by associating latitude and longitude coordinates with the values (custom). For more information about creating geography data items, see “Working with Geography Data Items” in the SAS Visual Analytics 8.1 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. Hierarchies that consist of all geographic data items are considered geographic hierarchies and can be used in geo maps. For more information about hierarchies, see “Working with Hierarchies in a Report” in the SAS Visual Analytics 8.1 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 SAS Visual Analytics 8.1 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 are available:</p> <table border="1"> <tr> <td>Difference from previous period</td><td>Displays the difference between the value for the current time period and the value for the previous time period.</td></tr> <tr> <td>Difference from previous parallel period</td><td>Displays the difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.</td></tr> <tr> <td>Percent difference from previous period</td><td>Displays the percentage difference between the value for the current time period and the value for the previous time period.</td></tr> <tr> <td>Percent difference from previous parallel period</td><td>Displays the percentage difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.</td></tr> <tr> <td>Percent of subtotals</td><td> <p>Displays the percentage of the subtotal value for the measure on which it is based. You can create a percentage of subtotal only when the source data item has an aggregation of Sum or Count.</p> <p>Note: The Percent of subtotals derived item is available only for use in crosstabs.</p> </td></tr> <tr> <td>Percent of total – sum</td><td>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.</td></tr> </table>	Difference from previous period	Displays the difference between the value for the current time period and the value for the previous time period.	Difference from previous parallel period	Displays the difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.	Percent difference from previous period	Displays the percentage difference between the value for the current time period and the value for the previous time period.	Percent difference from 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	<p>Displays the percentage of the subtotal value for the measure on which it is based. You can create a percentage of subtotal only when the source data item has an aggregation of Sum or Count.</p> <p>Note: The Percent of subtotals derived item is available only for use in crosstabs.</p>	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 .
Difference from previous period	Displays the difference between the value for the current time period and the value for the previous time period.												
Difference from previous parallel period	Displays the difference between the value for the current time period and the value for the previous parallel time period within a longer time interval.												
Percent difference from previous period	Displays the percentage difference between the value for the current time period and the value for the previous time period.												
Percent difference from 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	<p>Displays the percentage of the subtotal value for the measure on which it is based. You can create a percentage of subtotal only when the source data item has an aggregation of Sum or Count.</p> <p>Note: The Percent of subtotals derived item is available only for use in crosstabs.</p>												
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 .												

Derived items (continued)	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 SAS Visual Analytics 8.1 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, and ranks. For more information about parameters, see "Working with Parameters in Reports".	

Calculated Item: Example

Calculated items are created by performing operations on unaggregated data.

$$(\text{Salary} * \text{Increase})$$

Gender	Salary	Increase	New Salary
Male	40,000	1.05	42,000
Female	65,000	1.10	71,500
Female	32,000	1.05	33,600
Male	80,000	1.10	88,000
Female	56,000	1.15	64,400



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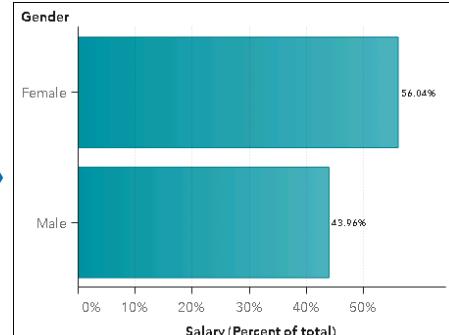
Aggregated Measure: Example

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

$$(\text{Sum } \text{ByGroup}_- \text{ (Salary) } / \text{Sum } \text{ForAll}_- \text{ (Salary) })$$

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

3.02 Quiz

Match each new data item with the type of calculation.

- Gross Profit Margin (Total Profit/ Total Revenue) A. calculated item
- Date (from month, day, year)
- Hemisphere (from continents) B. aggregated measure
- GDP Growth (year-over-year)
- Number of Employees (distinct count)
- State Abbreviations (uppercase)

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Custom Category: Example

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

Calculated item

```

IF Continent Name In -multiple selected-
  RETURN " Northern "
  ELSE " Southern "

```

This calculated item and custom category will produce equivalent results.

Custom category

Value Groups	
▼	Northern
Asia	
Europe	
North America	
▼	Southern
Africa	
Oceania	
+ Click or drag values here to add a value group	

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3.03 Quiz

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

Customer Birth Date ▲
01Jan1938
02Jan1938
03Jan1938
04Jan1938
05Jan1938
06Jan1938
07Jan1938
08Jan1938
09Jan1938
10Jan1938
11Jan1938
12Jan1938

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3.04 Multiple Choice Poll

Which operator enables a numeric or datetime value to be used as a different type for the calculation?

- a. Format
- b. ChangeType
- c. TreatAs
- d. Informat

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Calculated Columns: Customer Age

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

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



Creating Data Items

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

1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo3.3a** to open the report.
7. In the upper left corner of the report, click the **Page 3** tab.
8. View new calculated items (**Number of Orders**, **Customer Age**, and **Customer Age Group**).
 - a. In the left pane, click the **Data** icon.
 - b. View **Number of Orders** (new derived data item) in the Aggregated Measure group.

▼ Aggregated Measure

- Frequency Percent
- Number of Orders**

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

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

▼ Measure

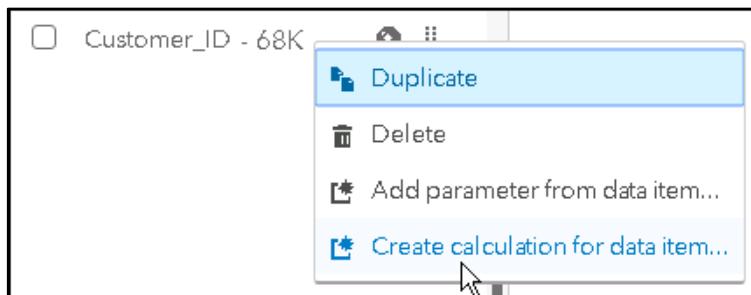
- Customer Age**
- Days to Delivery
- Discount

- d. View **Customer Age Group** (new calculated data item) in the Category group.

▼ Category

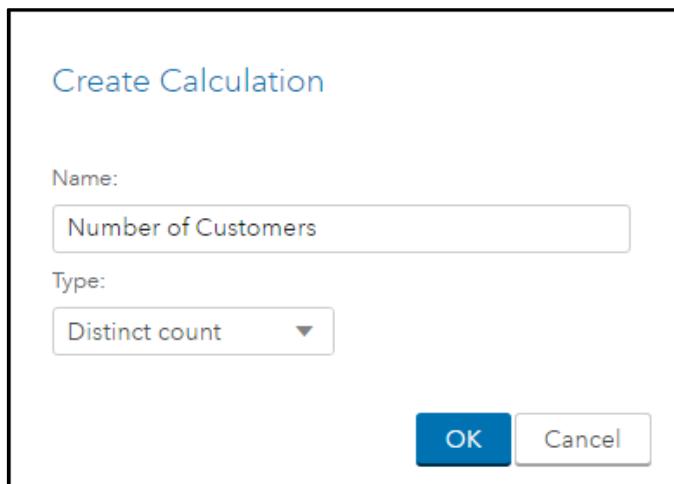
- City Name - 11K
- Continent Name - 5
- Customer Age Group - 5**

9. Create new distinct count data items.
 - a. In the left pane, click the **Data** icon.
 - b. Right-click **Customer_ID** in the Category group, and select **Create calculation for data item**.



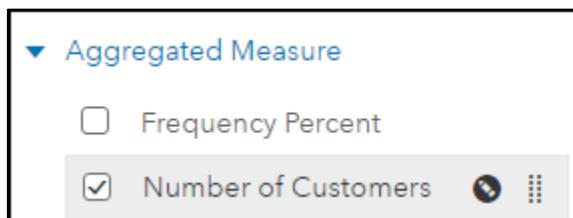
- c. Enter **Number of Customers** in the **Name** field.
- d. Verify that **Distinct count** is selected for the **Type** field.

The Create Calculation window should resemble the following:



- e. Click **OK**.

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



10. Create an automatic chart.
- a. In the Data pane, select the following data items:

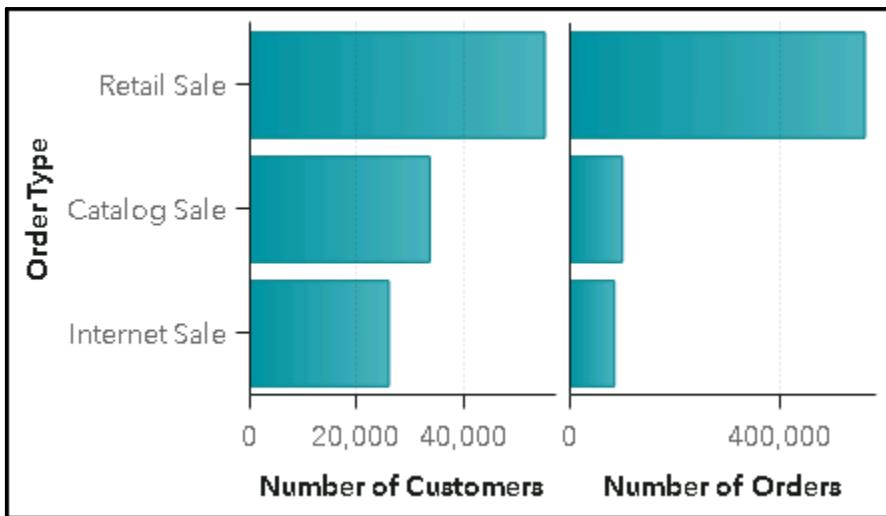
Number of Orders

Order Type.

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

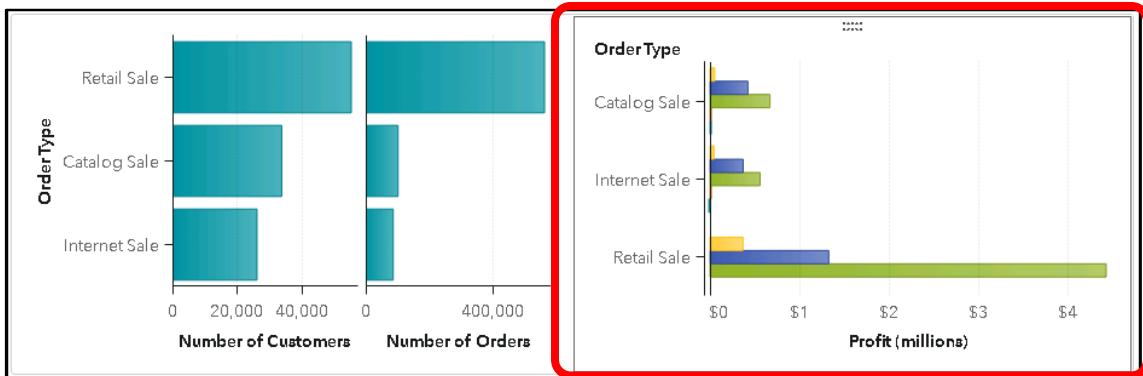
- b. Click  next to **Order Type** and drag the columns to the left side of the canvas.

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



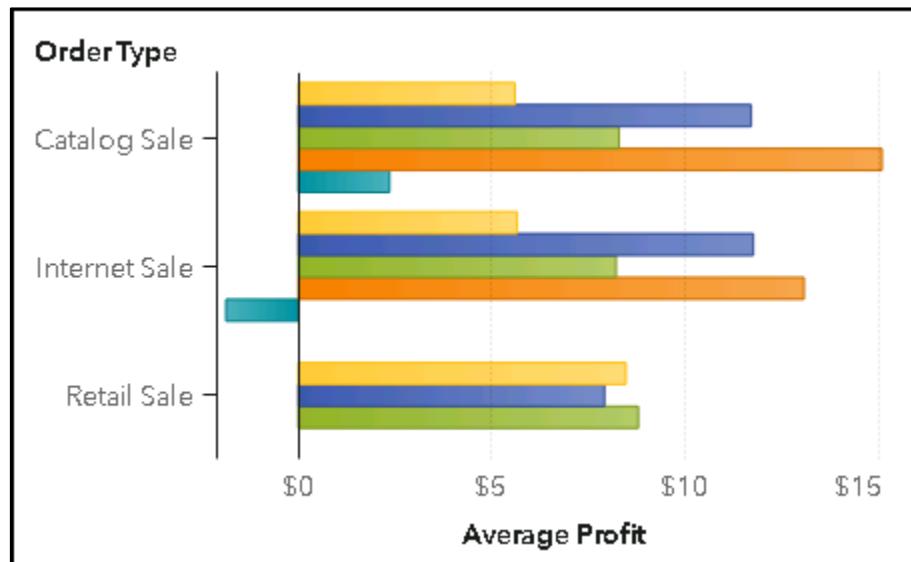
Total profit is lower in the Internet and catalog channels because there are fewer customers that place orders through those channels. There are also significantly lower orders placed through those channels.

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



- b. In the right pane, click the **Roles** icon.
- c. For the **Measure** role, select **Profit** \Rightarrow **Average Profit**.

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 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 catalog and Internet. Then, if the marketing strategy is successful, it will be implemented in other locations.

13. Create a new calculated data item, **Customer Gender**.

- a. In the Data pane, select **Add** \Rightarrow **Add custom category**.
- b. In the Add Custom Category window, enter **Customer Gender** in the **Name** field.
- c. Select **Title** in the **Based on** field.
- d. Right-click **Value Group 1** and select **Edit group name**.
 - 1) Enter **Male** in the **Name** field.
 - 2) Click **OK**.
 - 3) Click next **Mr.** in the left pane and drag to the **Drag values here** area on the right.

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

- 1) Right-click **Value Group 1** and select **Edit group name**.
- 2) Enter **Female** in the **Name** field.
- 3) Click **OK**.

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

- g. Click **OK** to create the new calculated data item.

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 "Other"
  
```

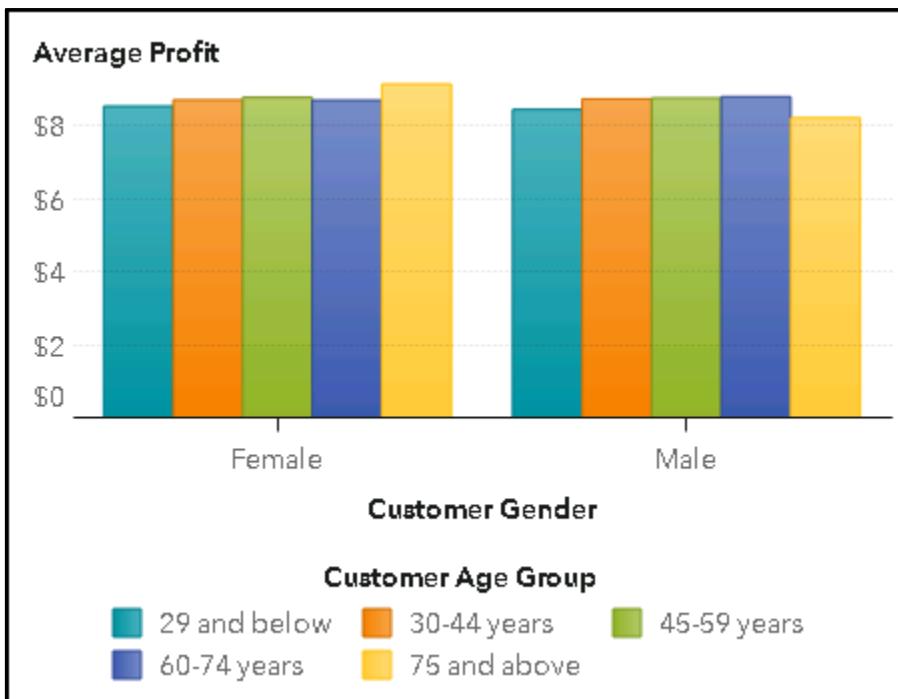
The new data item, **Customer Gender**, should appear in the Category group.

▼ Category

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

14. Duplicate the average profit by order type and continent bar chart.
 - a. In the canvas area, on the upper right corner of the **Average Profit by Order Type and Continent** bar chart, select (More options) \Rightarrow **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 **General** section.
 - h. Enter **Average Profit by Gender and Age Group** in the **Name** field.
 - i. In the Bar section, click (**Vertical**) for the **Direction** field.

The bar chart should resemble the following:



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

15. In the upper right corner, select (More options) \Rightarrow Save.
16. Select Eric \Rightarrow Sign Out in the upper right corner to sign out of SAS Visual Analytics.

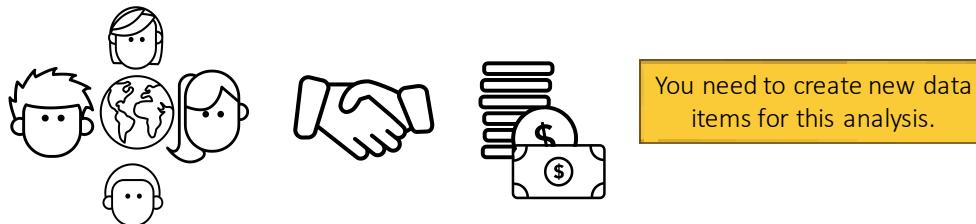
End of Demonstration

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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3.05 Quiz

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

Employee Hire Date	Employee Termination Date
01Apr2005	31Jan2010
01Jul1991	.
01Jan1978	.
01Apr2010	.
01Dec2006	30Sep2008
01Aug1978	.
01Jan2007	30Jun2007
01Jan2007	30Jun2007
01Jan2007	30Jun2007

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Exercises

4. Creating Data Items

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise3.3a** report from the **Shared Data/Basics/Exercises (HR)** folder.
- Create a new data item, **Employee Status**, by assigning the following labels to the values:

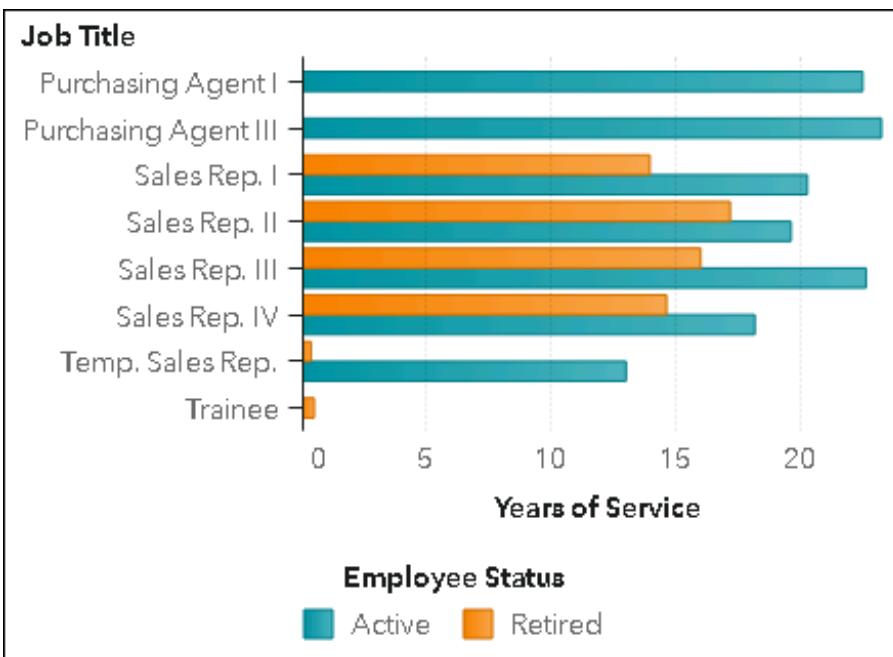
Employee Status (label)	Employee TerminationDate (value)
Active	.
Retired	<all remaining values>

- 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:



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.

i. Sign out of Visual Analytics.

End of Exercises

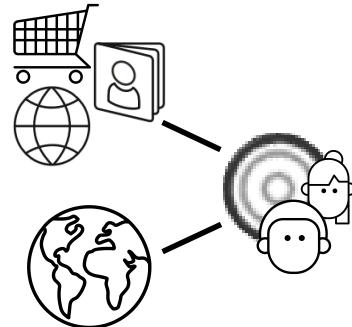
Business Scenario: Customers



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, you 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.



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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 created and modified only by the report designer:

Data source filter	Subsets the data for the entire report and are 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 8.1 documentation.

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

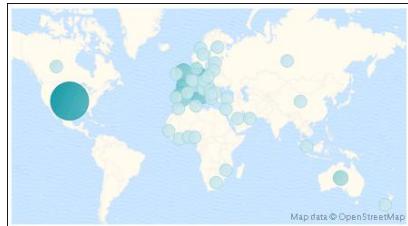
Filters are applied in the following order:

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

Objects: Graphs (Geography)

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

Bubbles



Coordinates



Regions



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

Geo map

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

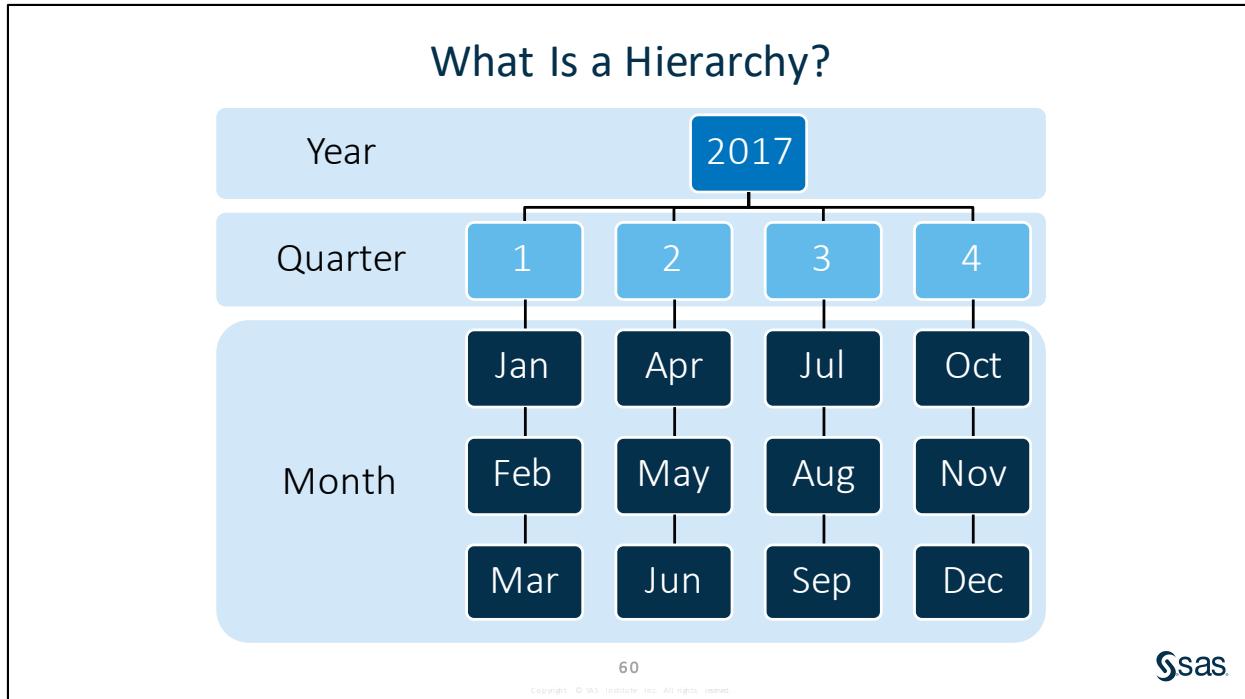
Note: The Regions map style is not available for custom geographic roles or for ZIP codes

For more information about creating geography data items, see “Working with Geography Data Items” in the SAS Visual Analytics 8.1 documentation.

3.06 Multiple Answer Poll

Which graph 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, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo3.3b** to open the report.
7. In the upper left corner of the report, click the **Page 4** tab.
8. Create new data items.
 - a. In the left pane, click the **Data** icon.
 - b. Click  (Edit properties) next to **State Name**.
 - c. Select **Geography** for the **Classification** field.
 - d. In the Geography Classification for State Name window, select **US State Names** for the **Geography** field.
 - e. Click **OK**.

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

- f. In the Data pane, click  (Edit properties) next to **Postal code**.
- g. Select **Geography** for the **Classification** field.
- h. In the Geography Classification for Postal code window, select **US Zip Codes** for the **Geography** field.
- i. Click **OK**.

The Geography group should resemble the following:

▼ Geography

- 🌐 Postal code - 19K
- 🌐 State Name - 272

- j. In the Data pane, select **Add** ⇒ **Add hierarchy**.
- k. In the Add Hierarchy window, enter **US Hierarchy** in the **Name** field.
- l. Double-click the following data items in the Available items list to move them to the Selected items list:

State Name

Postal code

Add Hierarchy

US Hierarchy

Available items (16):	Selected items (2):
Customer_ID - 68K	State Name - 272
Customer_LastName - 42K	Postal code - 19K

- m. Click **OK**.

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

▼ Hierarchy

- 🌐 US Hierarchy

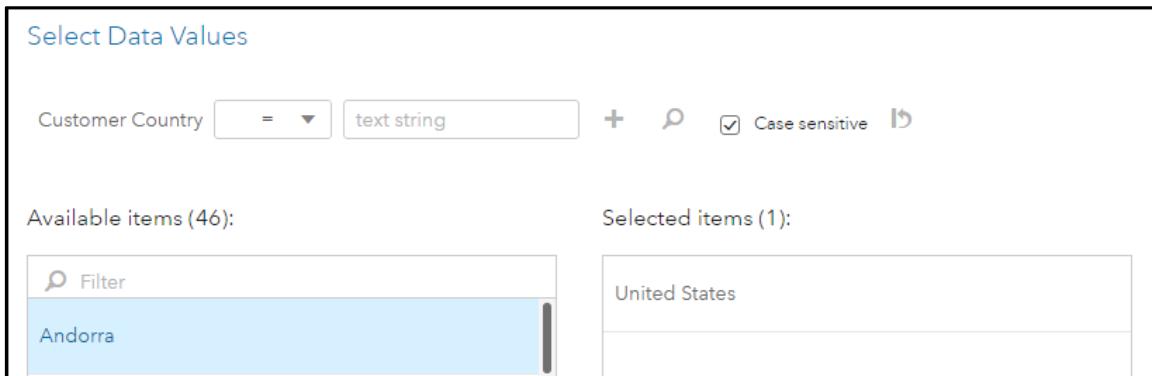
9. Add a data source filter.

- a. In the Data pane, click (**Add 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.
- 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.



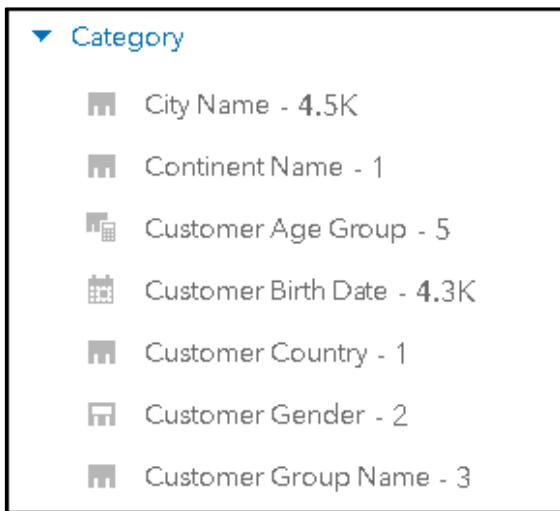
- h. Click **OK**.
- i. Scroll to the bottom of the Add Data Source Filter window to view the number of returned observations.

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

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

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

The Data pane should resemble the following:

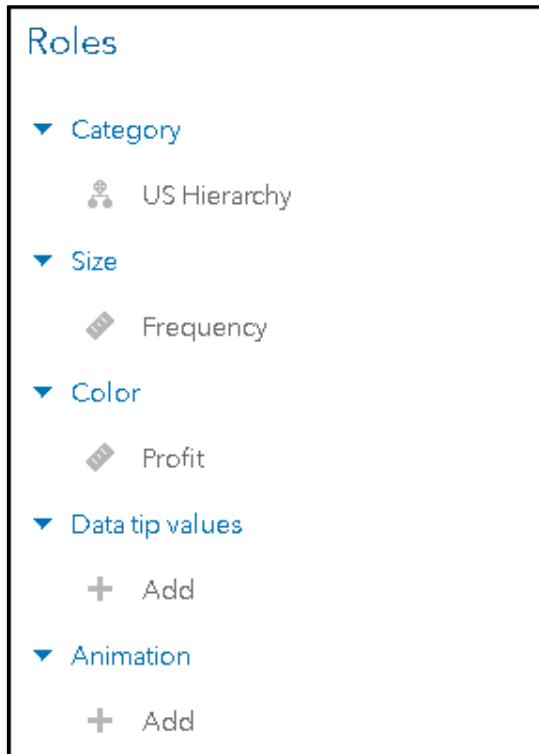


The data source filter is applied to every report object that uses the data source and updates the cardinality values that appear in the Data pane.

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

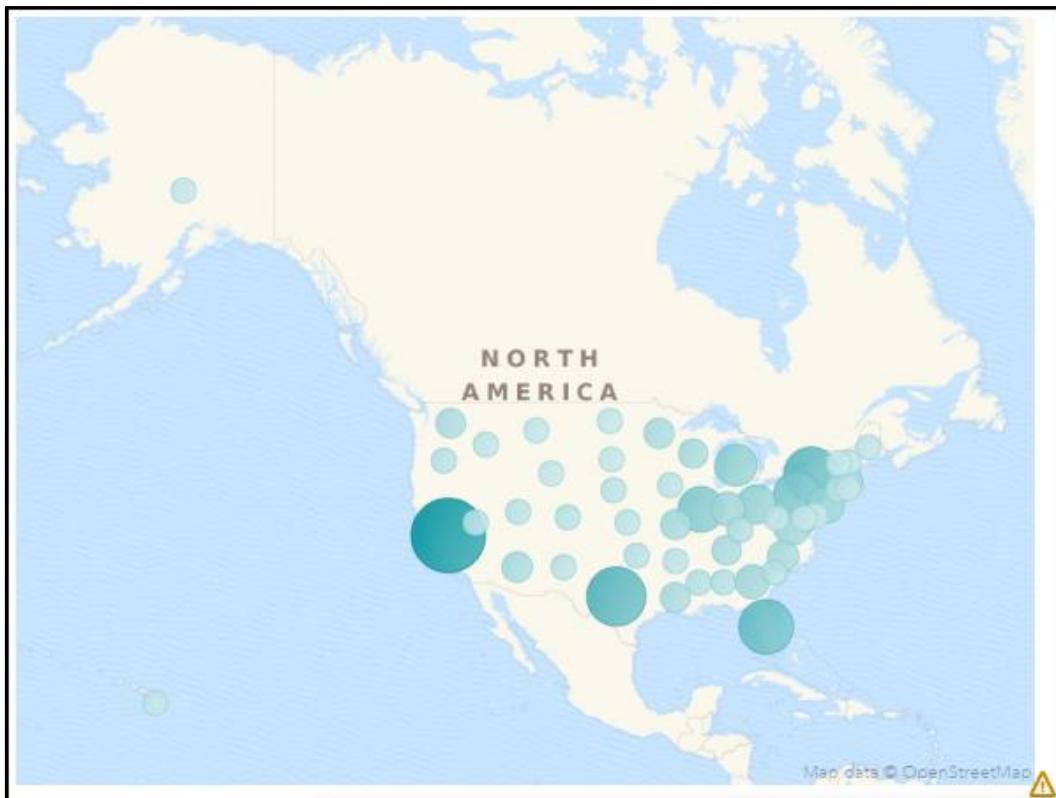
- f. For the **Color** role, select **Add** ⇒ **Profit**.

The Roles pane should resemble the following:

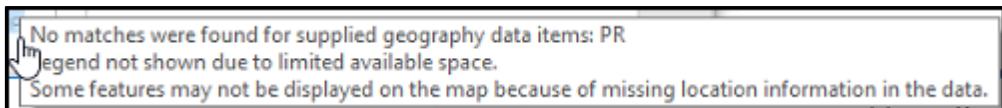


The geo map requires a geography data item for the Category role. A measure data item can be added to the Color role to color the geographic regions based on the measure.

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.



- h. In the right pane, click the **Options** icon.
i. If necessary, expand the **General** group.
j. Enter **Profit by Location** in the **Name** field.

Options

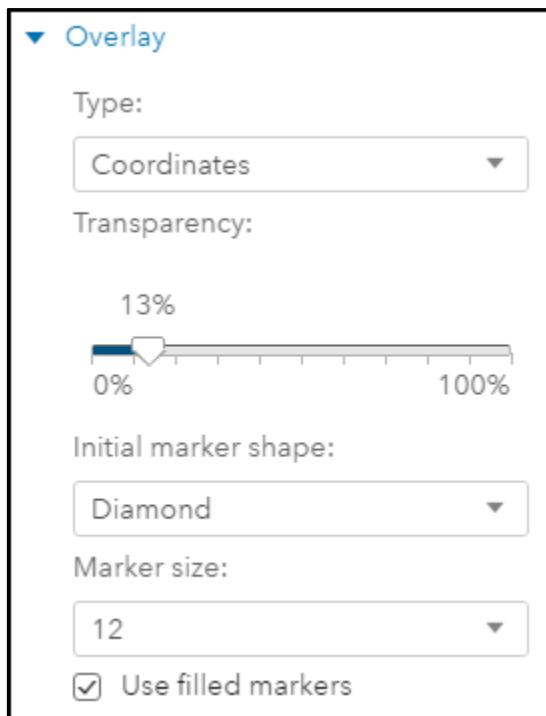
▼ General

Name: *

Profit by Location

- k. In the Overlay group, select **Coordinates** for the **Type** field.
l. Select **Diamond** for the **Initial marker shape** field.
m. Select **12** for the **Marker size** field.

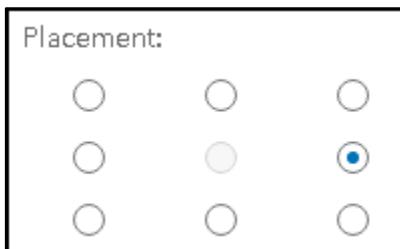
The Options pane should resemble the following:



The updated geo map should resemble the following:



- n. Expand the **Legend** group.
- o. 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. In the right pane, click the **Roles** icon.
- q. For the **Data tip values** role, right-click **Frequency** and select **Remove Frequency**.
- r. For the **Color** role, select **Profit** \Rightarrow **Average Profit**.

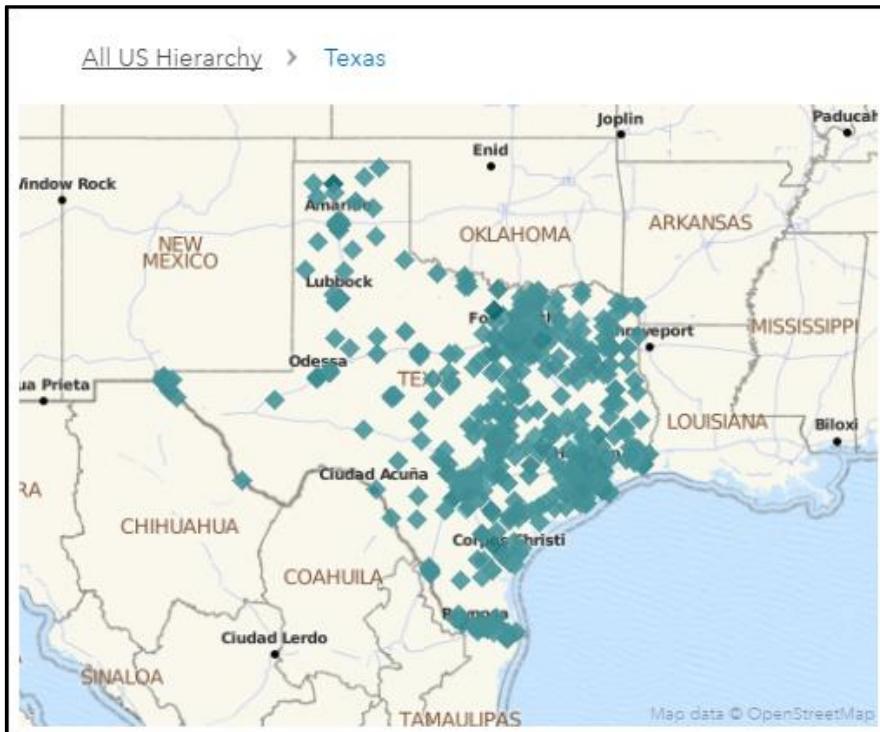
The updated geo map should resemble the following:



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 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.

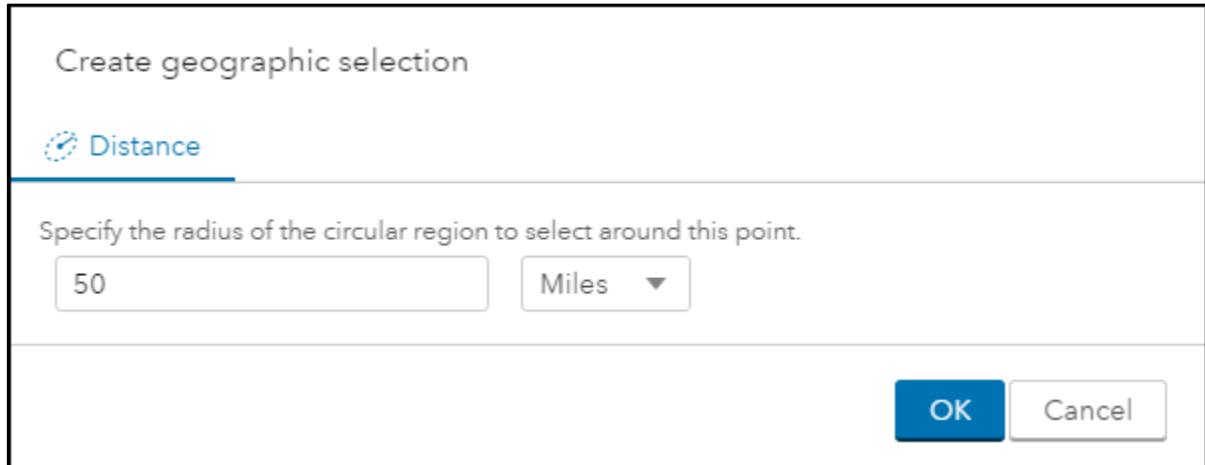


- t. In the upper left corner, click (**Search**).
u. Enter **Austin, TX** in the **Search** field and press Enter.



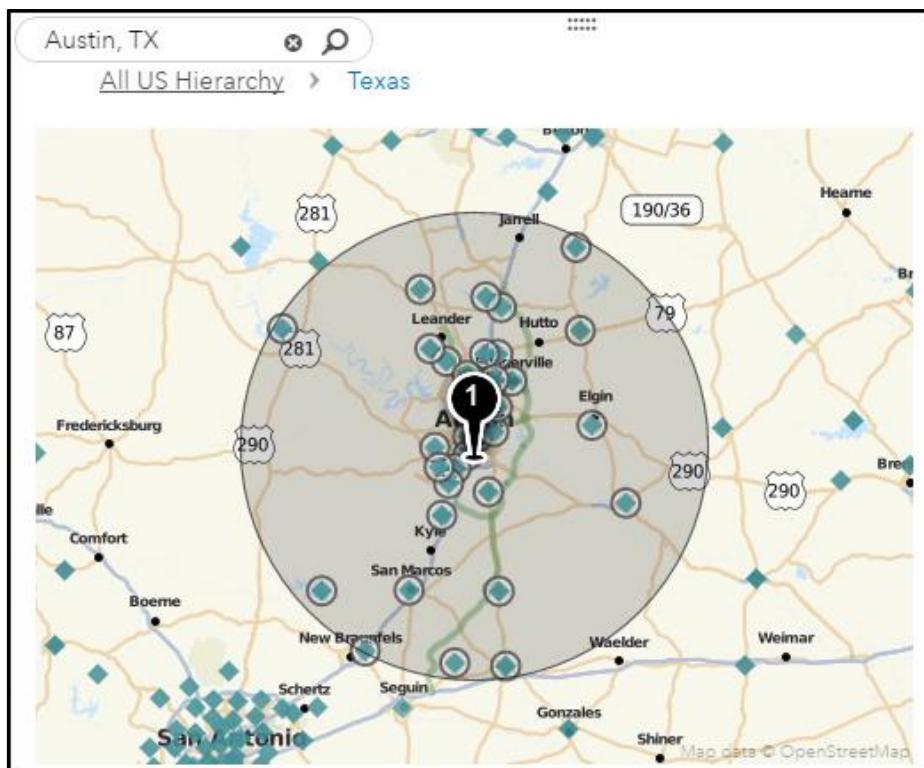
The location for Austin, TX is marked on the geo map.

- v. Right-click the marker and select **Create geographic selection**.
- w. In the Create geographic selection window, enter **50** in the **Specify the radius of the circular region to select around this point** field.
- x. Verify that **Miles** is specified.



- y. Click **OK**.

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



11. In the upper right corner, select (**More options**) \Rightarrow **Save**.
12. Select **Eric** \Rightarrow **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

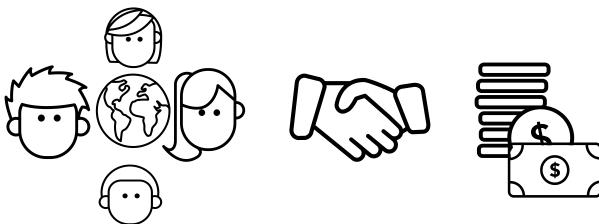
End of Demonstration

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.

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Exercises

5. Applying Filters

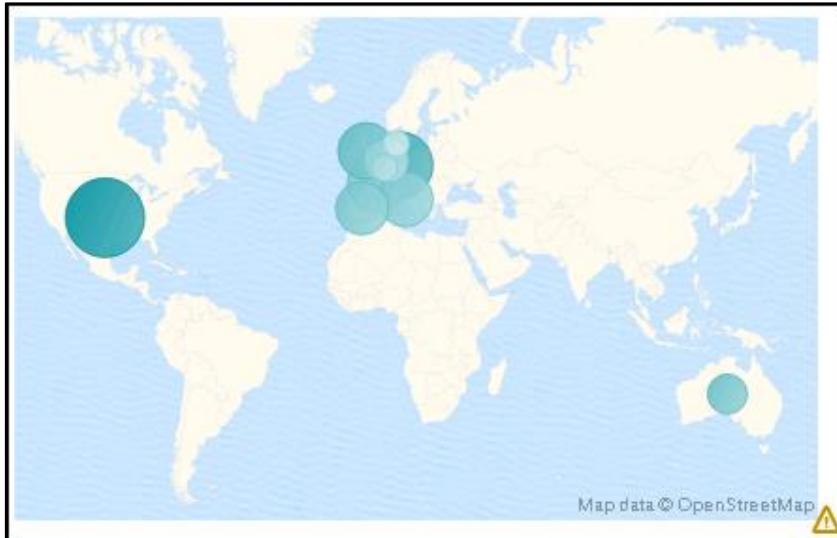
- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise3.3b** report from the **Shared Data/Basics/Exercises (HR)** folder.
- Add a data source filter to filter for active employees in the Sales Department.

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** ⇒ **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:



- Use Explore mode to answer the following question:

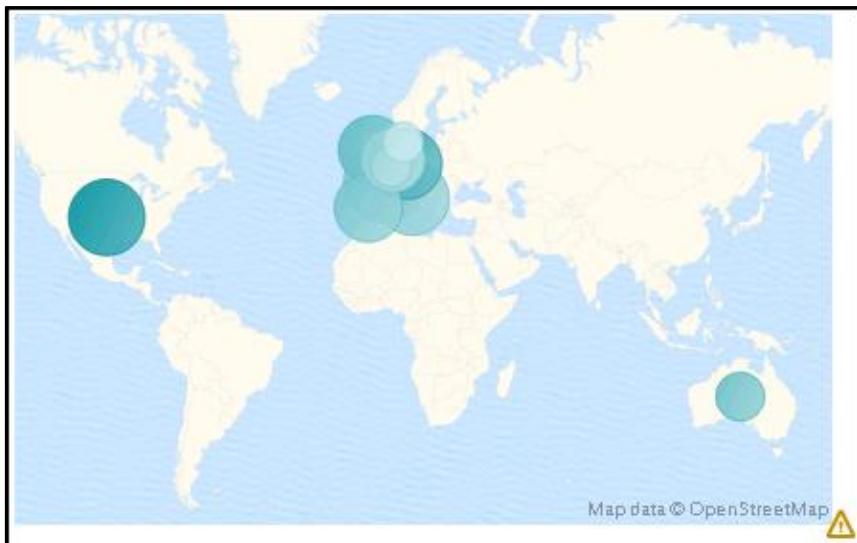
Management has decided that one possible criterion for promotion is profit generated. Which two countries generate the highest profit? Why do they have such high profits?

Answer: _____

Hint: After answering the question, click (**Return to report**) in the upper left 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. Use Explore mode to answer the following question:

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

Answer: _____

Hint: After answering the question, click  (Return to report) in the upper left corner.

- j. Save the report.
k. Sign out of Visual Analytics.

End of Exercises

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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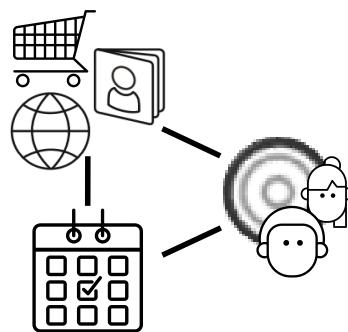
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Business Scenario: Customers



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.

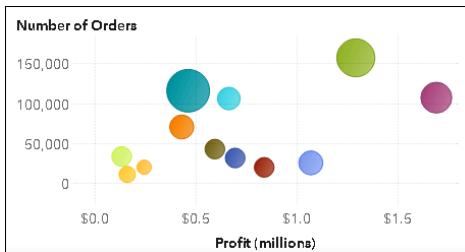


70

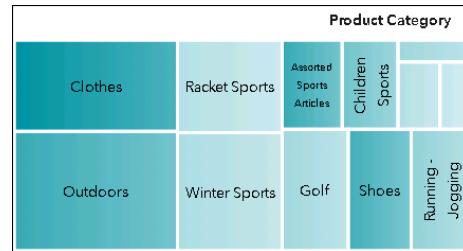
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Objects: Graphs (Analysis)



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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Sas.

Bubble plot

A bubble plot displays the values of at least three measures by using differently sized plot markers (bubbles) 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. 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.

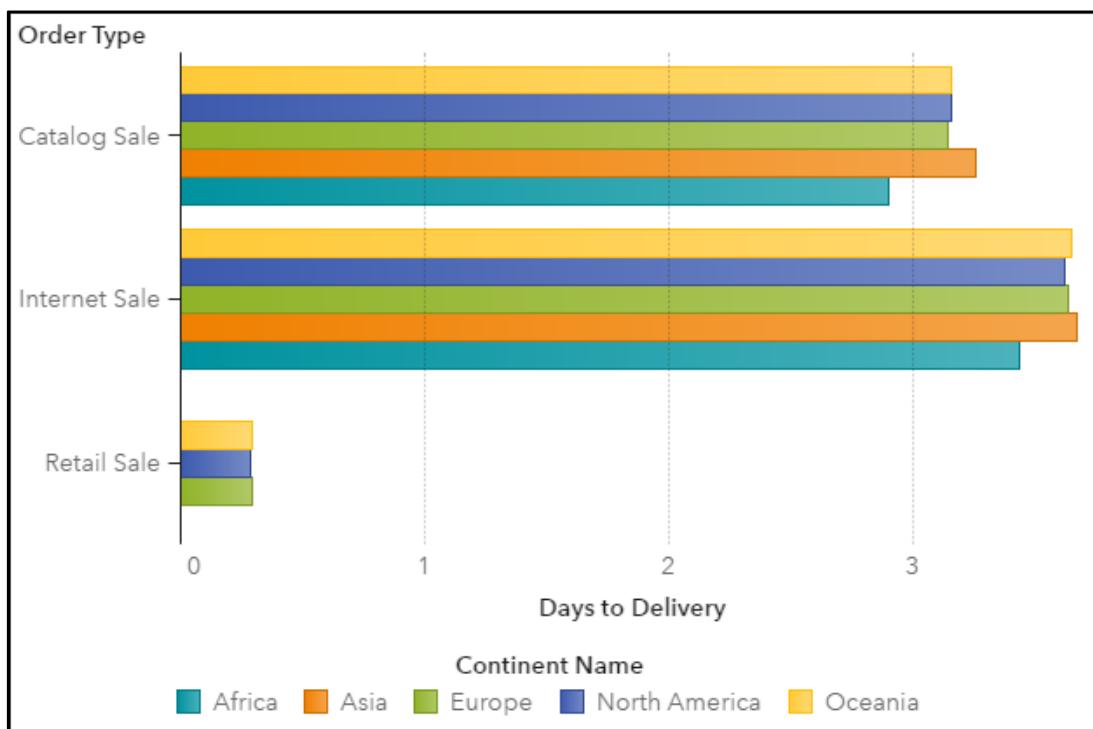
Note: The layout of the tiles in the treemap is dependent on the size of the display area because it uses a space-filling algorithm to lay the tiles out. This means that the same treemap might appear slightly different in Visual Analytics than it does in the Report Viewer or in the Mobile BI app.



Analyzing Data

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

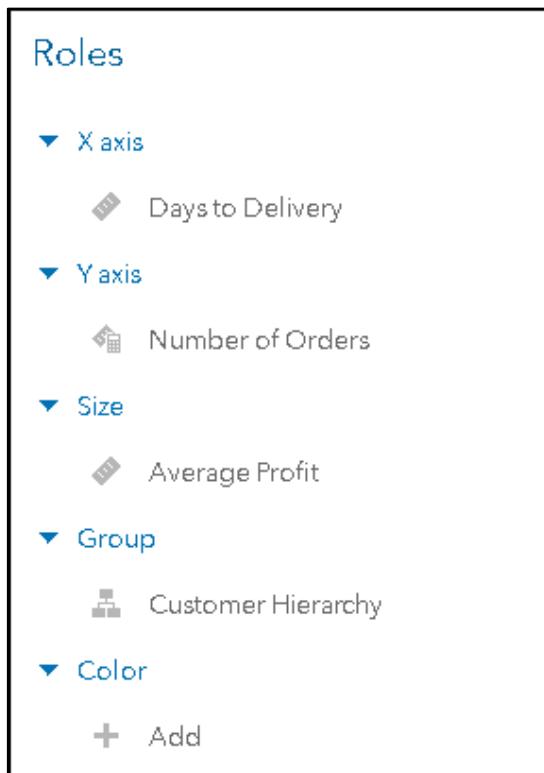
1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo3.4a** to open the report.
7. In the upper left corner of the report, click the **Page 4** tab.
8. View the days to delivery by order type and continent bar chart.



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

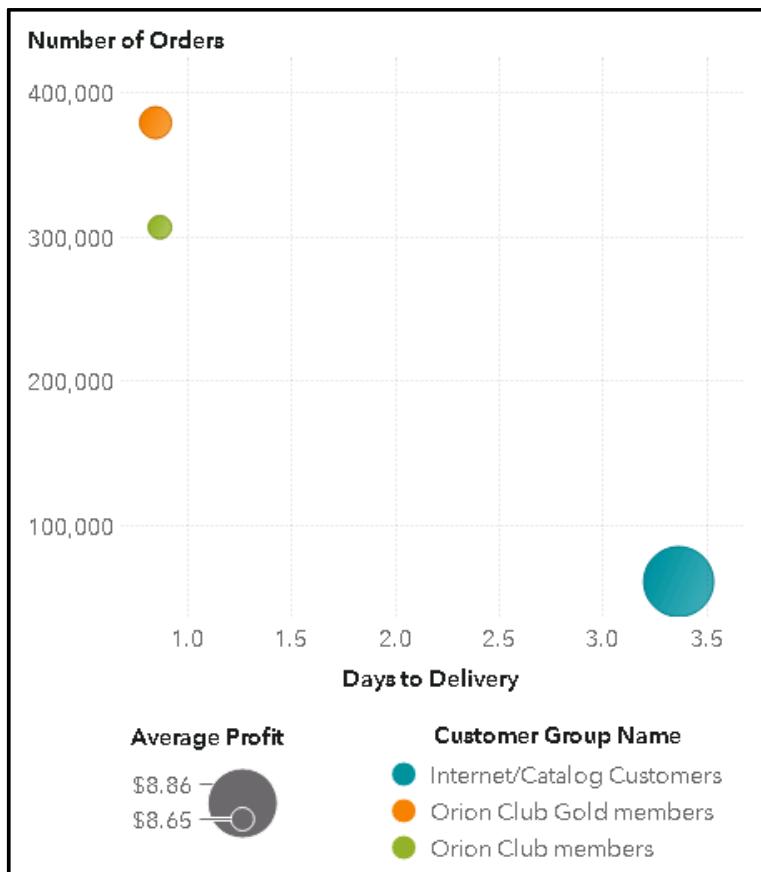
9. Create a bubble plot.
 - a. In the right pane, click the **Objects** icon.
 - b. Drag the **Bubble Plot** object, from the Graphs group, to the right side of the canvas.
 - c. In the left pane, click the **Roles** icon.
 - d. For the **Group** role, select **Add** \Rightarrow **Customer Hierarchy**.
 - 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:

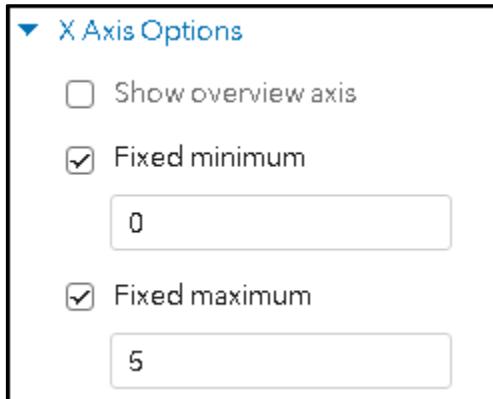


Measure data items can be added to the X axis and Y axis roles to determine the placement of the bubble. A measure data item can be added to the Size role to determine the size of the bubble.

The bubble plot should resemble the following:

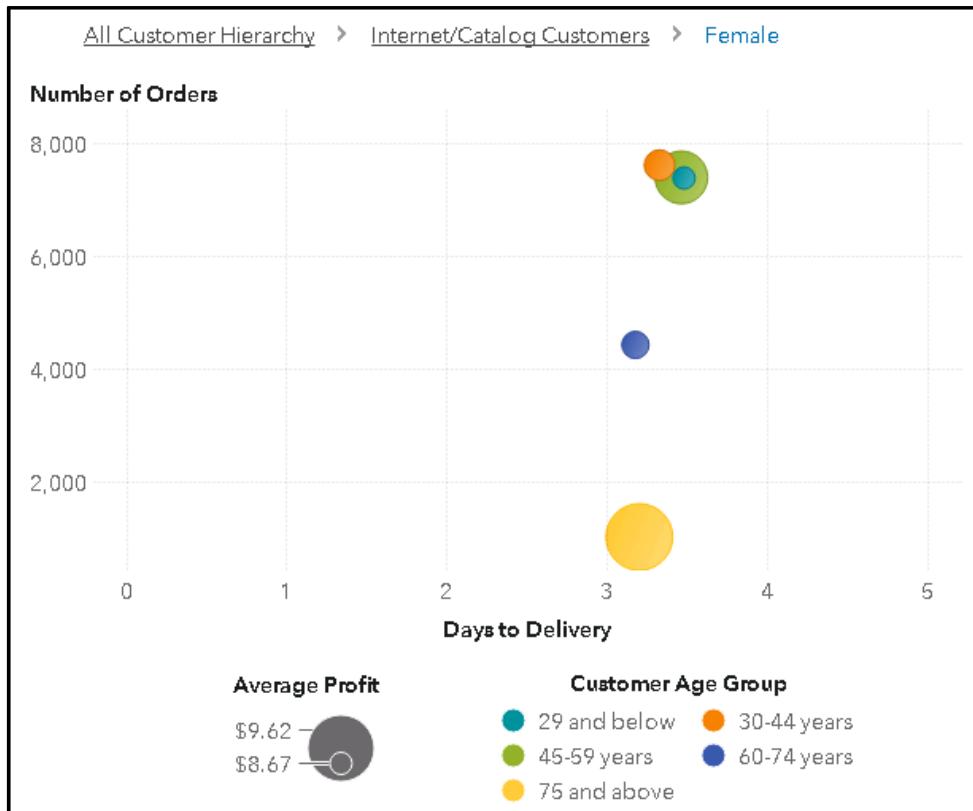


- h. In the right pane, click the **Options** icon.
- i. Expand the **X Axis Options** group.
 - 1) Select **Fixed minimum**.
 - 2) Enter **0** in the **Fixed minimum** field.
 - 3) Select **Fixed maximum**.
 - 4) Enter **5** in the **Fixed maximum** field.



- j. Double-click the **Internet/Catalog Customers** bubble.
- k. Double-click the **Female** bubble.

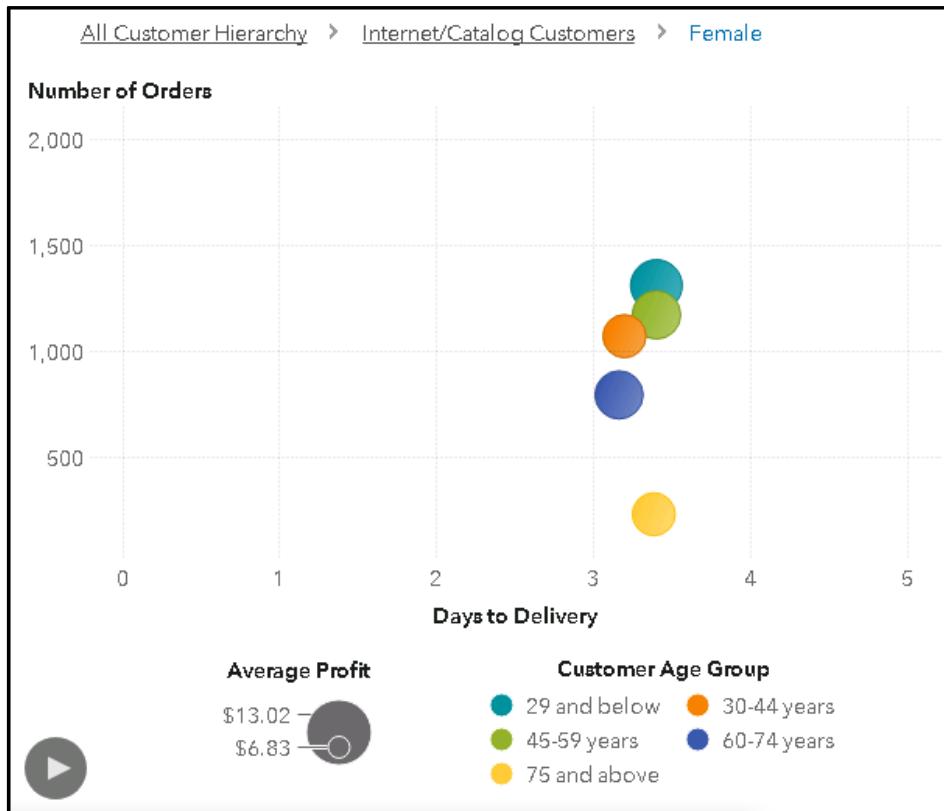
The bubble plot should resemble the following:



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 for these groups to try to increase orders.

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

The updated bubble plot should resemble the following:



- 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. The number of orders, however, has a marked increase in 2014 for customers in the 30-44 age group and 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 remain fairly constant but average profit decreases over time.

11. In the upper right corner, select (More options) \Rightarrow Save.
12. Select Eric \Rightarrow Sign Out in the upper right corner to sign out of SAS Visual Analytics.

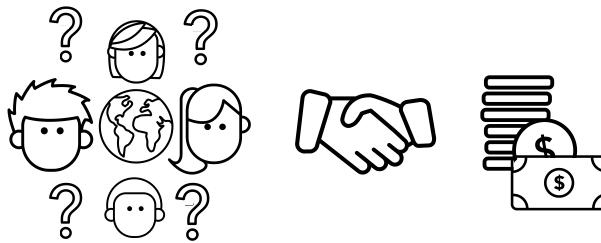
End of Demonstration

Business Scenario: Employees



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

They have asked you to identify the companies and job titles where they should begin promotions.



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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.



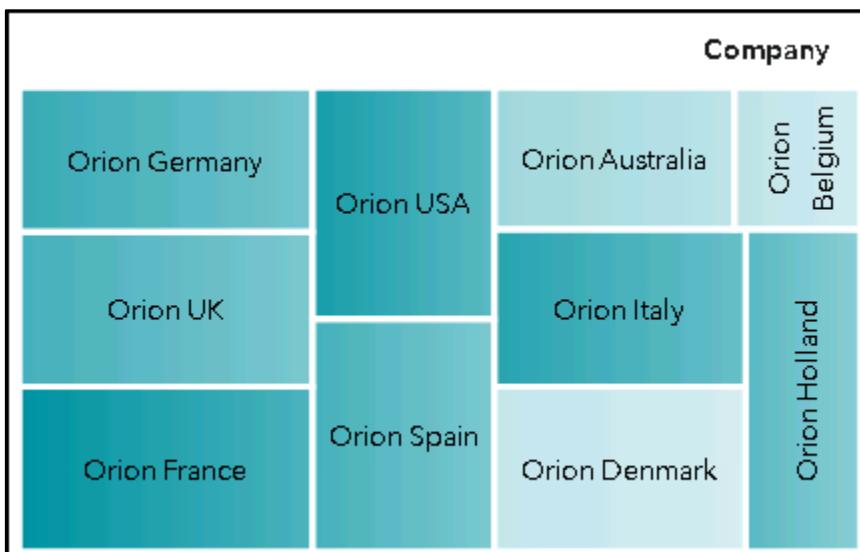
Exercises

6. Analyzing Data

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise3.4a** report from the **Shared Data/Basics/Exercises (HR)** folder.
- On Page 5, create a treemap by assigning the following data items to the specified roles:

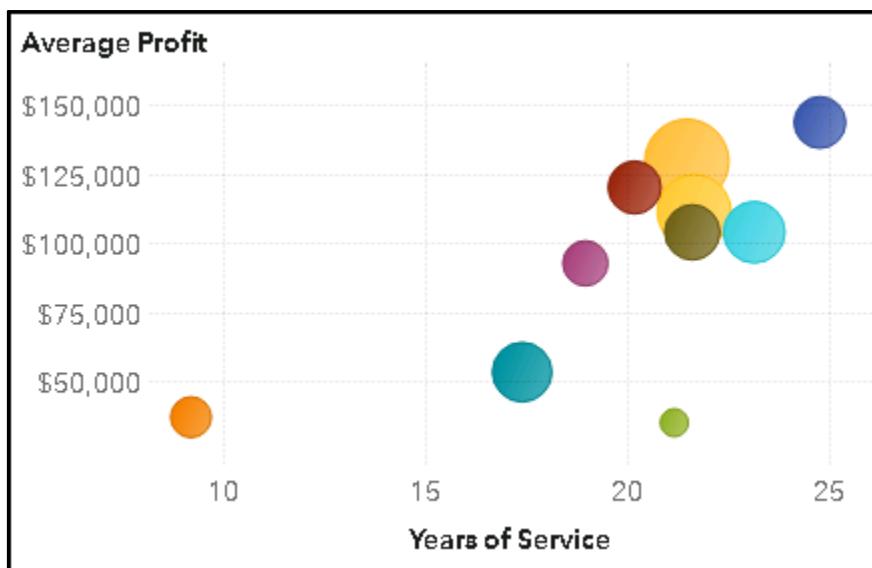
Title	Company
Size	Years of Service
Color	Average Profit
Data tip values	Number of Employees

The treemap should resemble the following:



- Change the treemap to a bubble plot and move **Company** to the **Group** role.

The bubble plot should resemble the following:



- e. Create a new hierarchy (Employee Hierarchy) that contains the following categories:
Company
Job Title
Employee Gender
- f. In the bubble plot, specify **Employee Hierarchy** for the **Group** role and navigate through the hierarchy to answer the following questions:
 Which two companies have the highest average years of service and average profit generated (the possible criteria 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: _____
- g. Save the report.
- h. Sign out of Visual Analytics.

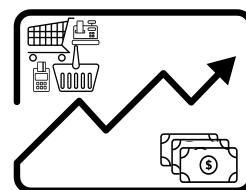
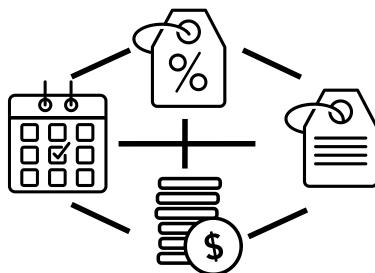
End of Exercises

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.

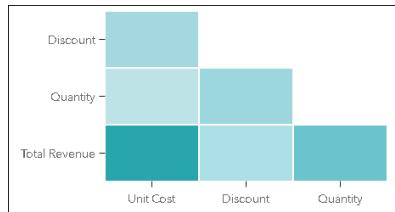
In addition, you need to determine the relationship between profits and number of orders and predict how these trends will continue in the future.



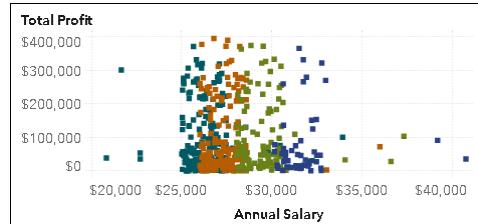
79

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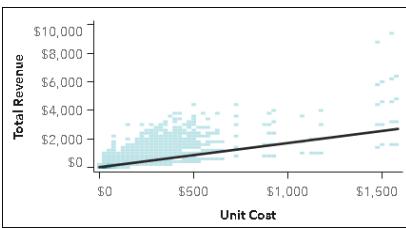
Objects: Graphs (Analysis)



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. Note: Scatter plots do not use aggregated data. Because of this, you will 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 Report Objects" in the SAS Visual Analytics 8.1 documentation.
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.
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 measures increase as well, and negative correlation values indicate that as one measure increases, the other measure decreases.

3.07 Quiz

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

What are some examples of high-cardinality data items?

What are some examples of low-cardinality data items?

Fit Lines

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

The figure displays four scatter plots with fitted curves:

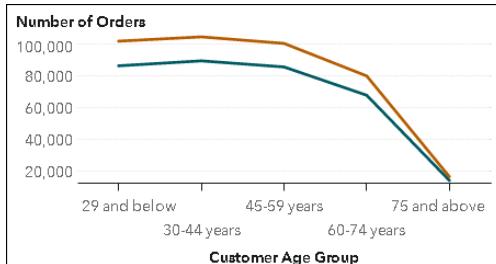
- Linear:** Shows a positive linear relationship between Cost (X-axis, \$0 to \$300) and Retail Price (Y-axis, \$0 to \$800). A straight line is fitted through the data points.
- Quadratic:** Shows a negative quadratic relationship between Engine Size (L) (X-axis, 0 to 8) and MPG (City) (Y-axis, 10 to 30). A parabolic curve is fitted, showing a peak at low engine sizes and a decline at higher sizes.
- Cubic:** Shows a cubic relationship between Years in the Major Leagues (X-axis, 0 to 25) and Log Salary (Y-axis, 4 to 8). A smooth S-shaped curve is fitted, showing a non-linear increase in salary over time.
- PSpline:** Shows a PSpline fit line (a smoothing spline) between Diastolic (X-axis, 60 to 140) and Systolic (Y-axis, 100 to 300). The line is highly curved, showing multiple inflection points and sharp turns.

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

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

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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.

Time series plot

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

Forecasting

Forecasts can be added to time series plots to show estimates of future values based on historical trends in the data.



Visual Analytics automatically selects the best forecasting model for your data.

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Adding a forecast to a time series plot adds a line in the future with predicted values and a colored band that represents the confidence interval. By default, the following models are evaluated to determine the one that best fits your data:

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

For more information about working with time series plots and forecasts, see “Working with Time Series Plots” in the SAS Visual Analytics 8.1 documentation.



Adding Data Analysis

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

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

Days to Delivery

Discount

Total Revenue

Unit Cost

- f. Click **OK**.

The Roles page should resemble the following:

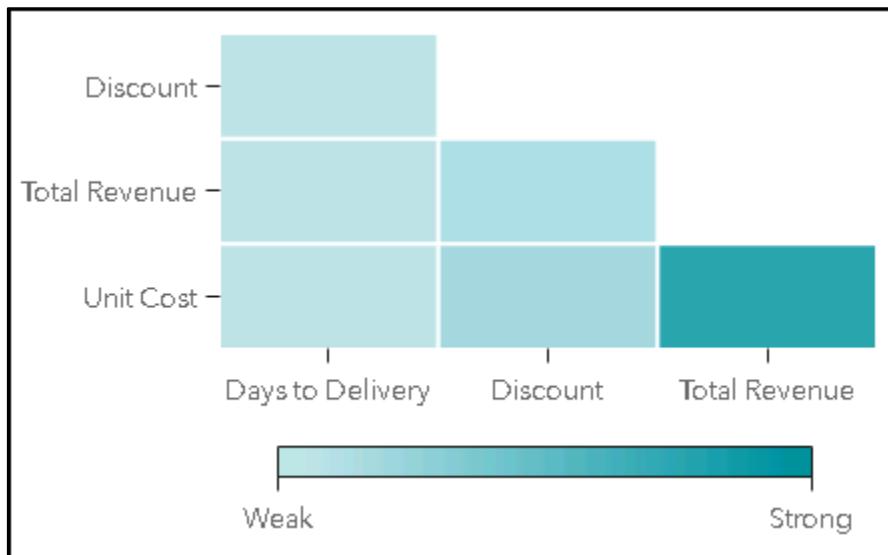
Roles

▼ **Measures**

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

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

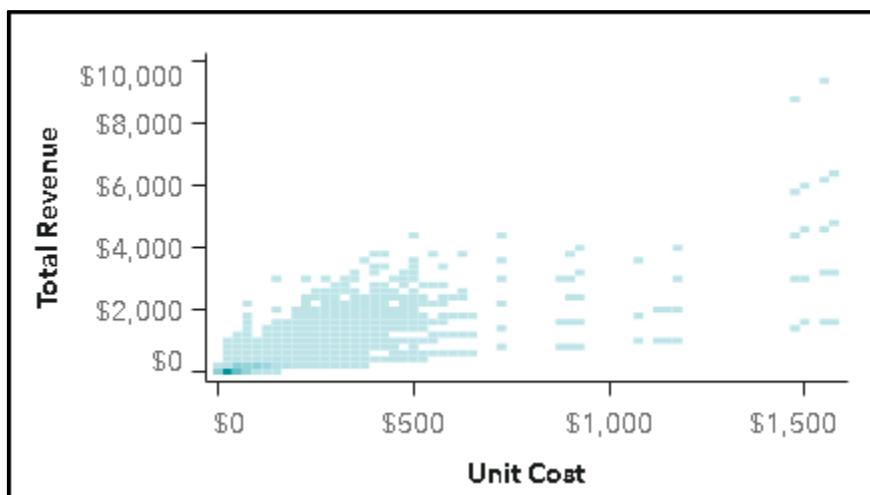
The correlation matrix should resemble the following:



There is a strong relationship between unit cost and total revenue. Placing your cursor over the cell shows a correlation of 0.7790, meaning as unit cost increases, so does total revenue. We should examine these two measures more closely to better understand the relationship.

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

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

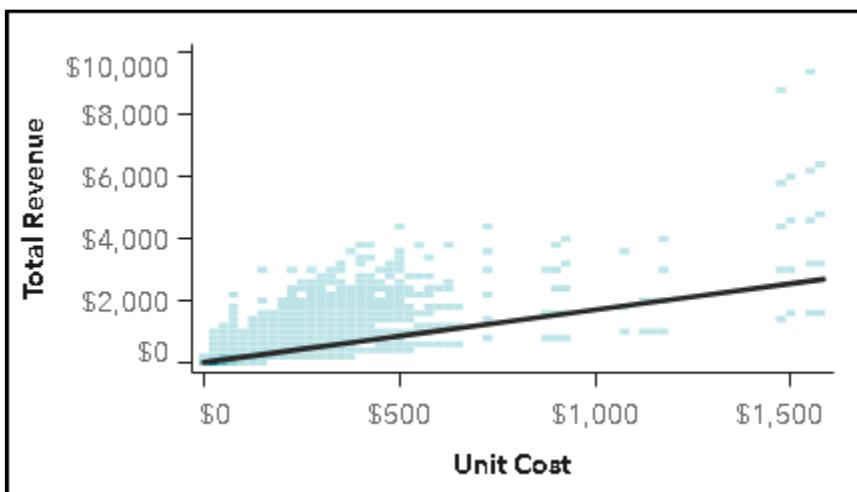


Because **Unit Cost** and **Total Revenue** are both high-cardinality data items, a heat map is used to display the relationship between the measures. For low-cardinality data items, a scatter plot would be used.

- d. In the upper right corner of the chart, select (Change Auto Chart to) \Rightarrow Use Heat Map.
- e. In the right pane, click the Options icon.
- f. In the Fit Line group, select Linear for the Type field.



The heat map should resemble the following:



- g. In the upper right corner of the heat map, select (Explore) to view additional details.
- h. 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...	
R-square value	0.6068	
Correlation	A correlation of 0.78 suggests there is a strong linear relationship b...	
Correlation help	A positive correlation value means that as one variable increases, the...	
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.

- i. In the upper left corner, click (Return to report).
10. Modify the time series plot.
 - a. Click the time series plot to make it active.
 - b. In the right pane, click the **Options** icon.
 - c. In the Time Series group, select **Automatic** for the **Binning interval** field.
 - d. Click **Show forecast**.

▼ Time Series

Show data labels

Grouping style:

Overlay unfilled

Line thickness:

3

Show markers

Binning interval:

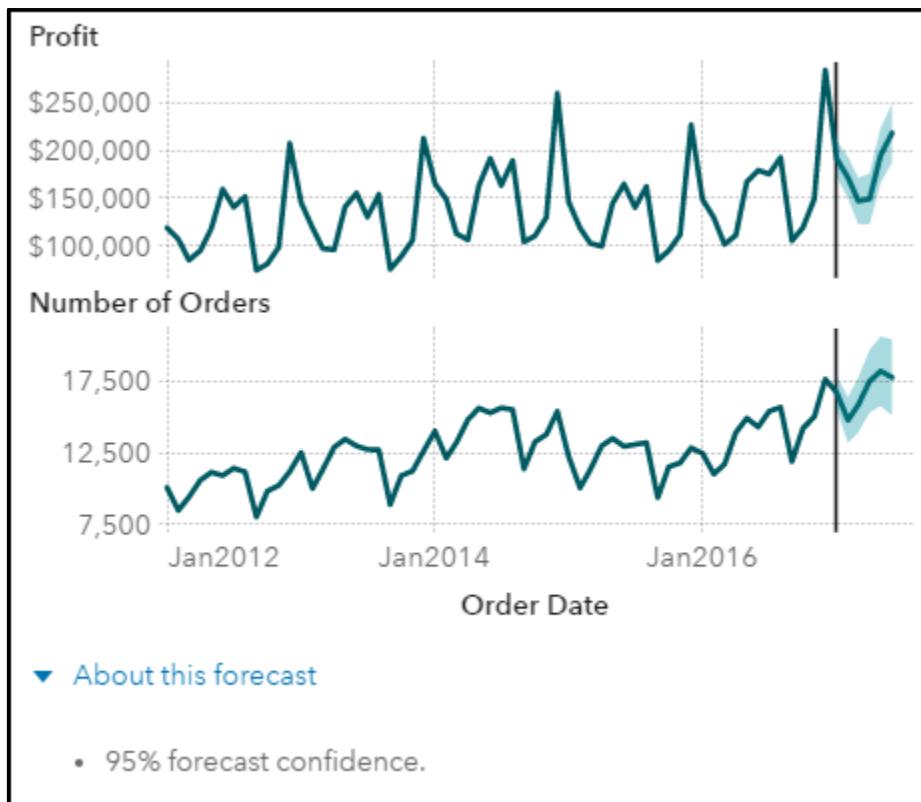
Automatic

Fixed bin count:

300

Show forecast

The time series plot should resemble the following:



We can see that profit and the number of orders are closely related; when the numbers of orders rise, so do profits. Notice, however, that orders seem to be trending up, but profits are trending up a bit more slowly. Adding a forecast shows that this trend is expected to continue in the near future.

- In the upper right corner of the heat map, select (Explore) to view additional details.
- Scroll to the bottom of the table of data values below the chart.

Results Dependent Variables Results						
Order Date	Profit	Lower Confi...	Upper Confi...	Number of Orders	Lower Confid...	Upper Confid...
Nov2010	\$147,117.20	.	.	15,000	.	.
Dec2016	\$284,648.43	.	.	17,621	.	.
Jan2017	\$191,613.12	\$172,491.30	\$210,734.95	16,709	15524.055901	17894.928613
Feb2017	\$171,522.19	\$149,610.98	\$193,433.40	14,777	13190.634585	16364.197335
Mar2017	\$146,998.65	\$122,601.04	\$171,396.25	15,842	13935.18766	17748.634255
Apr2017	\$149,128.21	\$122,462.26	\$175,794.17	17,495	15313.573459	19676.337187
May2017	\$194,887.30	\$166,119.40	\$223,655.20	18,188	15761.598744	20613.973879
Jun2017	\$218,496.70	\$187,759.06	\$249,234.35	17,765	15115.665821	20414.527299

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

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

Results	Dependent Variables Results
Dependent Variable	Algorithm
Profit	Winters Method (Additive)
Number of Orders	Winters Method (Additive)

Visual Analytics has determined that the Winters Method (Additive) algorithm best forecasts profit and number of orders. This algorithm cannot be changed.

- h. In the upper left corner, click  (**Return to report**).
11. In the upper right corner, select  (**More options**) \Rightarrow **Save**.
12. Select **Eric** \Rightarrow **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

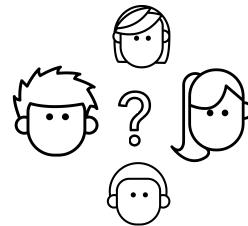
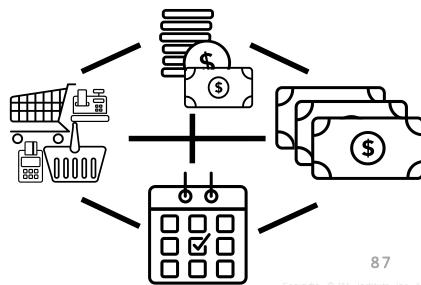
End of Demonstration

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

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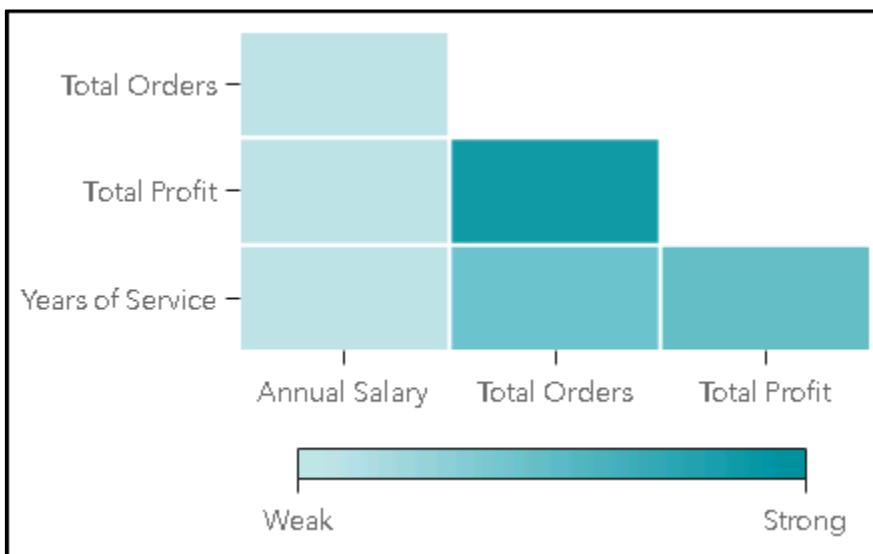
Exercises

7. Adding Data Analysis

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise3.4b** report from the **Shared Data/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:

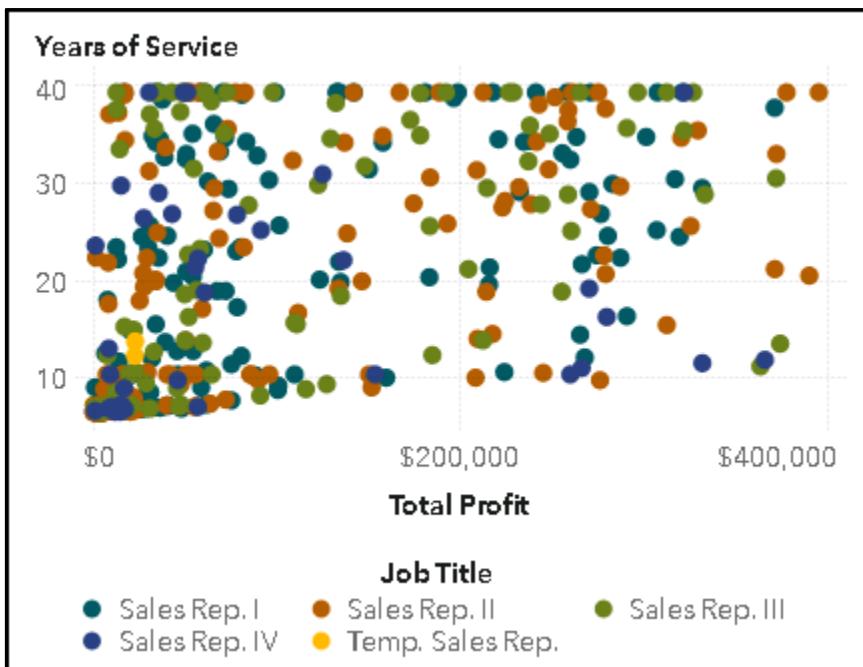
During a management meeting, it was mentioned that total orders might be a better criterion for promotion than profit generated. Do you agree?

Answer: _____

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

Measures	Total Profit
	Years of Service
Color	Job Title

The scatter plot should resemble the following:

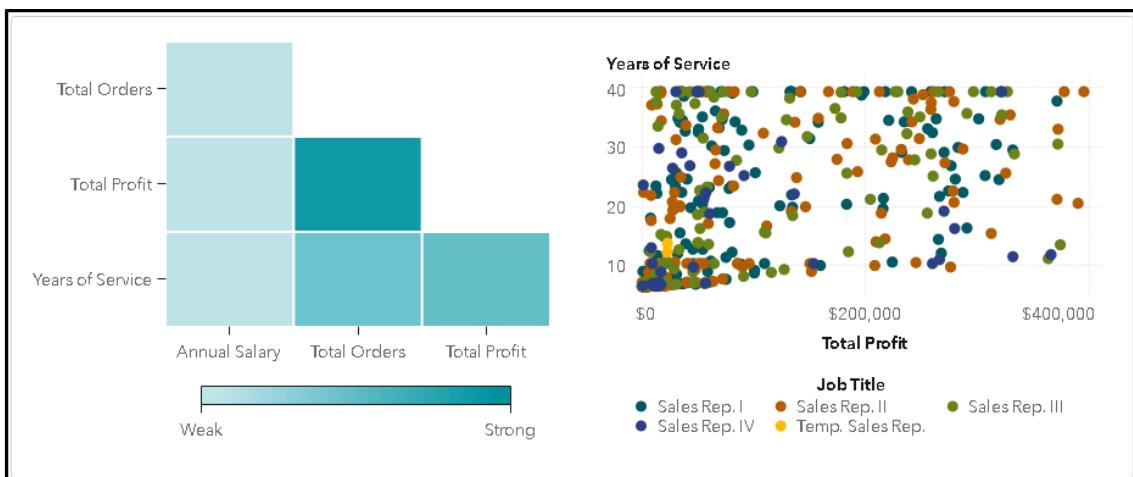


- f. Answer the following question:

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

Answer: _____

Page 6 should resemble the following:



- g. Save the report.
h. Sign out of Visual Analytics.

End of Exercises

3.5 Solutions

Solutions to Exercises

1. Working with Data Items

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- b. Open the **VA1- Exercise3.1** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) In the Open window, navigate to the **Shared Data/Basics/Exercises (HR)** folder.
 - 4) Double-click **VA1- Exercise3.1** to open the report.

- c. If necessary, click the **Data** icon in the left pane.

The screenshot shows the Data pane with two main sections: **Category** and **Measure**.

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

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.

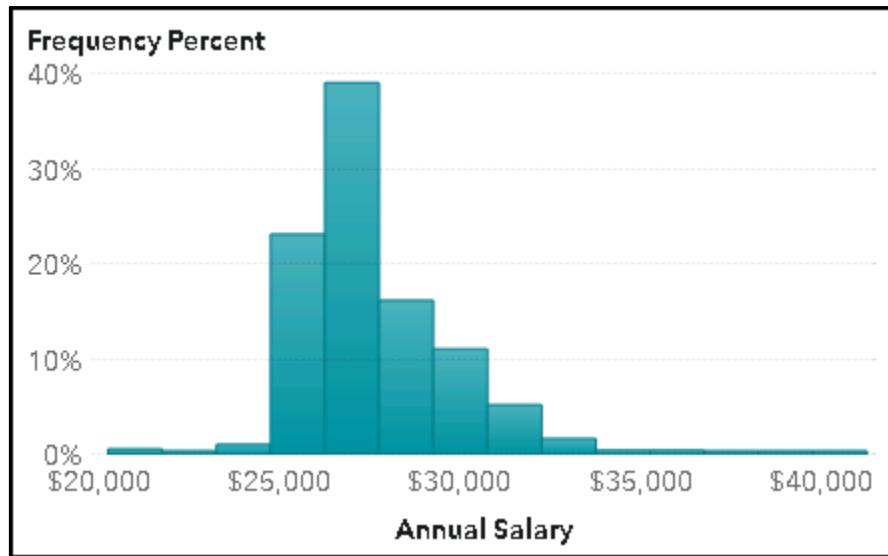
- 1) In the Measure group, click (Edit properties) next to **Annual Salary**.
- 2) Click **Dollar** for the **Format** field.
- 3) In the Format window, verify that **13** is specified for the **Width** field.
- 4) Enter **2** for the **Decimals** field.

- 5) 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) If necessary, click  (Refresh data source) at the top of the Data pane to apply the name change to Frequency
- g. In the upper right corner, select  (More options) \Rightarrow **Save** to save the report.
- h. Select **Eric** \Rightarrow **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.
- 2. Exploring Data: Part 1**
- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
 - b. Open the **VA1- Exercise3.2a** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Exercises (HR)** folder.
 - 4) Double-click **VA1- Exercise3.2a** to open the report.
 - c. Create an automatic chart.
 - 1) In the right pane, click the **Data** icon.
 - 2) Click the following data items to select them:

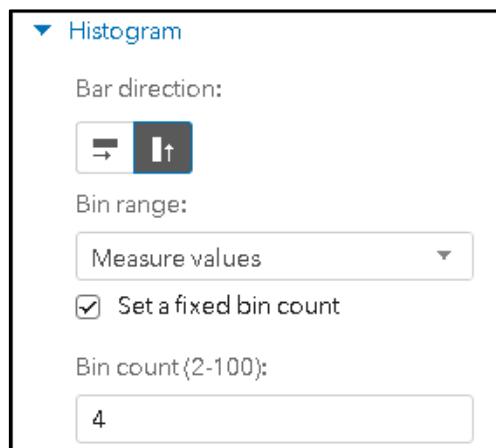
Annual Salary

Frequency Percent
 - 3) Click  next to the data items and drag them to the canvas.

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

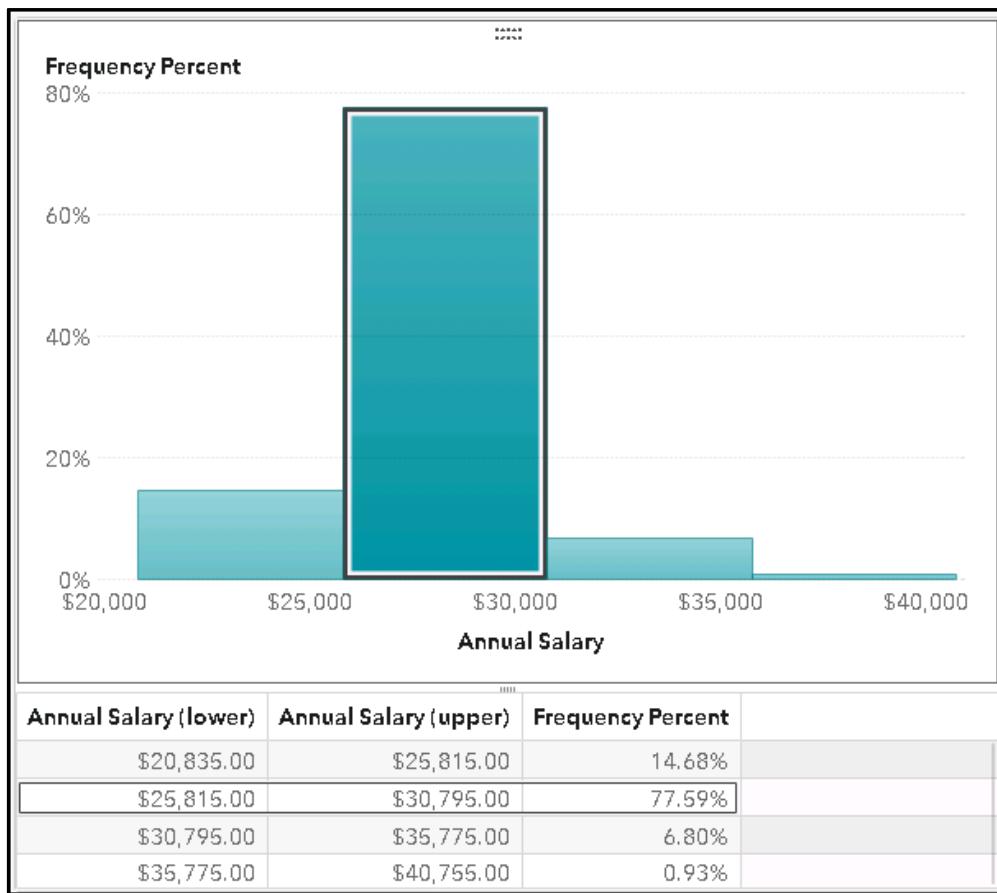


- d. Modify the options for the automatic chart.
 - 1) In the right pane, click the **Options** icon.
 - 2) If necessary, expand the **General** group.
 - 3) Enter **Distribution of Salary** in the **Name** field.
 - 4) In the Histogram group, select **Measure values** for the **Bin range** field.
 -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



- e. Use Explore mode to answer the question.
 - 1) In the upper right corner of the chart, select to view additional details. In Explore mode, a table of data values is displayed at the bottom of the chart.

- 2) Click the highest bar in the graph.

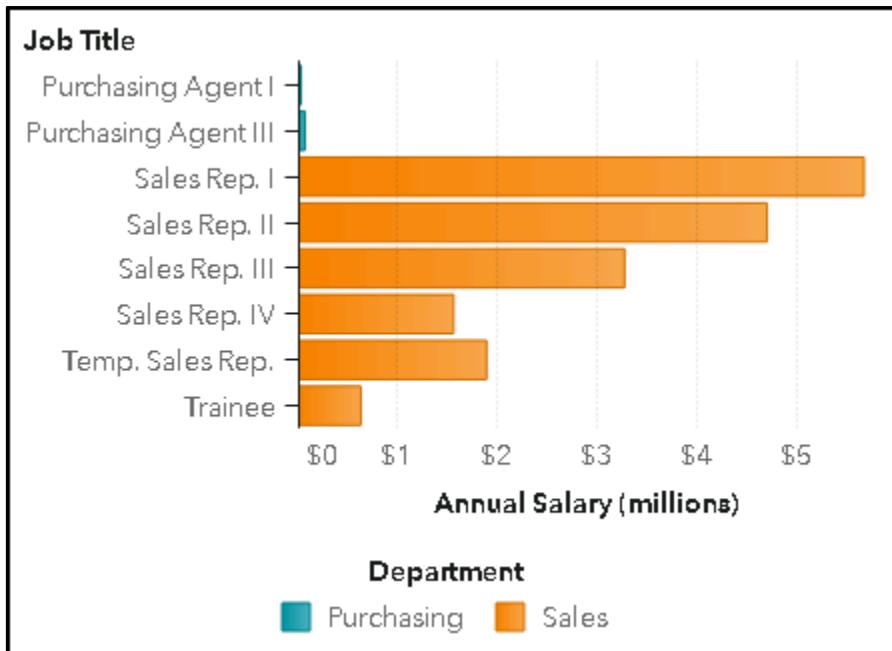


Into which range do a majority of salaries fall?

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

- 3) In the upper left corner, click (**Return to report**).
- 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 **General** 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, we can assume there are more employees with this job title.

- i. In the upper right corner, select (More options) \Rightarrow **Save** to save the report.
- j. Select **Eric** \Rightarrow **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

3. Exploring Data: Part 2

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

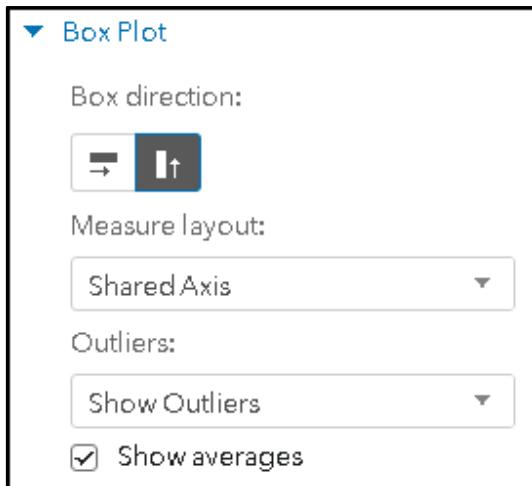
- b. Open the **VA1- Exercise3.2b** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Exercises (HR)** folder.
 - 4) Double-click **VA1- Exercise3.2b** to open the report.
- c. On Page 2, create a box plot.
 - 1) In the upper left corner of the report, click the **Page 2** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Box Plot** object from the Graphs group to the canvas.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the **Category** role, select **Add** \Rightarrow **Job Title**.
 - 6) For the **Measures** role, select **Add** \Rightarrow **Annual Salary** and click **OK**.

The box plot should resemble the following:



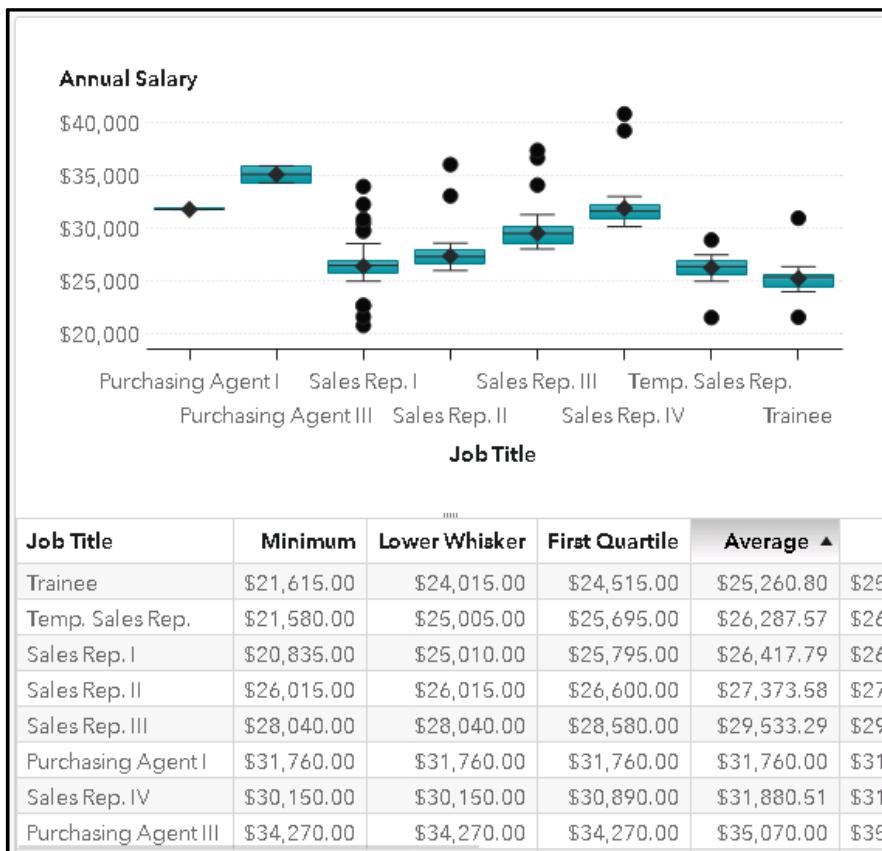
- d. Modify the options for the box plot.
 - 1) In the right pane, click the **Options** icon.
 - 2) If necessary, expand the **General** section.
 - 3) Enter **Salary Analysis by Job Title** in the **Name** field.
 - 4) In the Box Plot group, select **Show Outliers** for the **Outliers** field.
 - 5)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

The Options pane should resemble the following:



e. Use Explore mode to answer the questions.

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



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**, because that job title most likely has the largest number of employees and because 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 left corner, click  (Return to report).
 - f. In the upper right corner, select  (More options) \Rightarrow **Save** to save the report.
 - g. Select **Eric** \Rightarrow **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.
- #### 4. Creating Data Items
- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
 - b. Open the **VA1- Exercise3.3a** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Human Resources** folder.
 - 4) Double-click **VA1- Exercise3.3a** to open the report.
 - c. Create a new data item, **Employee Status**.
 - 1) In the left pane, click the **Data** icon.
 - 2) In the Data pane, select **Add** \Rightarrow **Add custom category**.
 - 3) In the Add Custom Category window, enter **Employee Status** in the **Name** field.
 - 4) Select **Employee Termination Date** in the **Based on** field.
 - 5) Right-click **Value Group 1** and select **Edit group name**.
 - a) Enter **Active** in the **Name** field.
 - b) Click **OK**.
 - c) Drag **.** (missing value) from the left pane to the **Drag values here** area on the right.
 - 6) In the Remaining Values area, enter **Retired** in the **Group as** field.
 - 7) Click **OK** to create the new calculated data item.

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

Category

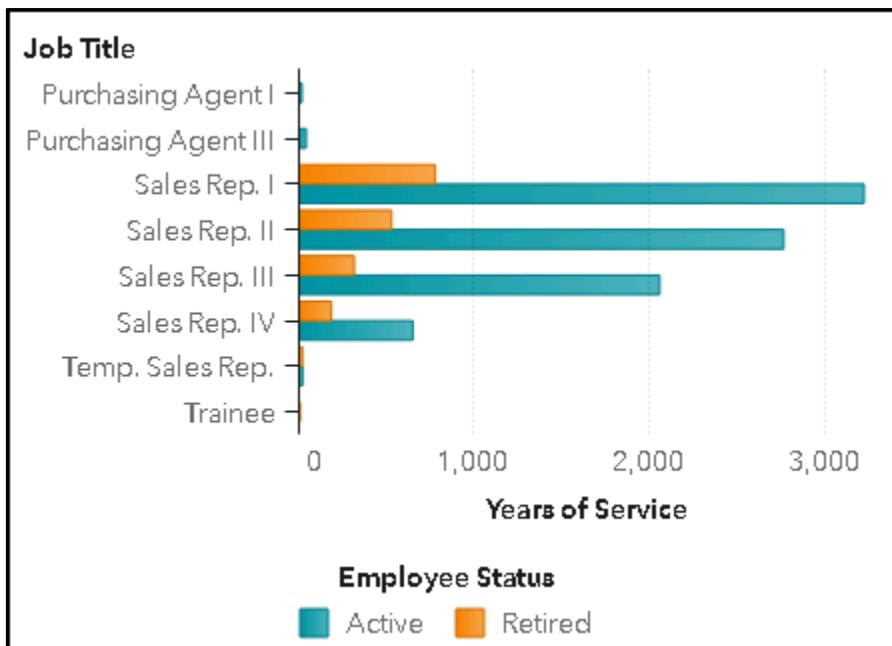
- Anniversary Month - 12
- Company - 11
- Department - 2
- Employee Country - 10
- Employee Gender - 2
- Employee Hire Date - 239
- Employee Status - 2

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



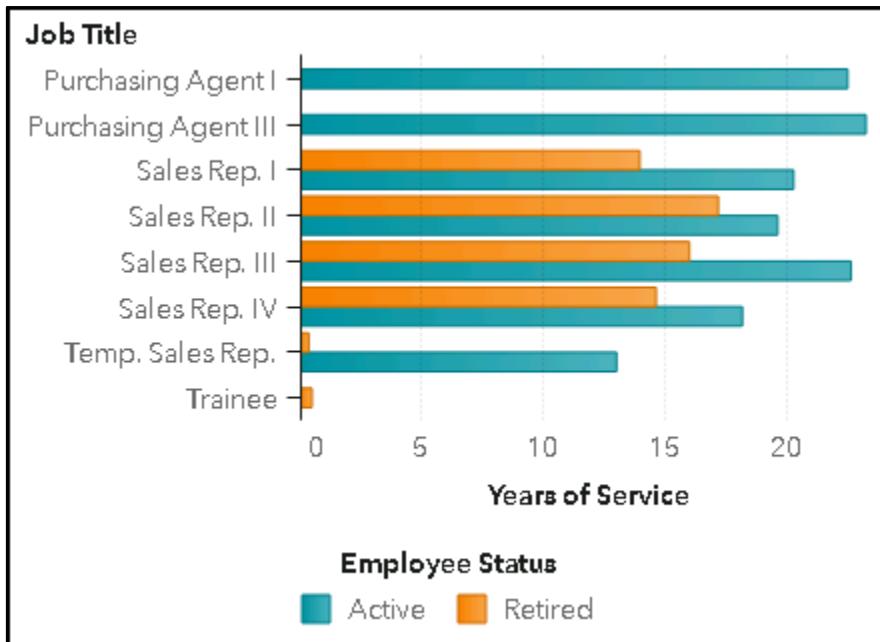
- d. On Page 3, create a bar chart.
 - 1) In the upper left corner of the report, click the **Page 3** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Bar Chart** object, from the Graphs group, to the canvas.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the **Category** 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 **General** 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 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. In the upper right corner, select (More options) \Rightarrow Save to save the report.
- i. Select Eric \Rightarrow Sign Out in the upper right corner to sign out of SAS Visual Analytics.

5. Applying Filters

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- b. Open the **VA1- Exercise3.3b** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Human Resources** folder.
 - 4) Double-click **VA1- Exercise3.3b** to open the report.

- c. Add a data source filter to filter for active employees in the Sales Department.
- 1) In the left pane, click the **Data** icon.
 - 2) In the Data pane, click  (Add data source filter).
 - 3) Click **Operators** on the left.
 - 4) Expand **Boolean**.
 - 5) Double-click **AND** to add it to the expression.
 - 6) On the left, click **Data Items**.
 - 7) Expand **Character**.
 - 8) Select **Employee Status**.
 - 9) In the Conditions area, double-click **Employee Status = 'x'** to add it to the first condition in the expression area.
 - 10) Enter **Active** as the string for the first condition.
 - 11) In the Character group, select **Department**.
 - 12) In the Conditions area, double-click **Department = 'x'** to add it to the second condition in the expression area.
 - 13) Enter **Sales** as the string for the second condition.

The expression should resemble the following:



- 14) In the upper right corner, click  (Preview result).
- 15) Scroll down to the bottom of the list.

Preview Result		
Number of rows to show:	50	Total matching observations: 429
Data Source Filter	Employee Type	Department
False	Retired	Sales

- 16) Click **Close** to close the preview.
- 17) Click **OK** to apply the data source filter.

The Data pane should resemble the following:

The screenshot shows the Data pane with a list of categories. The 'Category' section is expanded, displaying the following items:

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

- d. Change the classification for **Employee Country** to Geography ⇔ 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.
 - 4) In the Geography Classification for Employee Country window, select **Country or Region ISO 2-Letter Codes** for the **Geography** field.

The screenshot shows the 'Geography Classification for Employee Country' dialog box. It has a title bar with the text 'Geography Classification for Employee Country'. Below the title bar, there is a 'Geography:' label followed by a dropdown menu containing the text 'Country or Region ISO 2-Letter Codes'.

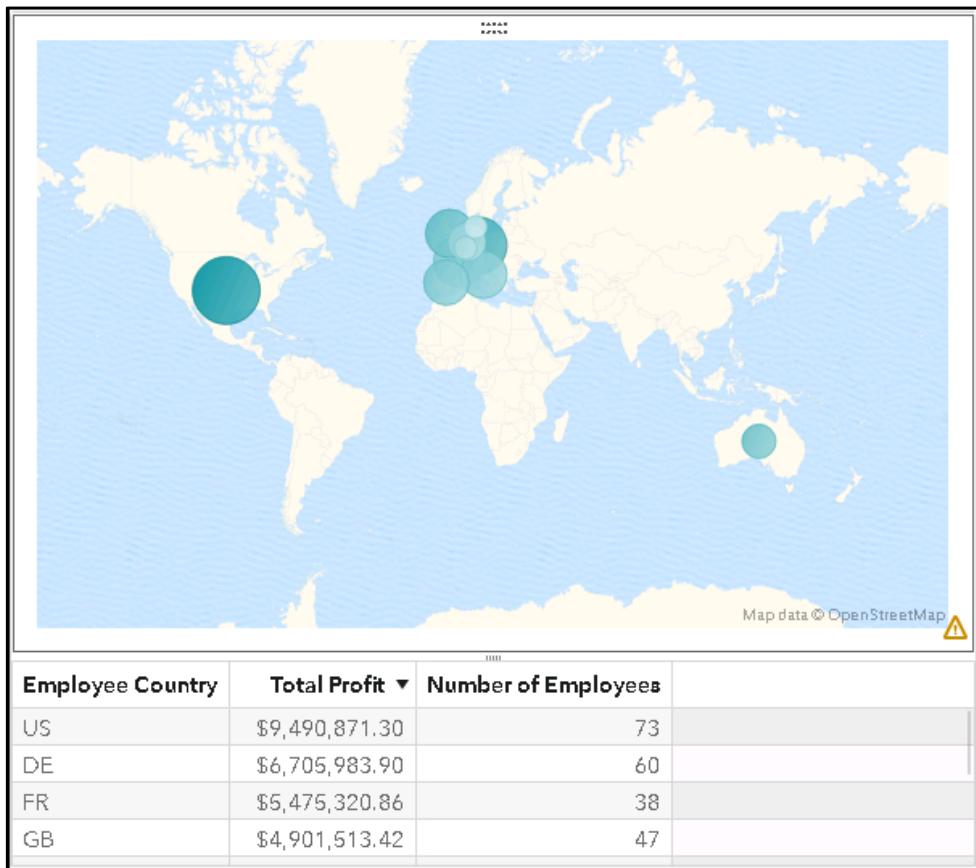
- 5) Click **OK**.
- A new group, **Geography**, is added to the Data pane.

The screenshot shows the Data pane with the 'Geography' group expanded. It contains one item:

- ▼ Geography
- Employee Country - 10

- e. On Page 4, create a geo map.
 - 1) In the upper left corner of the report, click the **Page 4** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Geo Map** object, from the Graphs group, to the right side of 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. Use Explore mode to answer the question.
 - 1) In the upper right corner of the chart, select  \Rightarrow  (**Explore**) to view additional details.
 - 2) In the detail data, click **Total Profit** twice to sort by that column in descending order.



- 3) Answer the question.

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 companies, which could explain the higher profits.**

- 4) In the upper left corner, click  (**Return to report**).
- g. Modify the roles 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.

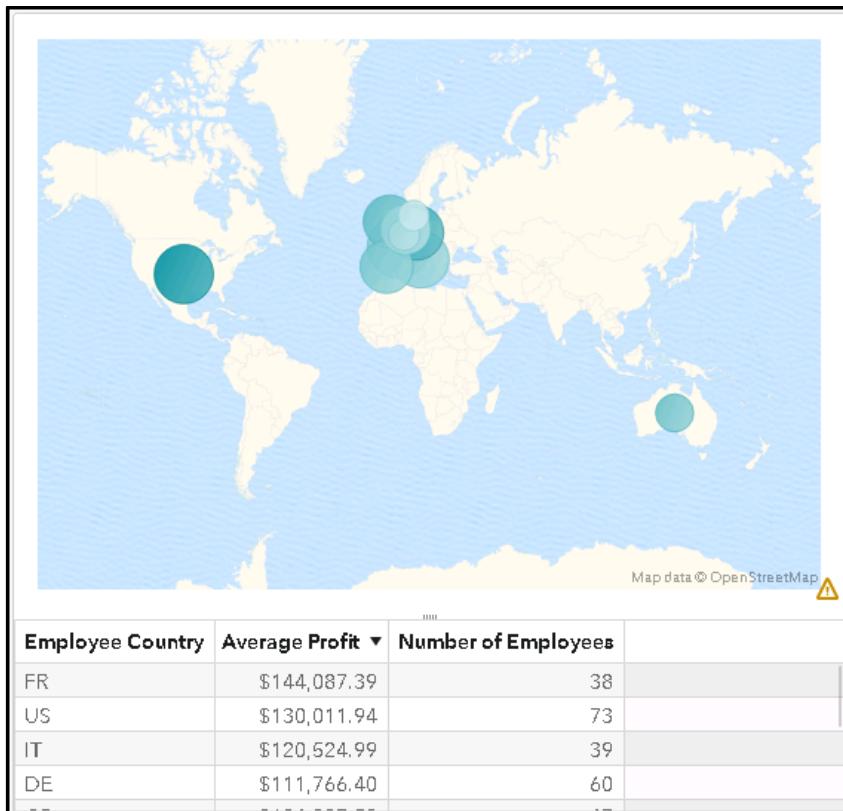
2) If necessary, expand the **General** section.

3) Enter **Average Profit and Number of Employees by Country** in the **Name** field.

i. Use Explore mode to answer the question.

1) In the upper right corner of the chart, select  (Explore) 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 company would you recommend starting the promotion analysis 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 left corner, click  (Return to report).

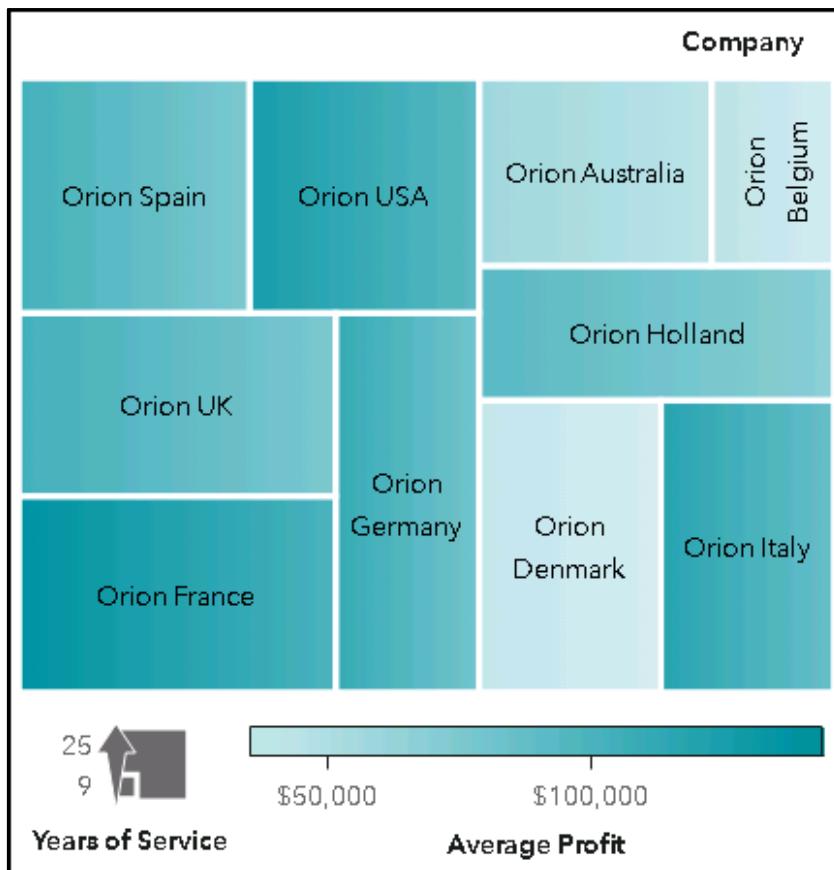
j. In the upper right corner, select  (More options) ▷ Save to save the report.

k. Select **Eric** ▷ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

6. Analyzing Data

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- b. Open the **VA1- Exercise3.4a** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Human Resources** folder.
 - 4) Double-click **VA1- Exercise3.4a** to open the report.
- c. On Page 5, create a treemap.
 - 1) In the upper left corner of the report, click the **Page 5** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Treemap** object, from the Graphs group, to the canvas.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the **Tile** role, select **Add** \Rightarrow **Company**.
 - 6) For the **Size** role, select **Number of Employees** \Rightarrow **Years of Service**.
 - 7) For the **Color** role, select **Add** \Rightarrow **Average Profit**.
 - 8) For the **Data tip values** role, select **Add** \Rightarrow **Number of Employees** and click **OK**.

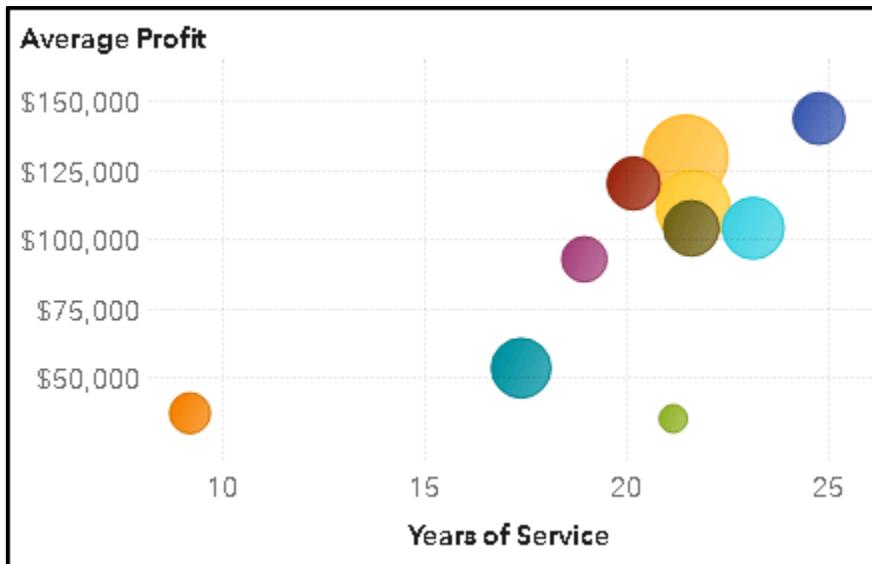
The treemap should resemble the following:



- d. Change the treemap to a bubble plot and modify the roles.

- 1) In the upper right corner of the chart, select (Change Treemap to) \Rightarrow More.
- 2) In the Select a New Type window, select **Bubble Plot**.
- 3) If necessary, click the **Roles** icon in the right pane.
- 4) Move **Company** from the **Color** role to the **Group** role.

The bubble plot should resemble the following:



- e. Create a new hierarchy (Employee Hierarchy).
 - 1) In the left pane, click the **Data** icon.
 - 2) In the Data pane, select **Add** \Rightarrow **Add hierarchy**.
 - 3) In the Add Hierarchy window, enter **Employee Hierarchy** in the **Name** field.
 - 4) Double-click the following data items, in the specified order, in the Available items list to move them to the Selected items list:

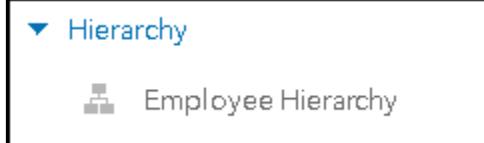
Company

Job Title

Employee Gender

- 5) Click **OK** to create the hierarchy.

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



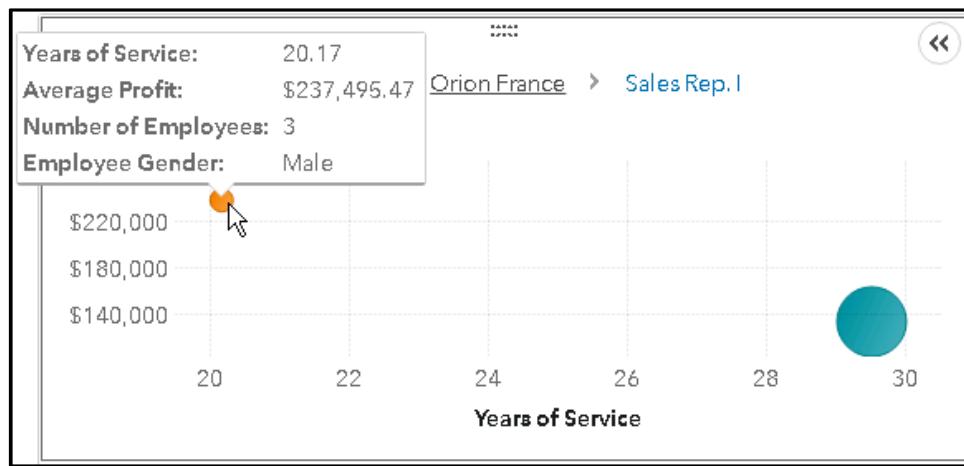
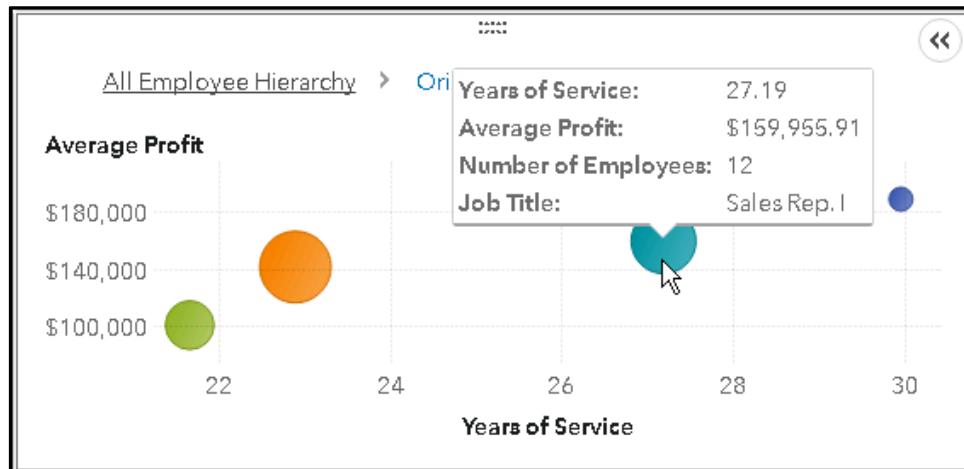
- f. Modify the roles in the bubble plot and answer the questions.
 - 1) If necessary, select the bubble plot.
 - 2) In the right pane, click the **Roles** icon.
 - 3) For the **Group** role, select **Company** \Rightarrow **Employee Hierarchy**.
 - 4) Answer the questions.

Which two companies have the highest average years of service and average profit generated (the possible criteria for promotion)?

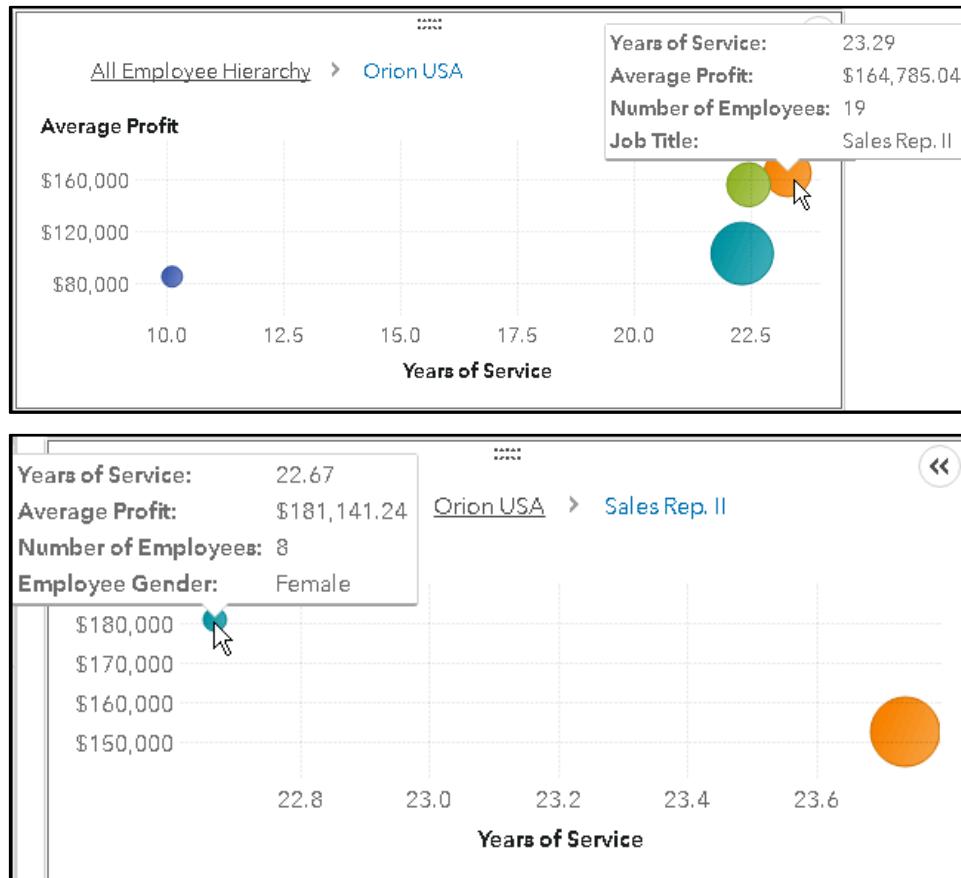
Answer: Orion France and Orion USA have the highest years of service and average profit generated.

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, Sales Rep. I jobs have the highest average years of service and the highest profit per employee among the jobs with the most number of employees. For Sales Rep. I, males have higher profit per employee but fewer years of service and fewer employees.



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



- g. In the upper right corner, select (More options) \Rightarrow Save to save the report.
- h. Select Eric \Rightarrow Sign Out in the upper right corner to sign out of SAS Visual Analytics.

7. Adding Data Analysis

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- b. Open the **VA1- Exercise3.4b** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Human Resources** folder.

- 4) Double-click **VA1- Exercise 3.4b** to open the report.
- c. On Page 6, create a correlation matrix.
- 1) In the upper left corner of the report, click the **Page 6** tab.
 - 2) In the left pane, click the **Objects** icon.
 - 3) Drag the **Correlation Matrix** object, from the Graphs group, to the canvas.
 - 4) In the right pane, click the **Roles** icon.
 - 5) For the **Measures** role, click **Add**.
 - 6) In the Add Data Items window, select the following measures:

Annual Salary

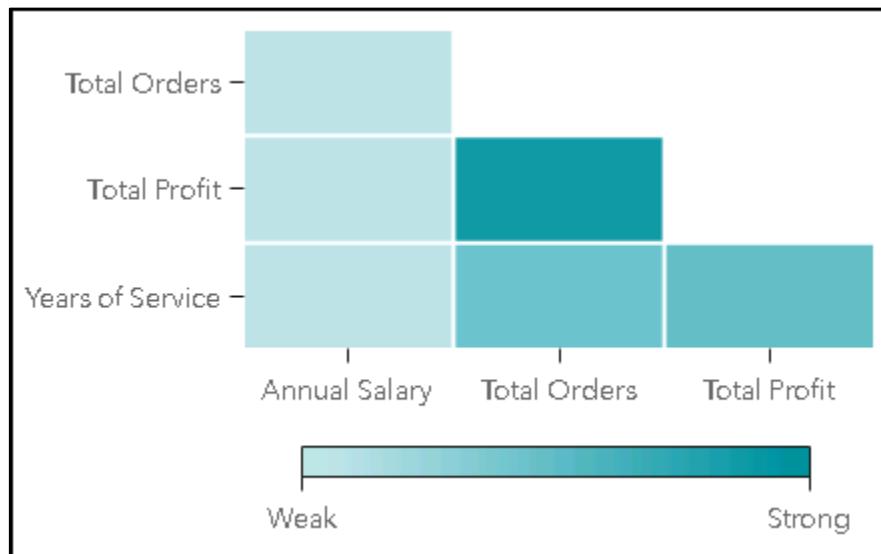
Total Orders

Total Profit

Years of Service

- 7) Click **OK**.

The correlation matrix should resemble the following:



- d. Answer the question.

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

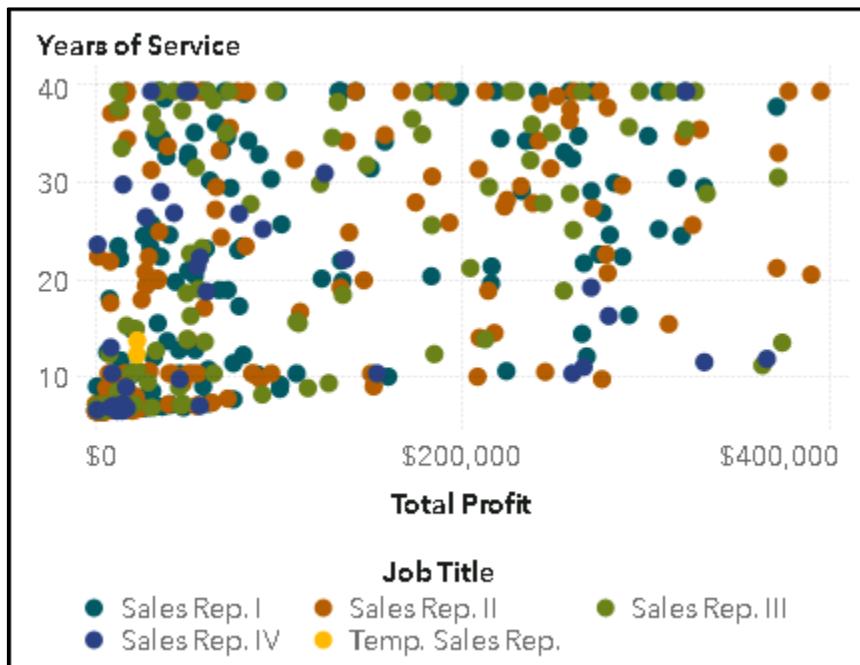
Answer: Looking at the correlation matrix, Total Profit and Total Orders are highly correlated (0.8783), so either measure would be appropriate for promotion criteria.

- e. Create a scatter plot.

- 1) In the left pane, click the **Objects** icon.
- 2) Drag the **Scatter Plot** object, from the Graphs group, to the right side of the canvas.
- 3) In the right pane, click the **Roles** icon.
- 4) For the **Measures** role, click **Add**.

- 5) In the Add Data Items window, select **Total Profit** and **Years of Service** and click **OK**.
- 6) For the **Color** role, select **Add \Rightarrow Job Title**.

The scatter plot should resemble the following:



- f. Answer the question.

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

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

- g. In the upper right corner, select **(More options) \Rightarrow Save** to save the report.
- h. Select **Eric \Rightarrow Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

End of Solutions

Solutions to Student Activities (Polls/Quizzes)

3.01 Multiple Choice Poll – 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

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3.02 Quiz – 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)

A State Abbreviations (uppercase)

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3.03 Quiz – 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 Date ▲
01Jan1938
02Jan1938
03Jan1938
04Jan1938
05Jan1938
06Jan1938
07Jan1938
08Jan1938
09Jan1938
10Jan1938
11Jan1938
12Jan1938

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3.04 Multiple Choice Poll – Correct Answer

Which operator enables a numeric or datetime value to be used as a different type for the calculation?

- a. Format
- b. ChangeType
- c. TreatAs
- d. Informat

45

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3.05 Quiz – 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:

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

Retired employees:

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

Employee Hire Date	Employee Termination Date
01Apr2005	31Jan2010
01Jul1991	.
01Jan1978	.
01Apr2010	.
01Dec2006	30Sep2008
01Aug1978	.
01Jan2007	30Jun2007
01Jan2007	30Jun2007
01Jan2007	30Jun2007

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

3.06 Multiple Answer Poll – Correct Answer

Which graph 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.

3.07 Quiz – 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 or data 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

Exercise Review

3.1 Working with Data Items – Solution

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

View the data items in the Data pane and answer the following questions:

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

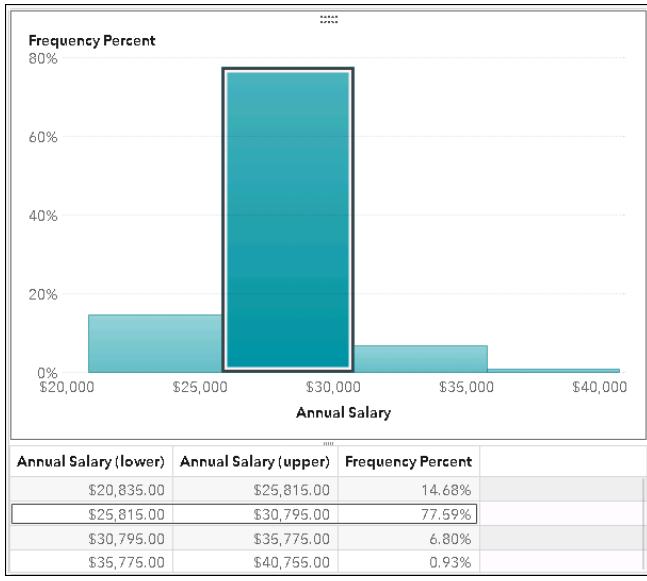
Employee_ID has a classification of category.

Manager at 1. level has a classification of measure.

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

Frequency represents the number of employees.

3.2 Exploring Data: Part 1 – Solution



Use Explore mode to answer the following question:

Into which range do a majority of salaries fall?

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



3.2 Exploring Data: Part 1 – Solution

View the bar chart and answer the following questions:

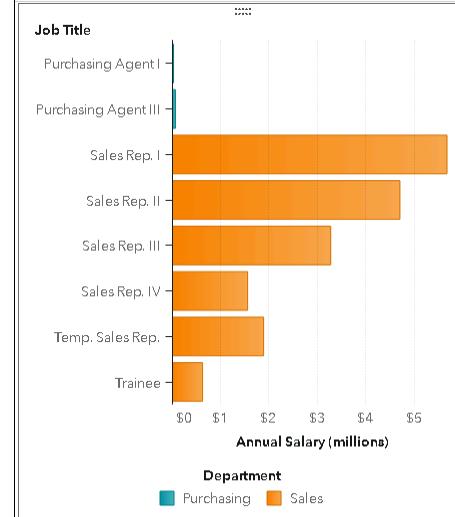
In which department are a majority of our salary costs spent? For which job title?

Sales department

Sales Rep. I job title

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

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



3.3 Exploring Data: Part 2 – Solution



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

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

Purchasing Agent III has the highest (\$35,070.00).

Trainee has the lowest (\$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?

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

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"
  
```

3.4 Creating Data Items – Solution



View the bar chart and 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?

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.

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3.5 Applying Filters – Solution

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

Data source filter

```

AND
  ( Employee Status = "Active" )
  ( Department = "Sales" )

```

▼ Category

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



64



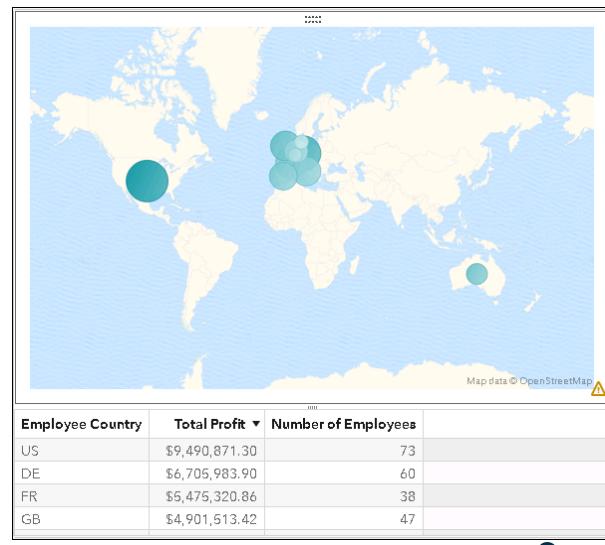
3.5 Applying Filters – Solution

Use Explore mode to answer the following question:

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?

United States (\$9,490,871.30) and Germany (\$6,705,983.90)

These countries have more employees, which could explain the higher profits.



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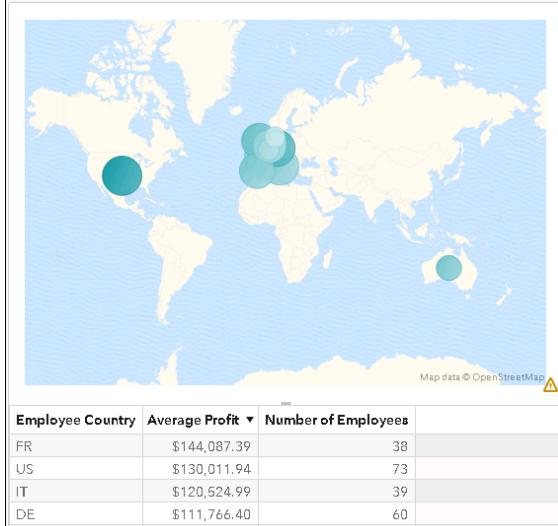
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3.5 Applying Filters – Solution

Use Explore mode to answer the following question:

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

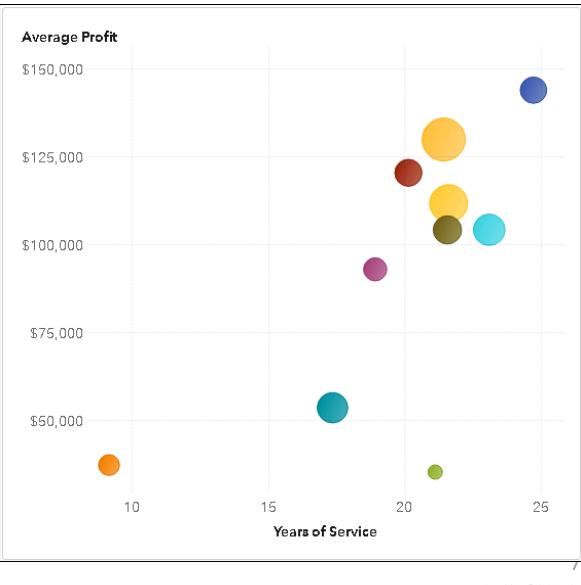
United States, because although France has the highest average profit, they also have about half the number of employees as the United States.



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3.6 Analyzing Data – Solution



View the bubble plot to answer the following questions:

Which two companies have the highest average years of service and average profit generated (the possible criteria for promotion)?

Orion France and Orion USA



3.6 Analyzing Data – Solution

View the bubble plot and answer the following questions:

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 jobs have the highest average years of service and the highest profit per employee among the jobs with the most number of employees.

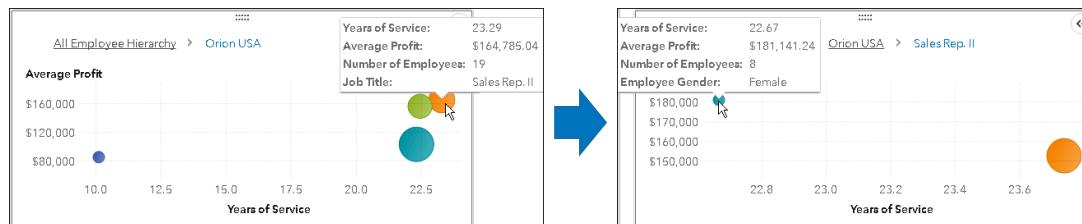


3.6 Analyzing Data – Solution

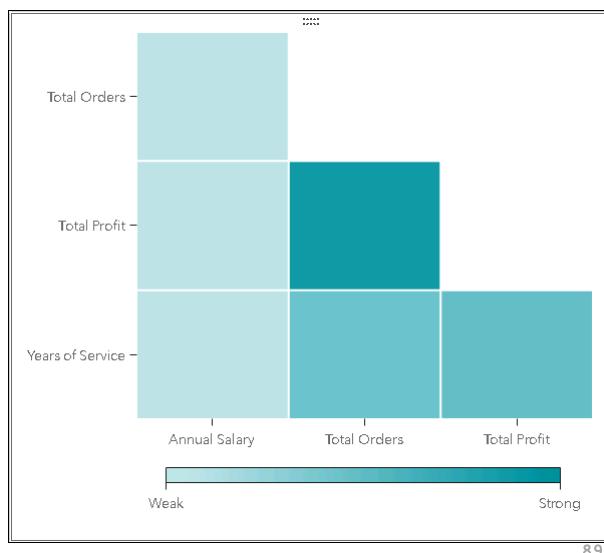
View the bubble plot and answer the following questions:

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 average years of service and the highest profit per employee.



3.7 Adding Data Analysis – Solution



View the correlation matrix and answer the following questions:

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.

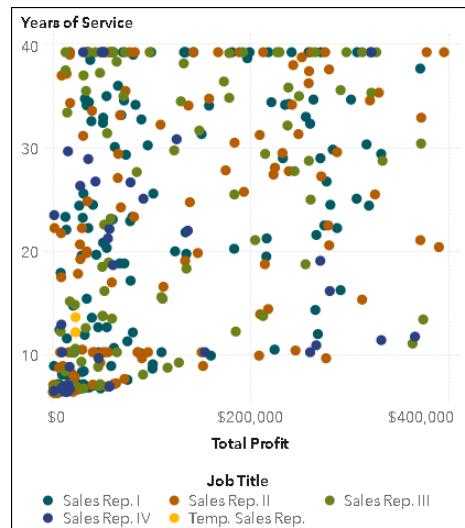
3.7 Adding Data Analysis – Solution

View the scatter plot and answer the following question:

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.



Sas.

Chapter 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
- Gauges



4





For more information about how to create effective reports, see <http://support.sas.com/rnd/report-design-best-practice/index.html>.

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.

ORION STAR
Sports & Outdoors

sas

Objects: Graphs (Reporting)

Utrecht 's-Gravenhage Milano Hamburg Madrid
München Amsterdam Roma Barcelona Stuttgart
Torino Roma Barcelona Berlin Köln Paris
Paris la Défense Düsseldorf Frankfurt am Main Brooklyn

Use a **word cloud** to show a general glimpse of summary information in an appealing fashion.

Profit

\$2,080,349.57

OrderType	Value
Retail Sale	Large Segment (Teal)
Catalog Sale	Medium Segment (Orange)
Internet Sale	Small Segment (Green)

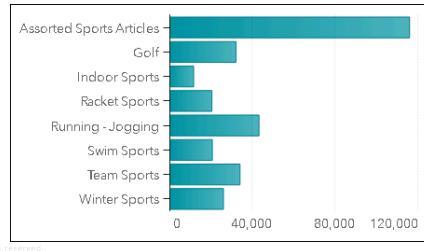
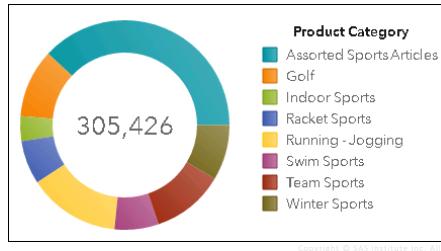
Use a **pie chart** to compare a few groups whose values vary greatly.

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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: In Visual Analytics, the default pie chart is a donut chart (a pie chart with a hole in the center). 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).
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.

4.01 Quiz

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?



4.02 Multiple Choice Poll

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

- a. bubble plot
- b. pie chart
- c. bar chart
- d. treemap

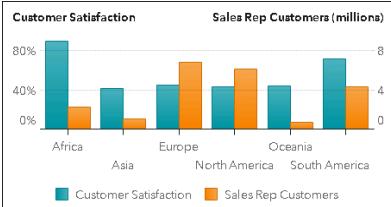
Continent	▲	Profit
Africa		(\$127.68)
Asia		\$15,503.70
Europe		\$5,659,450.59
North America		\$2,121,645.56
Oceania		\$462,934.64



Objects: Graphs (Dual Axis)

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

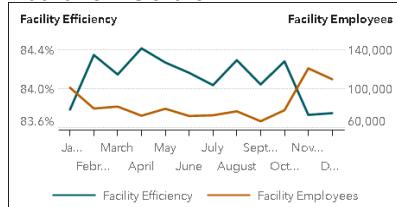
Dual axis bar chart



Dual axis bar-line chart



Dual axis line chart



Dual axis time series plot



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Dual axis bar chart

A dual axis bar chart displays two bar charts with a shared category axis and separate response axes.

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.

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.

Dual axis time series plot

A dual axis time series plot displays two time series with a common time axis on separate response axes.

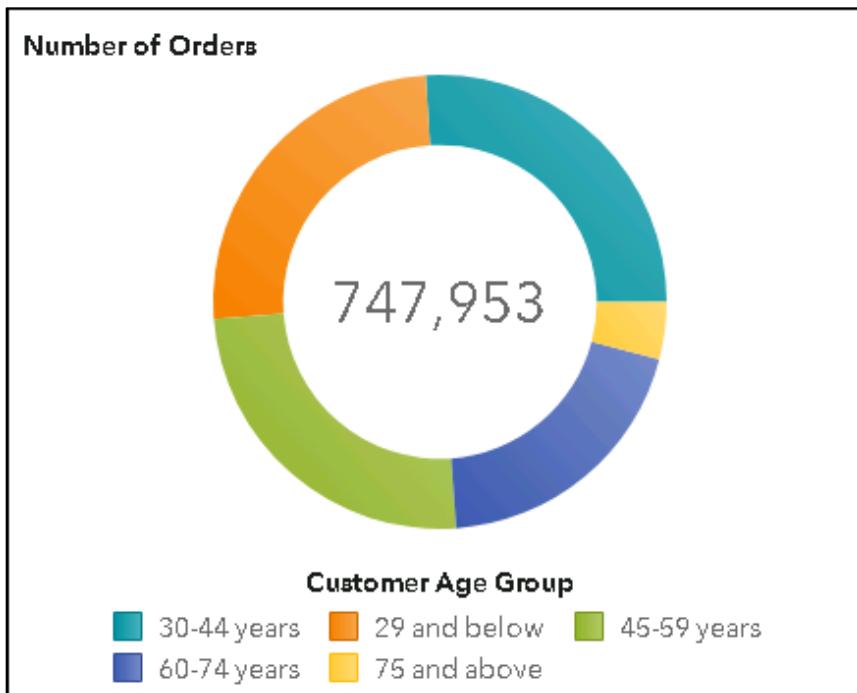


Creating a Simple Report

This demonstration illustrates how to create a simple report in Visual Analytics.

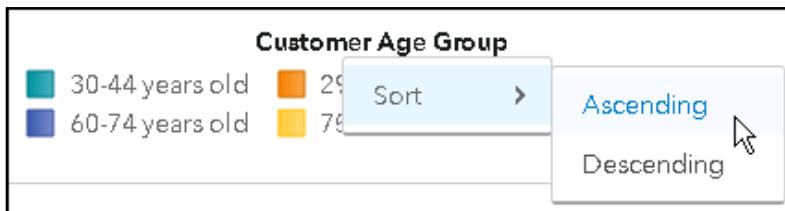
1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo4.1** to open the report.
7. Create a pie chart.
 - a. In the left pane, click the **Objects** icon.
 - b. Drag the **Pie Chart** object, from the Graphs group, to the top of the canvas.
 - c. In the right pane, click the **Roles** icon.
 - d. For the **Category** role, select **Add** \Rightarrow **Customer Age Group**.
 - e. For the **Measure** role, select **Frequency** \Rightarrow **Number of Orders**.

The pie chart should resemble the following:

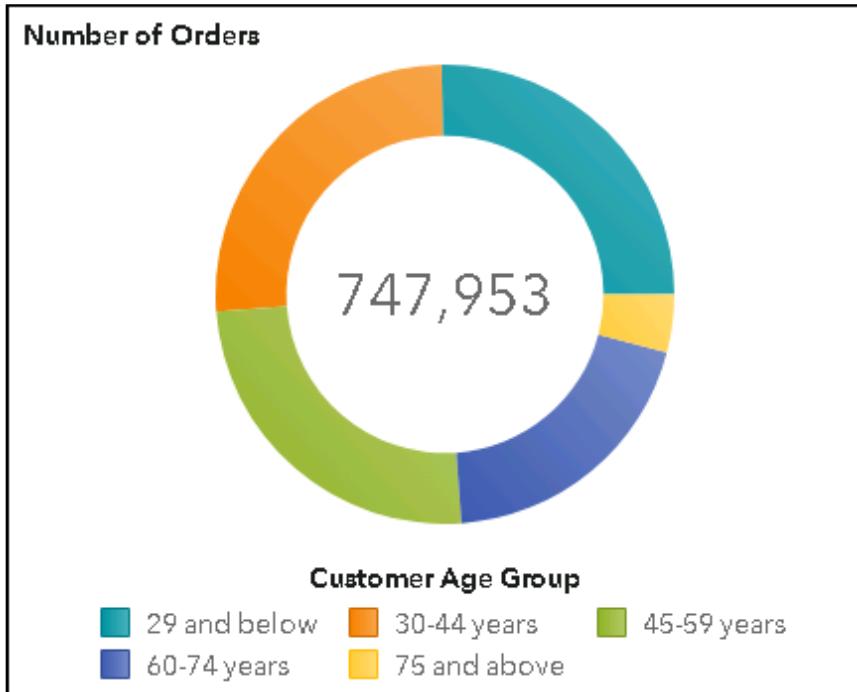


By default, the slices in a pie chart are sorted by the measure in descending order.

- f. In the pie chart, right-click **Customer Age Group** below the pie chart and select **Sort ➔ Ascending**.

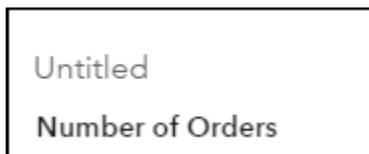


The updated pie chart should resemble the following:



- g. In the upper right corner of the chart, select (More options) ➔ **Add title**.

A default title is added to the upper left corner of the pie chart.



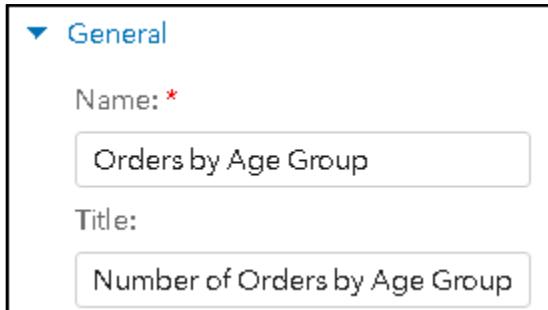
Note: You can also add a title in the General group of the Options pane.

- h. Double-click **Untitled**, enter **Number of Orders by Age Group**, and press Enter.

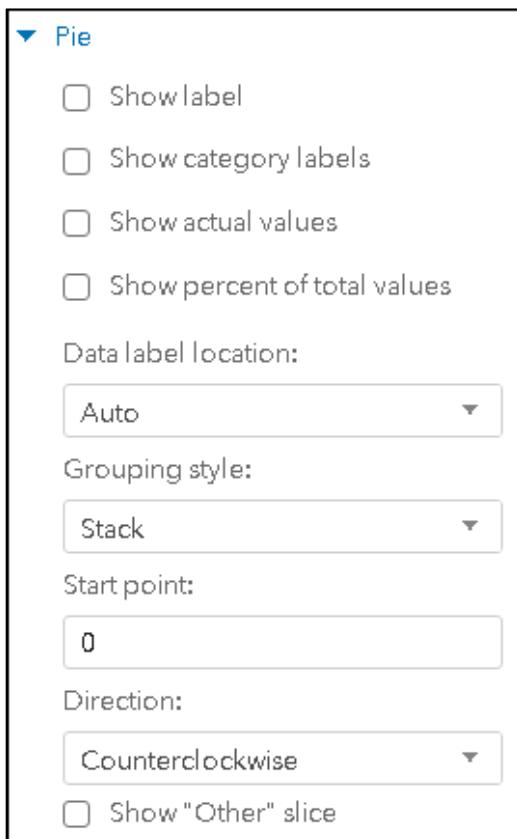


A font formatting tool appears to format the title.

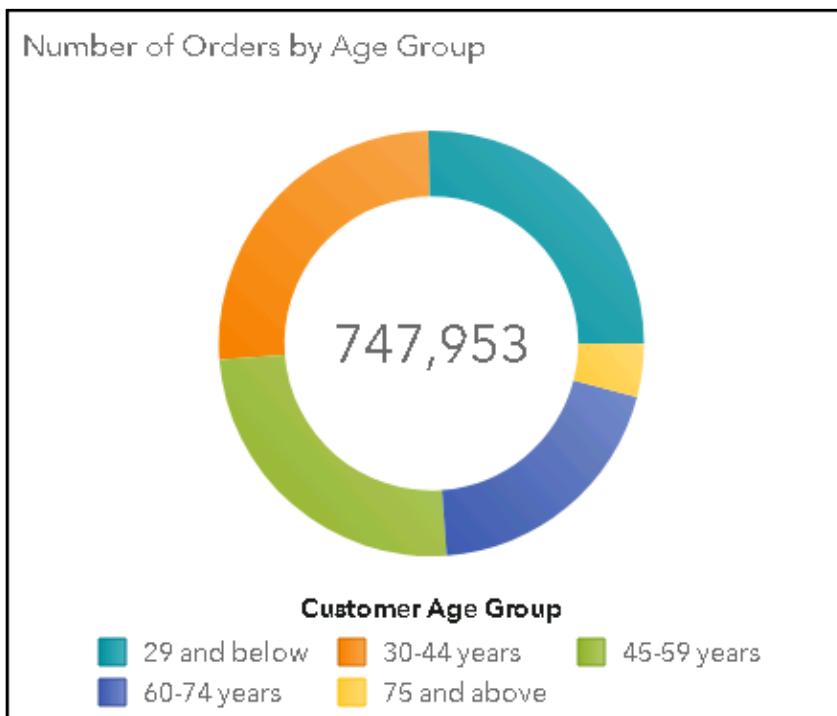
- i. In the right pane, click the **Options** icon.
- j. In the General group, enter **Orders by Age Group** in the Name field.



- k. In the Pie group, clear **Show label**.
- l. Clear **Show "Other" slice**.

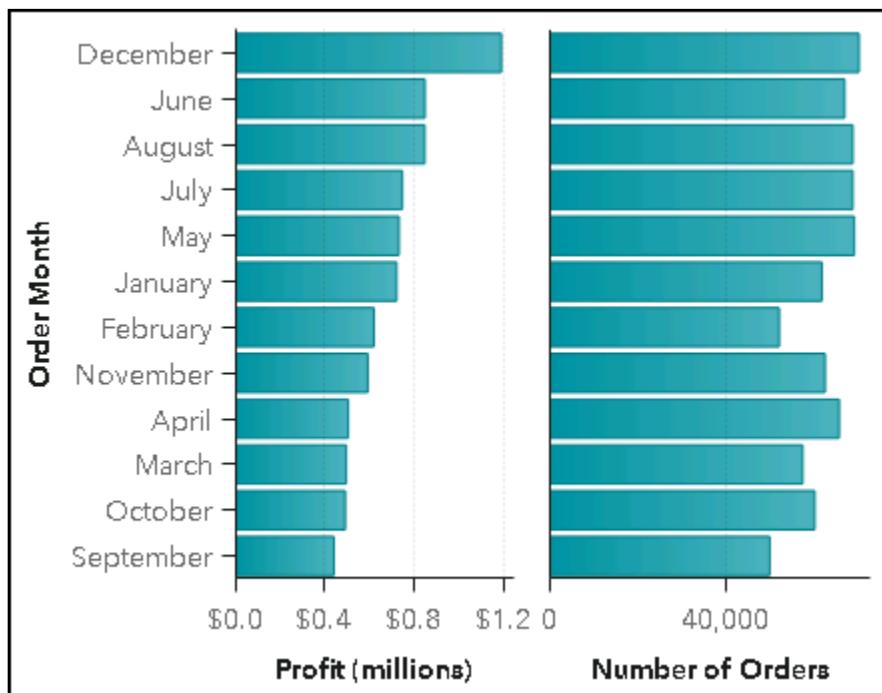


The updated pie chart should resemble the following:



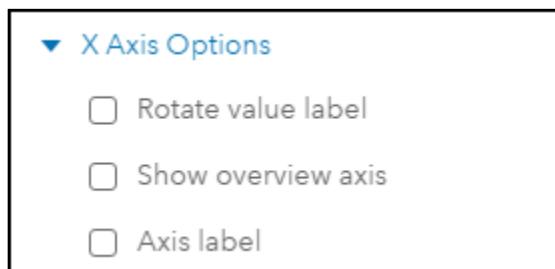
8. Create a bar chart.
 - a. In the left pane, click the **Objects** tab.
 - b. Drag the **Bar Chart** object, from the Graphs group, to the drop zone on the right side of the pie chart.
 - c. In the right pane, click the **Roles** tab.
 - d. For the **Category** role, select **Add** \Rightarrow **Order 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:

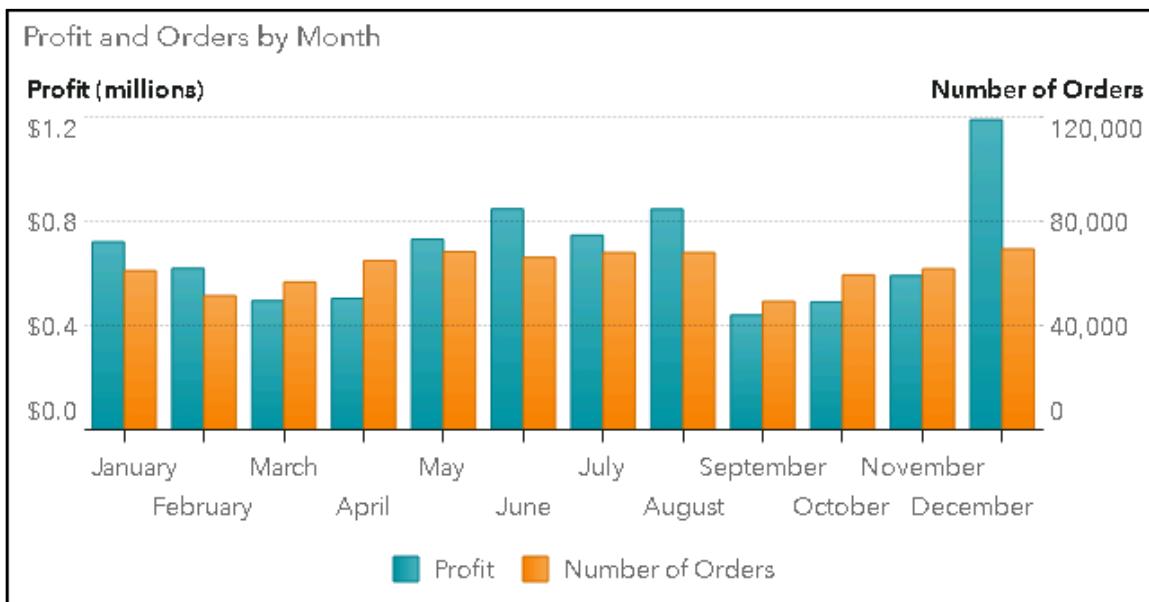


Because profit and number of orders have different ranges, they are displayed in different bar charts. We can change to a dual axis bar chart to display both measures together.

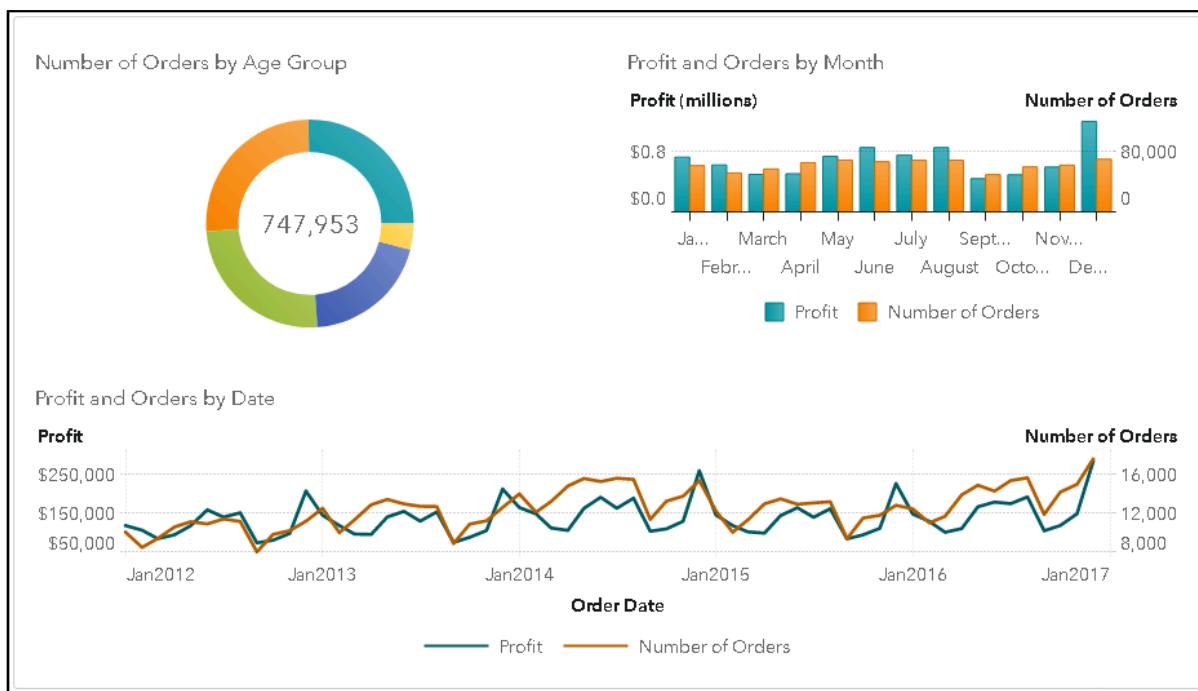
- g. In the upper right corner of the chart, select (Change Bar Chart to) \Rightarrow More.
- h. In the Select a New Type window, select **Dual Axis Bar Chart**.
- i. In the dual axis bar chart, right-click **Order Month** on the horizontal axis and select **Sort \Rightarrow Ascending**.
- j. In the right pane, click the **Options** icon.
- k. In the General group, enter **Profit and Orders** in the **Name** field.
- l. Enter **Profit and Orders by Month** in the **Title** field.
- m. Expand the **X Axis Options** group.
- n. Clear **Axis label**.



The updated dual axis bar chart should resemble the following:



The report should resemble the following:



9. In the upper right corner, select (More options) \Rightarrow Save.
10. Select Eric \Rightarrow Sign Out in the upper right corner to sign out of SAS Visual Analytics.

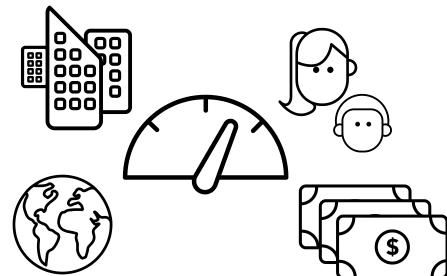
End of Demonstration

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.

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





Exercises

1. Creating a Simple Report

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise4.1** report from the **Shared Data/Basics/Exercises (HR)** folder.
- Create a geo map, to the left of the bar chart, by assigning the following data items to the specified roles:

Category	Employee Country
Size	<remove Number of Employees>
Color	Average Profit
Data tip values	Number of Employees

- Modify the following options for the geo map:

General: Name	Average Profit by Country
General: Title	Average Profit by Country
Overlay: Type	Coordinates
Legend: Visibility	Off

The geo map should resemble the following:



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

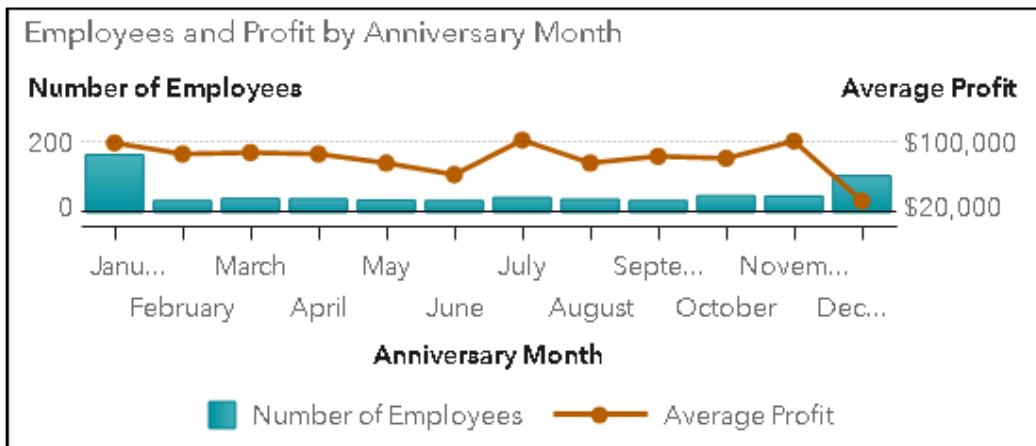
Category	Anniversary Month
Measure (bar)	Number of Employees
Measure (line)	Average Profit

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

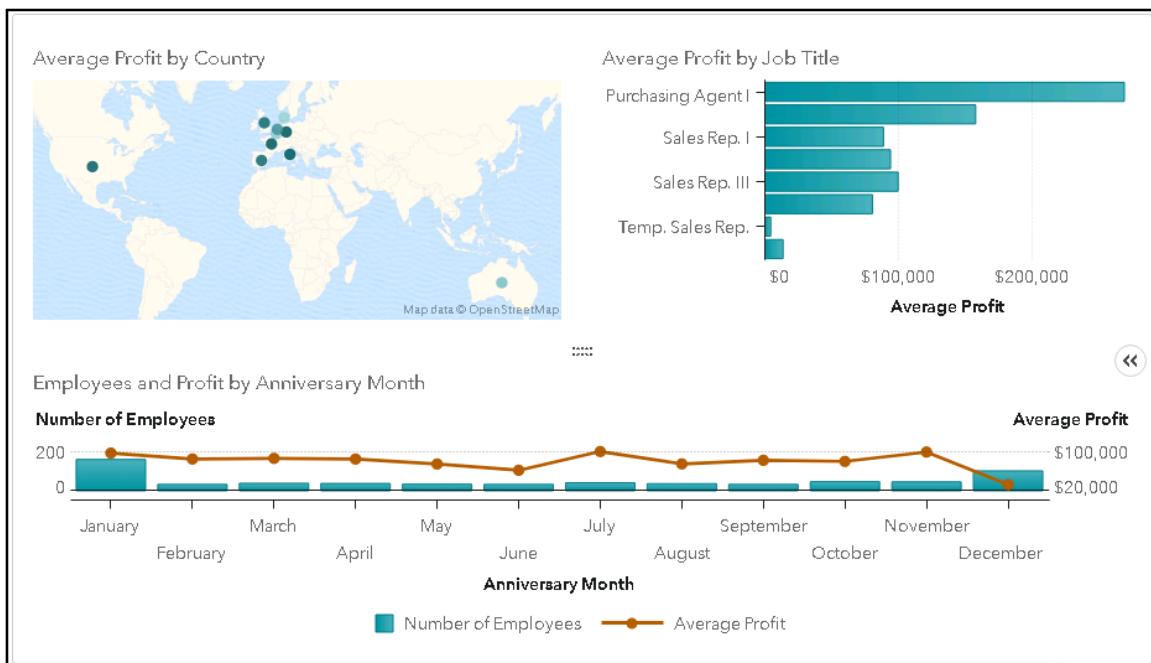
General: Name	Employees and Profit by Anniversary Month
General: Title	Employees and Profit by Anniversary Month
Line: Show markers	<selected>

- g. Sort the bars by **Anniversary Month** in ascending order.

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



The report should resemble the following:



- h. Save the report.
i. Sign out of Visual Analytics.

End of Exercises

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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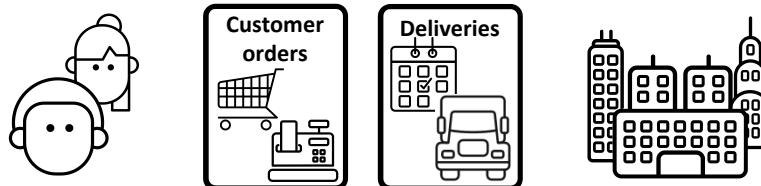


Business Scenario: Customers



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, you can link to hidden pages to provide additional details.

Each page in your report can use one or more data sources and can contain one or more report objects. However, each report object can use only a single data source. There is no limit to the number of pages that can be added to a report. However, it is a good idea to limit the number of pages in a report to make your report easier to access, easier to navigate, and easier to understand. If you need more than six or seven visible pages to tell your data story, you should consider creating multiple reports and use links between reports to provide additional information. Links are discussed in more detail in a later section.

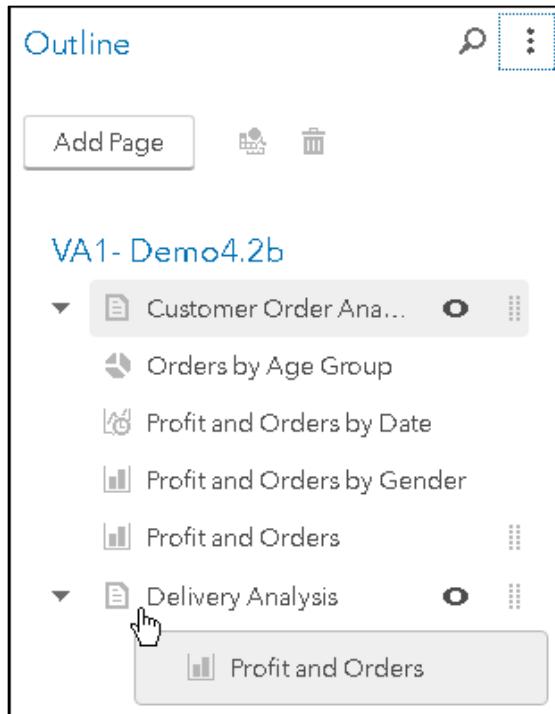


Working with Pages and Ranks

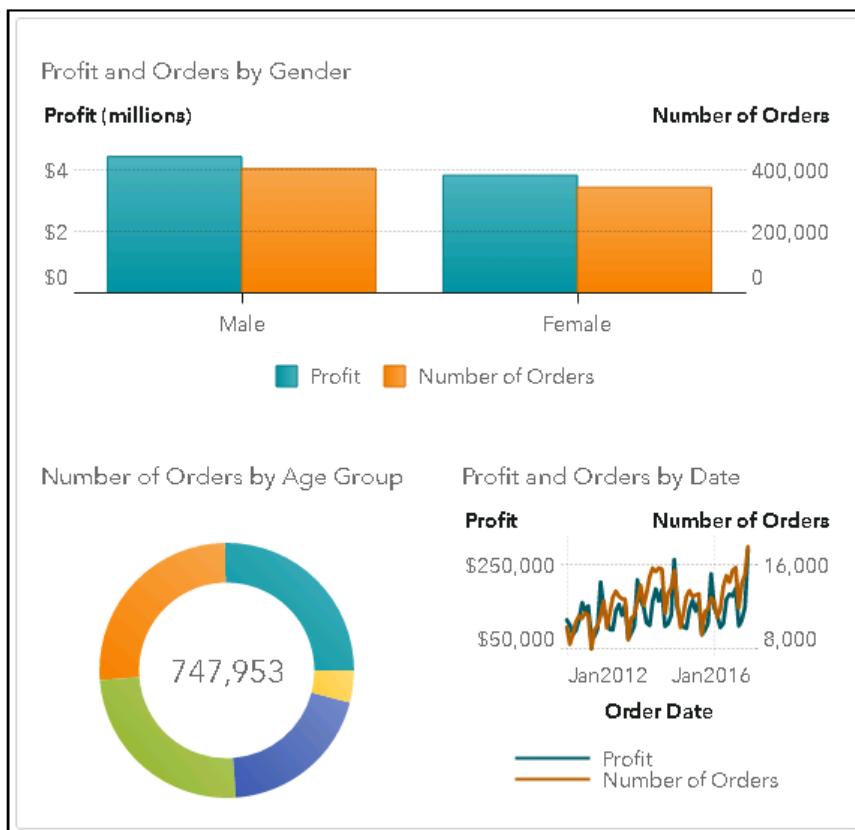
This demonstration illustrates how to create new pages, how to move graphs between pages, and how to apply ranks to graphs to create interactive reports in Visual Analytics.

1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo4.2a** to open the report.
7. Create a new page.
 - a. In the upper left corner of the report, click  (**Add a 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. Double-click the **Page 1** heading to make it editable.
 - f. Enter **Customer Order Analysis** and press Enter.
8. Move the profit and orders by month bar chart to the new page.
 - a. In the left pane, click the **Outline** icon.

- b. Click  next to **Profit and Orders** and drag it under the **Delivery Analysis** page.



9. Click the **Customer Order Analysis** tab to make it active.
 10. Rearrange the graphs on the Customer Order Analysis page so that it resembles the following:



11. Create a bubble plot.

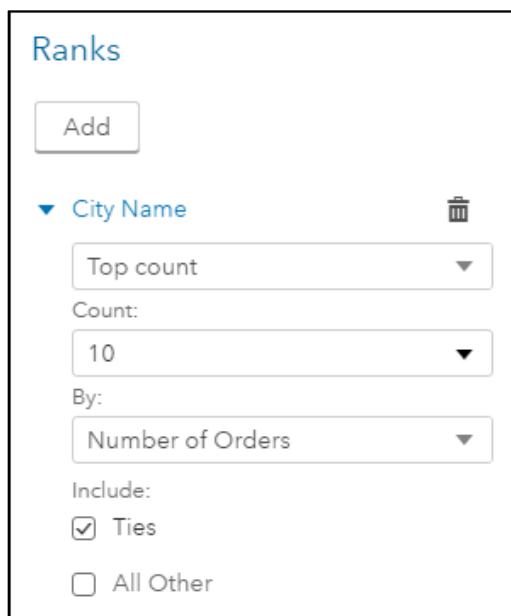
- a. Click the **Delivery Analysis** tab to make it active.
- b. In the left pane, click the **Objects** icon.
- c. Drag the **Bubble Plot** object, from the Graphs group, to the left side of the canvas.
- d. In the right pane, click the **Roles** icon.
- e. For the **Group** role, select **Add** \Rightarrow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

A warning appears in the lower right corner of the bubble plot.

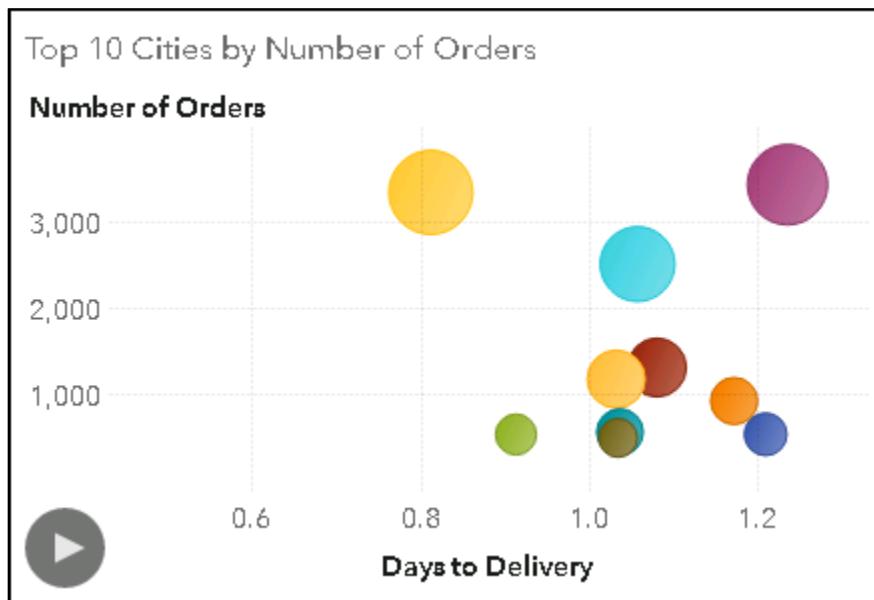
No data appears because too many values were returned from the query. Filter your data to reduce the number of values.

There are too many distinct values of city to display as bubbles in the plot. Later, we will add a rank to reduce the number of bubbles.

- i. For the **Animation** role, select **Add** \Rightarrow **Order Month**.
- j. In the right pane, click the **Options** icon.
- k. In the General group, enter **Order Information by Month** in the **Name** field.
- l. Enter **Top 10 Cities by Number of Orders** in the **Title** field.
- m. In the right pane, click the **Ranks** icon.
- n. In the Ranks pane, select **Add** \Rightarrow **City Name**.
- o. Verify that **Top count** is specified.
- p. Verify that **10** is specified for the **Count** field.
- q. Select **Number of Orders** for the **By** field.
- r. Clear **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 .
12. In the upper right corner, select (More options) \Rightarrow Save.
13. Select Eric \Rightarrow Sign Out in the upper right corner to sign out of SAS Visual Analytics.

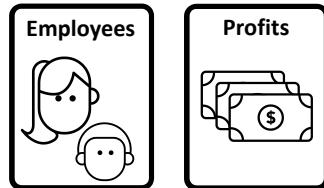
End of Demonstration

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





Exercises

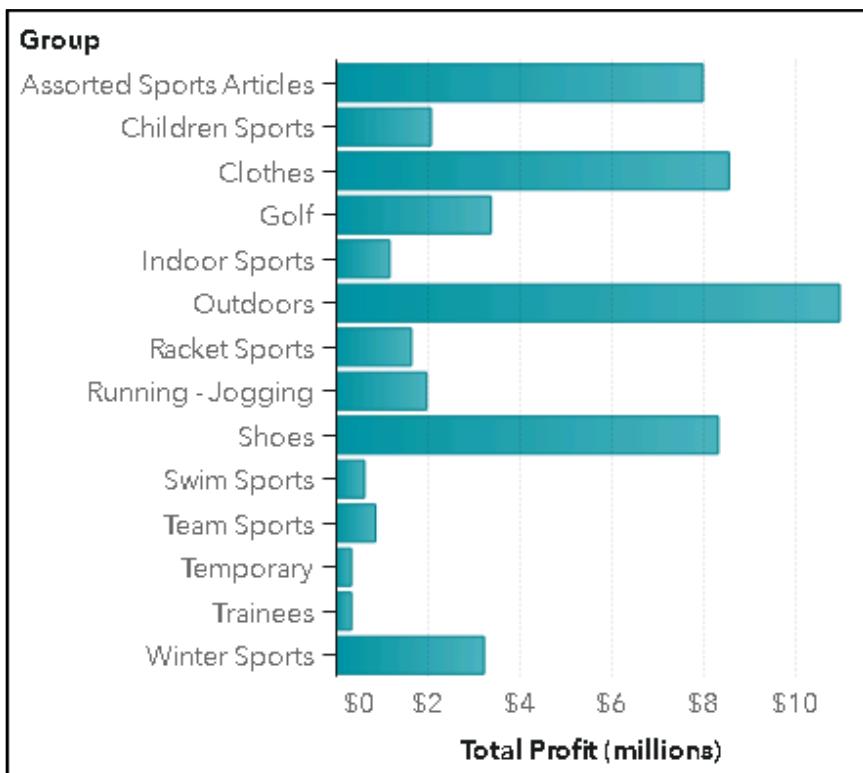
2. Working with Pages

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise4.2a** report from the **Shared Data/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 per Group** as the name of the bar chart.
- Sort the bars by **Group** in ascending order.

The Profit Analysis page should resemble the following:



- Save the report.
- Sign out of Visual Analytics.

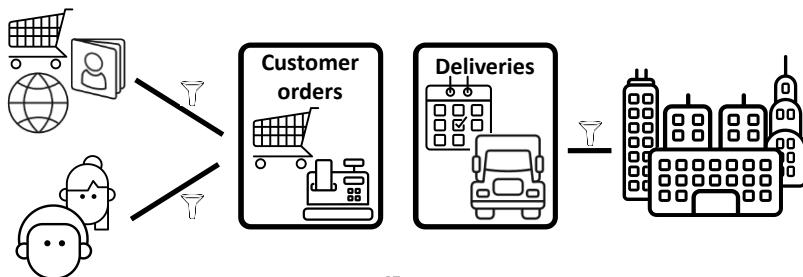
End of Exercises

Business Scenario: Customers



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

- For the customer orders page, add some way to filter by type of order
- For the customer orders page, view profit and order information for a specific gender and age group
- For the deliveries page, view profit and order information for a specific city



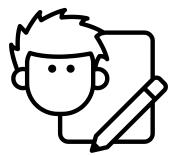
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Filtering Data

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

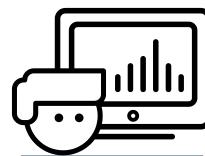


Report Designer

Detail report filters

- Data source
- Basic
- Advanced

Post-aggregate report filters



Report Viewer

Prompts

- Report
- Page

Actions

- Filter
- Links

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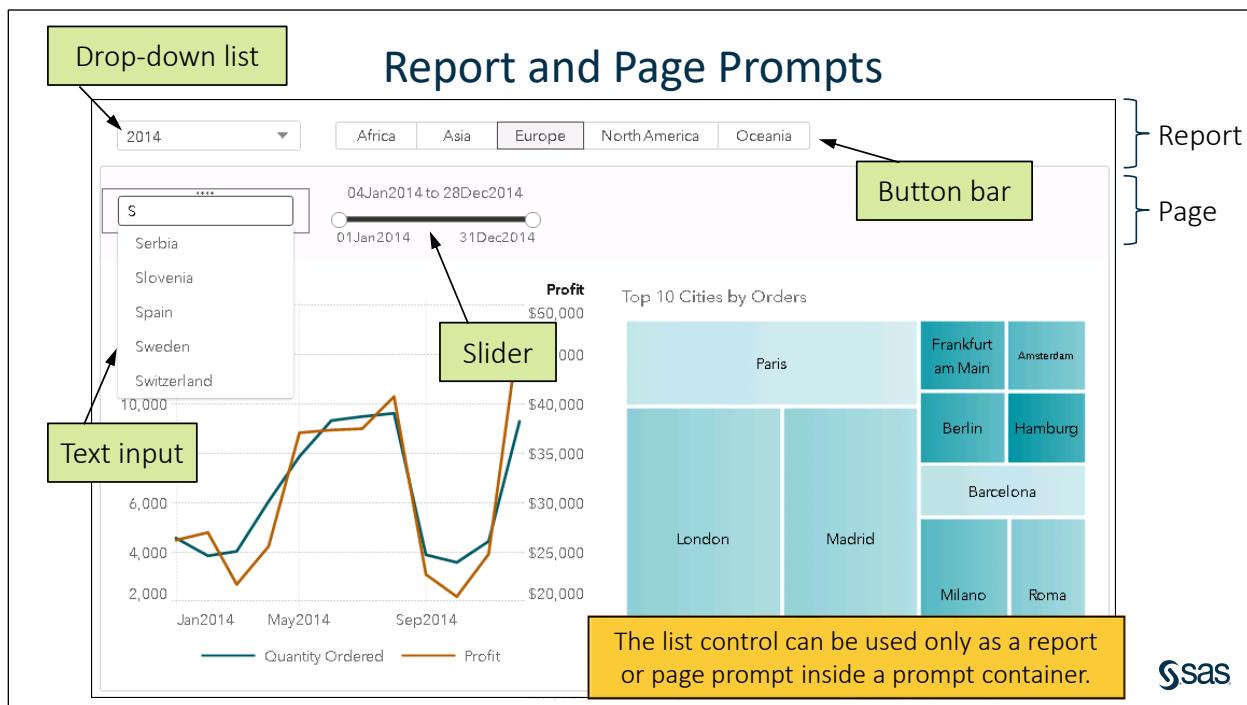


The following types of filters can be modified by report viewers:

Report prompt	Automatically subsets the data for all objects in the report as long as 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 8.1 documentation.
Page prompt	Automatically subsets the data for all objects on the page as long as the report object uses the same data source as the prompt.
Filter action	Subsets the data in the target object based on selections in a source object.
Link 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 8.1 documentation.

For more information about actions and links, see “Working with Report Actions and Links” in the SAS Visual Analytics 8.1 documentation.



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 three examples of report controls:

- Drop-down list:** A vertical list titled "Product Group" with options like "Clear filter", "Assorted Sports articles", "Darts", "Petanque - Boule", and "Skates". A callout box below it says: "In a **drop-down list**, use a category with a moderate number of distinct values."
- Button bar:** A horizontal row of four buttons labeled "Children", "Clothes & Shoes", "Outdoors", and "Sports". A callout box next to it says: "On a **button bar**, use a category with few distinct values."
- Text input:** A single-line text field containing "X" with a list of suggestions: "X-Large Bottlegreen/Black", "Xcountry Women's Anorak", "Xi Hockey", and "Xp Q-Lok Plus 22-pack". A callout box below it says: "In a **text input**, use a category with a lot of distinct values."

Sas

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 a control object is used to filter values, the AND operator is used for the filter.

Button bar	A button bar control displays buttons, which represent a narrowed scope of data, 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 narrow 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 "Overview of Parameters in Reports" in the SAS Visual Analytics 8.1 documentation.

4.03 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.

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List	A list control enables a viewer to select one or more category values from a list.
	Note: List controls can be used only as a report prompt or page prompt if it is located inside a prompt container.
Slider	A slider control enables a viewer to move a selector horizontally or vertically to select a single value or a range of values. A slider control will accept only date time or measure data items. Note: The single-point slider control can be used to populate the value of a parameter.

Adding Actions to a Page

Select a continent:

<input type="checkbox"/> Africa	(\$127.68)
<input type="checkbox"/> Asia	\$15,503.70
<input checked="" type="checkbox"/> Europe	\$5,659,450.59
<input type="checkbox"/> North America	\$2,121,645.56
<input type="checkbox"/> Oceania	\$462,934.64

Profit **Number of Orders**

Country	Product Line	Profit	Number of Orders
Italy	Children	\$20,920.85	3,326
Italy	Clothes & Shoes	\$317,677.91	41,018
Italy	Outdoors	\$215,364.86	12,310
Italy	Sports	\$377,051.40	21,088

- The list control filters the geo map.
- The geo map filters the bar chart and list table.
- A linked selection is established between the bar chart and the list table.

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

Linked selection	A linked selection enables you to show the same data highlighted simultaneously in two or more tables, graphs, or controls. The linked selection highlights a percentage that reflects the number of shared observations in the data set. The data for the linked selection has the same appearance in each object, which makes the data easily apparent to report viewers.
Filter	A filter is used to restrict the data that is returned from a query to a data source. Filters are simply a set of rules or conditions that you specify to subset the data that is displayed in a table or graph.

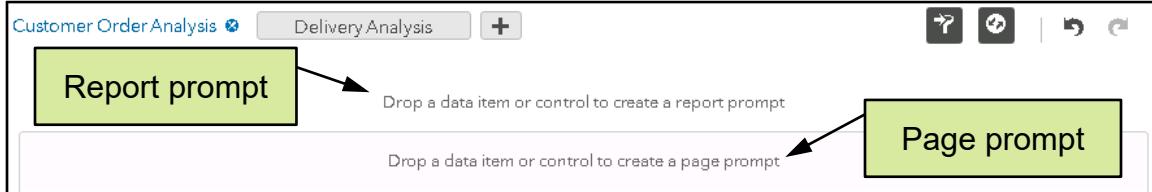


Working with Prompts and Actions

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

1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 2. Enter **Eric** in the **User ID** field.
 3. Enter **Student1** in the **Password** field.
 4. Click **Sign In**.
 5. Click **SAS Visual Analytics** in the application shortcut area.
- The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo4.2b** to open the report.
 7. Add a page prompt to Customer Order Analysis.
 - a. If necessary, click the **Customer Order Analysis** page to make it active.
 - b. If necessary, click  (**Show report and page prompt areas**) in the upper right corner.

The report and page prompt areas are shown above the canvas:



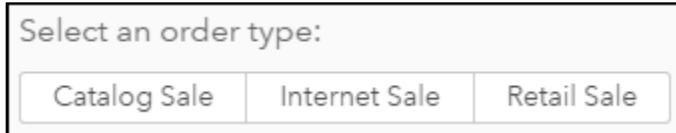
- c. In the left pane, click the **Data** icon.
- d. Drag **Order Type** from the Category group to the **Drop a data item or control to create a page prompt** area.

An auto control determines the best control to use for the selected data.



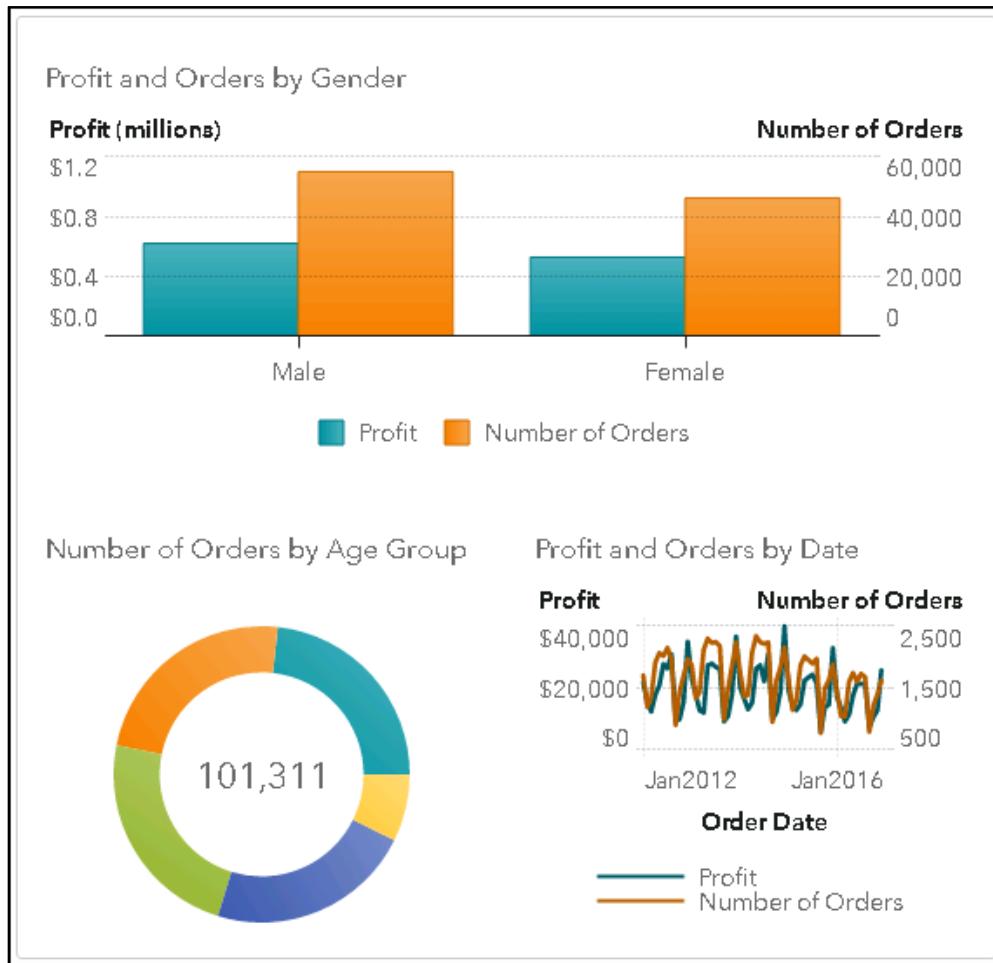
- e. In the right pane, click the **Options** icon.
- f. In the General group, enter **Order Type Selector** in the **Name** field.
- g. Enter **Select an order type:** in the **Title** field.

The auto control should resemble the following:



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

The Customer Order Analysis section should resemble the following:



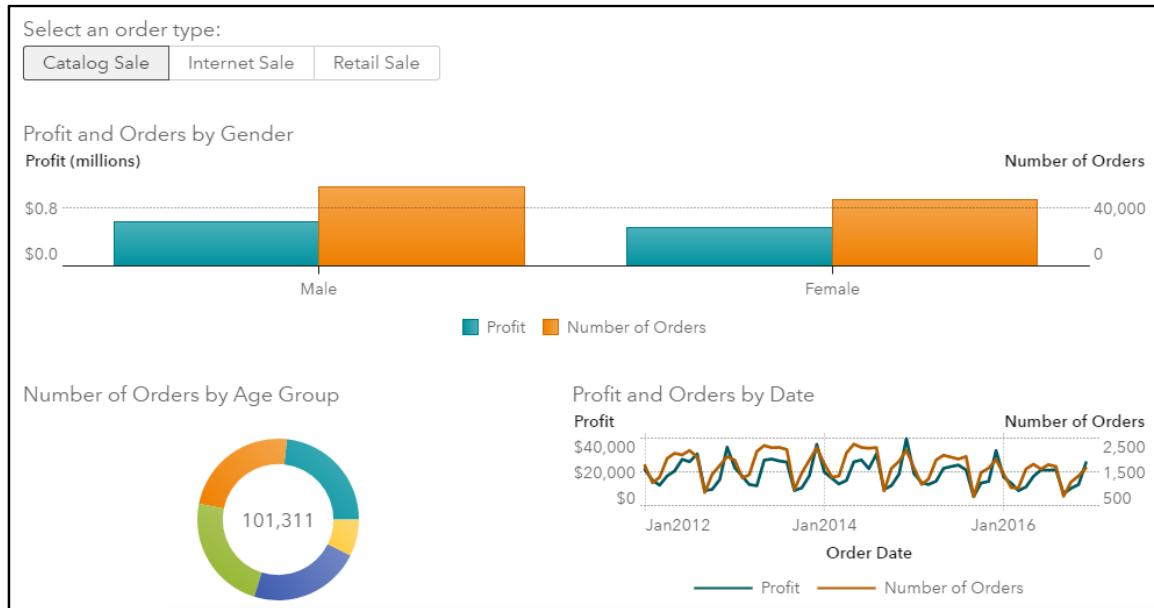
- i. Click **Catalog Sale** in the control to de-select it.
8. Add actions between objects on the Delivery Analysis page.
- Click the **Delivery Analysis** page to make it active.
 - Click the drop-down list control to select it.
 - In the right pane, click the **Actions** icon.
 - In the Actions pane, select **Add** ⇒ **Add filter**.
 - In the Add Filter Action window, select **Profit and Orders** (the dual axis bar chart).
 - Click **OK**.
 - In the Actions pane, select **Add** ⇒ **Add linked selection**.
 - In the Add Filter action window, verify that **Order Information by Month** (the bubble plot) is selected.
 - Click **OK**.

The Actions pane should resemble the following:

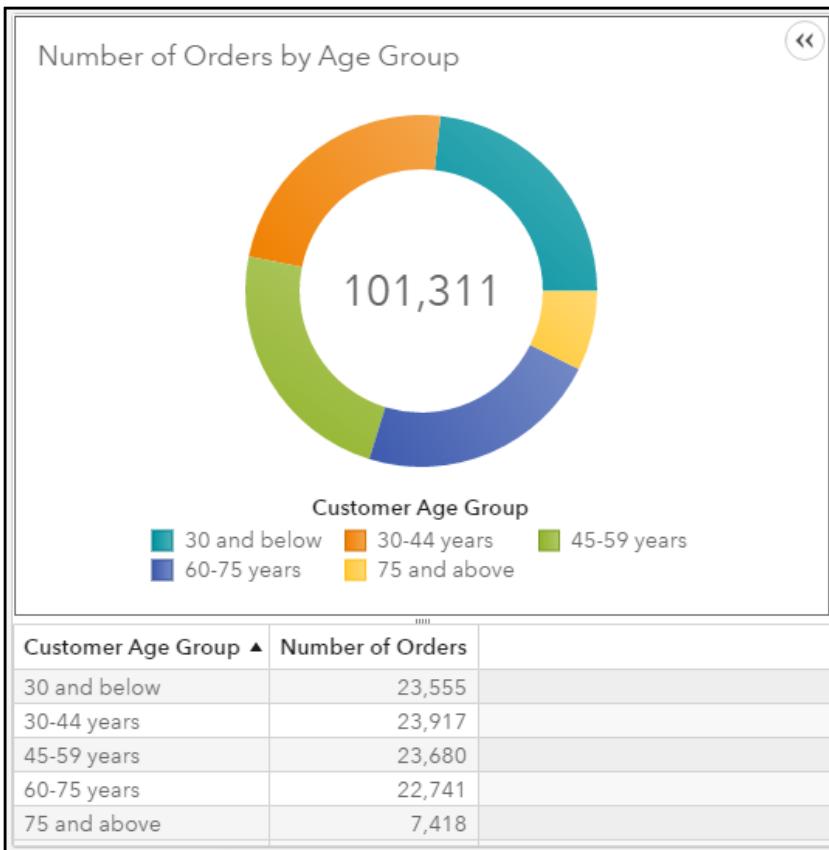
Actions

- Add
- City Selector
- Filters Profit and Orders
- Selects Order Information by...

9. In the upper right corner, select (More options) \Rightarrow Save.
10. View the report.
 - a. In the upper right corner, select (More options) \Rightarrow View report.
The report opens in the Report Viewer.
 - b. Click **Catalog Sale** in the button bar.
The Customer Order Analysis page updates to show information about catalog products ordered.



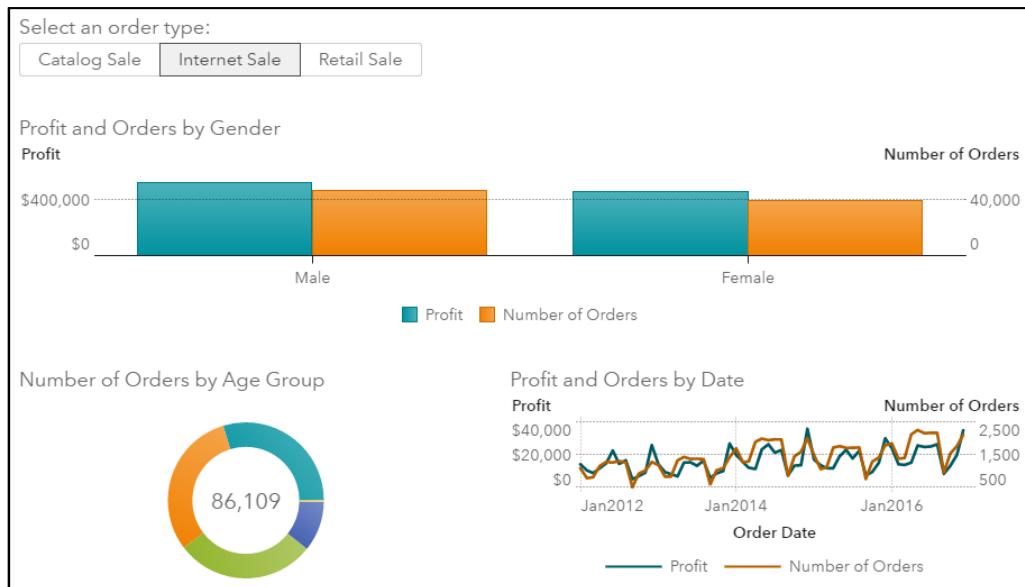
- c. In the upper right corner of the pie chart, select   (Maximize view).



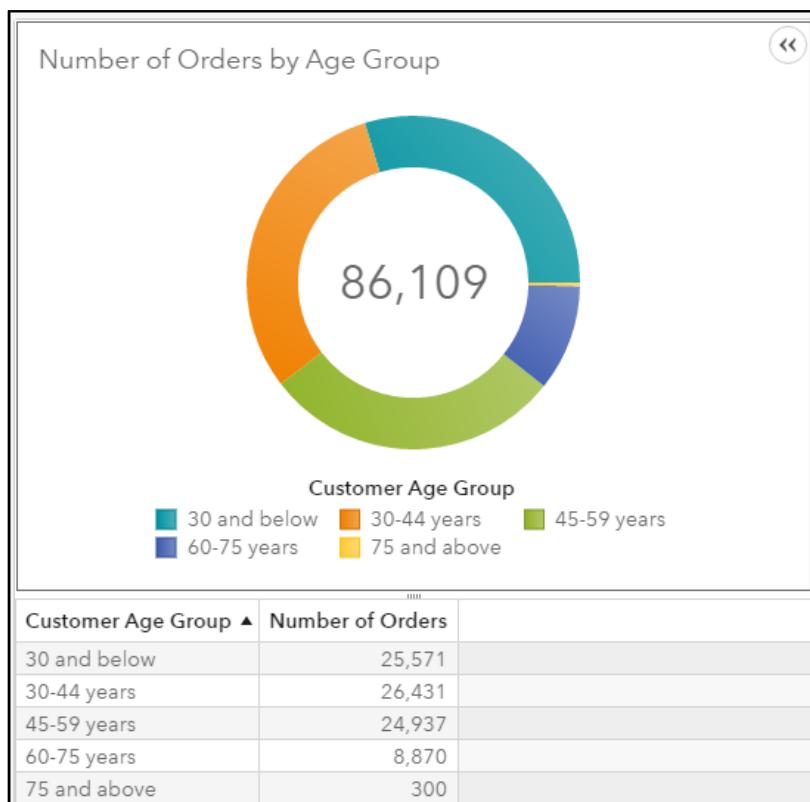
About 30% $[(22,741+7,418)/101,311 = 29.77\%]$ of all catalog orders are placed by customers in the older age groups (60-75 years and 75 and above).

- d. In the upper right corner of the pie chart, select   (Exit maximized view).
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, select (Maximize view).

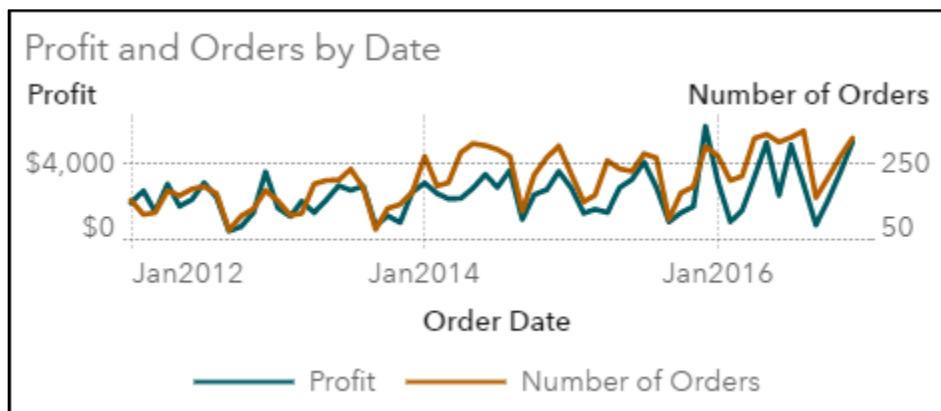




Only about 10% $[(8,870+300)/86,109 = 10.65\%]$ of all Internet orders are placed by customers in the older age groups (60-75 years and 75 and above). This appears to be a generational difference. How do we plan for this difference in ordering patterns among different age groups? Do we expect this difference to continue over time or do we expect the difference to eventually get smaller?

- g. In the upper right corner of the pie chart, select (Exit maximized view).
- 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.

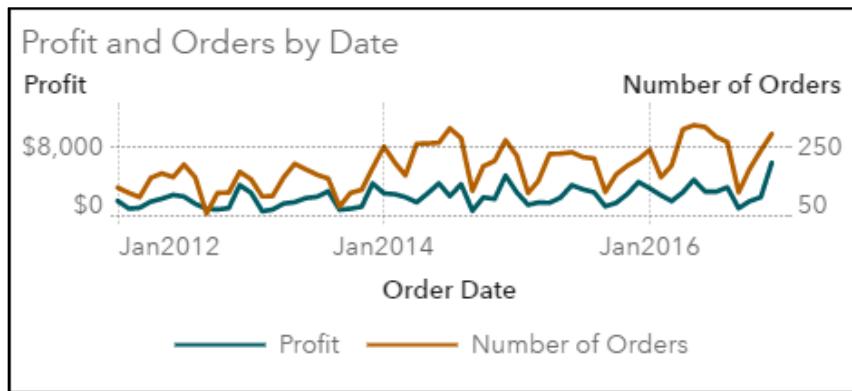
The dual axis time series plot should resemble the following:



For 30-44 year olds, 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.

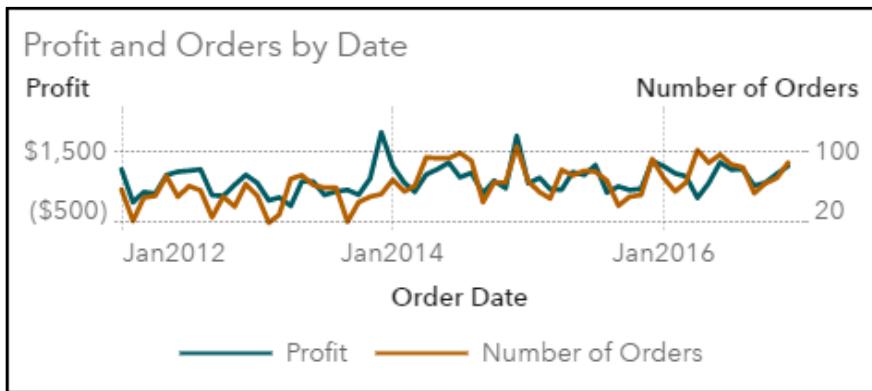
The dual axis time series plot should resemble the following:



For 45-59 year olds, 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.

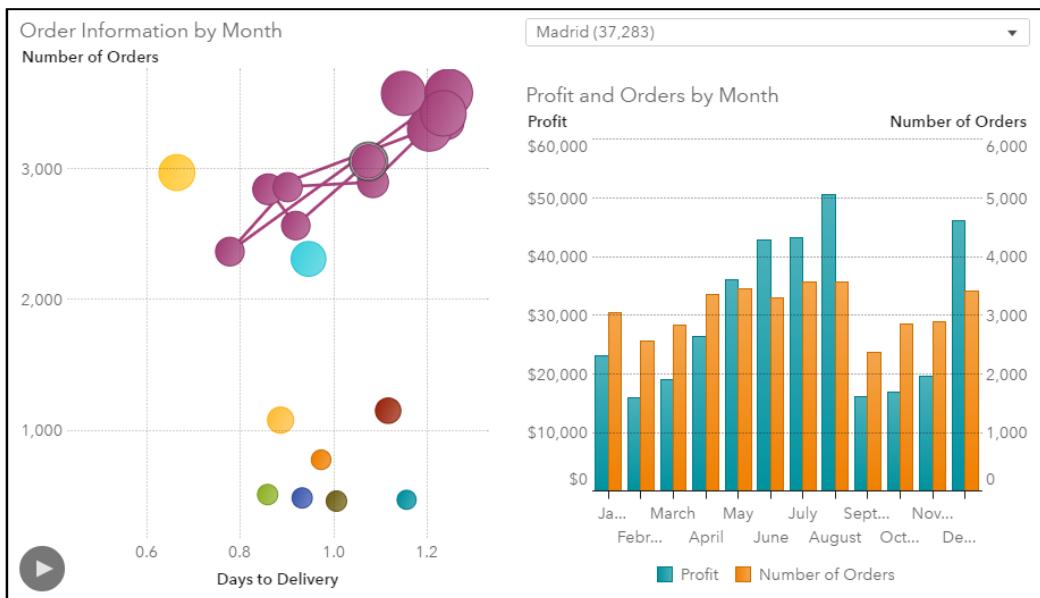
The dual axis time series plot should resemble the following:



For 60-74 year olds, 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, we 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, we 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?

11. Select **Eric** ⇒ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

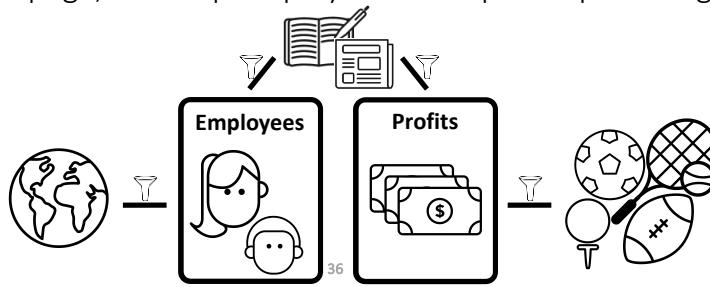
End of Demonstration

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



Exercises

3. Working with Prompts and Actions

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise4.2b** report from the **Shared Data/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

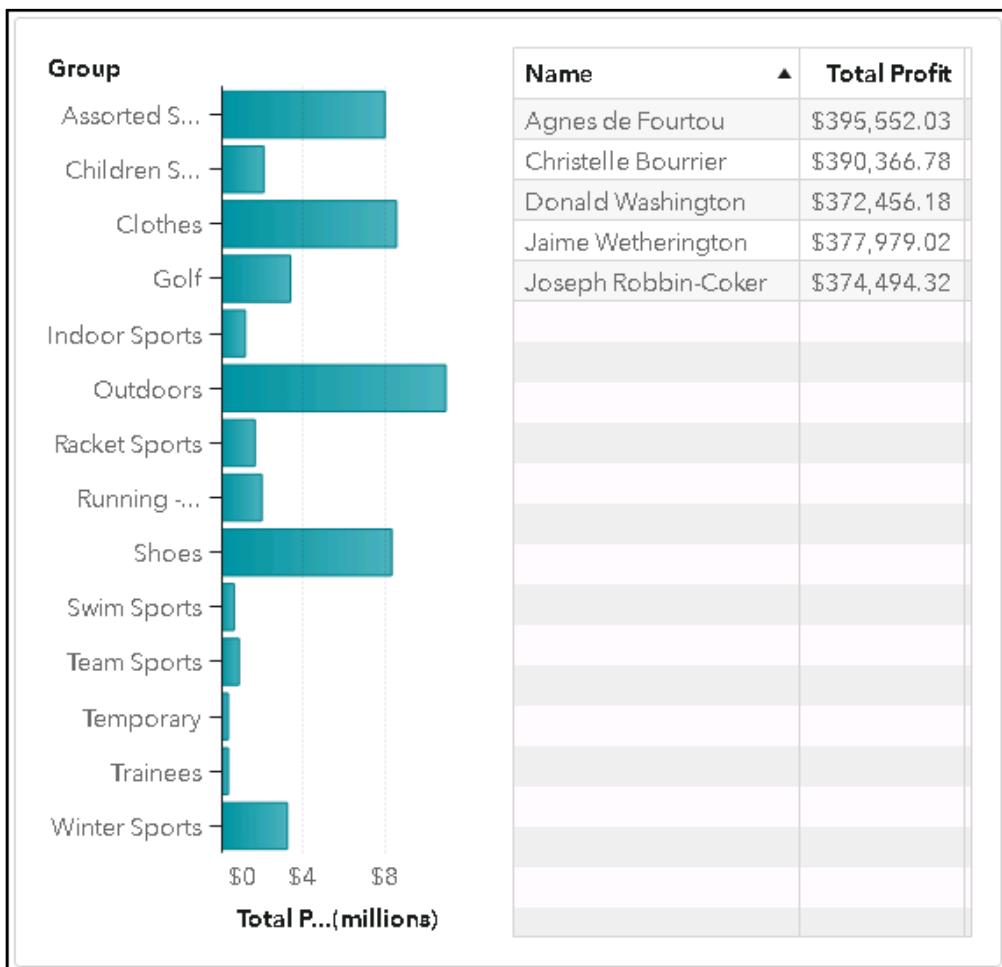
- Add the following actions between objects on the Employee Analysis page.
 - The geo map filters the bar chart and the dual axis bar-line chart.
 - The bar chart highlights the dual axis bar-line chart.
- Add a rank to the list table, on the Profit Analysis page, to show the top five employees by total profit.

Note: Add a rank for **all** visible categories.

The list table should resemble the following:

Name	Total Profit
Agnes de Fourtou	\$395,552.03
Christelle Bourrier	\$390,366.78
Donald Washington	\$372,456.18
Jaime Wetherington	\$377,979.02
Joseph Robbin-Coker	\$374,494.32

The Profit Analysis page should resemble the following:



- g. Save the report.
- h. View the report and answer the following questions:
Which job title has the highest average profit among active employees in Australia?
Answer: _____
For Orion USA, which active sales representative had the highest total profit generated for the Indoor Sports group?
Answer: _____
For Orion France, how many active sales representatives sold items for the Racket Sports group?
Answer: _____
- i. Sign out of Visual Analytics.

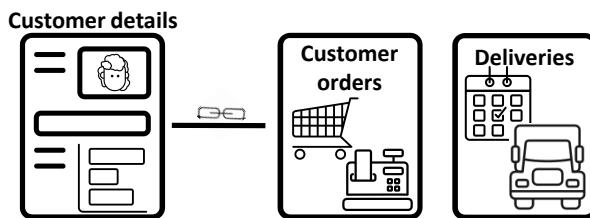
End of Exercises

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



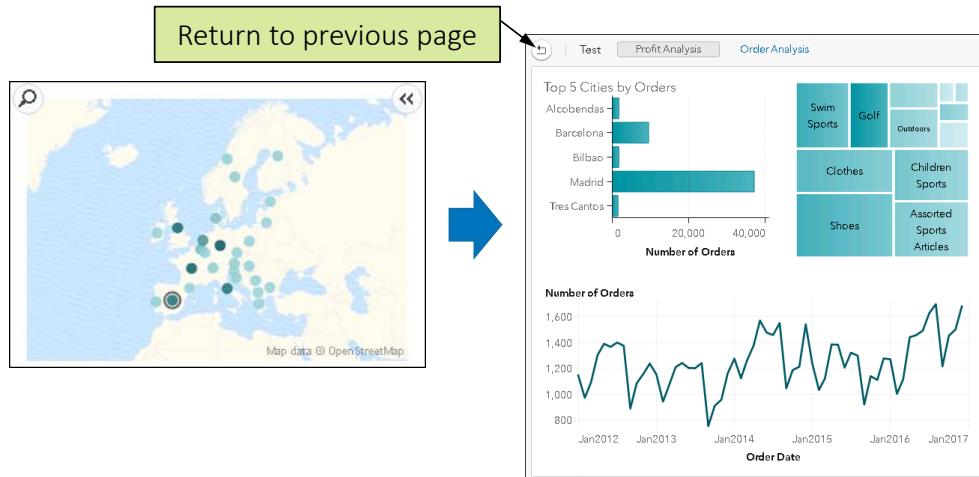
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Adding Page Links

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



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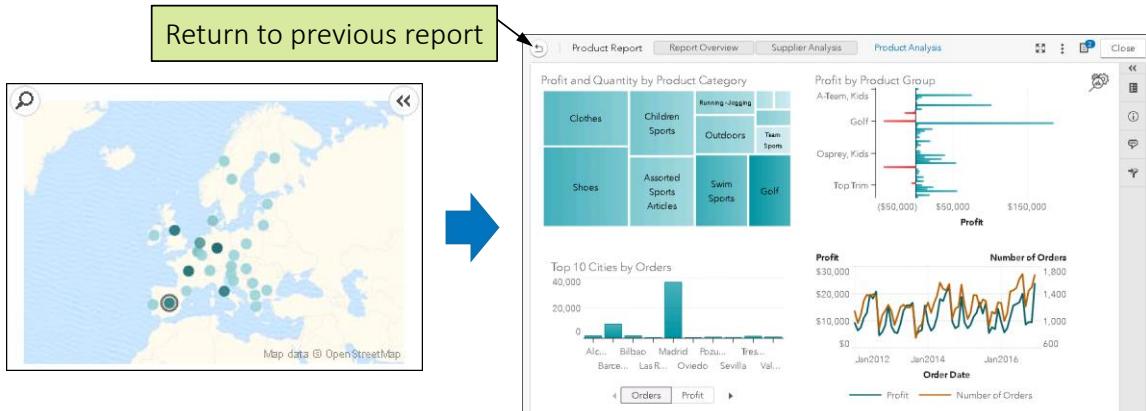


Linking has elements of both a filter and an action. A page that is the target of a link is filtered by the values selected in the linked report object.

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 are able to choose the initial page of the destination report that will open 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 8.1 on SAS Viya: Video Library.



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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, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1- Demo4.2c** to open the report.
7. Change the name of Page 3 and hide the page.
 - a. Click the **Page 3** tab to make the page active.
 - b. Double-click the **Page 3** heading to make it editable.
 - c. Enter **Customer Details** and press Enter.
 - d. Click **(Hide page)** to the left of **Customer Details** to make the page hidden.

Note: Hidden pages do not appear when viewing the report unless they are linked to.

8. Add links between objects.
 - a. Click the **Customer Order Analysis** page to make it active.
 - b. Click the pie chart to make it active.
 - c. In the right pane, click the **Actions** icon.
 - d. In the Actions pane, select **Add** \Rightarrow **Add page link**.
 - e. In the Add Page Link Action window, select **Customer Details**.
 - f. Click **OK**.

The Actions pane should resemble the following:

Actions

Add

Orders by Age Group

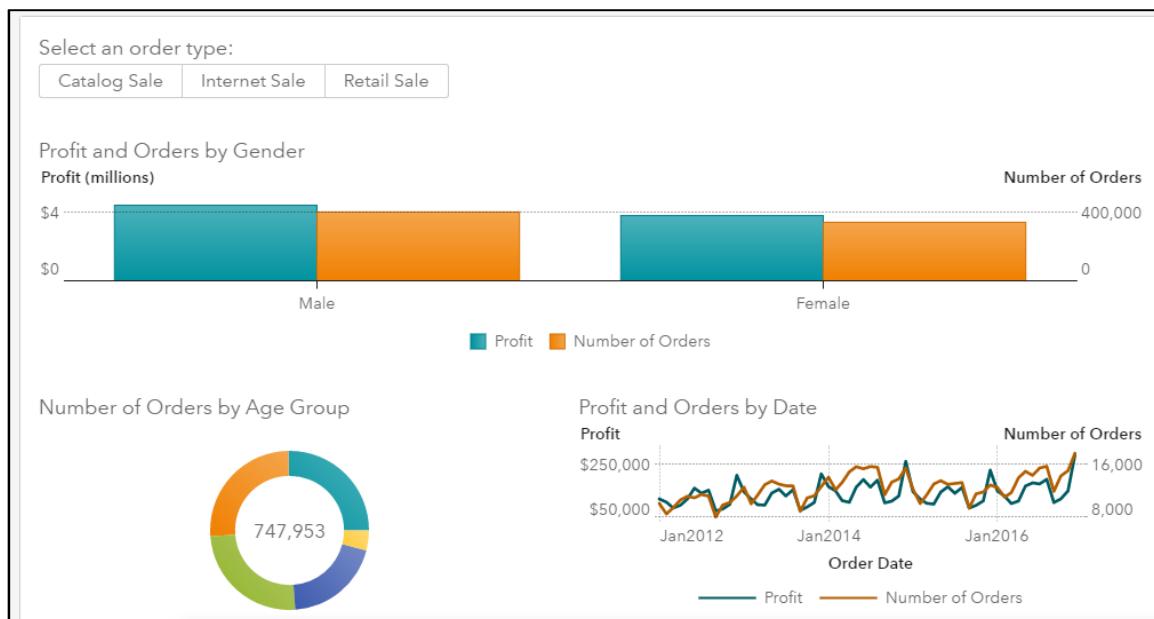
Filters Profit and Orders by D... Delete

Filtered by Profit and Orders... Delete

Links to Customer Details Delete

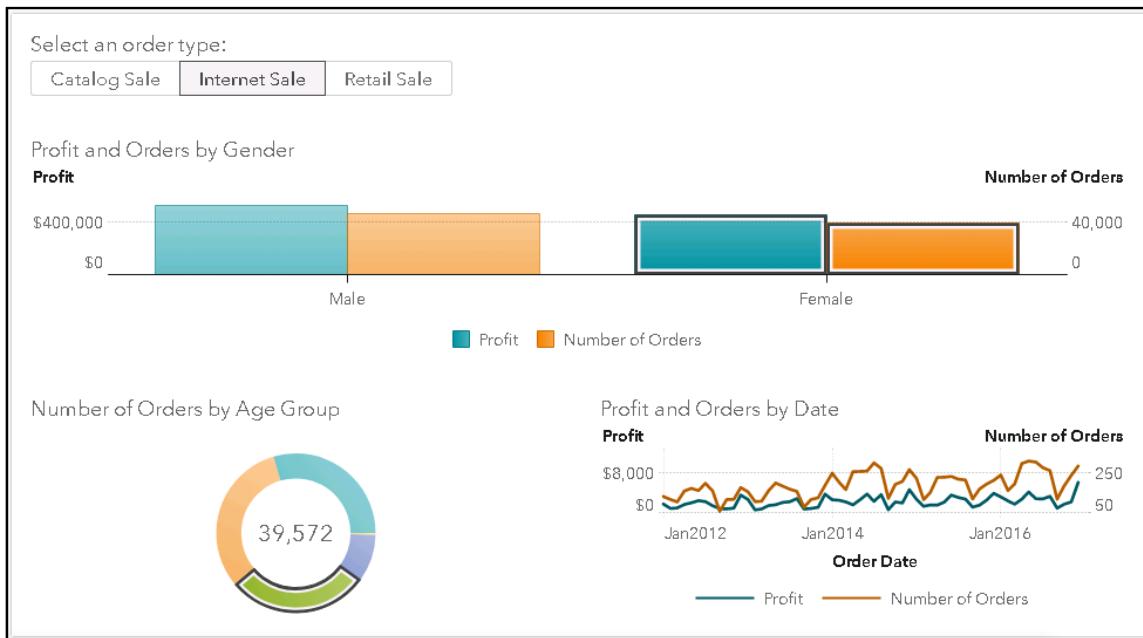
9. In the upper right corner, select (More options) \Rightarrow Save.
10. View the report.
 - a. In the upper right corner, select (More options) \Rightarrow View report.

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. Select the **45-59 years** slice (green slice) in the pie chart.

The Customer Order Analysis page should resemble the following:

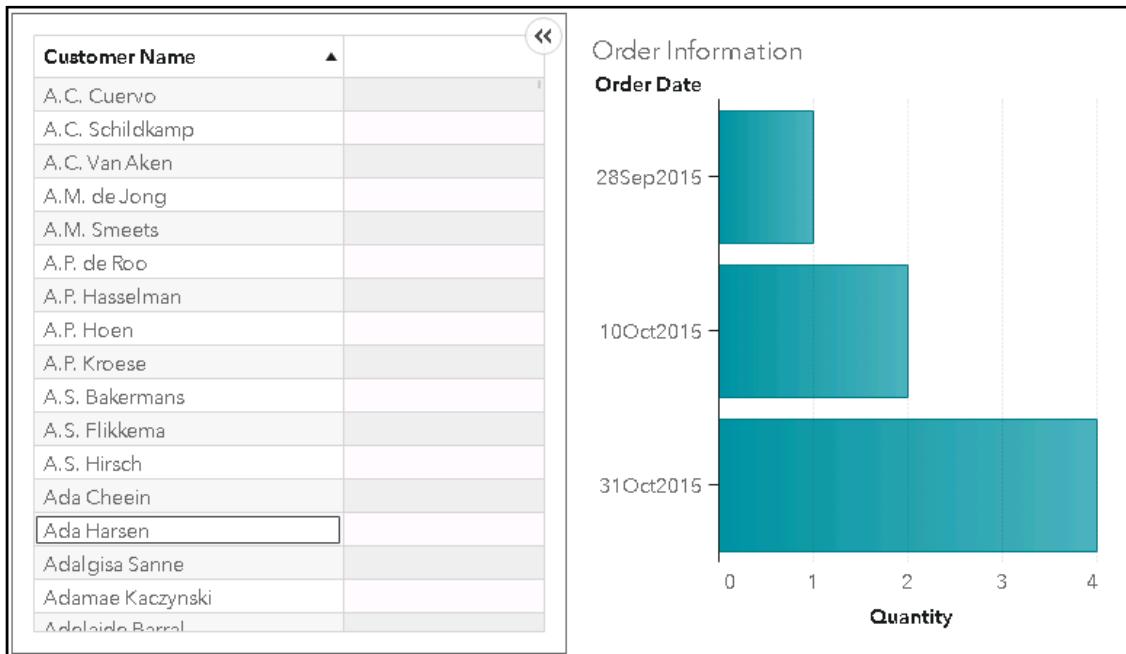


- Double-click the slice for **45-59 years** (green slice) in the pie chart.

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

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

h. Click **Close**.

11. Select **Eric** ⇒ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

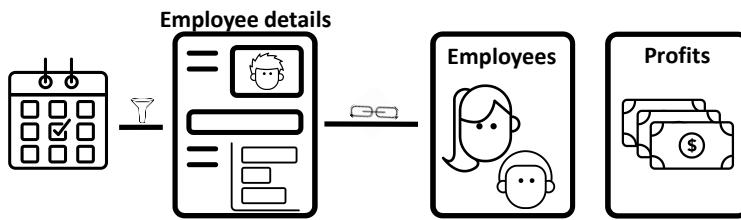
End of Demonstration

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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Exercises

4. Working with Hidden Pages and Links

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
- b. Open the **VA1- Exercise4.2c** report from the **Shared Data/Basics/Exercises (HR)** folder.
- c. Hide Page 3 and rename the page to **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:

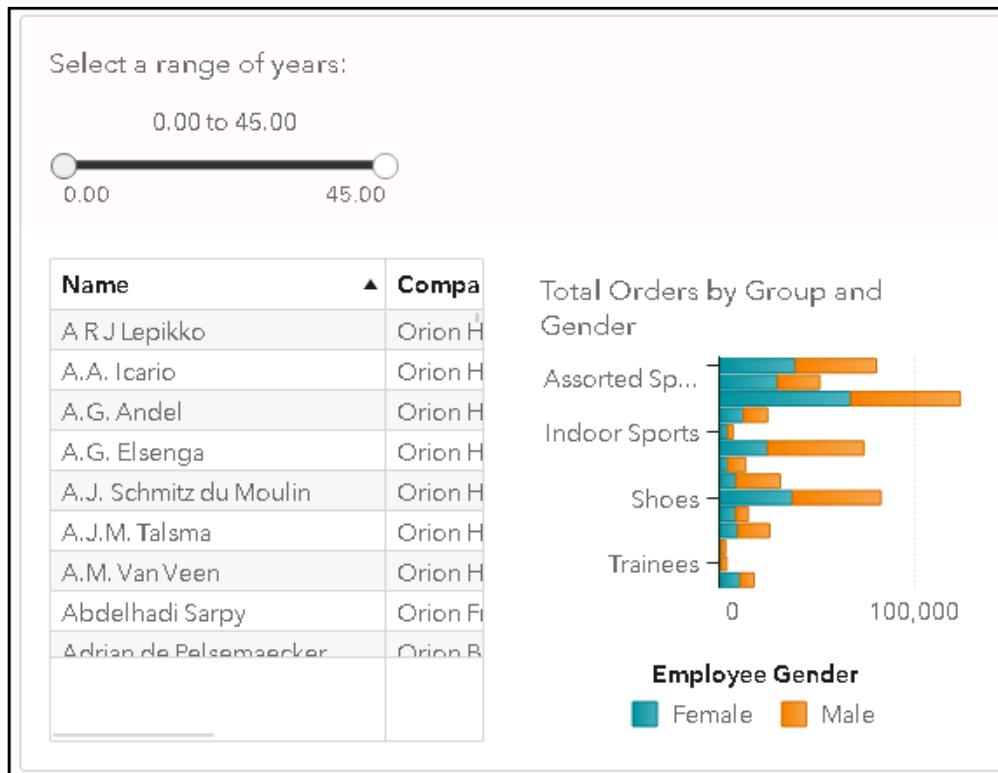
General: Name	Years of Service Selector
General: Title	Select a range of years:
Slider: Set a fixed range	<selected>
Slider: Minimum	0
Slider: Maximum	45

Note: Select the entire range of years for the slider control.

The slider control should resemble the following:

A screenshot of a slider control interface. The title above the slider is "Select a range of years:". Below the title, it shows "0.00 to 45.00". The slider itself is a horizontal bar with two circular endpoints. The left endpoint is labeled "0.00" and the right endpoint is labeled "45.00".

The Employee Details page should resemble the following:



- f. Add a page link from the bar chart on the Employee Analysis page to the Employee Details page.
- g. Save the report.
- h. View the report and answer the following questions:

How many employees retired in Italy with the Sales Rep. III job title?

Answer: _____

Management has decided to start promotions with active employees in the United States with the Sales Rep. I job title. Of the active employees with 25 or more years of service, how many generate a total profit more than \$200,000?

Answer: _____

- i. Sign out of Visual Analytics.

End of Exercises

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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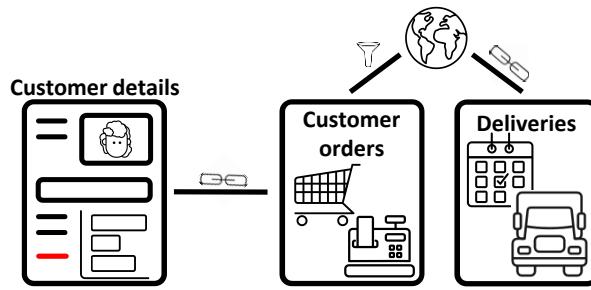


Business Scenario: Customers



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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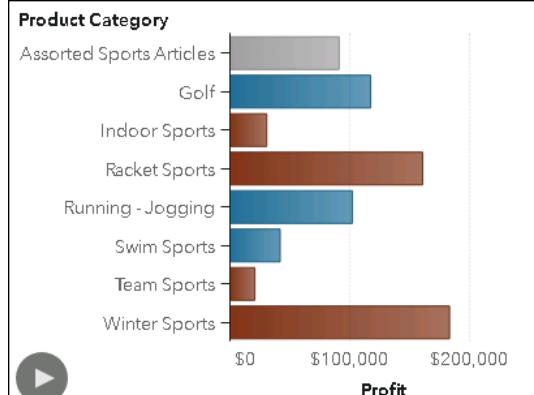
Graph-Level Display Rules

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) or to the graph itself. If the graph contains a hierarchy, you can specify the hierarchy levels where the display rule will be applied.

Color-mapped values

Color-mapped values display rules are based on the value of a category data item, but cannot be applied to date or date time data items.

Table-Level Display Rules

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

List table

Use the Ctrl key to sort by multiple columns.

Product Line	OrderType	Profit	Number of Orders
Outdoors	Catalog Sale	\$283.90	17
Outdoors	Internet Sale	\$666.80	28
Outdoors	Retail Sale	\$92,423.31	8,996
Sports	Catalog Sale	\$14,156.53	2,604
Sports	Internet Sale	\$12,653.48	2,145
Sports	Retail Sale	\$224,171.36	17,782

Crosstab

OrderType	Catalog Sale	Internet Sale	Retail Sale
	Profit	Profit	Profit
OrderYear	\$140,363.91	\$88,294.94	\$520,769.33
	\$137,699.33	\$80,387.69	\$552,563.33
	\$134,667.86	\$122,209.10	\$682,896.88
	\$113,563.29	\$98,423.76	\$589,974.29
	\$96,793.67	\$128,960.72	\$703,063.45

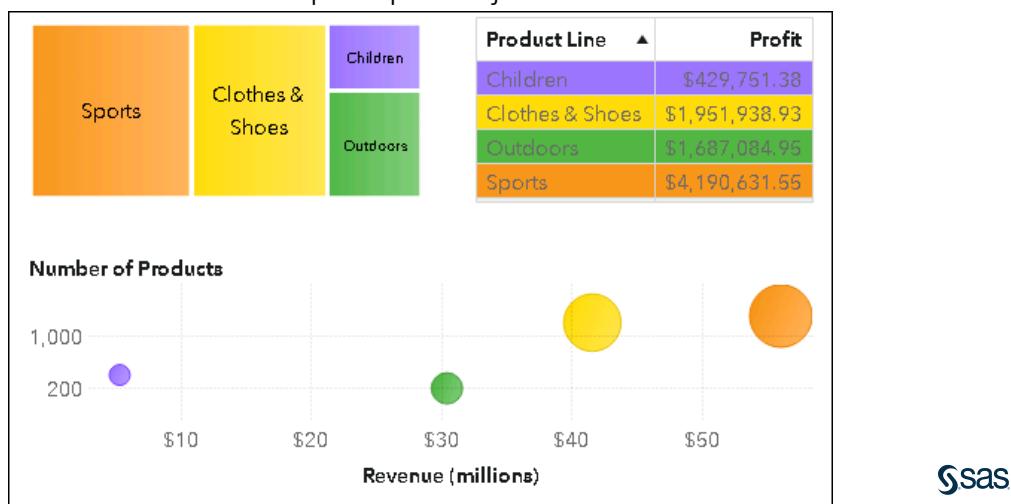
Avoid adding too much color.
Make everything that is normal appear normal.



Expression	Expression display rules are based on the value of a measure data item. For a list table, the expression display rule can be applied to the measure used in the expression, to another column in the table, or to the entire row. Crosstabs accept only expression display rules. If the crosstab contains a hierarchy or totals and subtotals are displayed, you can specify the hierarchy levels or intersections where the display rule will be applied.
Color-mapped values	Color-mapped values display rules are based on the value of a category data item, but cannot be applied to date or date time data items. For a list table, the color-mapped values display rule can be applied to any column in the table or to the entire row.
Gauge	Gauge display rules are based on intervals for a measure data item. For a list table, the gauge display rule can be added to any column in the table and can be displayed to the left of the value, to the right of the value, or replace the value.

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.



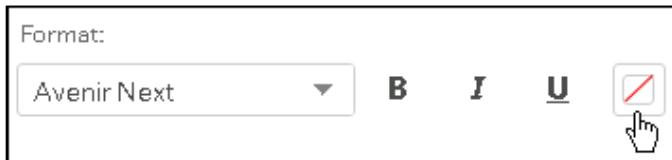
A report-level display rule applies to all objects in the report.



Working with Graph-Level Display Rules

This demonstration illustrates how to add graph-level display rules in Visual Analytics.

1. From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
2. Enter **Eric** in the **User ID** field.
3. Enter **Student1** in the **Password** field.
4. Click **Sign In**.
5. Click **SAS Visual Analytics** in the application shortcut area.
The Welcome to SAS Visual Analytics window appears.
6. Click **Open**.
 - a. Navigate to the **Shared Data/Basics/Demos (Marketing)** folder.
 - b. Double-click **VA1-Demo4.3** to open the report.
7. Add a 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 **Add** ⇒ **Add expression**.
 - e. In the Add Display Rule: Expression window, select **Profit** for the **Column** field.
 - f. Select **<** for the **Operator** field.
 - g. Verify that **0** is specified for the **Value** field.
 - h. In the Format area, click  (**Select a font color**).



- i. Choose **Alizarin red** as the color.



- j. Verify that **Row** is selected in the **Specify where the style applies** field.
- k. Click **OK**.

The Display Rules pane should resemble the following:

The screenshot shows the 'Display Rules' pane with a single rule defined. The rule is 'Profit < 0' and its value is '1,234.56'. The value is displayed in red, indicating it is a negative number.

Expression	Value
Profit < 0	1,234.56

- I. If necessary, scroll down to find a row where profit is less than 0.

The list table should resemble the following:

Customer Name
A R J Swart Rc
A.A. Broekhuisen
A.A. Busselaar
A.A. Duim
A.A. Hautvast
A.A. Hilhorst

8. In the upper right corner, select (More options) \Rightarrow **Save**.
9. View the report.
 - a. In the upper right corner, select (More options) \Rightarrow **View report**.
The report opens in the Report Viewer.
 - b. Select **Retail Sale** in the page prompt.

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** in the page prompt.

The geo map should resemble the following:

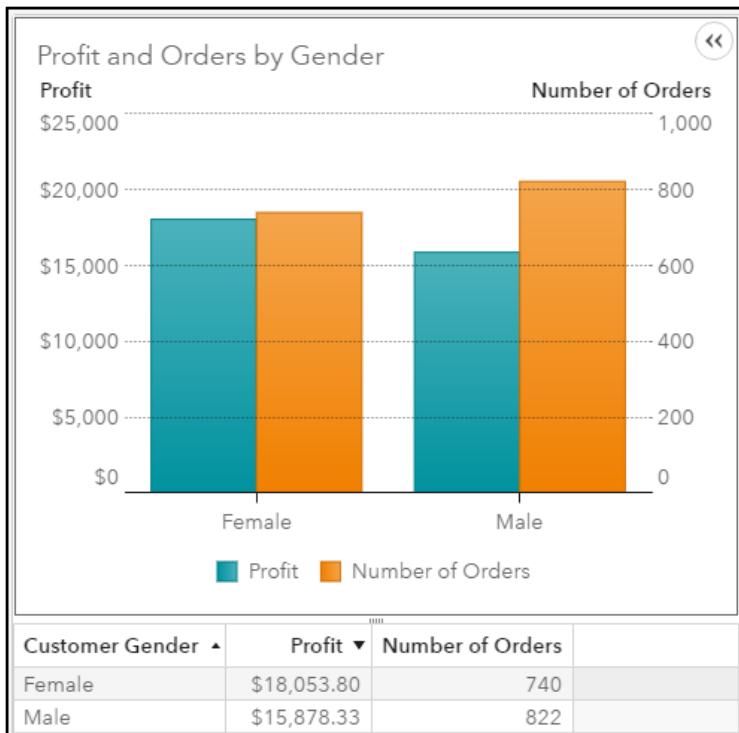


Through the Internet, we can reach more countries and more customers. Perhaps we can start marketing campaigns in South America as we currently have no customers in that continent.

- d. Select **Canada** in the geo map.

The page updates and the other objects are filtered to show product orders in Canada.

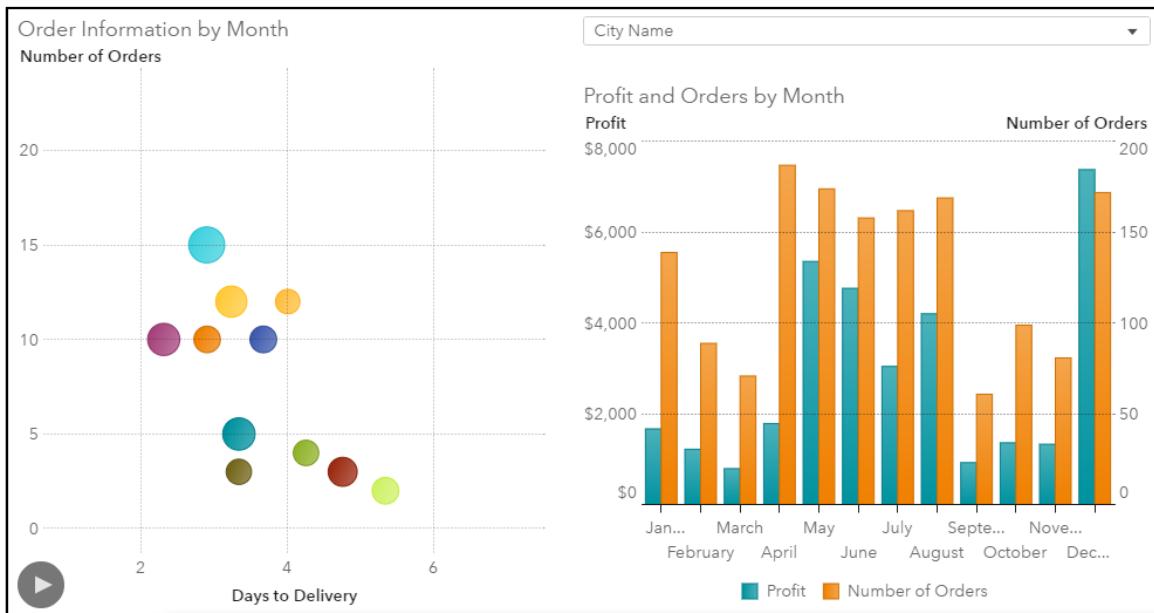
- e. In the upper right corner of the dual axis bar chart, select   (Maximize view).



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, select   (Exit maximized view).
g. Double-click **Canada** in the geo map.

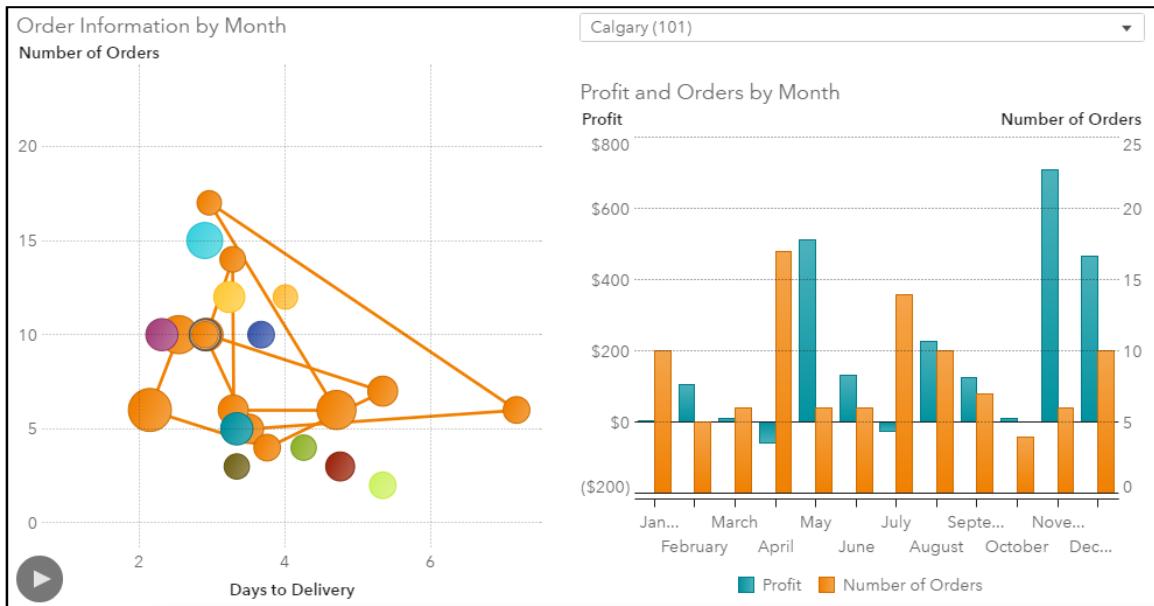
The Delivery Analysis page is displayed and filtered to show information about Canada.



The monthly profits and orders in Canada seem to follow a similar trend to other countries (higher in the summer and winter months). It is interesting to note, however, 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

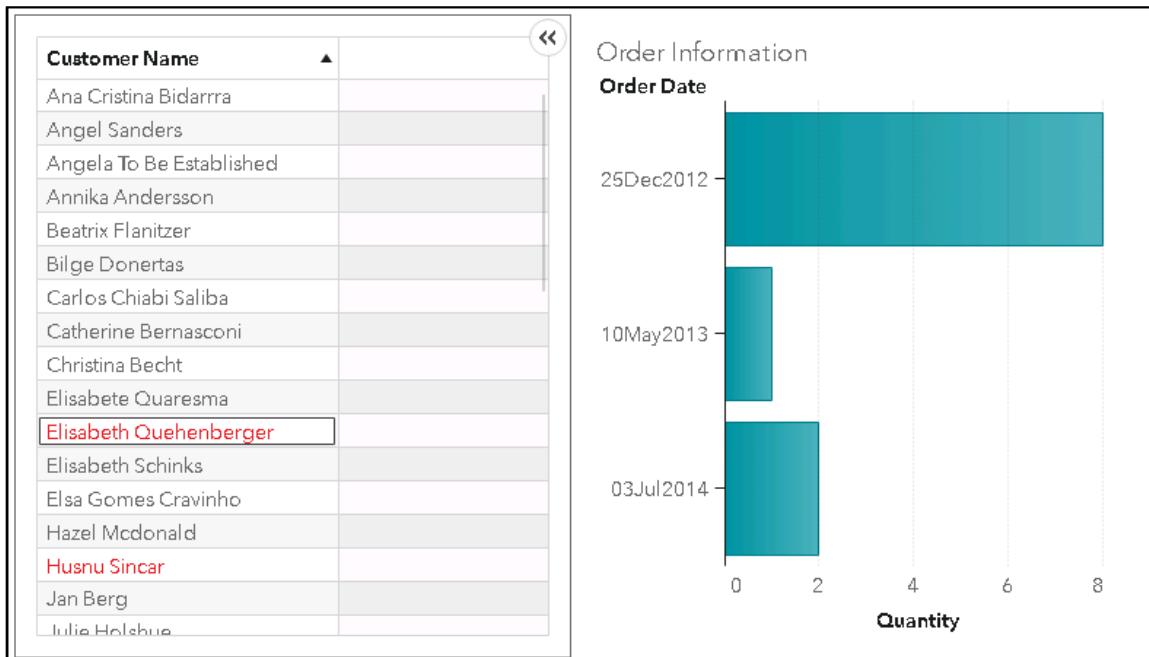
number of orders are pretty low. Is it the types of items that are ordered in those months that are creating this phenomenon?

- 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 (yellow slice) in the pie chart.

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

- l. Click  (Maximize view) in the upper right corner.
- m. Scroll down in the list table and select the row for **Elisabeth Quehenberger**.

The info window should resemble the following:



Elisabeth 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**.
10. Select **Eric**  Sign Out in the upper right corner to sign out of SAS Visual Analytics.

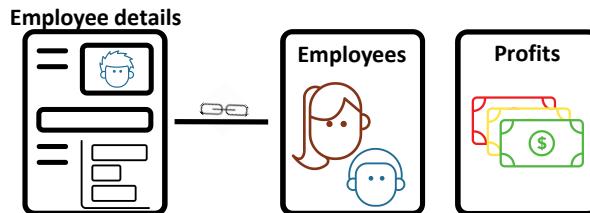
End of Demonstration

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





Exercises

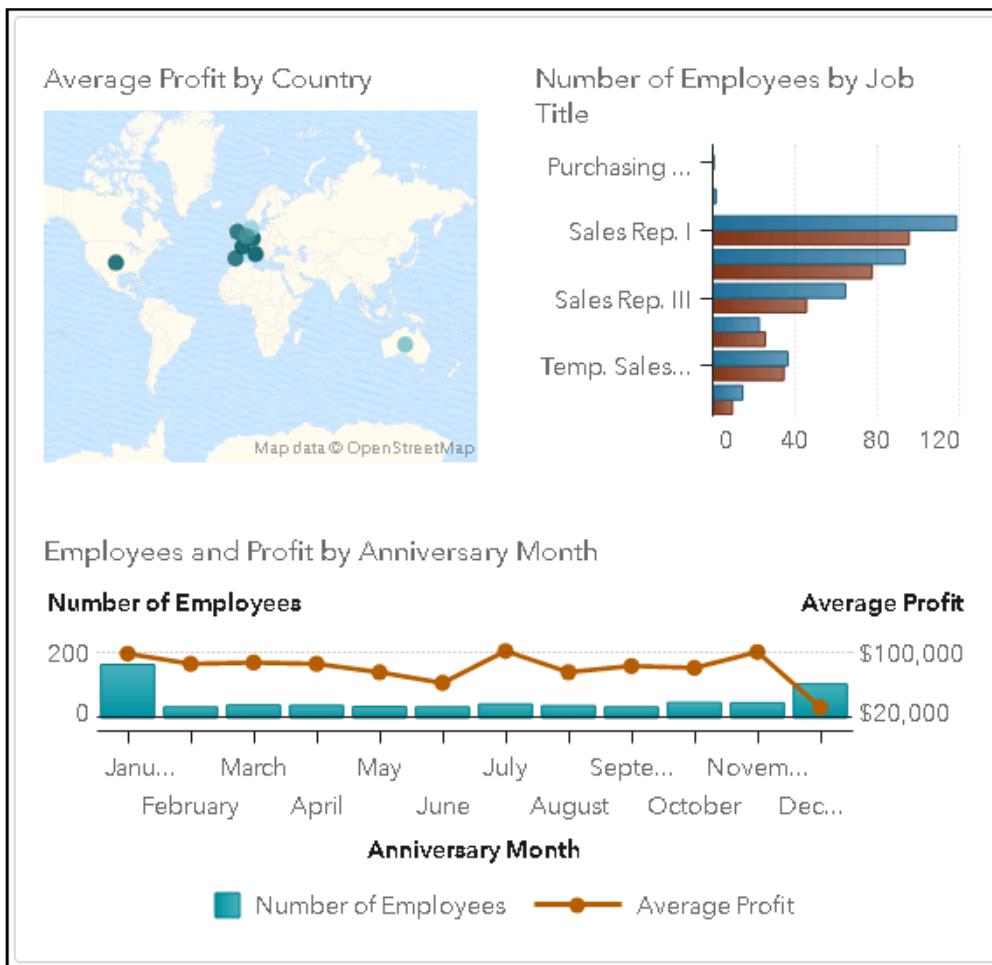
5. Working with Report-Level and Graph-Level Display Rules

- Open the browser and sign in to Visual Analytics using Eric's credentials.
- Open the **VA1- Exercise4.3** report from the **Shared Data/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

Hint: Click (Change the display rule to a report-level display rule) next to the display rule on the Rules tab, if necessary.

The Employee Analysis page should resemble the following:

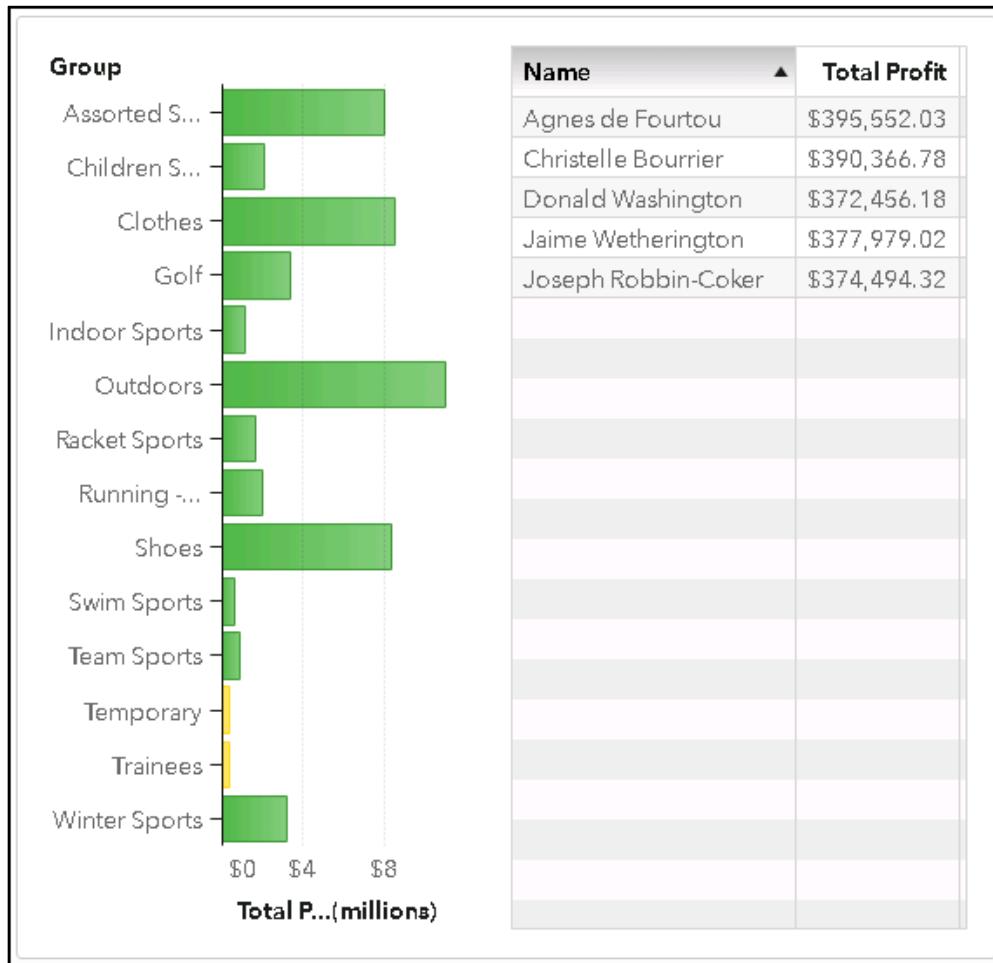


- d. Add three expression display rules to the bar chart on the Profit Analysis page by assigning the following colors to the ranges of total profit:

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.
f. View the report and answer the following questions:

How many employees retired in Spain? How many retired with the Sales Rep. I job title? Of those, how many were female?

Answer: _____

View the Profit Analysis page. Among active employees in Orion Spain, how many groups generated a total profit above \$500,000?

Answer: _____

- g. Sign out of Visual Analytics.

End of Exercises

4.4 Solutions

Solutions to Exercises

1. Creating a Simple Report

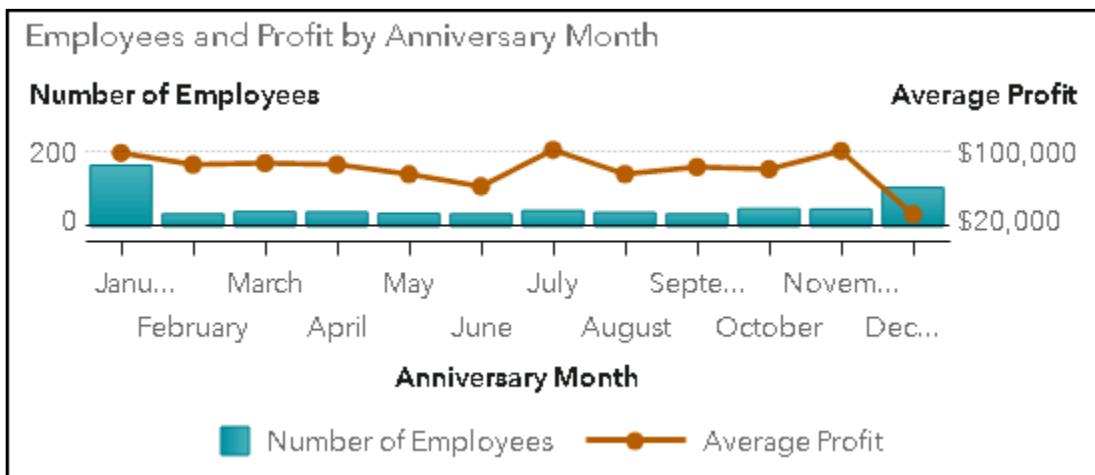
- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- b. Open the **VA1- Exercise4.1** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Exercises(HR)** folder.
 - 4) Double-click **VA1- Exercise4.1** to open the report.
- c. Create a geo map, to the left of the bar chart.
 - 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 **Roles** icon.
 - 4) For the **Category** role, select **Add** \Rightarrow **Employee Country**.
 - 5) For the **Color** role, select **Add** \Rightarrow **Average Profit**.
 - 6) For the **Size** role, right-click **Number of Employees** and select **Remove Number of Employees**.
 - 7) For the **Data tip values** role, select **Add** \Rightarrow **Number of Employees** and click **OK**.
- d. Modify options for the geo map.
 - 1) In the right pane, click the **Options** icon.
 - 2) In the General group, enter **Average Profit by Country** in the **Name** field.
 - 3) Enter **Average Profit by Country** in the **Title** field.
 - 4) In the Overlay group, select **Coordinates** for the **Type** field.
 - 5) In the Legend group, select **Off** for the **Visibility** field.

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 General group, enter **Employees and Profit by Anniversary Month** in the Name field.
 - 3) Enter **Employees and Profit by Anniversary Month** in the Title field.
 - 4) In the Line group, select **Show markers**.
- g. In the dual axis bar-line chart, right-click **Anniversary Month** on the horizontal axis and select **Sort** \Rightarrow **Ascending**.

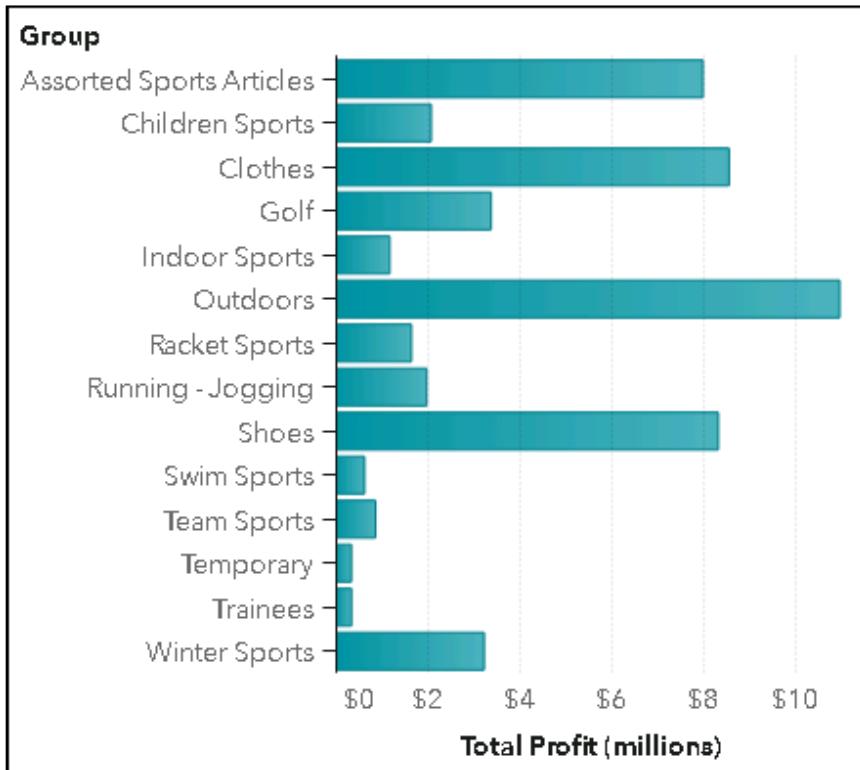
The dual axis bar-line chart should resemble the following:



- h. In the upper right corner, select (More options) \Rightarrow Save.
 - i. Select Eric \Rightarrow Sign Out in the upper right corner to sign out of SAS Visual Analytics.
2. Working with Pages
- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
 - b. Open the **VA1- Exercise4.2a** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Exercises(HR)** folder.
 - 4) Double-click **VA1- Exercise4.2a** to open the report.
 - c. Add a new page to the report and rename pages.
 - 1) In the upper left corner of the report, click (Add a 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 General group, enter **Total Profit per Group** in the **Name** field.
- f. In the new bar chart, right-click **Group** on the vertical axis and select **Sort** \Rightarrow **Ascending**.

The new bar chart should resemble the following:



- g. In the upper right corner, select (**More options**) \Rightarrow **Save**.
 - h. Select **Eric** \Rightarrow **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.
- ### 3. Working with Prompts and Actions
- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.

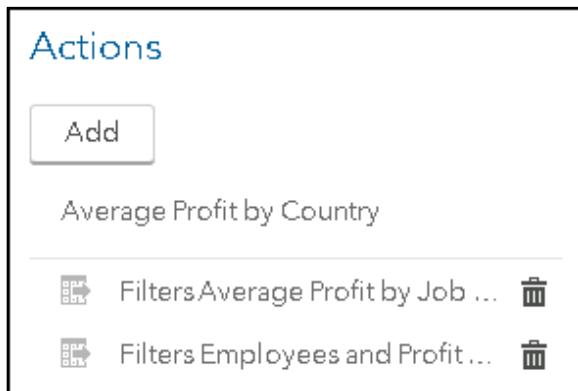
- b. Open the **VA1- Exercise4.2b** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Exercises(HR)** folder.
 - 4) Double-click **VA1- Exercise4.2b** to open the report.
- c. Add a report prompt that uses a button bar to select the employee type.
 - 1) If necessary, click  (**Show report and page prompt areas**) in the upper right corner.
 - 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 General group, enter **Employee Status Selector** in the **Name** field.
 - 3) Enter **Select an employee status:** in the **Title** field.

The button bar should resemble the following:

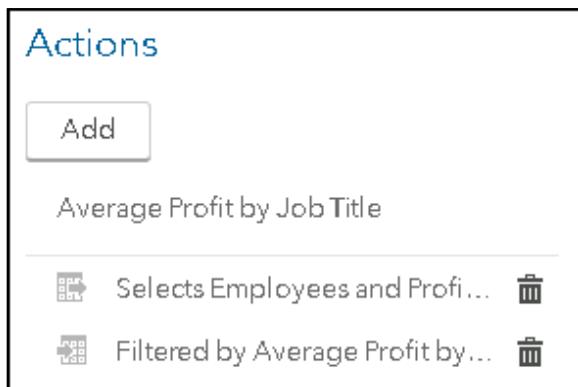


- e. Add actions between objects on the Employee Analysis page.
 - 1) If necessary, click the **Employee Analysis** page to make it active.
 - 2) Click the geo map on the page to select it.
 - 3) In the right pane, click the **Actions** icon.
 - 4) In the Actions pane, select **Add** \Rightarrow **Add filter**.
 - 5) In the Add Filter Action window, click **Select all** in the Target area.
 - 6) Click **OK**.

The Actions pane should resemble the following:



- 7) Click the bar chart to select it.
- 8) In the right pane, click the **Actions** icon.
- 9) In the Actions pane, select **Add** \Rightarrow **Add linked selection**.
- 10) In the Add Linked Selection Action window, verify that **Employees and Profit by Anniversary Month** (the dual axis bar-line chart) is selected.
- 11) Click **OK**.



- f. Add a rank to the list table, on the Profit Analysis page, to show the top five employees by total profit.
 - 1) Click the **Profit Analysis** page to make it active.
 - 2) Select the list table.
 - 3) In the right pane, click the **Ranks** icon.
 - 4) In the Ranks pane, select **Add** \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:

Ranks

Add

▼ All visible categories X

Top count ▾
Count:
5

By:
Total Profit

Include:
 Ties

The list table should resemble the following:

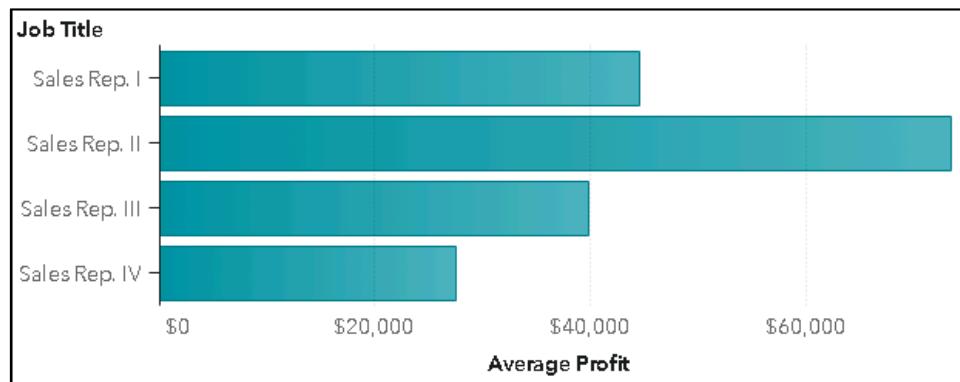
Top 5 Employees by Total Profit Generated		
Name	▲	Total Profit
Agnes de Fourtou	\$395,552.03	
Christelle Bourrier	\$390,366.78	
Donald Washington	\$372,456.18	
Jaime Wetherington	\$377,979.02	
Joseph Robbin-Coker	\$374,494.32	

- g. In the upper right corner, select (More options) \Rightarrow Save.
- h. View the report and answer the questions.
 - 1) In the upper right corner, select (More options) \Rightarrow 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 in the bar chart.

Top 5 Employees by Total Profit Generated	
Name	Total Profit ▾
Tywanna Mcdade	\$178,299.60
Daniel Pulliam	\$172,949.97
Clement Davis	\$17,429.24

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

Answer: **One employee (Marc Zampa)**

- In the Company Selector (page prompt), select Orion France.
- Click the Racket Sports bar in the bar chart.

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

- i. Select **Eric** ⇒ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

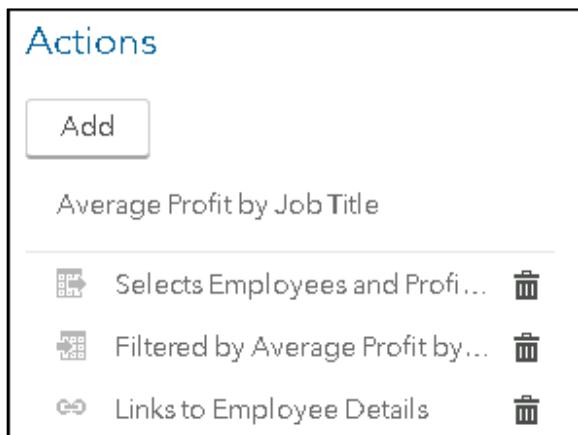
4. Working with Hidden Pages and Pages Links

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- b. Open the **VA1- Exercise4.2c** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Exercises(HR)** folder.
 - 4) Double-click **VA1- Exercise4.2c** to open the report.
- c. Add a new hidden page to the report named **Employee Details**.
 - 1) Click **Page 3** to make it active.
 - 2) Click  (**Hide page**) to the left of **Page 3** 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) If necessary, click  (**Show report and page prompt areas**) in the upper right corner.
 - 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 General group, enter **Years of Service Selector** in the **Name** field.
 - 3) Enter **Select a range of years:** in the **Title** field.
 - 4) In the Slider group, select **Set fixed range**.
 - 5) Enter **0** in the **Minimum** field.
 - 6) Enter **45** in the **Maximum** field.
 - 7) 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, select **Add** ⇒ **Add page link**.
 - 5) In the Add Page Link Action window, select **Employee Details**.
 - 6) Click **OK**.



- g. In the upper right corner, select (**More options**) ⇒ **Save**.
- h. View the report and answer the questions.
 - 1) In the upper right corner, select (**More options**) ⇒ **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)

- 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 in 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:

Employee Information	
Name	▲
Giulia Buonocunto	
Giuseppe Franco Scoditti	

- 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: Four employees

- 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 in 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.

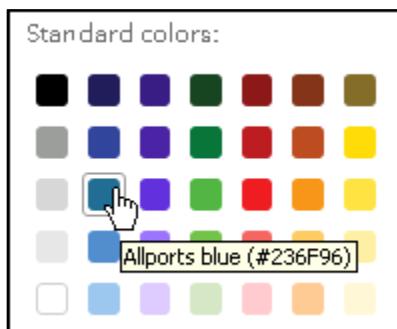
Employee Information				
Name	Company	Job Title	Annual Salary	Total Profit ▼
Ray Abbott	Orion USA	Sales Rep. I	\$25,660.00	\$371,506.09
Donald Court	Orion USA	Sales Rep. I	\$27,100.00	\$271,089.42
Tachaun Voron	Orion USA	Sales Rep. I	\$25,125.00	\$260,146.86
Glorina Myers	Orion USA	Sales Rep. I	\$26,025.00	\$220,995.63

- Click Close to close the Employee Details window.

- i. Select **Eric**  **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

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

- a. Open the browser and sign in to Visual Analytics using Eric's credentials.
 - 1) From the browser window, select **SAS Home** from the bookmarks bar or from the link on the page.
 - 2) Enter **Eric** in the **User ID** field.
 - 3) Enter **Student1** in the **Password** field.
 - 4) Click **Sign In**. SAS Visual Analytics appears, and the home page is displayed by default.
- b. Open the **VA1- Exercise4.3** report from the **Shared Data/Basics/Exercises (HR)** folder.
 - 1) Click **SAS Visual Analytics** in the application shortcut area. The Welcome to SAS Visual Analytics window appears.
 - 2) Click **Open**.
 - 3) Navigate to the **Shared Data/Basics/Exercises(HR)** folder.
 - 4) Double-click **VA1- Exercise4.3** to open the report.
- c. Add a report-level display rule for gender.
 - 1) In the right pane, click the **Rules** icon.
 - 2) In the Display Rules pane, select **Add** \Rightarrow **Add color-mapped values**.
 - 3) In the Add Display Rule: Color Map window, select **Employee Gender** for the **Specify a column or value** field, if necessary.
 - 4) Click the plus sign to add a new line, specify a color, and enter Male as the first value.
 - 5) Click **(Select a color)** on the left of the value.
 - 6) Choose **Allports blue** as the color.



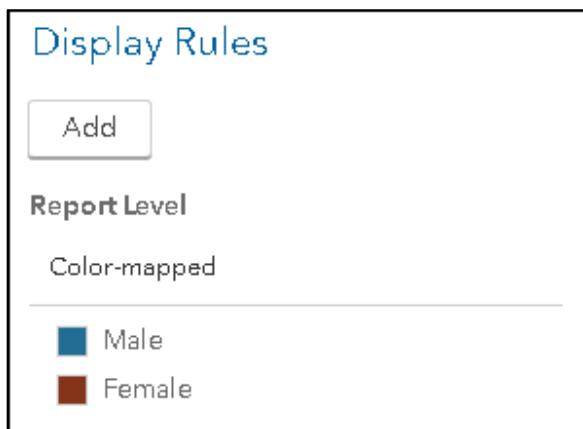
- 7) Click **(Add)**.
- 8) Enter **Female**.
- 9) Click **(Select a color)** on the left of the value.

10) Choose **Russet brown** as the color.

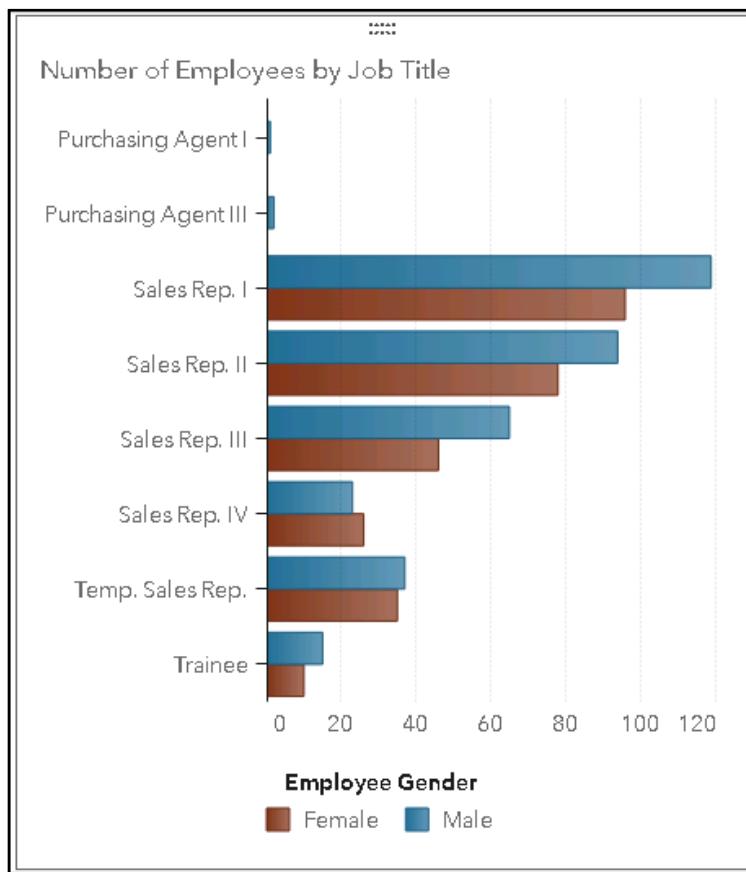


11) Click **OK**.

12) In the Display Rules pane, click (Change the display rule to a report-level display rule) if necessary.



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) In the right pane, click the **Rules** icon.
 - 4) In the Display Rules pane, select **Add** \Rightarrow **Add expression**.
 - a) In the Add Display Rule: Expression window, verify that **Total Profit** is selected for the **Column** field.
 - b) Select **<** for the **Operator** field.
 - c) Enter **200,000** for the **Value** field.
 - d) Select **Graph** for the **Style Area** field.
 - e) For the Color field, click (**Select a color**).

f) Choose **Alizarin red** as the color.



g) Click **OK**.

5) In the Display Rules pane, select **Add** \Rightarrow **Add expression**.

- In the Add Display Rule: Expression window, verify that **Total Profit** is selected for the **Column** field.
- 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 Color field, click (**Select a color**).
- Choose **Paris daisy yellow** as the color.

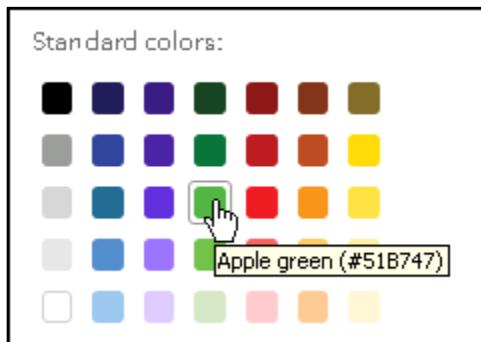


h) Click **OK**.

6) In the Display Rules pane, select **Add** \Rightarrow **Add expression**.

- In the Add Display Rule: Expression window, verify that **Total Profit** is selected for the **Column** field.
- Verify that **>** is selected for the **Operator** field.
- Enter **500,000** for the **Value** field.
- Select **Graph** for the **Style Area** field.
- For the Color field, click (**Select a color**).

f) Choose **Apple green** as the color.



g) Click **OK**.

Display Rules

Add

Total Profit by Group

Expression

[Green square] Total Profit > 500,000

Expression

[Yellow square] Total Profit BetweenInclusive(200,0...

Expression

[Red square] Total Profit < 200,000

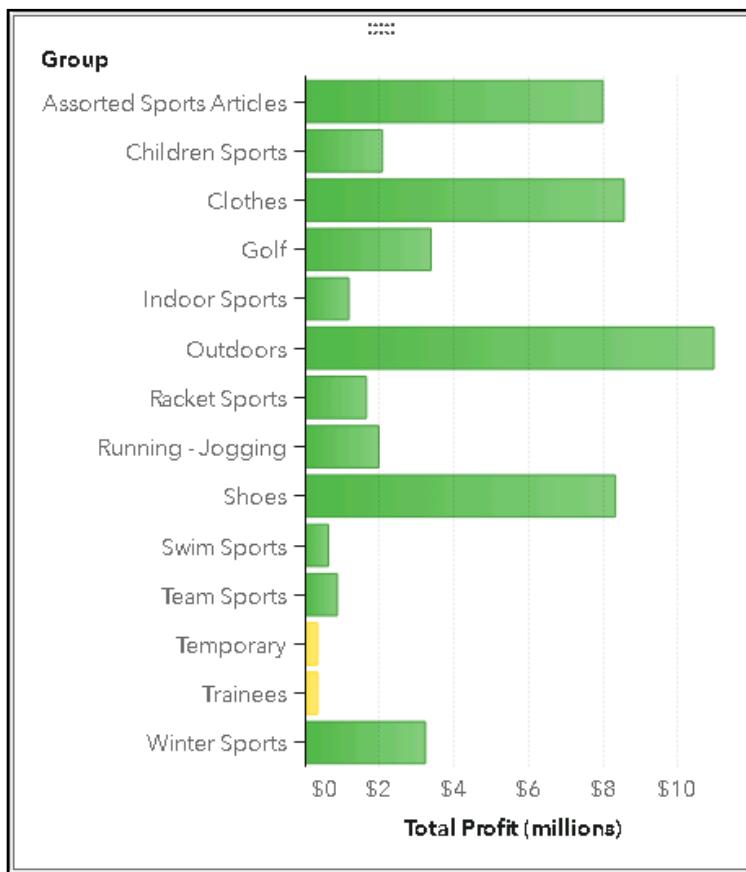
Report Level

Color-mapped

[Blue square] Male

[Brown square] Female

The bar chart should resemble the following:



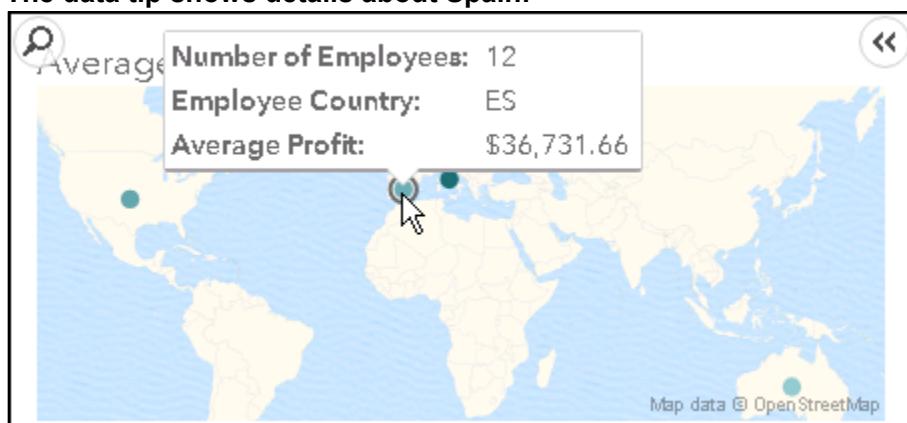
- e. In the upper right corner, select (More options) \Rightarrow Save.
- f. View the report and answer the questions.
 - 1) In the upper right corner, select (More options) \Rightarrow View report. The report opens in the Report Viewer.
 - 2) Answer the questions.

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, select (Maximize view).

The details table at the bottom shows the total number of employees for each group:

Job Title	▲	Number of Employees	Employee Gender	▲
Sales Rep. I		3	Female	
Sales Rep. I		1	Male	
Sales Rep. II		1	Male	
Sales Rep. III		1	Male	
Total Col = 12		2	Female	

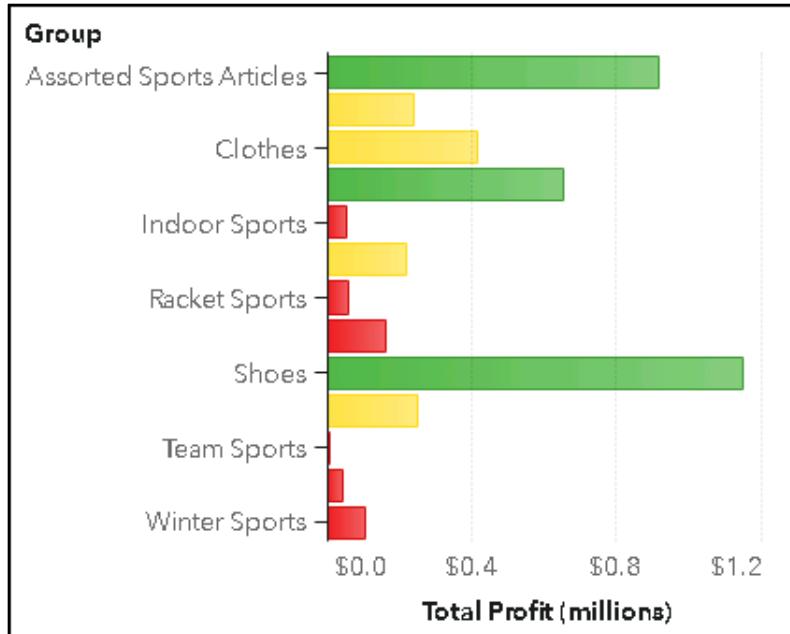
- In the upper right corner of the bar chart, select (Exit maximized view).

View the Profit Analysis page. Among active employees in Orion Spain, how many groups generated a total profit above \$500,000?

Answer: Three groups (Assorted Sports Articles, Golf, and Shoes)

- Click the Profit Analysis tab.
- Select Active in the Employee Status Selector (report prompt).
- Select Orion Spain from the Company Selector (page prompt).

View the bar chart:



- g. Select **Eric** ⇨ **Sign Out** in the upper right corner to sign out of SAS Visual Analytics.

End of Solutions

Solutions to Student Activities (Polls/Quizzes)

4.01 Quiz – 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 Sports**



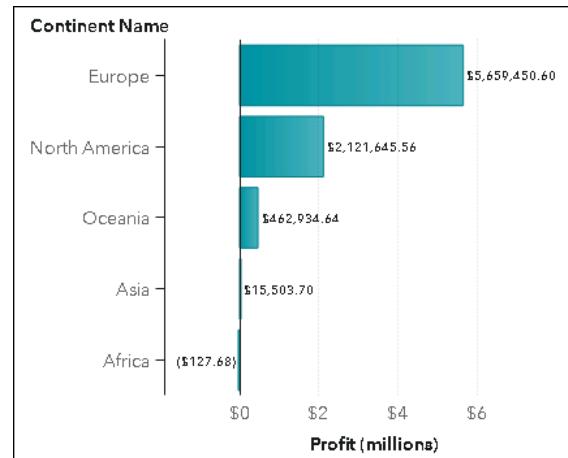
4.02 Multiple Choice Poll – Correct Answer

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

- a. bubble plot
- b. pie chart
- c. bar chart
- d. treemap

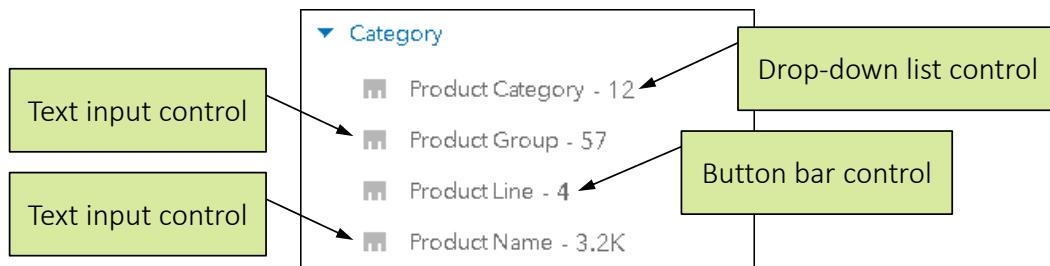
Bubble plots require three measures.

Pie charts and treemaps cannot display negative values.



4.03 Quiz – Correct Answer

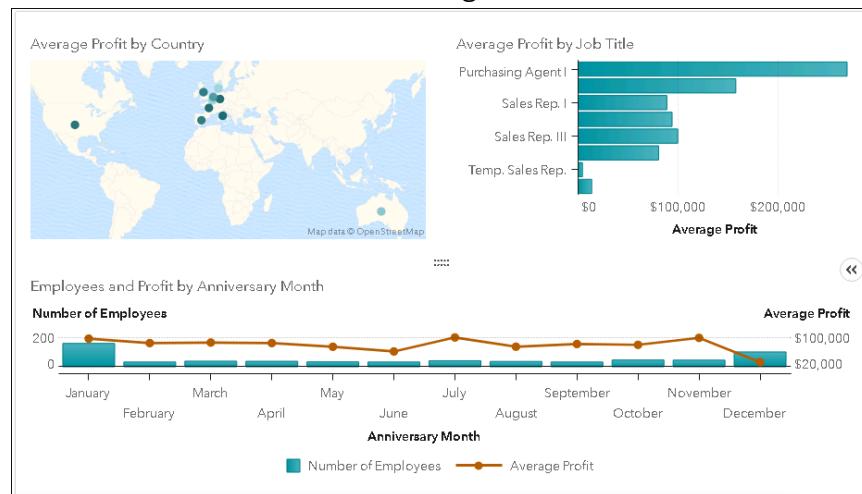
Given the distinct values, which control object would you use to filter for each category displayed below?



Exercise Review

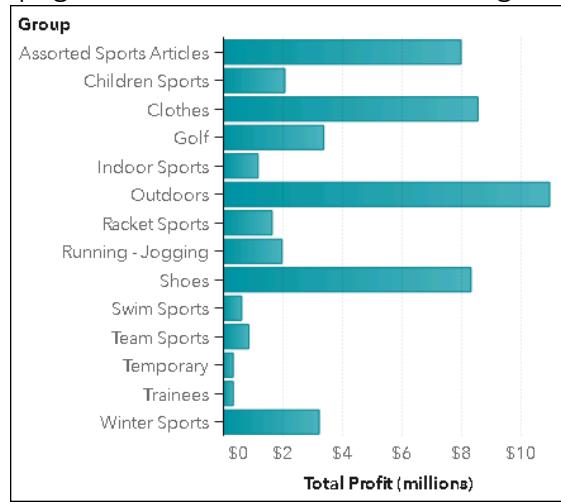
4.1 Creating a Simple Report – Solution

The report should resemble the following:



4.2 Working with Pages – Solution

The Profit Analysis page should resemble the following:



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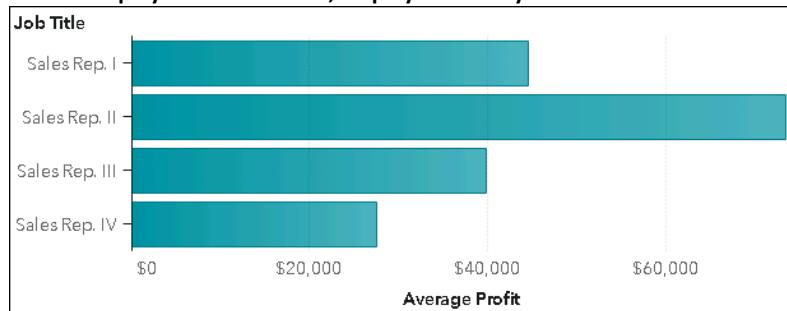


4.3 Working with Prompts and Actions – Solution

Which job title has the highest average profit among active employees in Australia?

Sales Rep. II (\$73,430.56)

Filters: Employee Status=Active, Employee Country=AU



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4.3 Working with Prompts and Actions – Solution

For Orion USA, which active sales representative had the highest total profit generated for the indoor sports group?

Tywanna Mcdade (\$178,299.60)

Filters: Employee Status=Active,
Company=Orion USA,
Group=Indoor Sports

Top 5 Employees by Total Profit Generated	
Name	Total Profit ▼
Tywanna Mcdade	\$178,299.60
Daniel Pulliam	\$172,949.97
Clement Davis	\$17,429.24

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	\$66,109.84

39

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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	▲
Giulia Buonocunto	
Giuseppe Franco Scoditti	

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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?

Four employees

Filters: Employee Status=Active, Employee Country=US, Job Title=Sales Rep. I, Years of Service=25+

Employee Information				
Name	Company	Job Title	Annual Salary	Total Profit ▾
Ray Abbott	Orion USA	Sales Rep. I	\$25,660.00	\$371,506.09
Donald Court	Orion USA	Sales Rep. I	\$27,100.00	\$271,089.42
Tachaun Voron	Orion USA	Sales Rep. I	\$25,125.00	\$260,146.86
Glorina Myers	Orion USA	Sales Rep. I	\$26,025.00	\$220,995.63

49



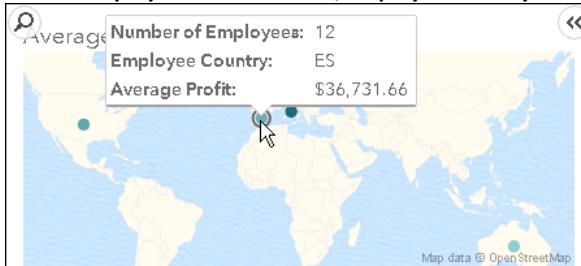
4.5 Working with Report-Level and Graph-Level Display Rules – Solution

How many employees retired in Spain? How many retired with the Sales Rep. I job title? Of those, how many were female?

Twelve employees retired in Spain. Four employees retired with Sales Rep. I job title.

Three employees were female.

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
Total Employees	2	Female

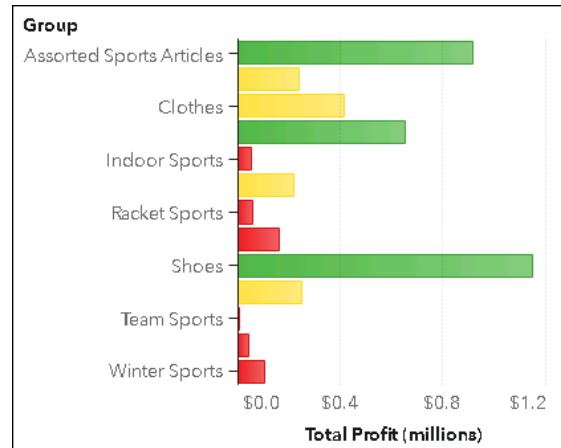
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4.5 Working with Report-Level and Graph-Level Display Rules – Solution

View the Profit Analysis page.
Among active employees in Orion Spain, how many groups generated a total profit above \$500,000?

3Three groups



Chapter 5 Learning More

5.1 SAS Resources.....	5-3
5.2 Beyond This Course	5-6

5.1 SAS Resources

Objectives

- Identify areas of support that SAS offers.
- List additional resources.

3

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4

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- preparation materials
- practice exams

<http://support.sas.com/certify>



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Customer Support

SAS provides a variety of self-help and assisted-help resources including the following:

- SAS Knowledge Base
- downloads and hot fixes
- license assistance
- SAS discussion forums
- SAS Technical Support

<http://support.sas.com>



User Groups and SAS Support Communities

SAS supports many local, regional, international, and special-interest SAS user groups.

<http://support.sas.com/usergroups>



SAS Support Communities enable you to collaborate with SAS and other SAS users.

<http://communities.sas.com>



Networking

Social media channels, SAS blogs, and user group organizations enable you to

- interact with other SAS users and SAS staff
- learn new programming tips and tricks
- obtain exclusive discounts.

<http://support.sas.com/socialmedia>



5.2 Beyond This Course

Objectives

- Introduce the different types of SAS training.
- Identify additional learning opportunities that follow this course.

Several “Flavors” of SAS Training

SAS Education provides a variety of training formats that are designed to satisfy your learning style, including the following:

- classroom
- Live Web
- e-learning
- on-site training
- mentoring

Training Formats
Choose the style that suits your learning needs. [Satisfaction guaranteed.](#)

Specialized Training Services also available: [Business Knowledge Series](#), [Six Sigma Training](#) and [Consulting](#)

[Classroom](#) [Live Web Classroom](#) [e-Learning](#) [On-site Training](#) [Mentoring](#)



Classroom Training
Taught by certified instructors at high-tech facilities across the country

- A SAS expert at your side
- Focused learning away from the office
- Networking opportunities
- State-of-the-art facilities
- Business Knowledge Series: in-depth courses on the latest business topics

Resources:
[Locations](#)
[Course learning paths](#)
[Courses A-Z](#)
[Registration policies](#)

<http://support.sas.com/training/options>

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Classroom Training and e-Learning

SAS Education provides training on all aspects of the SAS System.

Classroom training can be delivered in SAS training centers, in the Live Web classroom, and at your site.

<http://support.sas.com/training/us/paths>

SAS e-Learning provides award-winning training when and where you need it.

<http://support.sas.com/elearn>

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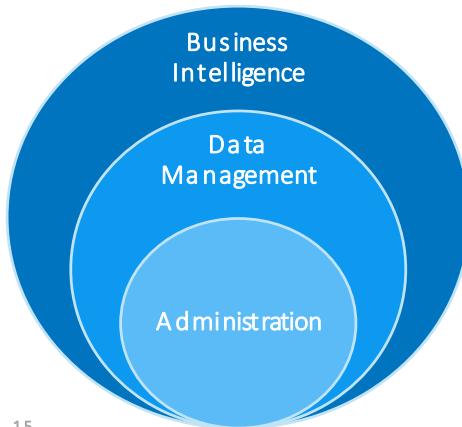


SAS Platform Training Paths

SAS Education training paths are used to organize training by similar functionality based on common job tasks.

Here are the training paths for the SAS platform:

- Administration
- Data Management
- Business Intelligence



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Additional Training Categories

In addition to SAS platform training, courses are available in the following areas:

- Advanced Analytics
- SAS Foundation
- SAS Solutions

Visit <http://support.sas.com/training/us/patterns> to view all of the courses that are available to meet your training needs.

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SAS Video Tutorials

SAS Education provides an extensive set of “how-to” videos, tutorials, and demos to learn tips and tricks for working with SAS software.

SAS Tutorials
View SAS training "how to" videos, tutorials and demos to learn tips and tricks for working with SAS software.

Get Started with SAS Studio
Get started with SAS Studio by learning how to view a data table, write and submit SAS code, view the log and results, and much more.
[View Now](#)

New to SAS Visual Analytics Analytics Programming Business Intelligence Solutions

Free tutorials to teach you the basics of SAS programming

Getting Started	Performing Statistical Analyses
Getting Started with SAS Studio	Random Sampling of Data Using SAS
Writing a Basic SAS Program	Explore the Distribution of a Variable in SAS
Accessing Data in SAS Libraries	Explore Bivariate Correlations Using SAS

<http://support.sas.com/training/tutorial>

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Next Steps

After you complete this course, you have access to extended learning resources, including the following:

- an electronic copy of the course notes
- links to technical papers
- links to SAS Publishing documentation and books
- links to white papers, SAS Global Forum papers, and much more

To grow your SAS skills, remember to activate the extended learning page for this course.



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