



# SAS® Visual Analytics 2 for SAS® Viya®: Advanced

## Course Notes

*SAS® Visual Analytics 2 for SAS® Viya®: Advanced Course Notes* was developed by Nicole Ball. Additional contributions were made by Richard Bell, Beth Hardin, and Lynn Matthews. Instructional design, editing, and production support was provided by the Learning Design and Development team.

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### **SAS® Visual Analytics 2 for SAS® Viya®: Advanced Course Notes**

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To learn more...



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



# Lesson 1      SAS® Visual Analytics Overview

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# 1.1 Overview of SAS Visual Analytics

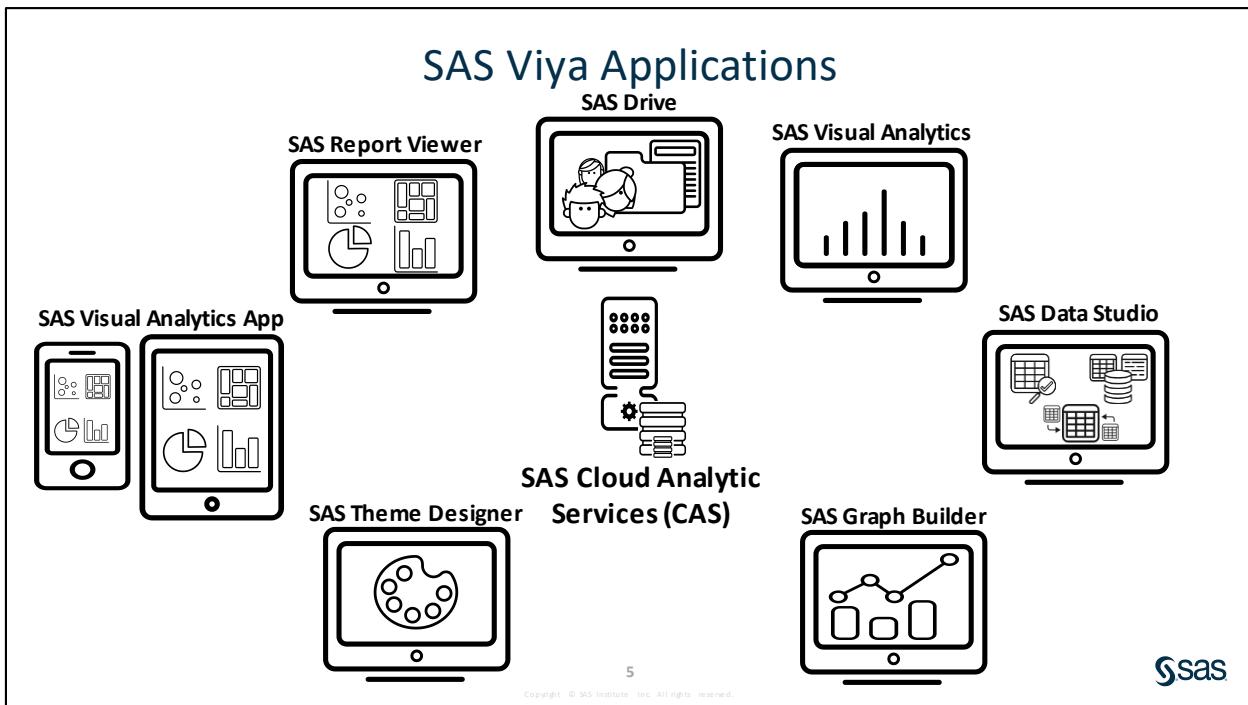
## Objectives

- Describe the purpose of SAS Visual Analytics.
- List the components of SAS Viya.
- Describe the structure of the course.
- Describe the different types of Visual Analytics users.
- Describe folders in the course environment.

**What Is SAS Visual Analytics?**

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

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

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

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

## Course Overview

### Restructuring

- Column transforms
- Custom transforms
- Data quality transforms\*
- Multi-input transforms
- Row transforms

### Analytics

- Geographic mapping
- Forecasting
- Network analysis
- Path analysis
- Text analytics

### Reporting

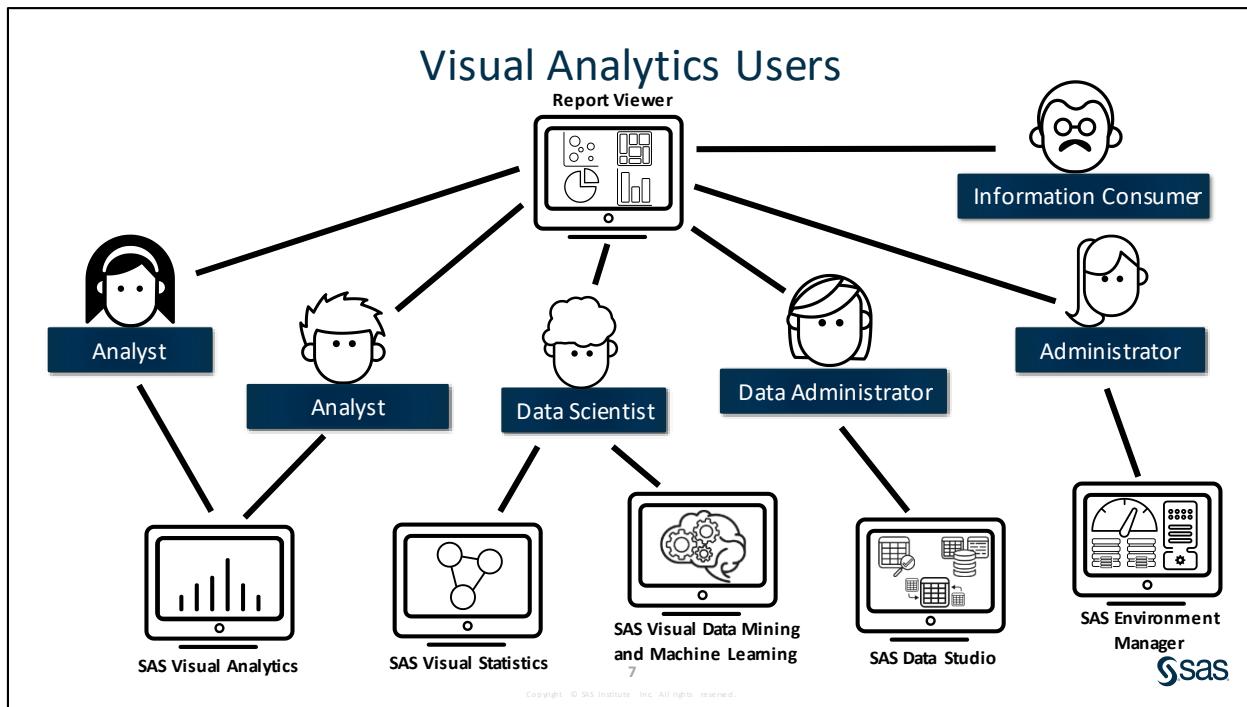
- Calculations
- Filters
- Parameters

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\* Data quality transforms are available if SAS Data Preparation is licensed at your site.



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

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

## Course Environment: Folders

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

My Folder	YVA183	Advanced	Demos
Courses	YVA283		Exercises
Model Repositories			VA2-Activity
Products			VA2-Activity
Projects			VA2-Activity
Public			

**Note:** Existing content is in Courses/YVA283/Advanced folder and subfolders.

All work will be saved in **My Folder**.

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

## 1.2 Organizing Content in SAS Drive

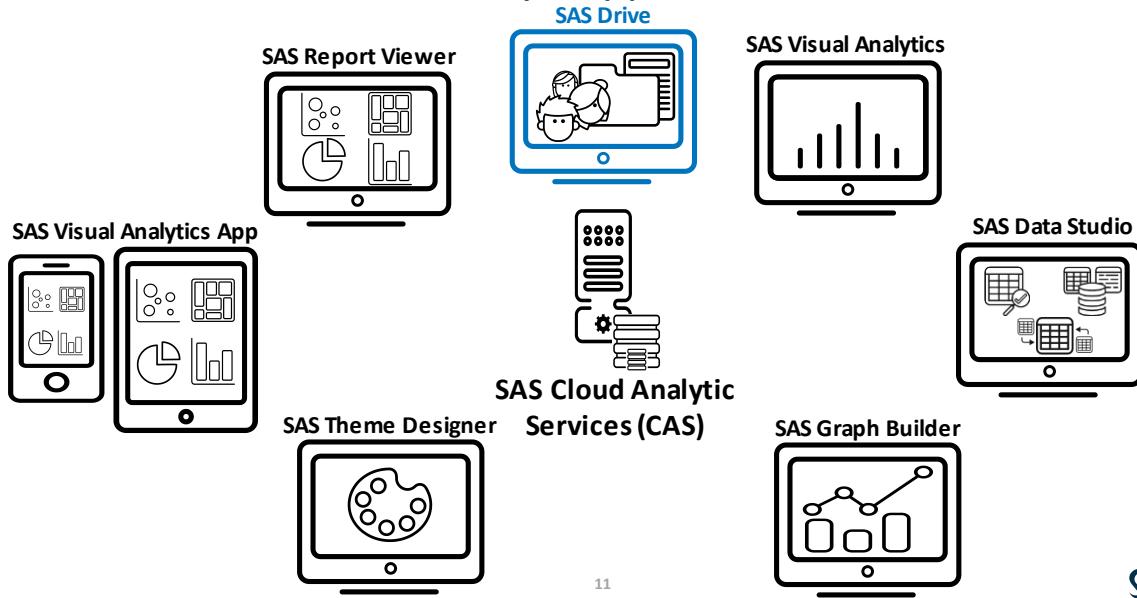
### Objectives

- Add a URL link in SAS Drive.

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### SAS Viya Applications

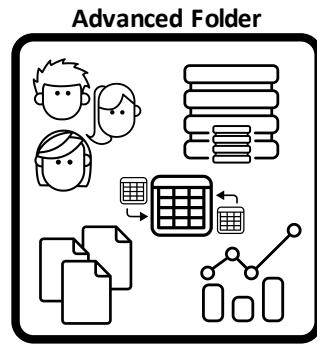


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## Business Scenario

A folder that contains all the content that you need for this course has been created. You need to familiarize yourself with the content in the folder before class begins.



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## Adding a URL Link in SAS Drive

This demonstration illustrates how to add a URL link in SAS Drive.

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

**Note:** The URL that is used to access SAS Visual Analytics is specific to the SAS Viya for Learners configuration. The URL used at your site will be different.

SAS Drive is displayed by default.

The screenshot shows the SAS Drive interface. At the top, there is a navigation bar with a 'New' button, a search bar, and various icons. Below the navigation bar is a 'Quick Access area' containing a folder icon and a link to 'SAS Videos'. The main area is titled 'My Folder' and contains a table listing a single item: 'SAS Videos'. The table has columns for Name, Date Created, Created By, Date Modified, Modified By, and Type. The 'Name' column shows 'SAS Videos', 'Date Created' shows '07/15/19 08:00 ...', 'Created By' shows 'Me', 'Date Modified' shows '07/15/19 08:00 ...', 'Modified By' shows 'Me', and 'Type' shows 'Folder'. On the left side, there is a sidebar with tabs for All, Recent, Projects, View Reports, Prepare Data, Build Graphs, Build Models, and Manage Models. The 'All' tab is selected. Below the sidebar is a 'Tabs area' containing a list of tabs: My Favorites, My Folder (which is currently selected and highlighted in blue), SAS Content, and Recycle Bin. The entire interface is framed by a light gray border.

Currently, there is a link to SAS videos in the Quick Access area. In the Tabs area, the All tab provides access to the SAS folder structure that is available to the user. Other tabs, such as Recent, provides quick access to recently viewed content and additional tabs provide access to content that is specific to an application. For example, the View Reports tab shows reports that can be viewed in SAS Report Viewer.

**Note:** You can hide or reorder the tabs displayed by clicking (Menu) and selecting **Manage tabs** in the upper right corner of SAS Drive.

- Examine the contents of the All tab.
  - Click the **All** tab.
  - If necessary, click **My Folder**. This is the folder in which you have permission to save content.
  - Expand **SAS Content/Courses/YVA283/Advanced**.
  - Click the **Demos** folder. These are the starting plans and reports for all demonstrations.
  - Click the **Exercises** folder. These are the starting plans and reports for all practices.
- Add a link to the Beautiful Reports web site.
  - Click (Menu) in the upper right and select **Add link**.
  - Enter [www.sas.com/BeautifulReports](http://www.sas.com/BeautifulReports) in the **URL** field.

- c. Enter **Beautiful Reports** in the **Label** field.
- d. Verify that the value for **Location** is **My Folder**.

Add Link

URL:

Label:

Location:

📁

Image:

Browse

OK Cancel

- e. Click **OK**.
- f. Select **My Folder** on the All tab.
- g. Verify that the link to Beautiful Reports has been added.

All Recent View Reports

My Folder

<input type="checkbox"/>	Name
<input type="checkbox"/>	SAS Videos
<input type="checkbox"/>	Beautiful Reports

My Favorites  
My Folder  
SAS Content

**End of Demonstration**

## 1.01 Activity

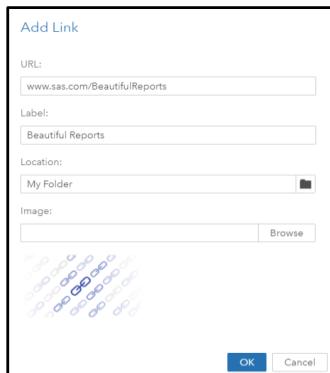
Sign in to SAS Viya for Learners. Add a link in **My Folder** to the Beautiful Reports site ([www.sas.com/beautifulreports](http://www.sas.com/beautifulreports)).

# 1.3 Solutions

## Solutions to Activities and Questions

### 1.01 Activity – Correct Answer

Sign in to SAS Viya for Learners. Add a link in **My Folder** to the Beautiful Reports site ([www.sas.com/beautifulreports](http://www.sas.com/beautifulreports)).



Add Link

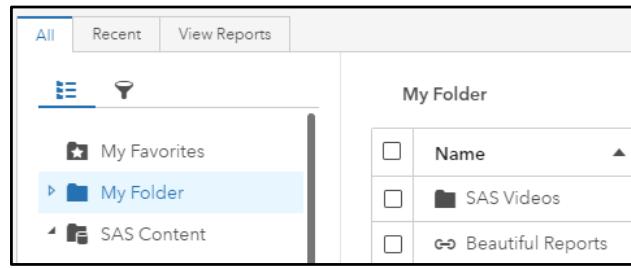
URL:  
www.sas.com/BeautifulReports

Label:  
Beautiful Reports

Location:  
My Folder

Image:

OK Cancel



All Recent View Reports

My Folder

	Name
<input type="checkbox"/>	SAS Videos
<input type="checkbox"/>	Beautiful Reports





# Lesson 2      Restructuring Data for Geographic Mapping

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## 2.1 Introduction to SAS Data Studio

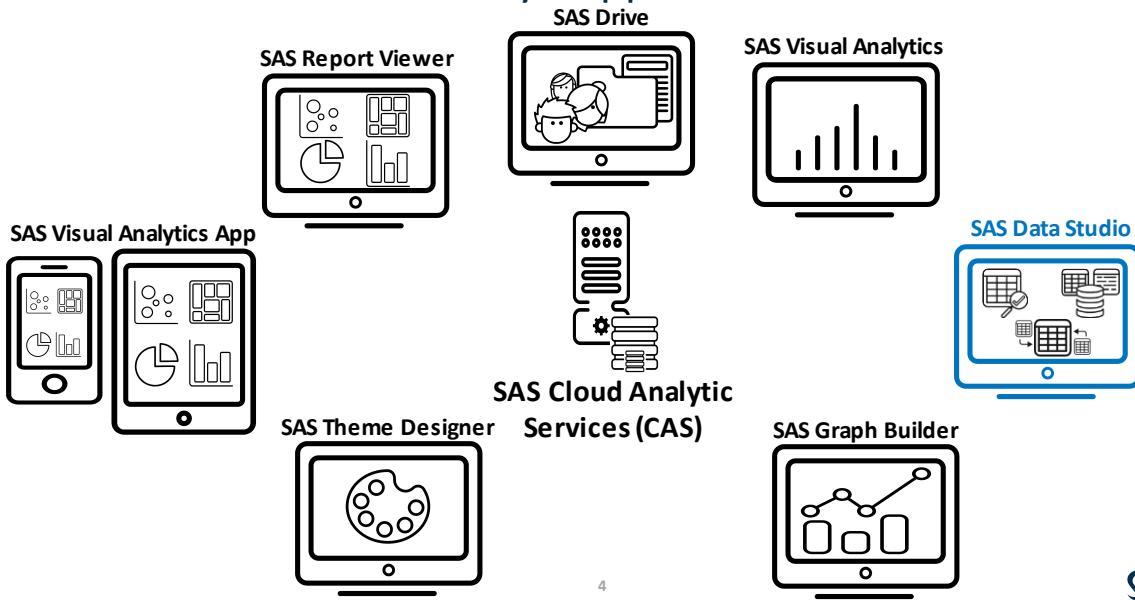
### Objectives

- Describe the features of SAS Data Studio.
- Identify the components of SAS Data Studio.

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### SAS Viya Applications



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## SAS Data Studio: Features

SAS Data Studio enables users to perform the following tasks:

- view table metadata
- view metrics about columns in a table\*
- view a preview of the results
- create plans that perform actions and transforms on a table
  - modify columns, filter, or transpose tables
  - create calculated columns or write custom code
  - join or append tables
  - improve data quality\*\*
- create a CAS table as a result of the plan actions
- create jobs from plan actions that can be scheduled with SAS Job Monitor

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\*Standard metrics are available with SAS Visual Analytics. If SAS Data Preparation is licensed, advanced column metrics are available.

\*\*Data quality transforms are available if SAS Data Preparation is licensed.

## SAS Data Studio

The screenshot shows the SAS Data Studio interface with the following components labeled:

- Left pane**: A sidebar on the left containing icons for data sources, plans, and other tools.
- Workspace**: The central workspace area where a plan is being edited.
- Right pane**: A sidebar on the right containing icons for data sources, plans, and other tools.
- Bottom pane**: The data preview pane at the bottom showing a table named "CUSTOMERS".

The "CUSTOMERS" table data is as follows:

City	Continent	Postal_Co	State_Pro	Street_Na	ContinentLat	ContinentLon	Customer_ID	Employee_ID	Street
Leinster	Oceania	6437	Wester...	New So...	50.210...	138.515...	8818	99999999	16001
Berowra	Oceania	2081		Circuit ...	-18.312...	138.515...	47793	99999999	16001
Berowra	Oceania	2081	New So...	Circuit ...	-18.312...	138.515...	47793	99999999	16001

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Before a table can be used as a data source for a new plan, it must be loaded in CAS. However, if you open an existing plan that uses a table that is not currently loaded, it is automatically loaded to the CAS Server.

The bottom pane contains the following information:

<b>Table</b>	The Table tab displays a sample of rows of the result table.  <b>Note:</b> Only the first 300 columns are displayed in the workspace. However, this does not affect your ability to work with all of the data in the table. Any changes made are applied to the entire table, not just the columns that are displayed.
<b>Profile</b>	The Profile tab displays column metrics for the source and result tables.  <b>Note:</b> If SAS Data Preparation is licensed at your site, advanced column metrics are displayed.
<b>Metadata</b>	The Metadata tab displays a list of column attributes (including name, label, type, and length).  <b>Note:</b> After you run a transform, the Metadata view reflects the current state of the table, including any changes that have been made.

The left pane contains the following icons:

<b>Transforms</b> 	The Transforms pane displays a list of all transforms available for the plan.
<b>Source Table</b> 	The Source Table pane displays properties of the source table.

The right pane contains the following icons:

<b>Plan</b> 	The Plan pane displays a list of all actions associated with the plan.
<b>Result Table</b> 	The Result Table pane displays properties of the result table.

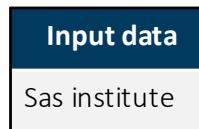
## 2.01 Activity

Sign in to SAS Viya for Learners and access SAS Data Studio.

**Hint:** To access SAS Data Studio, click **New** ⇒ **Data plan** from SAS Drive.

Which transforms can be used to modify the case of columns?

## Casing Transforms



Transform	Definition	Output data
Change Case	Lowercase	sas institute
Change Case	Uppercase	SAS INSTITUTE
Casing	Proper	Sas Institute
Casing	Proper (Organization)	SAS Institute

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**Note:** If SAS Data Preparation is licensed at your site, then you have access to more advanced options using the Casing transform.

## 2.2 Restructuring Data

### Objectives

- Discuss when to use geographic graphs in SAS Visual Analytics.
- Describe the structure of the table needed for geographic analysis.

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### Objects: Graphs (Geography)

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

**Bubbles**



**Coordinates**



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

**Contour**



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

**Regions**

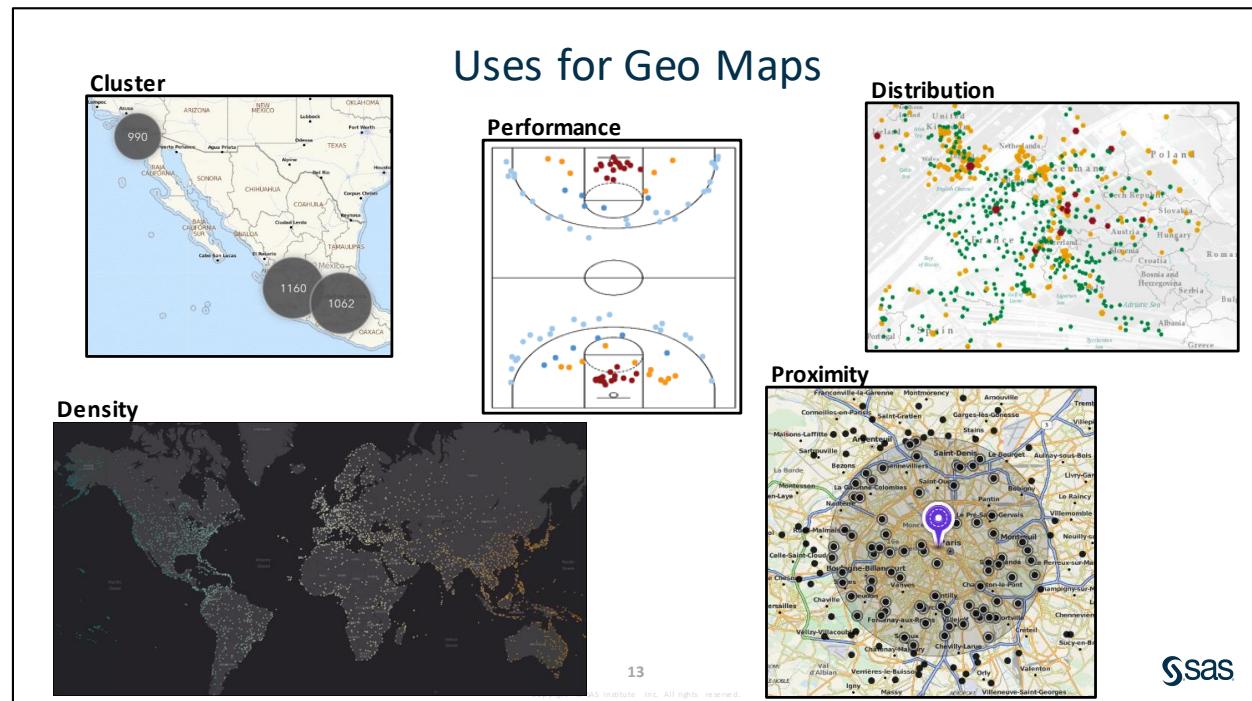


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<b>Geo map</b>	<p>A geo map overlays data on a geographic map. Data can be displayed as coordinates, colored regions, bubbles, or a contour plot. In order to display data on a geo map, at least one category data item must have values that are mapped to geographical locations or regions.</p>
<b>Coordinates</b>	<p>A coordinates geo map (also known as a <i>dot distribution map</i> or a <i>dot density map</i>) helps with detecting spatial patterns and understanding the distribution of data over a geographical region, which can help reveal patterns using clustered points.</p>
<b>Regions</b>	<p>A regions geo map (also known as a <i>choropleth map</i>) uses colors to show variations by location. However, larger regions appear more emphasized than smaller ones, which can affect perceptions of colors.</p>
<b>Bubbles</b>	<p>A bubble geo map displays bubbles over a geographical region. The bubble size helps with comparing proportions over regions without the size of the region causing distortions, but the size of the bubble can overlap with other bubbles and regions making the chart difficult to read.</p>
<b>Contour</b>	<p>A contour geo map displays shaded regions over a geographical region. Contour maps are best used to show very dense data.</p>

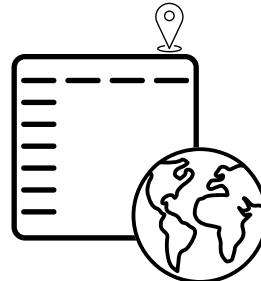
For more information about creating geography data items, see “Working with Geography Data Items” in the SAS® Visual Analytics 8.3 documentation.



## Geo Maps: Data Structure

To create a geo map, the data source must contain one of the following types of geographic data:

- predefined
  - country names or codes
  - state or province names or ID values
  - US State names or abbreviations
  - US postal codes
- custom coordinates (latitude and longitude\*)
- custom polygonal shapes (region ID\*\*)



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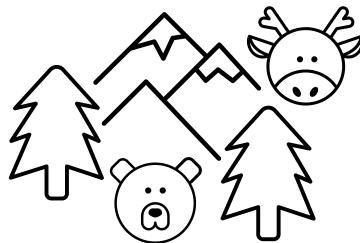
\*Latitude and longitude values are required for custom coordinates (geographic selections that are not predefined). If the data source does not contain latitude and longitude values, a data source join can be used to add latitude and longitude values. For more information about using custom coordinates, see “Working with Geography Data Items” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

\*\*Region ID is required for custom polygonal shapes. For more information about adding custom polygons, see “Loading Geographic Polygon Data as a CAS Table” in the *SAS® Viya® 3.4 Administration: Data Administration* documentation.

## Business Scenario: Parks

The US National Park Service has asked for a map that shows the locations of all national parks and lists the species located in each.

Currently, we have a table that contains information about the parks (size, location, name) and a table that contains information about the species (type, location, name). We need to join the tables together to produce the desired map.



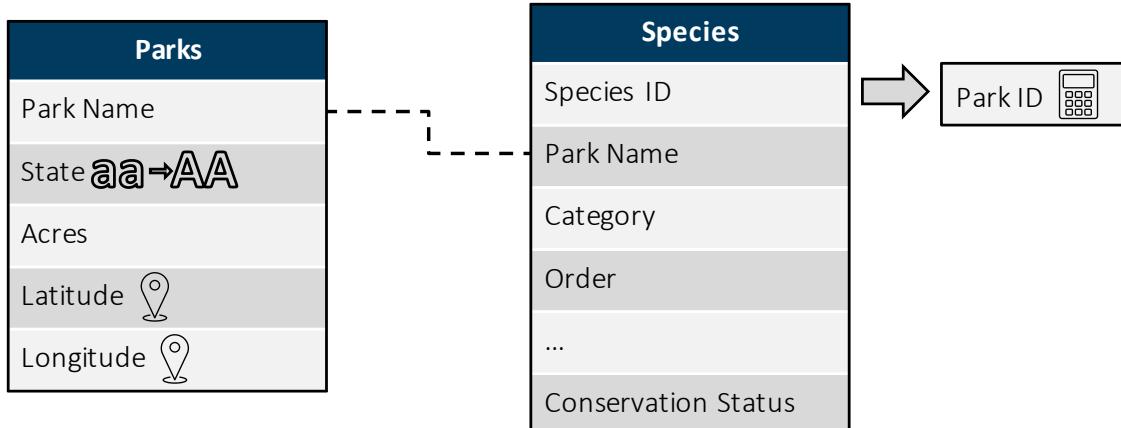
Sas

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**Note:** Beginning with Visual Analytics 8.3, users can perform a data source join within SAS Visual Analytics without having to use SAS Data Studio. For more information about data source joins, see “Working with Data Source Joins in Reports” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

## Business Scenario: Parks



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Sas

In the demonstration, we perform the following steps:

1. Convert **State** to uppercase.
2. Create an inner join of the **Parks** table and the **Species** table (using **Park Name**)
3. Remove a column from the result table (**Park Name** from the **Species** table)
4. Calculate **Park ID** from the first four characters of **Species ID**.

The plan creates a new CAS table (**Parks\_Loc**) that is used in a later section.



## Creating a Geographic Data Source

This demonstration illustrates how to explore a data source and use transforms (Change Case, Join, and Calculated Column) to create a geographic data source in SAS Data Studio.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA283/Advanced/Demos** folder.

The canvas displays the objects located in that folder.

SAS Content > Courses > YVA283 > Advanced > Demos						
	Name	Date Created	Created By	Date Modified	Modified By	Type
<input type="checkbox"/>	Solutions	06/28/19 01:35 PM	v4e.provider@v4e.sas.c...	06/28/19 01:35 PM	v4e.provider@v4e.sas.com	Folder
<input type="checkbox"/>	VA2-Demo2.2	06/28/19 01:34 PM	v4e.provider@v4e.sas.c...	06/28/19 01:34 PM	v4e.provider@v4e.sas.com	Data plan
<input type="checkbox"/>	VA2-Demo2.3	06/19/18 05:11 PM	sasdemo	06/20/18 04:37 PM	sasdemo	Report
<input type="checkbox"/>	VA2-Demo3.1	06/28/19 01:34 PM	v4e.provider@v4e.sas.c...	06/28/19 01:34 PM	v4e.provider@v4e.sas.com	Data plan

3. Right-click **VA2-Demo2.2** and select **Prepare data**.

The plan is opened in SAS Data Studio.

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

Columns	Rows	Size
5	56	4.7 KB

Label:  
(not available)

Location:  
cas-v4e010-default/YVA283

Location will reflect your unique CAS server.

5. View metadata, profile, and table information for the source table.

- a. In the bottom pane, click **Metadata**.

The screenshot shows a software window titled "VA2-Demo2.2". At the top right are "Run" and a dropdown menu buttons. Below the title bar is a large empty workspace with the placeholder text "Add a transform to the plan." A horizontal toolbar at the bottom contains three buttons: "Table", "Profile", and "Metadata". The "Metadata" button is highlighted with a red rectangle.

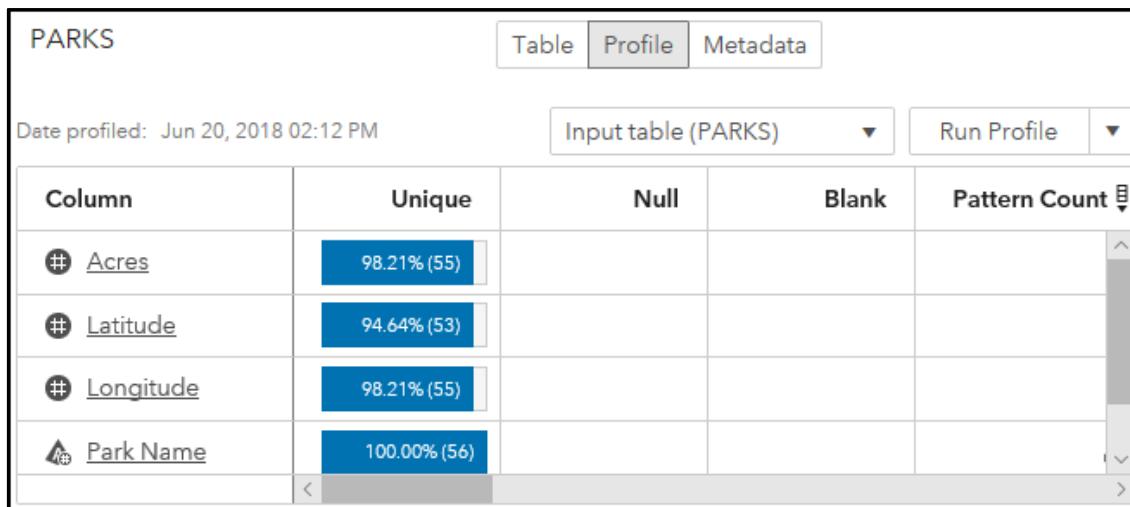
A list of columns attributes (including name, label, type, and length) appears in the bottom pane.

The screenshot shows the "Metadata" view for the "PARKS" table. At the top left is the table name "PARKS". Below it is a "Filter" input field. The main area is a table with the following data:

#	Name	Label	Type	Raw Length	Formatte
1	Park Name		varchar	46	
2	State		varchar	10	
3	Acres		double	8	
4	Latitude		double	8	

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

- c. On the right side, click **Run Profile** to execute the profile, if necessary.



Notice that the **Park Name** column has a uniqueness of 100%, meaning that this table contains one row for each national park in the United States.

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

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

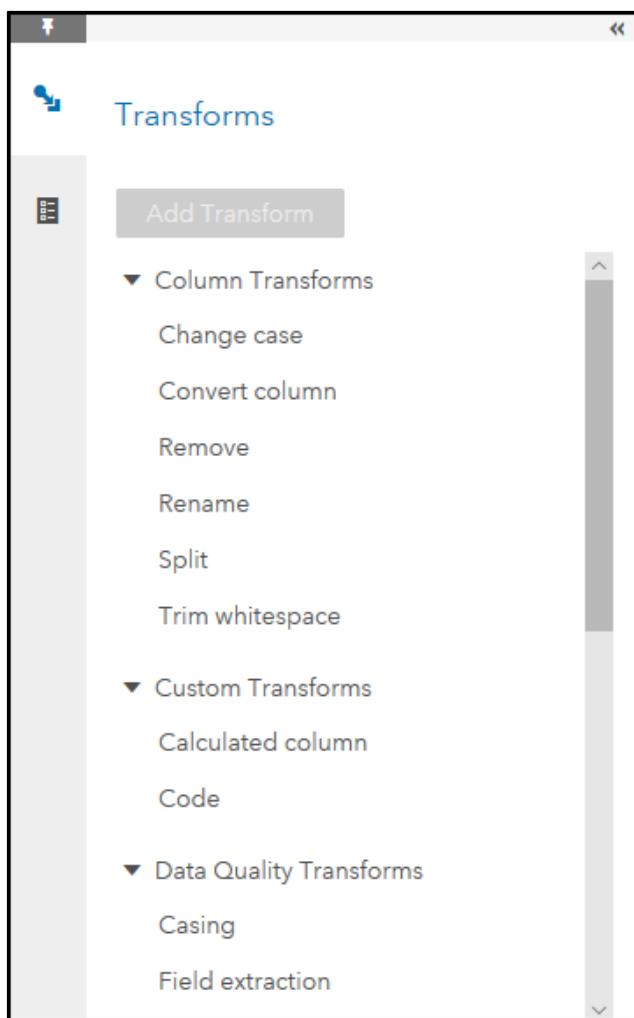
- d. In the bottom pane, click **Table**.

▲ Park Name	▲ State	④ Acres	④
Acadia National Park	me	47390	
Arches National Park	ut	76519	
Badlands National P...	sd	242756	
Big Bend National P...	tx	801163	

A sample of rows from the **PARKS** data source is displayed.

6. Add transforms to the plan.

- a. In the left pane, click  (Transforms) to view the available transforms.



- b. In the Column Transforms group, double-click **Change case** to add the transform to the plan.

**Note:** As an alternative, you can right-click a column in the table in the lower portion of the window to add transforms to the plan.

**Note:** The Casing transform, in the Data Quality Transforms group, provides advanced options for casing (such as proper casing using Quality Knowledge Base (QKB) definitions), but the SAS Data Preparation license is required.

- c. In the main portion of the window, the Change Case transform is added to the plan.

Change Case - Step 1 of 1

1 Change Case

Source column: Case:

Park Name Uppercase

Replace source column  Create new column

- 1) Click  (**How do I change the case in columns?**) to view information about using the transform.

### Changing the Case in Columns

You can change the case of column data to all uppercase or all lowercase characters. To change the case of column data, select a column from the **Source column** drop-down menu, and then select **Uppercase** or **Lowercase** in the **Case** drop-down menu. The **Source column** drop-down menu includes columns that contain character data only. You cannot change the case for columns that contain numeric data.

- 2) For the **Source column** field, select **State**.
- 3) For the **Case** field, verify that **Uppercase** is selected.
- 4) Verify that **Replace source column** is selected.

The Change Case transform should resemble the following:

1 Change Case

Source column: Case:

State Uppercase

Replace source column  Create new column

- 5) In the upper right corner, click **Run** to execute the transform on the data.

A sample of rows is displayed in the Table view at the bottom of the window. The **State** column is updated to reflect the change.

State
ME
UT
SD
TX

- d. In the left pane, double-click the **Join** transform, in the Multi-input Transforms group, to add it to the plan.

The Join Tables window appears.

**Join Tables**

Join Tables    Select Columns    Rename Columns

Table 1 (T1):  
PARKS (session)

T1.Park Name

Table 2 (T2):

Select all columns    No duplicate rows

- 1) For Table 1 (**PARKS**), verify that **T1.Park Name** is selected.
- 2) For Table 2, click **(Edit)**.
- 3) In the Choose Data window, under **Available**, scroll down to see whether the **Species** table has been loaded into CAS.
  - a) If it is available, select **Species**.

Details about the table appear on the right side of the window.

**SPECIES**

**Details**   **Sample Data**   **Profile**

**Filter**

#	Name
1	Species ID
2	Park Name
3	Category
4	Order
5	Family

Date profiled:  
(none)

Columns: **13**   Rows: **119.2 K**

Size: **38.7 MB**

Label: (not available)

Location: cas-v4e010-default/YVA283

**Note:** This is the same information that you can see in the plan using the bottom pane and the left pane.

- b) Click **OK** (and **skip** step 4 below).
- 4) If the **Species** table is not under **Available**, follow the steps below.
  - a) Click **Data Sources**.
  - b) Next to the **cas-v4exxx-default** server, click (**Down one level**).
  - c) Next to the **YVA283** library, click (**Down one level**).
  - d) Scroll through the list of tables and select **SPECIES.sashdat**.
  - e) In the upper right corner, click (**Load into memory**).
  - f) When the load is complete, click **OK** at the bottom of the window to add the data source to the plan.
- 5) For Table 2 (**SPECIES**), verify that **T2.Park Name** is selected as the column.

**Join Tables**   **Select Columns**   **Rename Columns**

Table 1 (T1):  
PARKS (session)

Table 2 (T2):  
SPECIES

T1.Park Name = T2.Park Name

**Note:** The two tables are joined using an inner join by default. You can click (**Click to select the join type**) to change the join type to Left, Right, or Full.

**Note:** You can click (Add a table to the join) to join additional tables.

**Note:** The two tables are joined on one column by default. You can click (Add a join condition) to join on additional columns.

- 6) At the bottom of the window, clear **Select all columns**.

At the top of the window, the Select Columns and Rename Columns tabs become active.



- 7) Click the **Select Columns** tab.
- 8) For the **Table** field, verify that **All** is selected.
- 9) In the Selected items area, select **T2.Park Name\_1** and click (Remove).

Select one or more columns for inclusion in the join.

Table:

All ▾

Available items (1):

Filter

T2.Park Name\_1

Selected items (17):

T1.Park Name

T1.State

- 10) At the bottom of the window, click **Run** to execute the join.
- 11) In the Table view, scroll to the right to view the new columns from the **SPECIES** data source.

Species ID	Category	Order	Family
ISRO-1001	Mammal	Artiodactyla	Cervidae
ISRO-1002	Mammal	Carnivora	Canidae
ISRO-1003	Mammal	Carnivora	Canidae
ISRO-1004	Mammal	Carnivora	Canidae

The first four characters of **Species ID** represent the park code where the species is located.

**Note:** The Table previews displayed in SAS Data Studio might not match what is displayed in the course notes.

- e. In the left pane, double-click the **Calculated column** transform, in the Custom Transforms group, to add it to the plan.

- 1) In the code area, enter **substr('Species ID'n, 1, 4)**.

**Note:** The SUBSTR function extracts a substring from an argument. The syntax for this function is as follows: **substr(column-name, position, length)**.

- *column-name* specifies the name of the column in the source table.
- *position* specifies the beginning position of the extraction.
- *length* specifies the length of the string (how many characters) to extract.

**Note:** To use a column name that contains blanks in the code area, use the following syntax: '*Column Name*'n

**Note:** For more information about DATA step expressions, see “Dictionary of SAS DATA Step Statements.”

**Note:** In this example, the Split transform (with a hyphen delimiter) can also be used to calculate the new column.

- 2) Below the code area, select **Create new column**.

- 3) For the name of the new column, enter **ParkID**.

- 4) Click **Options for new columns**.

- a) For the **Name of new column** field, verify that **ParkID** is specified.
- b) For the **Type** field, select **Char**.
- c) For the **Length** field, enter **4**.
- d) For the **Label** field, enter **Park ID**.

The Options for New Columns window should resemble the following:

Name of new column:	Type:	Length:	Label:
ParkID	Char ▾	4	Park ID

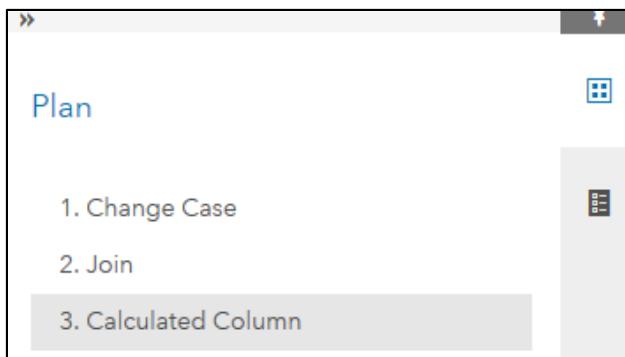
- e) Click **OK**.

- f) In the upper right corner, click **Run** to create the new column.

The **ParkID** column is added to the Table view at the bottom of the window.

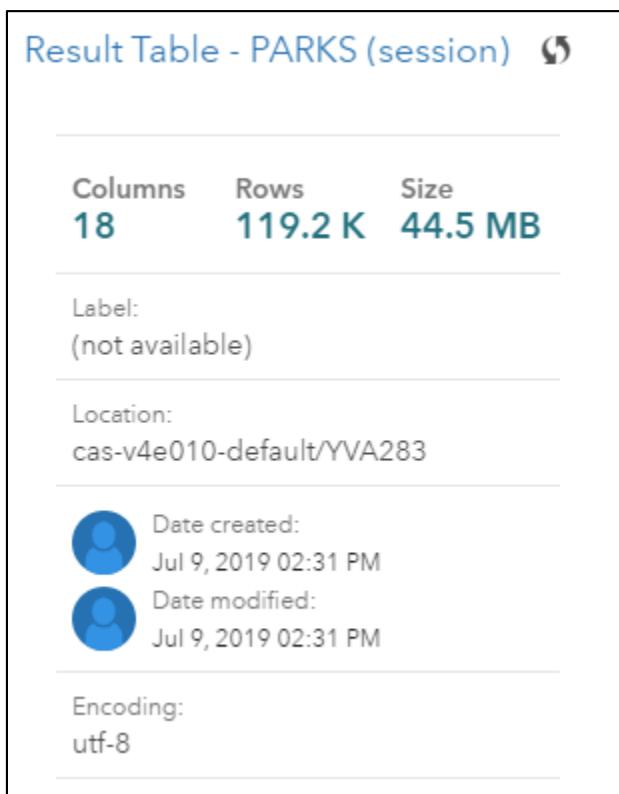
▲ ParkID
JOTR
JOTR
JOTR
JOTR

7. In the right pane, click  (Plan) to view the steps of the plan.



The screenshot shows a window titled "Plan". Inside, there is a list of three steps: "1. Change Case", "2. Join", and "3. Calculated Column". The third step, "3. Calculated Column", is highlighted with a gray background.

8. In the right pane, click  (Properties for the result table) to show details about the result table.



The screenshot shows a properties pane for a result table named "PARKS (session)". It displays the following information:

- Columns: 18
- Rows: 119.2 K
- Size: 44.5 MB
- Label: (not available)
- Location: cas-v4e010-default/YVA283
- Date created: Jul 9, 2019 02:31 PM
- Date modified: Jul 9, 2019 02:31 PM
- Encoding: utf-8

9. Save the plan and the result table.

- a. In the upper right corner of the plan, click  (More) and select **Save as**.

1) Navigate to **My Folder**.

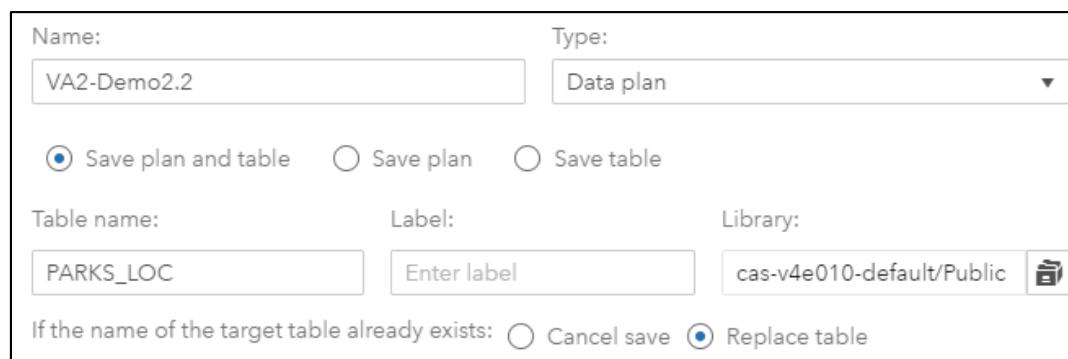
2) In the lower right, click  (Library).

3) Next to the **cas-v4exxx-default** server, click  (Down one level).

4) Click **Public**.

5) Click **Select**.

The bottom part of the Save As window displays the name of the table created from the plan.



Name:	Type:	
VA2-Demo2.2	Data plan	
<input checked="" type="radio"/> Save plan and table	<input type="radio"/> Save plan	<input type="radio"/> Save table
Table name:	Label:	Library:
PARKS_LOC	Enter label	cas-v4e010-default/Public 
If the name of the target table already exists: <input type="radio"/> Cancel save <input checked="" type="radio"/> Replace table		

- b. Click **Save**.

- c. If necessary, click **Yes** to replace the existing plan.

A note appears at the bottom of the workspace.

The table "PARKS\_LOC" in plan "VA2-Demo2.2" was successfully saved.

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

**Note:** You can open the result table for the plan in Visual Analytics by clicking  (More) and selecting **Actions** ⇒ **Saved table** ⇒ **Explore and visualize data**.

10. In the upper left corner, click  (Show applications menu) and select **SAS Drive** to return to SAS Drive.

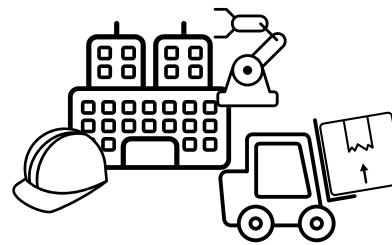
**End of Demonstration**

## Business Scenario: Facilities



The head of operations for Orion Star has requested a map of facility locations in North and South America.

We have a table that contains information about all facilities across the world. We need to filter the table to include details only about facilities in North and South America.



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**Note:** Beginning with Visual Analytics 8.3, users can create data views to save data settings (hierarchies, filters, calculated columns, parameters, and more) for a table. For more information about data views, see “Working with Data Views in Reports” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

## Business Scenario: Facilities



Facility	FacilityLat	FacilityLon	...	FacilityContinent	...
ARBUENOS0118	-34.629791	-58.462157		South America	
AUSYDNEY0142	-33.866095	151.207237		Oceania	
CNDEIJIN0127	39.889142	116.338605		Asia	
DEHAMBUR0107	53.567202	9.941885		Europe	
MXGUADAL0037	20.678052	-103.335076		North America	
ZAOJIANN0144	26.204920	28.040020		Africa	

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In the exercises, you filter the **Facility\_Toy** table to include only facilities located in North America or South America. The plan creates a new CAS table (**Facility\_Toy\_America**) that is used in a later section.



## Practice

---

### 1. Creating a Geographic Data Source

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2- Exercise2.2**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise2.2** and select **Prepare data**.

- c. View the source table properties and answer the following questions:

What is the name of the source table for the plan?

**Answer:** \_\_\_\_\_

How many rows are in the source table? How many columns?

**Answer:** \_\_\_\_\_

- d. View profile information about the source table and answer the following questions:

How many unique values exist for **Facility Continent**?

**Answer:** \_\_\_\_\_

What is the average number of products produced (**UnitActual**) by each unit? The minimum? The maximum?

**Answer:** \_\_\_\_\_

- e. Add a filter to the plan to include only facilities located in North America or South America.

- f. Save the plan in **My Folder**. Remember to update the Library location to your CAS server / Public library.

- g. View the result table properties and answer the following question:

How many rows are in the result table?

**Answer:** \_\_\_\_\_

- h. View profile information about the result table and answer the following questions:

What is the name of the result table for the plan?

**Answer:** \_\_\_\_\_

How many unique values exist for **Facility Continent**?

**Answer:** \_\_\_\_\_

What is the average number of products produced (**UnitActual**) by each unit? What does this tell you about production in the Americas compared to production in other continents?

**Answer:** \_\_\_\_\_

- i. Return to SAS Drive.

## Alternate Exercises (Optional)

### 2. Creating Report Data Views in SAS Visual Analytics

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2- Exercise2.2 (Alternate)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise2.2 (Alternate)** and select **Edit**.
- c. Answer the following questions:

How many observations are in the **FACILITY\_TOY** data source?

**Answer:** \_\_\_\_\_

How many unique values exist for **Facility Continent**?

**Answer:** \_\_\_\_\_

- d. Add a data source filter to include only facilities located in North America or South America.
- e. Answer the following questions:

How many observations are returned after the data source filter is applied?

**Answer:** \_\_\_\_\_

How many unique values exist for **Facility Continent**?

**Answer:** \_\_\_\_\_

- f. Save the data changes as a data view (**FACILITY\_TOY\_View**). Make the data view the default.

**Note:** Selecting **Default data view** automatically applies the view anytime that the data source is added to a report.

**Note:** An administrator has an option (**Shared data view**) that makes the view available to other users, not just the user who created the view.

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

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

- h. Create a new report using the **FACILITY\_TOY** data source.

- i. Answer the following questions:

How many observations are in the **FACILITY\_TOY** data source? Why?

**Answer:** \_\_\_\_\_

How many unique values exist for **Facility Continent**? Why?

**Answer:** \_\_\_\_\_

**Note:** You do not need to save the new report.

- j. Return to SAS Drive.

### 3. Creating Data Source Joins in SAS Visual Analytics

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2- Demo2.2 (Alternate)**.
  - Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - Right-click **VA2- Demo2.2 (Alternate)** and select **Edit**.
- Create a new data source join for the report with the following specifications:

<b>Name</b>	Parks_Species
<b>Join type</b>	Inner
<b>Data source 1</b>	PARKS
<b>Data source 2</b>	SPECIES

Both the **PARKS** and **SPECIES** tables contain a column named **Park Name**.

Verify that all columns, from both tables, are selected except the **Park Name** column from the **SPECIES** table.

**Note:** Create a new data source join from the Data pane by clicking  (Actions) and selecting **New data source join**.

- Rename the **State** column to **State (lower)**.
- Create a new data item, **State**, that is the uppercase version of **State (lower)**.
- Create a new data item, **Park ID**, that consists of the first four characters of **Species ID**.
- Save the report in **My Folder**.
  - To save the report, click  (Menu) in the upper right corner and select **Save As**.
  - Navigate to **My Folder**.
  - Click **Save**.

**End of Practices**

## 2.3 Analyzing Geographic Information

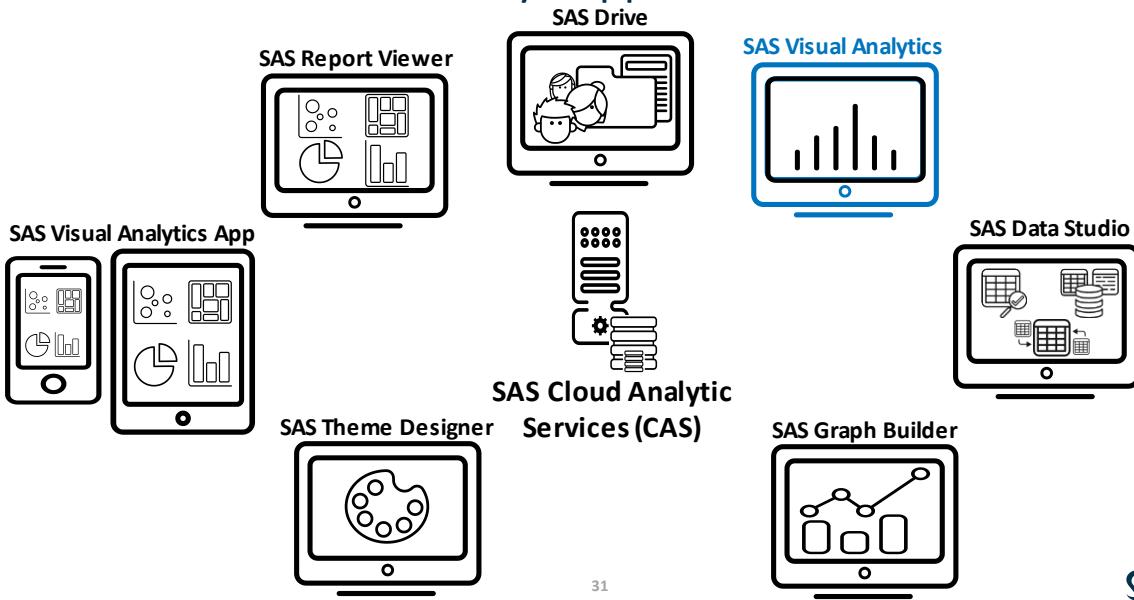
### Objectives

- Describe the difference between SAS Data Studio and SAS Visual Analytics.
- Discuss creating geo maps to perform location analysis.

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### SAS Viya Applications



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## 2.02 Question

Many report designers have asked that we add a data item to the CAS table (**Profit**). What are some ways in which this can be accomplished?

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## Discussion

What if the data item that you want to add is **Customer Age**?

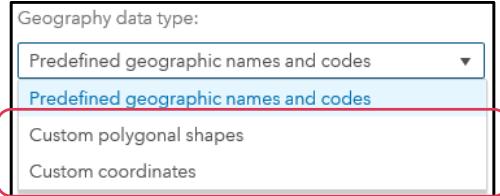


Some things to consider when answering this question:

- Do you want **Customer Age** to be static or dynamic?
- How often is the underlying CAS table updated?

## Setup for the Question

To create a geo map in SAS Visual Analytics, you need a geographic data item.



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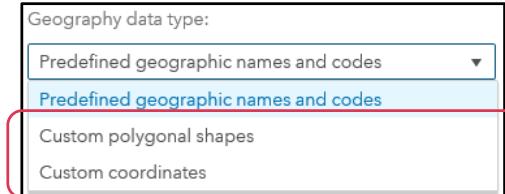


## 2.03 Multiple Answer Question

To create a geo map in SAS Visual Analytics, you need a geographic data item.

Which geographic areas would require custom polygonal shapes or custom coordinates? (Select all that apply.)

- a. voting districts
- b. cities
- c. sales regions
- d. school districts



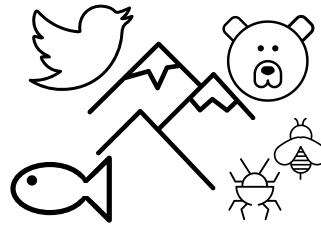
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## Business Scenario: Parks

The US National Park Service has asked for a map that shows the locations of all national parks and lists the species located in each.

They would like to see a map that shows each park along with a list of species (birds, mammals, fish, and others) in any selected park.



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## Analyzing a Geographic Data Source

This demonstration illustrates how to explore and visualize a geographic data source using SAS Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA283/Advanced/Demos** folder.
3. Right-click **VA2- Demo2.3** and select **Edit**.  
The report opens in SAS Visual Analytics.
4. In the left pane, click **Data**.

5. Create geography data items.
  - a. In the Data pane, right-click **Park Name** and select **New geography**.
 

**Note:** This creates a duplicate of the data item that is a geographic data item.

    - 1) In the New Geography Item window, in the **Name** field, enter **Park Location**.
    - 2) For the **Based on** field, verify that **Park Name** is specified.
    - 3) For the **Geography data type** field, select **Custom coordinates**.
    - 4) For the **Latitude (y)** field, select **Latitude**.
    - 5) For the **Longitude (x)** field, select **Longitude**.
    - 6) For the **Coordinate Space** field, verify that **World Geodetic System (WGS84)** is selected.

The map on the right shows that 100% of park locations are mapped.

### New Geography Item

Name:

Based on:

Geography data type:

Latitude (y):\*

Longitude (x):\*

Coordinate Space:

- 7) At the bottom of the window, click **OK**.

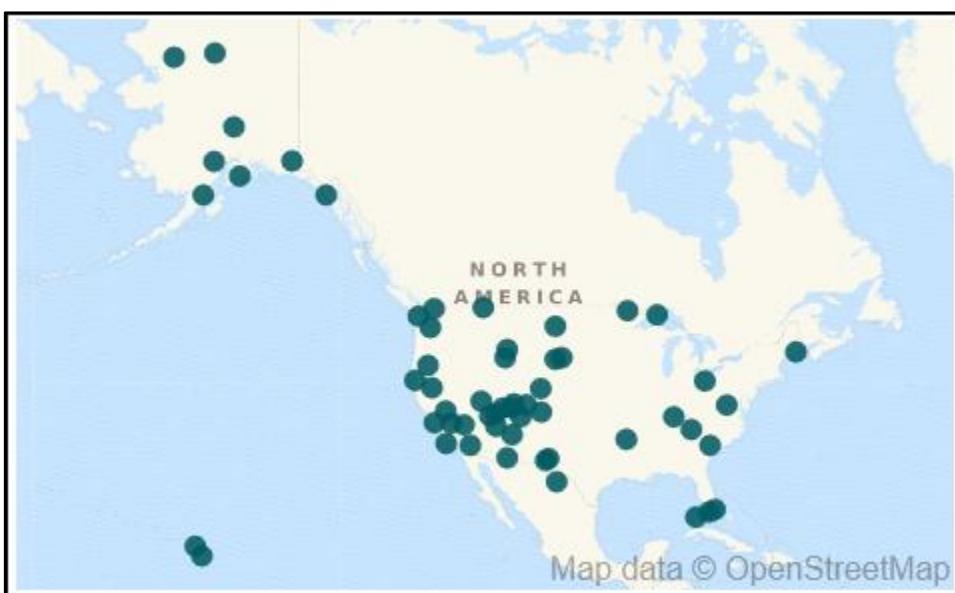
A new group, Geography, is added to the Data pane.

▼ Geography

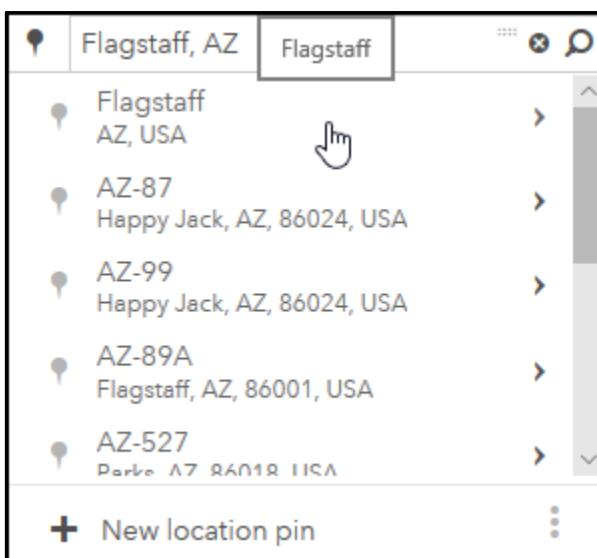
Park Location - 56

6. Create a geo map.
  - a. In the canvas, click the **Geo Map** object to select it.
  - b. In the right pane, click **Roles**.
    - 1) For the Category role, select **Add** ⇒ **Park Location**.
    - 2) For the Size role, right-click **Frequency** and select **Remove Frequency**.

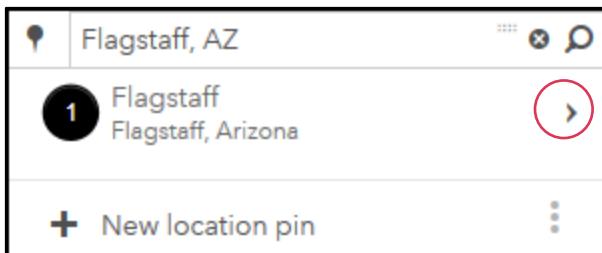
- c. In the right pane, click **Options**.  
1) In the Map group, for the **Type** field, select **Coordinates**.  
The geo map should resemble the following:



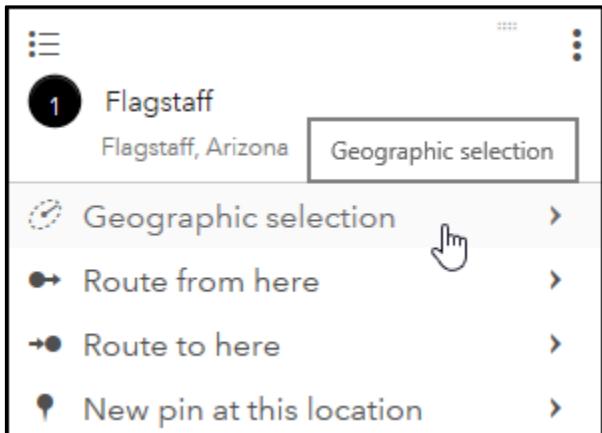
7. Search for parks within 500 miles of Flagstaff, AZ.  
a. In the upper left corner of the geo map, click (**Location**).  
b. In the **Search** field, enter **Flagstaff, AZ**.  
c. Select the search result for **Flagstaff AZ, USA**.



- d. Next to **Flagstaff**, click .



- e. Select **Geographic selection**.



- f. For the **Type** field, verify that **Distance** is selected.  
g. For the **Unit** field, verify that **Miles** is selected.

**Note:** The default distance unit can be modified by modifying the Geographic Mapping settings for Visual Analytics.

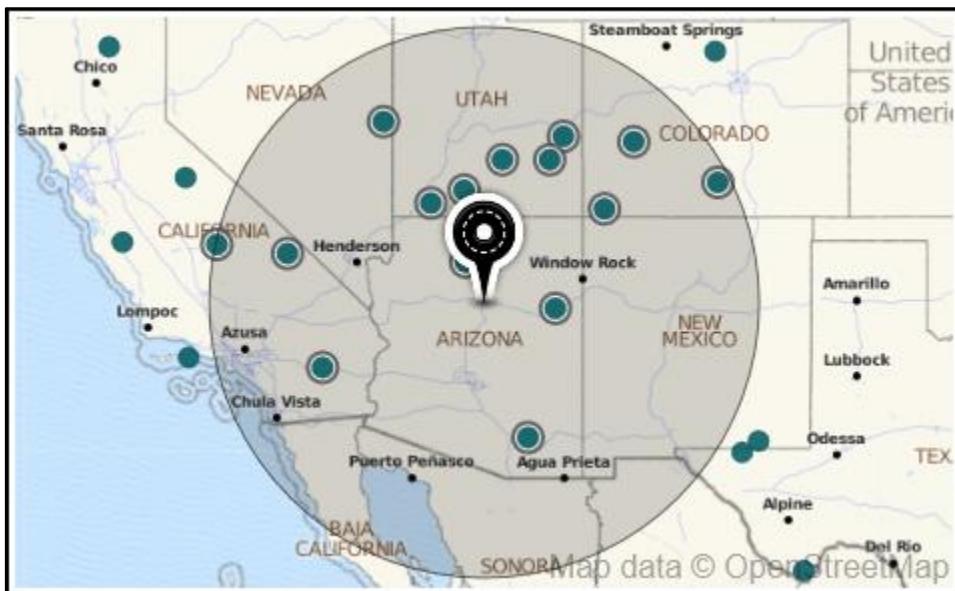
- h. For the **Distance** field, enter **500**.

The Geographic Selection window should resemble the following:

Geographic Selection	
1	Flagstaff Flagstaff, Arizona
Type:	Distance
Unit:	Miles
Distance:	500
Specify the radius of the circular region to select.	
Draw Selection	

i. **Click Draw Selection.**

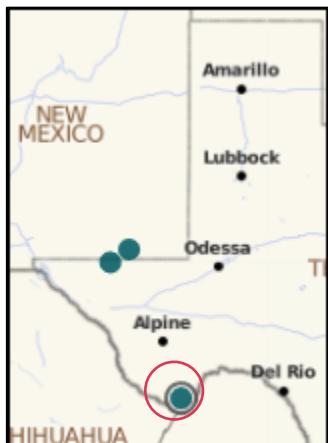
All parks within a 500-mile radius of Flagstaff, AZ, are highlighted.



The list table on the right shows all the species located in the selected parks.

Category	Common Names
Algae	None
Amphibian	Great Basin Spadefoot
Amphibian	Pickerel Frog
Amphibian	Northern Pacific Treefrog, Pacific Chorus Fro...
Amphibian	Fowler's Toad
Amphibian	Western Toad
Amphibian	Tehachapi Slender Salamander
Amphibian	Relictual Slender Salamander

8. In the geo map, click the bubble for Big Bend National Park (in Texas).



The list table on the right is updated to show all the species in Big Bend National Park.

Category	Common Names
Amphibian	American Bullfrog
Amphibian	Barred Tiger Salamander
Amphibian	Canyon Treefrog
Amphibian	Couch's Spadefoot
Amphibian	Great Plains Narrow-Mouthed Toad
Amphibian	Green Treefrog
Amphibian	Mexican Spadefoot
Amphibian	Red-Spotted Toad

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

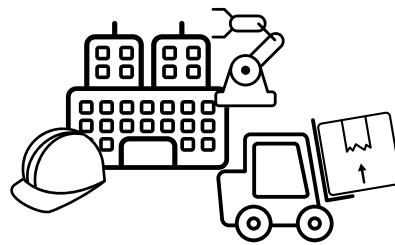
- a. In the upper right corner, click  (Menu) and select **Save As**.
- b. Navigate to **My Folder**.
- c. Click **Save**.

**End of Demonstration**

## Business Scenario: Facilities

The head of operations for Orion Star has requested a map of current facility locations in North and South America.

Specifically, she wants to see the production and number of employees in each facility location to determine which facilities need to be expanded and which facilities need to be shut down.



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## Practice

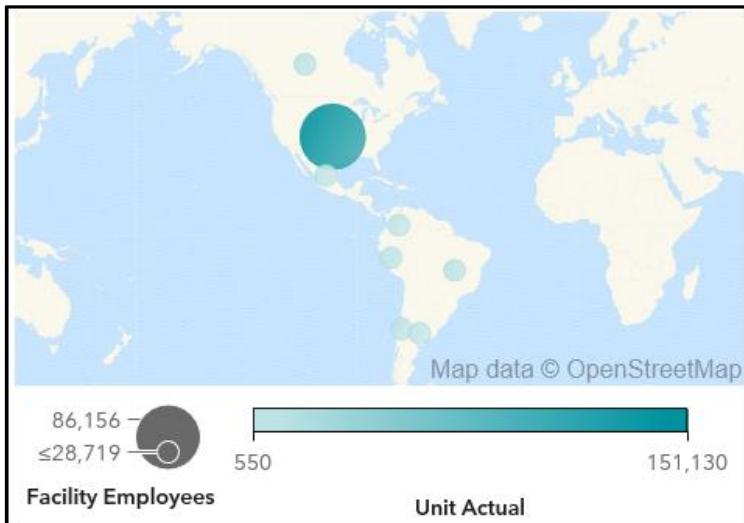
---

### 4. Analyzing a Geographic Data Source

- From the browser window, sign in to SAS Viya for Learners.
  - Open **VA2- Exercise2.3**.
    - Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
    - Right-click **VA2- Exercise2.3** and select **Edit**.
  - Change the classification for **Facility Country** to **Geography** using the **Country or Region Names** predefined geographic name.
- What percentage of data items are mapped?
- Answer:** \_\_\_\_\_
- Change the classification for **Facility** to **Geography** using the custom coordinates in the data source.
  - Create a geographic hierarchy (**Facility Hierarchy**) of the geographic data items.
  - Create a geo map by assigning the following data items to the specified roles:

Category	Facility Hierarchy
Size	Facility Employees
Color	Unit Actual

The geo map should resemble the following:



- Answer the following question:

How many facilities are in the United States within 250 miles of Topeka, KS?

**Answer:** \_\_\_\_\_

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

**End of Practices**

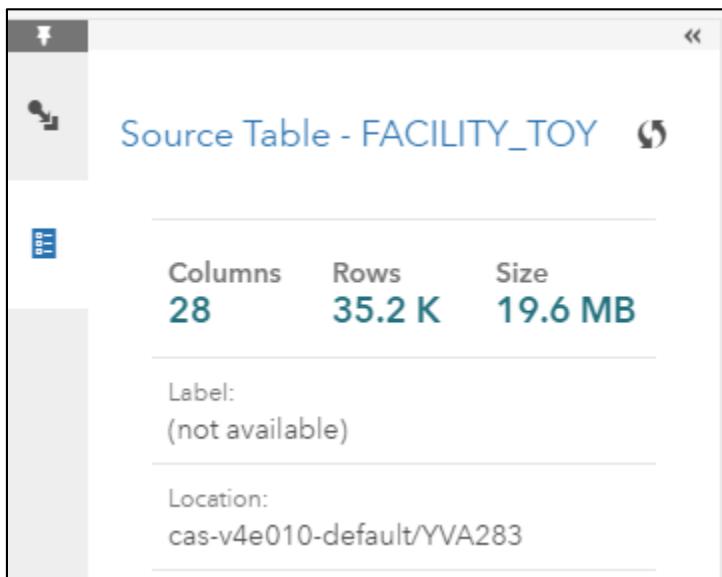
## 2.4 Solutions

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### Solutions to Practices

#### 1. Creating a Geographic Data Source

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2- Exercise2.2**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise2.2** and select **Prepare data**.
- c. View the source table properties and answer the questions.
  - 1) In the left pane, click  (**Properties for the source table**) to show details about the source table.



**Source Table - FACILITY\_TOY**

Columns	Rows	Size
28	35.2 K	19.6 MB

Label:  
(not available)

Location:  
cas-v4e010-default/YVA283

- 2) Answer the following questions:

What is the name of the source table for the plan?

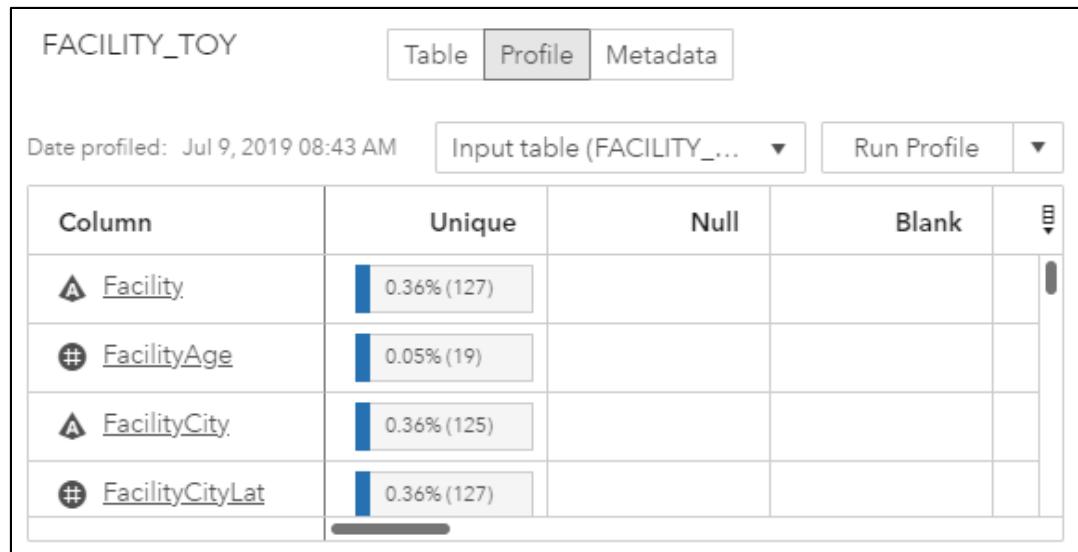
**Answer:** **FACILITY\_TOY**

How many rows are in the source table? How many columns?

**Answer:** **35.2K rows and 28 columns**

- d. View profile information about the source table and answer the questions.

- 1) In the bottom pane, click **Profile**.
- 2) On the right side, click **Run Profile** to execute the profile, if necessary.



3) Answer the following questions:

How many unique values exist for **Facility Continent**?

**Answer: Six unique values**

- Scroll down the profile to locate the FacilityContinent column.
- The Unique column lists the percentage of unique values and the number of unique values (in parentheses).

Column	Unique
FacilityContinent	0.02% (6)

What is the average number of products produced (**UnitActual**) by each unit? The minimum? The maximum?

**Answer: 6.86 products are produced by each unit on average. The minimum number of products produced by a unit is 1, and 55 is the maximum number of products produced by a unit.**

- Scroll down the profile to locate the UnitActual column.
- Scroll to the right to view the mean, the minimum, and the maximum.

Column	Mean	M.	M.	S..	S..	Minimum	Maximum
UnitActual	6.86					1.00	55.00

e. Add a filter to the plan to include only facilities located in North America or South America.

- 1) In the left pane, click (Transforms).
- 2) In the Row Transforms group, double-click **Filter** to add the transform to the plan.

Filter - Step 1 of 1

1 Filter

Column: Facility Operator: Equal to

Value:

Browse +

3) For the **Column** field, select **FacilityContinent**.

4) For the **Operator** field, select **In**.

5) In the **Value** field, enter the following values:

**North America**

**South America**

**Note:** The In and Not in operators are the only ones that can filter on multiple values. You can enter multiple values by pressing Enter after each value. There is no need for quotation marks around the text.

**Note:** You can also click **Browse** to choose from the distinct values for the column.

The Filter transform should resemble the following:

Filter - Step 1 of 1

1 Filter

Column: FacilityContinent Operator: In

Value:

North America  
South America

Browse +

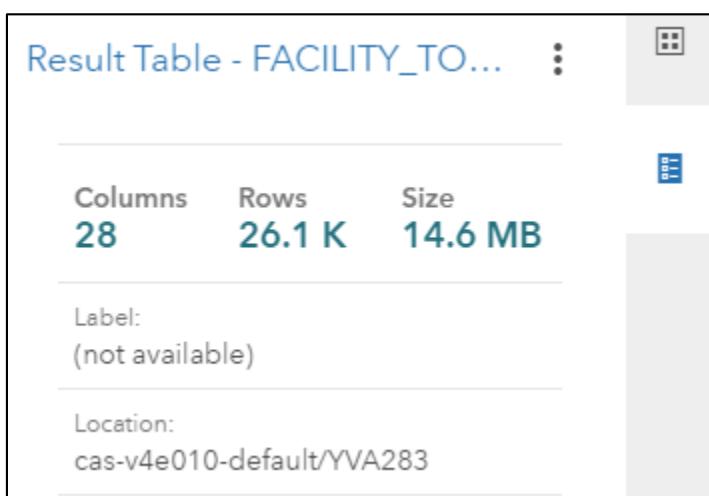
6) In the upper right corner, click **Run** to execute the transform on the data.

f. Save the plan and the result table.

- 1) In the upper right corner of the plan, click  (More) and select **Save as**.
- 2) Navigate to **My Folder**.
- 3) In the lower right, click  (Library).
- 4) Next to the **cas-v4exxx-default** server, click  (Down one level).
- 5) Click **Public**.
- 6) Click **Select**.
- 7) Click **Save**.

g. View the result table properties and answer the question.

- 1) In the right pane, click  (Properties for the result table) to show details about the result table.



Columns	Rows	Size
<b>28</b>	<b>26.1 K</b>	<b>14.6 MB</b>

Label:  
(not available)

Location:  
cas-v4e010-default/YVA283

- 2) Answer the following question:

How many rows are in the result table?

**Answer: 26.1K rows**

h. View profile information about the result table and answer the questions.

- 1) In the bottom pane, click **Profile**.
- 2) In the upper right corner of the Profile view, select **Saved table (FACILITY\_TOY\_AMERICA)** in the drop-down list.
- 3) In the upper right corner of the Profile view, click **Run Profile** to execute the profile, if necessary.
- 4) Answer the following questions:

What is the name of the result table for the plan?

**Answer: FACILITY\_TOY\_AMERICA**

Saved table (FACILITY_... ▾
Input table (FACILITY_TOY)
<b>Saved table (FACILITY_TOY_AMERICA)</b>

How many unique values exist for **Facility Continent**?

**Answer:** Two unique values (South America and North America)

- Scroll down the profile to locate the FacilityContinent column.
- The Unique column lists the percentage of unique values and the number of unique values (in parentheses).

Column	Unique
▲ FacilityContinent	0.01% (2)

What is the average number of products produced (**UnitActual**) by each unit? What does this tell you about production in the Americas compared to production in other continents?

**Answer:** 6.73 products are produced by each unit on average. Because this average is below the average for all continents (6.86), this implies that production in the Americas is below that in other continents.

- Scroll down the profile to locate the UnitActual column.
- Scroll to the right to view the mean.

Column	Mean
# UnitActual	6.73

i. Return to SAS Drive.

- 1) Select  (Show applications menu).
- 2) Select **SAS Drive**.

## 2. Creating Report Data Views in SAS Visual Analytics

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2- Exercise2.2 (Alternate)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise2.2 (Alternate)** and select **Edit**.
- Answer the questions.

How many observations are in the **FACILITY\_TOY** data source?

**Answer:** 35,159 observations

▼ More information	
Standard Deviation:	7.15
Standard Error:	0.04
Variance:	51.09
Distinct Count:	19
Number Missing:	0
<b>Total Observations:</b>	<b>35,159</b>
Skewness:	0.2978
Kurtosis:	-0.9217
Coefficient of Variation:	52.7576
Uncorrected Sum of Squares:	8,249,067.12
Corrected Sum of Squares:	1,796,054.52
T-statistic (for Average=0):	355.4132
P-value (for T-statistic):	<0.0001

- In the left pane, click the Data tab, if necessary.
- Click  (Actions) and select View measure details.
- Total observations are displayed at the bottom of the window.
- Click Close to close the Measure Details window.

How many unique values exist for Facility Continent?

**Answer:** Six unique values

▼ Category	
 Facility - 127	
 Facility City - 125	
 Facility Continent - 6	
 Facility Country - 32	
 Facility Opening Date - 19	
 Facility Region - 95	
 Unit - 166	
 Unit Status - 1	

- In the left pane, click the Data tab, if necessary.
- View Facility Continent, in the Category group.

- The number of unique values is listed next to the data item.
- d. Add a data source filter to include only facilities located in North America or South America.
- 1) In the left pane, click the **Data** tab, if necessary.
  - 2) Click  (Actions) and select **Apply data source filter**.
  - 3) On the left side of the window, verify that **Data Items** is selected.



- 4) Expand **Character**.
  - 5) Select **Facility Continent**.
  - 6) In the Conditions area, double-click **Facility Continent In (x)** to add it to the expression.
  - 7) In the expression, click **(none selected)**.
    - a) Double-click the following values in the Available items list to move them to the Selected items list:  
**North America**  
**South America**
    - b) Click **OK** to close the Select Data Values window.
- The expression should resemble the following:



The bottom of the window shows the number of observations returned after the data source filter is applied:

Returned observations: 26,138	Total observations: 35,159
-------------------------------	----------------------------

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

The Data pane is updated to show the number of unique values for category data items after the data source filter is applied.

The screenshot shows the SAS Data pane with a tree view. The root node is 'Category'. Under 'Category', there are eight items: 'Facility - 93', 'Facility City - 92', 'Facility Continent - 2', 'Facility Country - 9', 'Facility Opening Date - 13', 'Facility Region - 61', 'Unit - 146', and 'Unit Status - 1'. Each item has a small icon to its left.

- ▼ Category
  - Facility - 93
  - Facility City - 92
  - Facility Continent - 2
  - Facility Country - 9
  - Facility Opening Date - 13
  - Facility Region - 61
  - Unit - 146
  - Unit Status - 1

- e. Answer the questions.

How many observations are returned after the data source filter is applied?

**Answer: 26,138 observations**

Returned observations: 26,138

Total observations: 35,159

How many unique values exist for **Facility Continent**?

**Answer:** Two unique values

▼ Category

- Facility - 93
- Facility City - 92
- Facility Continent - 2
- Facility Country - 9
- Facility Opening Date - 13
- Facility Region - 61
- Unit - 146
- Unit Status - 1

- f. Save the data changes as a data view (**FACILITY\_TOY\_View**). Make the data view the default.

- 1) On the Data pane, click (Actions) and select **Save data view**.
- 2) In the **Name** field, enter **FACILITY\_TOY\_View**.
- 3) In the **Description** field, enter the following:

**Filter: Facility Continent in (North America, South America)**

**Note:** It is a best practice to apply a description that describes all data changes that have been applied.

- 4) Select **Default data view**.

The Save Data View window should resemble the following:

Name:	<input type="text" value="FACILITY_TOY_View"/>
Description:	<input type="text" value="Filter: Facility Continent in (North America, South America)"/>
<input checked="" type="checkbox"/> Default data view	

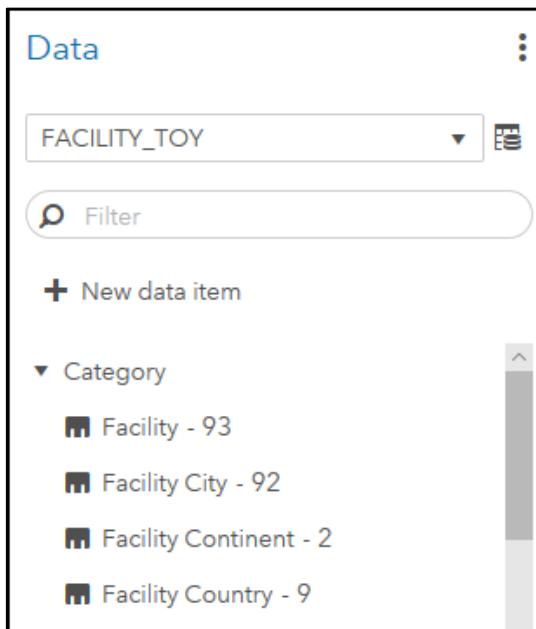
- 5) Click **Save** to create the data view.

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

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

- 2) Navigate to **My Folder**.
  - 3) Click **Save**.
- h. Create a new report using the **FACILITY\_TOY** data source.
- 1) In the upper right corner of the report, click  (Menu) and select **New**.
  - 2) In the left pane, click **Data**.
  - 3) Click **Select to add data**.
    - a) In the Open Data Source window, verify that **Available** is selected.
    - b) Scroll through the list of data sources and select **FACILITY\_TOY**.
    - c) In the lower right corner of the window, click **OK** to add the data source.

The data source is added to the report and the data items appear in the Data pane:



i. Answer the questions.

How many observations are in the **FACILITY\_TOY** data source? Why?

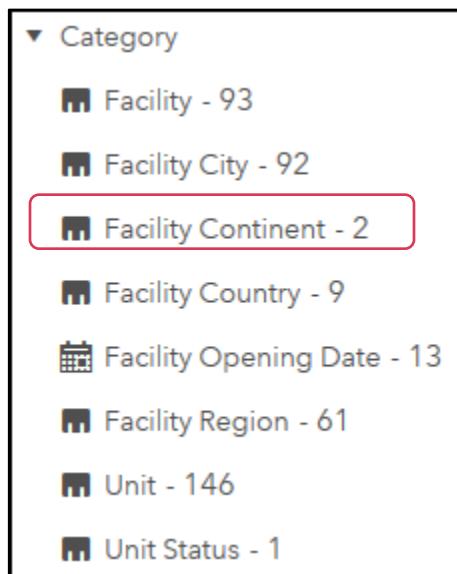
**Answer:** **26,138 observations. Because we created a data view and saved it as the default, it is applied automatically every time we select FACILITY\_TOY as a data source.**

▼ More information	
Standard Deviation:	7.47
Standard Error:	0.05
Variance:	55.73
Distinct Count:	13
Number Missing:	0
<b>Total Observations:</b>	<b>26,138</b>
Skewness:	0.0249
Kurtosis:	-1.2232
Coefficient of Variation:	49.8836
Uncorrected Sum of Squares:	7,310,511.02
Corrected Sum of Squares:	1,456,614.29
T-statistic (for Average=0):	324.0993
P-value (for T-statistic):	<0.0001

- In the left pane, click the Data tab, if necessary.
- Click  (Actions) and select View measure details.
- Total observations are displayed at the bottom of the window.
- Click Close to close the Measure Details window.

How many unique values exist for **Facility Continent**? Why?

**Answer:** Two unique values. Because we created a data view and saved it as the default, it is applied automatically every time we select FACILITY\_TOY as a data source.



- In the left pane, click the **Data** tab, if necessary.
- View **Facility Continent**, in the **Category** group.

j. Return to SAS Drive.

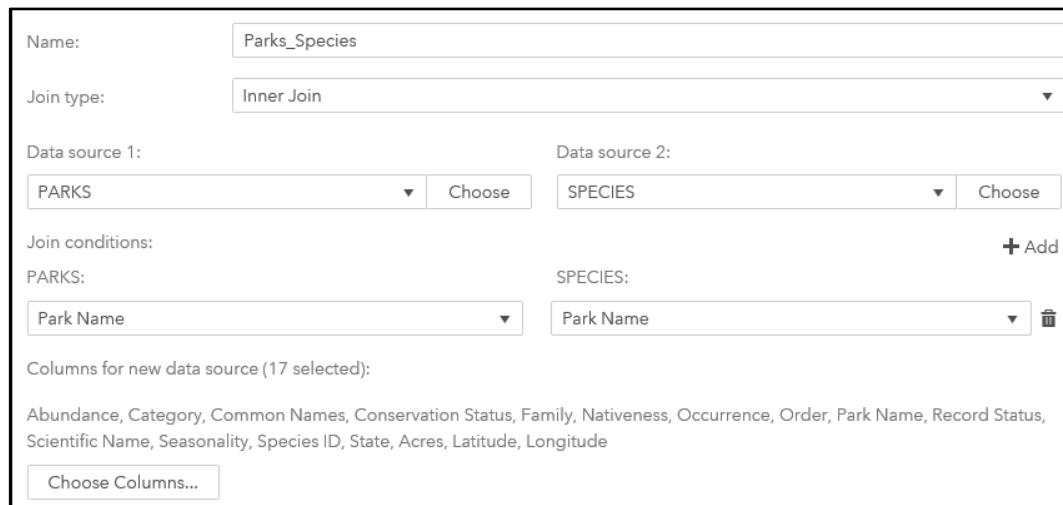
- 1) Select (Show applications menu).
- 2) Select **SAS Drive**.

### 3. Creating Data Source Joins in SAS Visual Analytics

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2- Demo2.2 (Alternate)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Demo2.2 (Alternate)** and select **Edit**.
- Create a new data source join for the report.
  - 1) In the left pane, click **Data**, if necessary.
  - 2) On the Data pane, click (**Actions**) and select **New data source join**.
  - 3) In the **Name** field, enter **Parks\_Species**.
  - 4) For the **Join type** field, select **Inner Join**.
  - 5) For **Data source 1**, select **Choose**.
    - a) In the Open Data Source window, verify that **Available** is selected.
    - b) Scroll through the list of data sources and select **PARKS**.
    - c) In the lower right corner of the window, click **OK**.
  - 6) For **Data source 2**, select **Choose**.

- a) In the Open Data Source window, verify that **Available** is selected.
  - b) Scroll through the list of data sources and select **SPECIES**.
  - c) In the lower right corner of the window, click **OK**.
- 7) In the Join conditions area, verify that **Park Name** is selected for the **PARKS** table.
- 8) For the **Species** table, verify that **Park Name** is selected.
- 9) At the bottom of the window, click **Choose Columns**.
- a) Click  (**Add all**) to add all columns to the Selected columns list.
  - b) In the Selected columns list, select **Park Name (SPECIES)** and click  (**Remove**) to remove the column.
  - c) Click **OK** to close the Choose Columns window.

The New Data Source Join window should resemble the following:



The screenshot shows the 'New Data Source Join' dialog box. The 'Name' field is set to 'Parks\_Species'. The 'Join type' is 'Inner Join'. Under 'Data source 1', 'PARKS' is selected. Under 'Data source 2', 'SPECIES' is selected. In the 'Join conditions' section, 'PARKS:' has 'Park Name' selected and 'SPECIES:' also has 'Park Name' selected. A '+' Add button is visible. Below this, under 'Columns for new data source (17 selected)', a list includes: Abundance, Category, Common Names, Conservation Status, Family, Nativeness, Occurrence, Order, Park Name, Record Status, Scientific Name, Seasonality, Species ID, State, Acres, Latitude, Longitude. At the bottom left is a 'Choose Columns...' button.

- 10) Click **OK** to create the new data source join.

The Data pane should resemble the following:

Parks\_Species

Filter

+ New data item

▼ Category

- Abundance - 9
- Category - 14
- Common Names - 36K
- Conservation Status - 12

- d. Rename the **State** data item to **State (lower)**.

- 1) On the Data pane, next to the **State** field, click (Edit properties).
- 2) In the **Name** field, enter **State (lower)**.

The data item should resemble the following:

State (lower) - 27

Name:  
State (lower)

Classification:  
Category

- e. Create a new data item, **State**, that is the uppercase version of **State (lower)**.

- 1) At the top of the Data pane, select **New data item**  $\Rightarrow$  **Calculated item**.
- 2) In the **Name** field, enter **State**.
- 3) For the **Result Type** field, select **Character**.
- 4) On the left side of the window, click **Operators**.
- 5) Expand **Text (simple)**.
- 6) Double-click **UpCase** to add the operator to the expression.

- 7) In the expression, right-click the **string** field and select **Replace with**  $\Rightarrow$  **State (lower)**.

The expression should resemble the following:

UpCase ( State (lower) )

- 8) In the lower right corner of the window, click **Preview**.

State	State (lower)
SD	sd

- 9) In the lower right corner of the window, click **Close**.

- 10) In the lower right corner of the window, click **OK** to create the new data item.

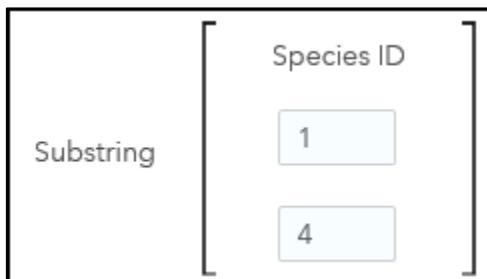
**State** is added to the Category group in the Data pane:

Park Name - 56
Record Status - 54
Scientific Name - 46K
Seasonality - 25
Species ID - 119K
State - 27
State (lower) - 27

- f. Create a new data item, **Park ID**, that consists of the first four characters of **Species ID**.
- At the top of the Data pane, select **New data item**  $\Rightarrow$  **Calculated item**.
  - In the **Name** field, enter **Park ID**.
  - For the **Result Type** field, select **Character**.
  - On the left side of the window, click **Operators**.
  - Expand **Text (advanced)**.
  - Double-click **Substring** to add the operator to the expression.
  - In the expression, right-click the **string** field and select **Replace with**  $\Rightarrow$  **Species ID**.

- 8) For the first number field in the expression, enter **1**.
- 9) For the second number field in the expression, enter **4**.

The expression should resemble the following:



- 10) In the lower right corner of the window, click **Preview**.

Park ID	Species ID
BADL	BADL-1327
BADL	BADL-1328
BADL	BADL-1329
BADL	BADL-1330

- 11) In the lower right corner of the window, click **Close**.
- 12) In the lower right corner of the window, click **OK** to create the new data item.

**Park ID** is added to the Category group in the Data pane:

Family - 2.3K
Nativeness - 6
Occurrence - 8
Order - 555
Park ID - 56
Park Name - 56

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

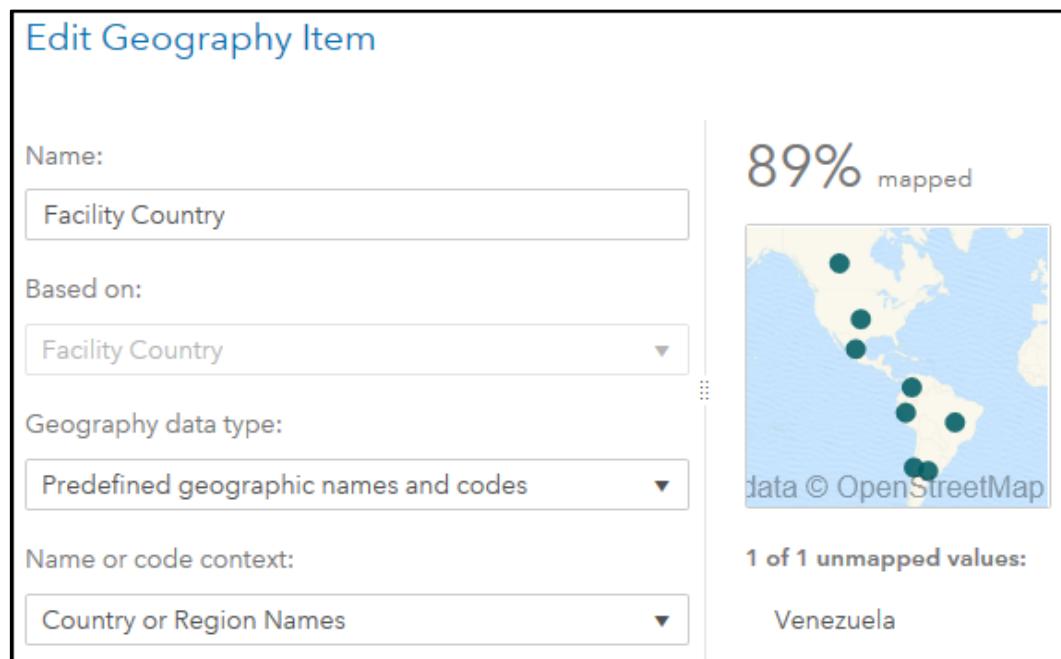
- 1) In the upper right corner, click (**Menu**) and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

#### 4. Analyzing a Geographic Data Source

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2- Exercise2.3**.
- Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- Right-click **VA2- Exercise2.3** and select **Edit**.
- Change the classification for **Facility Country** to **Geography** using the **Country or Region Names** predefined geographic name.
- In the left pane, click **Data**.
- In the Data pane, for **Facility Country**, click  (**Edit properties**).
  - For the **Classification** field, select **Geography**.
  - In the Edit Geography Item window, for the **Geography data type** field, verify that **Predefined geographic names and codes** is specified.
  - For the **Name or code context** field, select **Country or Region Names**.

What percentage of data items are mapped?

**Answer:** The map on the right shows that 89% of country codes are mapped.



- Click **OK**.

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



- Change the classification for **Facility** to **Geography** using the custom coordinates in the data source.

- 1) In the Data pane, for **Facility**, click  **(Edit properties)**.
  - a) For the **Classification** field, select **Geography**.
  - b) In the Edit Geography Item window, for the **Geography data type** field, select **Custom coordinates**.
  - c) For the **Latitude (y)** field, select **xyFacility Lat**.
  - d) For the **Longitude (x)** field, select **xyFacility Lon**.
  - e) For the **Coordinate Space** field, verify that **World Geodetic System (WGS84)** is selected.

The map on the right shows that 100% of facility locations are mapped.

### Edit Geography Item

Name:  
Facility

Based on:  
Facility

Geography data type:  
Custom coordinates

Latitude (y):\*  
xyFacility Lat

Longitude (x):\*  
xyFacility Lon

Coordinate Space:  
World Geodetic System (WGS84)



100% mapped  
data © OpenStreetMap

- f) Click **OK**.
- 2) At the bottom of the Data pane, click **Clear selection**, if necessary.

The Geography group should resemble the following:

▼ Geography

-  Facility - 93
-  Facility Country - 9

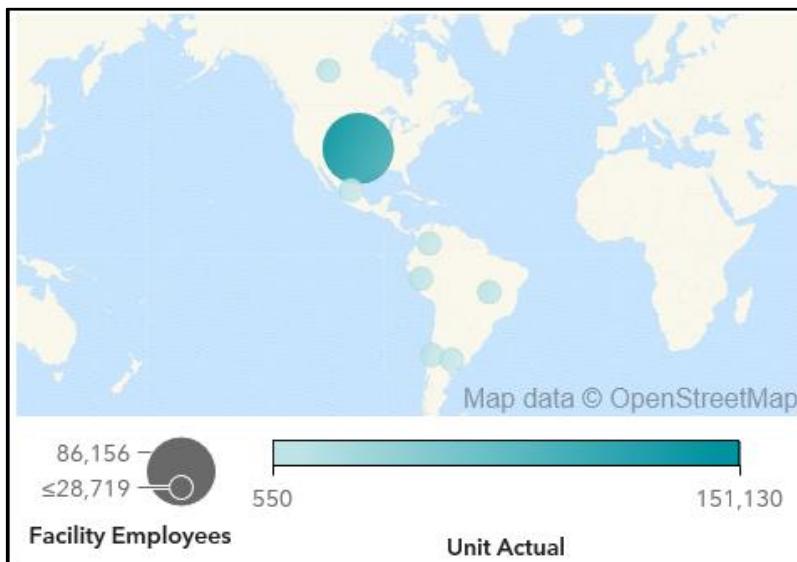
- e. Create a geographic hierarchy (**Facility Hierarchy**) of the geographic data items.
- 1) In the Data pane, select **New data item**  $\Rightarrow$  **Hierarchy**.
  - 2) In the **Name** field, enter **Facility Hierarchy**.
  - 3) In the Available items list, double-click the following data items (in order) to select them:  
**Facility Country**  
**Facility**
  - 4) Click **OK** to create the new hierarchy.

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



- f. Create a geo map by assigning data items to the specified roles.
- 1) In the canvas, click the **Geo Map** object to select it.
  - 2) In the right pane, click **Roles**.
    - a) For the Category role, select **Add**  $\Rightarrow$  **Facility Hierarchy**.
    - b) For the Size role, select **Frequency**  $\Rightarrow$  **Facility Employees**.
    - c) For the Color role, select **Add**  $\Rightarrow$  **Unit Actual**.

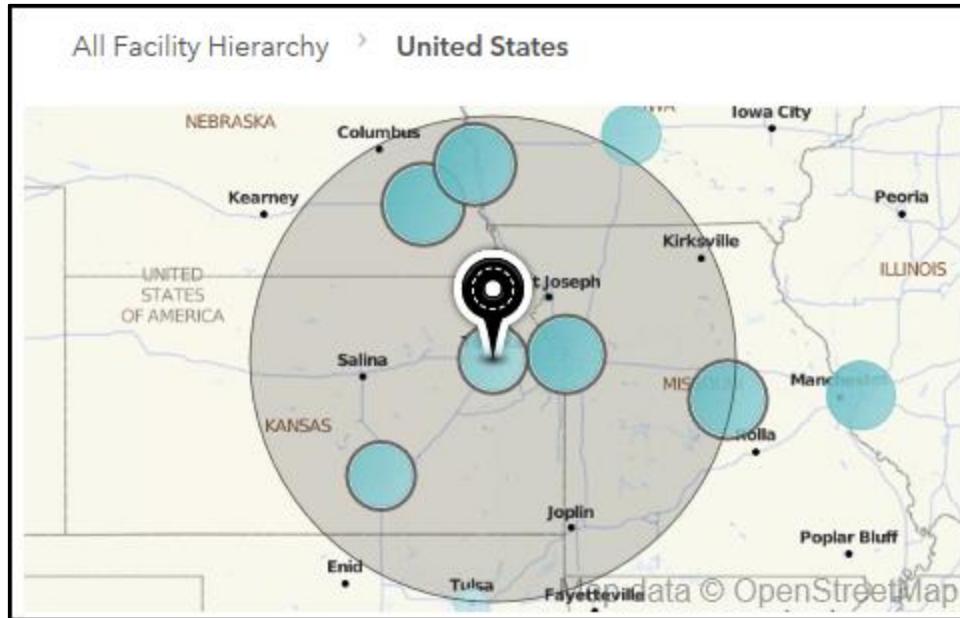
The geo map should resemble the following:



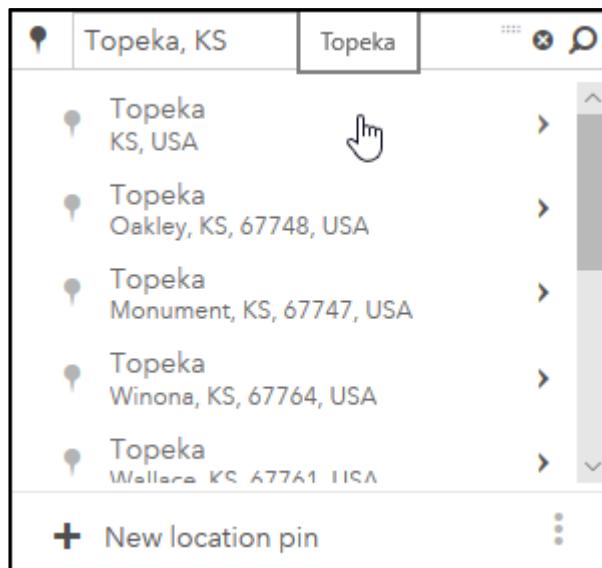
- g. Answer the question.

How many facilities are in the United States within 250 miles of Topeka, KS?

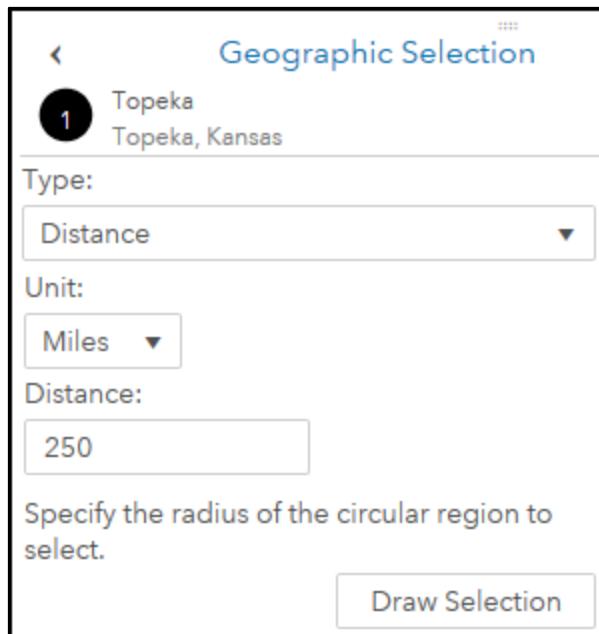
**Answer: Six facilities are in the United States within 250 miles of Topeka, KS.**



- In the geo map, double-click the bubble for the United States.
- In the upper left corner of the geo map, click (Location).
- In the Search field, enter Topeka, KS.
- Select the search result for Topeka KS, USA.



- Next to Topeka, click .
- Click Geographic selection.
- For the Type field, verify that Distance is specified.
- For the Unit field, verify that Miles is selected.
- For the Distance field, enter 250.



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

**End of Solutions**

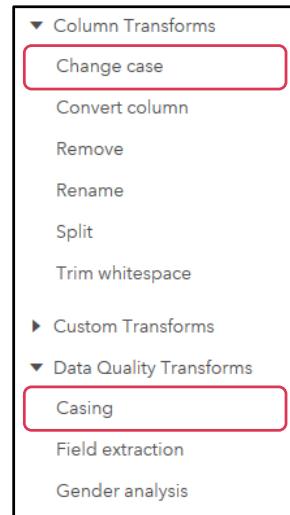
## Solutions to Activities and Questions

### 2.01 Activity – Correct Answer

Which transforms can be used to modify the case of columns?

**Change case (in the Column Transforms group) and Casing (in the Data Quality Transforms group)**

Data quality transforms are available only if SAS Data Preparation is licensed.



sas

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### 2.02 Question – Correct Answer

Many report designers have asked that we add a data item to the CAS table (**Profit**). What are some ways in which this can be accomplished?

**A new column can be added to the CAS table by doing one of the following:**

- **building a plan in SAS Data Studio to update the table**
- **writing SAS code to update the table**
- **using open source languages to update the table**
- **creating a shared data view in SAS Visual Analytics**

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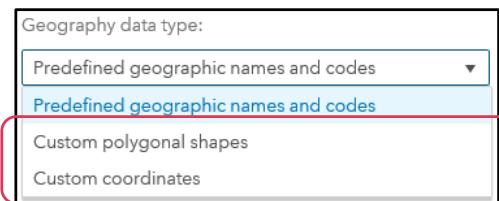
sas

## 2.03 Multiple Answer Question – Correct Answer

To create a geo map in SAS Visual Analytics, you need a geographic data item.

Which geographic areas would require custom polygonal shapes or custom coordinates? (Select all that apply.)

- a. voting districts
- b. cities
- c. sales regions
- d. school districts



To use custom polygonal shapes, a polygon provider must be defined.



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**Note:** Special user permissions are required to define and edit polygon providers. The **/maps/providers** URI controls the access to polygon provider. For more information, see “Access to Functionality” in the *SAS Viya 3.4 Administration: Identity Management* documentation.

## Practice Review

### 2.1 Creating a Geographic Data Source – Solution

What is the name of the source table for the plan?

**FACILITY\_TOY**

How many rows are in the source table?

**35.2K rows**

How many columns?

**28 columns**

Source Table - FACILITY_TOY		
Columns	Rows	Size
<b>28</b>	<b>35.2 K</b>	<b>19.6 MB</b>
Label: (not available)		
Location: cas-v4e010-default/YVA283		

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### 2.1 Creating a Geographic Data Source – Solution

How many unique values exist for Facility Continent?

**Six unique values**

Column	Unique
<b>FacilityContinent</b>	<b>0.02%(6)</b>

What is the average number of products produced by each unit?

The minimum? The maximum?

**Average=6.86, Minimum=1.00, Maximum=55.00**

Column	Mean	M.	M.	S..	S..	Minimum	Maximum
<b>UnitActual</b>	6.86					1.00	55.00

Result Table - FACILITY_TO...		
Columns	Rows	Size
<b>28</b>	<b>26.1 K</b>	<b>14.6 MB</b>

How many rows are in the result table?

**26.1K rows**

22



## 2.1 Creating a Geographic Data Source – Solution

What is the name of the result table for the plan?

**FACILITY\_TOY\_AMERICA**

Saved table (FACILITY_... ▾
Input table (FACILITY_TOY)
Saved table (FACILITY_TOY_AMERICA)

How many unique values exist for **Facility Continent**?

**Two unique values**

Column	Unique
FacilityContinent	0.01% (2)

What is the average number of products produced by each unit? What does this tell you about production in the Americas compared to production in other continents?

**Average=6.73**

This is below the average for all continents (6.86), so production in the Americas is below that in other continents.

Column	Mean
UnitActual	6.73

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## 2.2 Creating Report Data Views in SAS Visual Analytics – Solution

How many observations are in the

**FACILITY\_TOY** data source?

**35,159 observations**

▼ Category
■ Facility - 127
■ Facility City - 125
■ Facility Continent - 6
■ Facility Country - 32
■ Facility Opening Date - 19
■ Facility Region - 95
■ Unit - 166
■ Unit Status - 1

How many unique values exist for **Facility Continent**? **Six unique values**

▼ More information	
Standard Deviation:	7.15
Standard Error:	0.04
Variance:	51.09
Distinct Count:	19
Number Missing:	0
Total Observations:	35,159
Skewness:	0.2978
Kurtosis:	-0.9217
Coefficient of Variation:	52.7576
Uncorrected Sum of Squares:	8,249,067.12
Corrected Sum of Squares:	1,796,054.52
T-statistic (for Average=0):	355.4132
P-value (for T-statistic):	<0.0001

24



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## 2.2 Creating Report Data Views in SAS Visual Analytics – Solution

How many observations are returned after the data source filter is applied?

**26,138 observations**

Returned observations: 26,138

Total observations: 35,159

How many unique values exist for Facility Continent?

**Two unique values**

▼ Category

- Facility - 93
- Facility City - 92
- Facility Continent - 2
- Facility Country - 9
- Facility Opening Date - 13
- Facility Region - 61
- Unit - 146
- Unit Status - 1



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## 2.2 Creating Report Data Views in SAS Visual Analytics – Solution

How many observations are in the **FACILITY\_TOY**

data source? Why?

**26,138 observations**

▼ Category

- Facility - 93
- Facility City - 92
- Facility Continent - 2
- Facility Country - 9
- Facility Opening Date - 13
- Facility Region - 61
- Unit - 146
- Unit Status - 1

How many unique values exist for Facility Continent? Why?

**Two unique values**

▼ More information

Standard Deviation:	7.47
Standard Error:	0.05
Variance:	55.73
Distinct Count:	13
Number Missing:	0
<b>Total Observations:</b>	<b>26,138</b>
Skewness:	0.0249



26

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## 2.3 Creating Data Source Joins in SAS Visual Analytics – Solution

The data source join should resemble the following:

The screenshot shows the 'Data source 1' and 'Data source 2' sections. Under 'Data source 1', 'PARKS' is selected from the dropdown. Under 'Data source 2', 'SPECIES' is selected. In the 'Join conditions' section, 'PARKS' is paired with 'SPECIES' under 'Park Name'. A 'Choose Columns...' button is visible at the bottom left.

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## 2.3 Creating Data Source Joins in SAS Visual Analytics – Solution

The calculated data items should resemble the following:

**State**

UpCase ( State (lower) )

**Park ID**



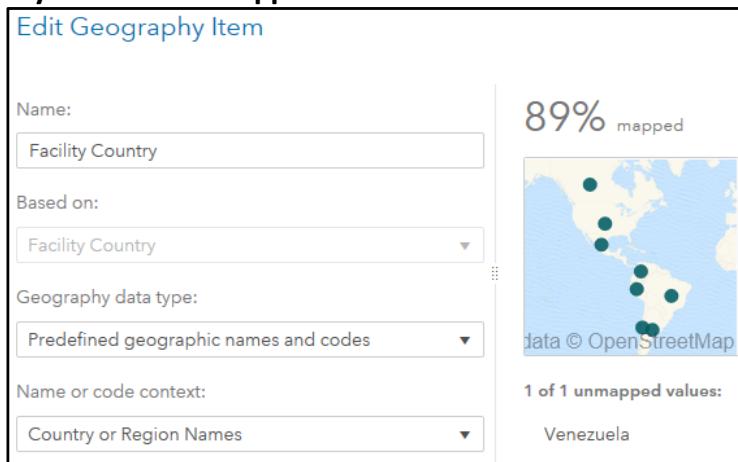
28



## 2.4 Analyzing a Geographic Data Source – Solution

What percentage of data items are mapped?

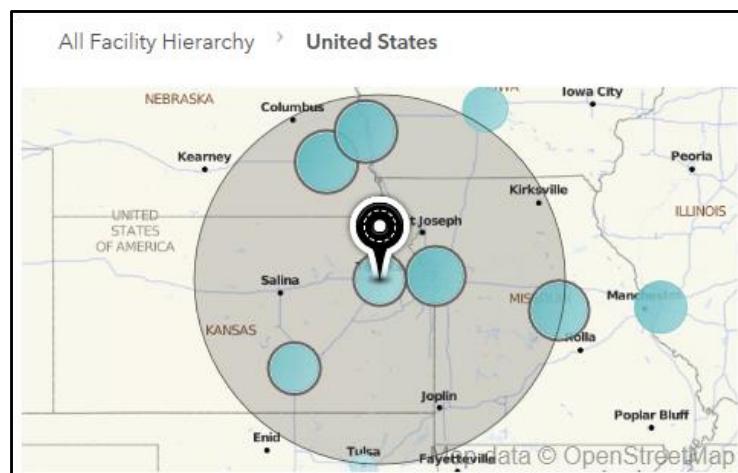
**89% of country codes are mapped.**



## 2.4 Analyzing a Geographic Data Source – Solution

How many facilities are in the United States within 250 miles of Topeka, KS?

**Six**



# Lesson 3      Restructuring Data for Forecasting

<b>3.1    Restructuring Data.....</b>	<b>3-3</b>
Demonstration: Creating a Forecasting Data Source.....	3-7
Practice.....	3-14
<b>3.2    Forecasting.....</b>	<b>3-15</b>
Demonstration: Analyzing a Forecasting Data Source .....	3-17
Practice.....	3-24
<b>3.3    Solutions .....</b>	<b>3-25</b>
Solutions to Practices .....	3-25
Practice Review.....	3-33



## 3.1 Restructuring Data

### Objectives

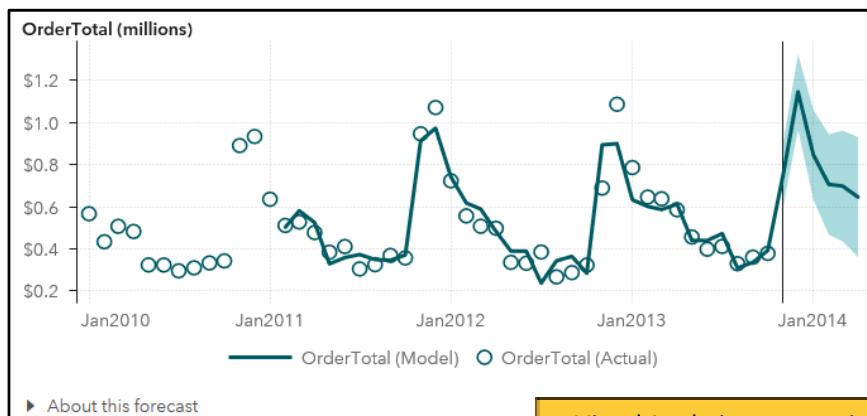
- Discuss when to use forecasting objects in SAS Visual Analytics.
- Describe the structure of the table needed for forecasting.

3



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### Objects: Analytics (Forecasting)



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

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

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## Forecasting

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

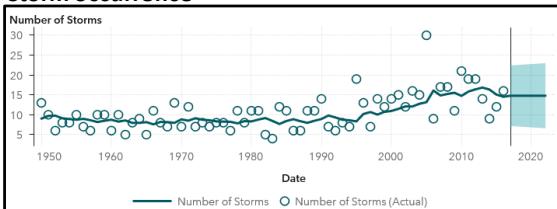
- ARIMA
- damped-trend exponential smoothing
- linear exponential smoothing
- seasonal exponential smoothing
- simple exponential smoothing
- Winters method (additive)
- Winters method (multiplicative)

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

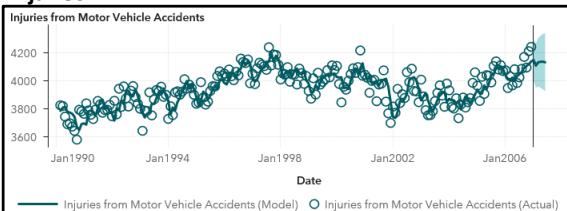
- Note:** If SAS Visual Statistics and SAS Visual Data Mining and Machine Learning are licensed at your site, you have the ability to create models instead of relying on the model automatically selected for forecasting.
- Note:** If SAS Visual Forecasting is licensed at your site, you have the ability to automatically produce large-scale time series analyses and hierarchical forecasts.

## Forecasting Examples

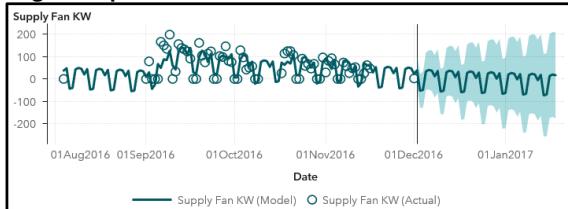
### Storm occurrence



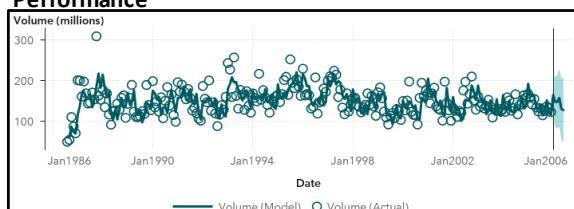
### Injuries



### High-use periods

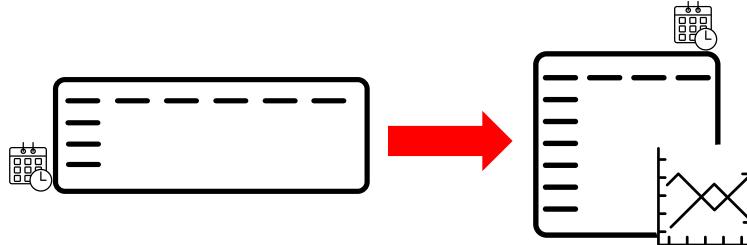


### Performance



## Forecasting: Data Shape

To create a forecasting object, the rows of the data source must represent time (date, time, or datetime).



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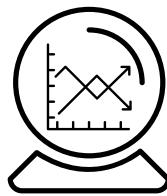


## Business Scenario: Sales



The Sales team at Orion Star has asked for a forecast of sales for the next six months.

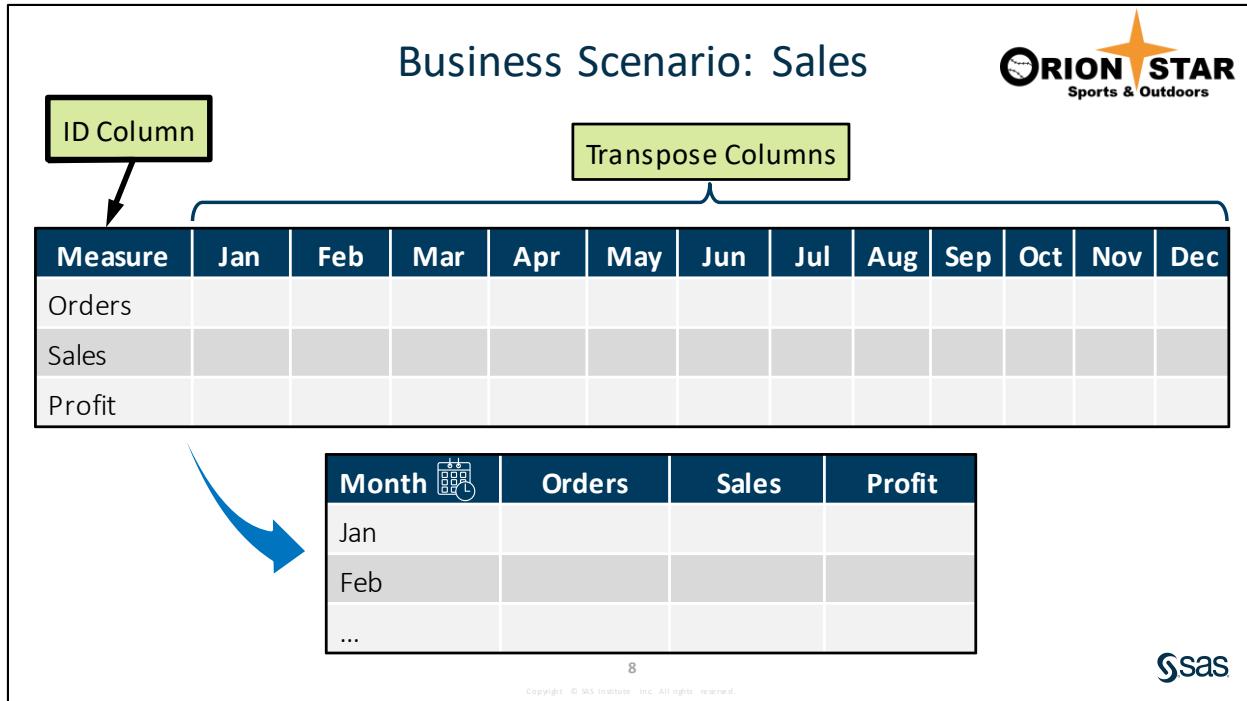
We have a table that contains columns for each month and rows for each measure (sales, costs, market penetration). We need to transpose the data to produce a data set suitable for forecasting.



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In this demonstration, we perform the following steps:

1. Transpose the **Sales\_Ord\_T** table.
2. Convert a character column (**Date**) to a date type (**TransactionDate**).
3. Remove the character column (**Date**).

The plan creates a new CAS table (**Sales\_Orders**) that is used in a later section.



## Creating a Forecasting Data Source

This demonstration illustrates how to explore a data source and use transforms (Transpose, Convert Column, and Remove) to create a forecasting data source in SAS Data Studio.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to the **SAS Content/Courses/YVA283/Advanced/Demos** folder.
3. Right-click the **VVA2-Demo3.1** data plan and select **Prepare data**.  
The plan opens in SAS Data Studio.
4. In the left pane, click (**Properties for the source table**) to show details about the source table.

Source Table - SALES\_ORD\_T

---

Columns	47	Rows	4	Size	1.6 KB
---------	----	------	---	------	--------

---

Label:  
(not available)

---

Location:  
cas-v4e020-default/YVC283

---

Date created:  
Jul 9, 2019 10:42 AM

Date modified:  
Jul 9, 2019 10:42 AM

---

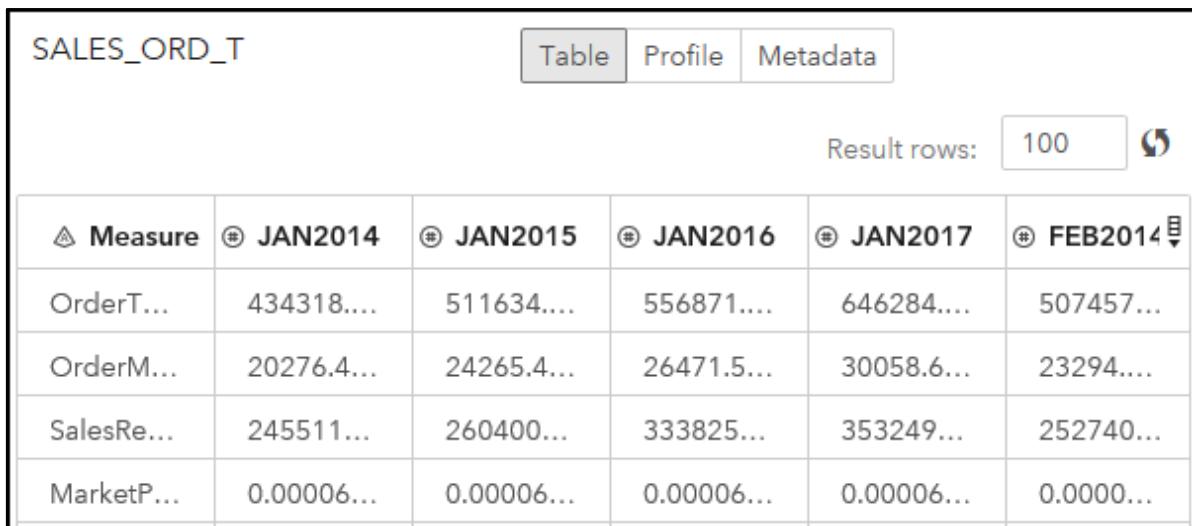
Encoding:  
utf-8

---

Tags (0):  
No items have  
been added.

The table contains only four rows of data and 47 columns.

5. In the bottom pane, verify that **Table** is selected.



Measure	JAN2014	JAN2015	JAN2016	JAN2017	FEB2014
OrderT...	434318....	511634....	556871....	646284....	507457...
OrderM...	20276.4...	24265.4...	26471.5...	30058.6...	23294....
SalesRe...	245511...	260400...	333825...	353249...	252740...
MarketP...	0.00006...	0.00006...	0.00006...	0.00006...	0.0000...

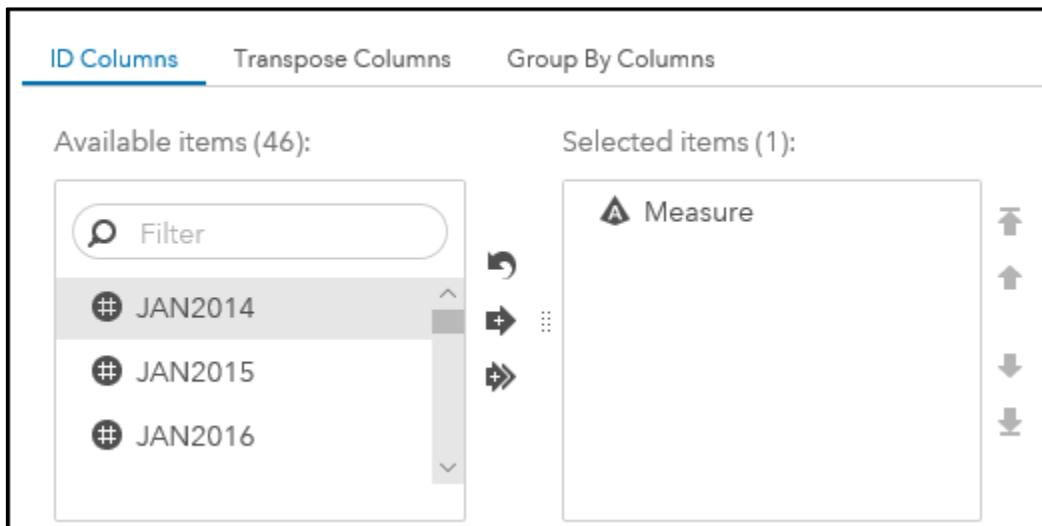
In order to perform forecasting in Visual Analytics, the table must contain one column for each measure and one row for each month (time series data). This table is not formatted properly and needs to be transposed.

6. Add transforms to the plan.

- In the left pane, click  (**Transforms**) to view the available transforms.
  - In the Row Transforms group, double-click **Transpose** to add the transform to the plan.
- At the top of the window, verify that **ID Columns** is selected.



- In the Available items list, double-click **Measure** to add it to the Selected items list.



For the ID columns, you want to select columns that contain row values that you want to transform into columns. In this example, we would like the new table to contain a column for each distinct value of **Measure**.

- 3) For the **Rename the \_NAME\_ column** field, enter **Date**.

**Options for Output Column Headings**

Include column prefix:

Rename the \_NAME\_ column:

Eliminate redundant values

**\_NAME\_** is the default column name for the column created by transposing the data. In this example, we want to transpose the month columns, so we name the column **Date**.

- 4) At the top of the window, click **Transpose Columns**.

For the Transpose columns, you want to select columns that contain the data that you want to use to populate the new table. In this example, we would like the new table to use the data from each of the month columns.

- 5) In the Available items list, click **JAN2014**, hold down the Shift key, and select **DEC2016**.  
 6) Click **➔ (Add)** to add the selected columns to the Selected items list.

**Note:** If **Measure** is added to the selected items, select it and click **⬅ (Remove)** to remove it from the list.

ID Columns	<b>Transpose Columns</b>	Group By Columns
Available items (1):	Selected items (46):	
<input type="text" value="Filter"/> <b>Measure</b>	<ul style="list-style-type: none"> <li># JAN2014</li> <li># JAN2015</li> <li># JAN2016</li> <li># JAN2017</li> <li># FEB2014</li> <li># FEB2015</li> <li># FEB2016</li> <li># FEB2017</li> <li># MAR2014</li> </ul>	<ul style="list-style-type: none"> <li>^</li> <li>↑</li> <li>↑</li> <li>↓</li> <li>↓</li> </ul>

- 7) At the bottom of the window, click **Run** to execute the transform.

The Table view is updated to reflect the transpose.

Date	MarketPenetration	OrderMarketingCost
JAN2014	0.0000685895	20276.497916
JAN2015	0.0000602122	24265.481173
JAN2016	0.0000658731	26471.522861
JAN2017	0.0000636889	30058.668071

The **Date** column is classified as a character column. We need to change the classification to **DATE** so that we can use Date functions and calculations in Visual Analytics.

- c. On the Transforms pane, in the Column Transforms group, double-click **Convert column** to add the transform to the plan.
  - 1) For the **Source column** field, verify that **Date** is selected.
  - 2) For the **Conversion** field, select **DATE**.
  - 3) For the **Informat or format** field, click (**Suggestions for informats or formats**).
    - a) In the Informat or Format window, select **MONYYw**.
    - b) For the **Informat or format** field, modify the value to **MONYY7**.  
The informat provides instructions on how to read the data. Because the **Date** column has a three-character month and a four-digit year (JAN2014), we need to specify a width of 7.
  - 4) For the **New column** field, enter **TransactionDate**.
  - 5) For the **Length** field, verify that **8** is specified.
  - 6) For the **Format** field, enter **DATE9.** as the format.  
The format provides instructions on how to write the data (01JAN2014).
  - 7) For the **Label** field, enter **Transaction Date**.

The transform should resemble the following:

- 8) In the upper right corner of the plan, click **Run** to execute the transform.

The new column is added to the Table view.

④ TransactionDate
01JAN2014
01JAN2015
01JAN2016
01JAN2017

- d. On the Transforms pane, in the Column Transforms group, double-click **Remove** to add the transform to the plan.

- 1) For the **Source column** field, select **Date**.

The transform should resemble the following:

Source column:
<input type="button" value="Date"/> +

- 2) In the upper right corner of the plan, click **Run** to execute the transform and remove the column.

The **Date** column is removed from the Table view.

7. Save the plan and the result table.

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

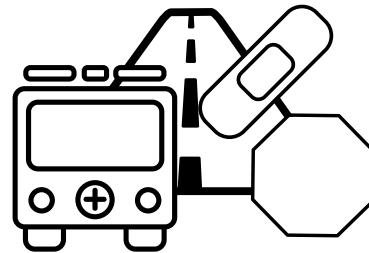
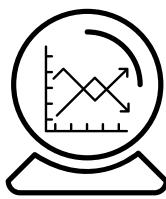
- 1) Navigate to **My Folder**.
  - 2) Verify that **Table name** is set to **SALES\_ORDERS**.
  - 3) In the lower right, click  (**Library**).
  - 4) Next to the **cas-v4exxx-default** server, click  (**Down one level**).
  - 5) Click **Public**.
  - 6) Click **Select**.
- b. Click **Save**.
8. In the upper left corner, click  (**Show applications menu**) and select **SAS Drive** to return to SAS Drive.

**End of Demonstration**

## Business Scenario: Motor Vehicle Accidents

The California Highway Patrol (CHP) has asked for a forecast of injuries from motor vehicle accidents for the next two years.

We have two tables that contain information about the number of injuries, drivers, and vehicles, and a tourism index for California. One table has information for the 1990s and the other has information for the 2000s. We need to append these tables to create a data set for forecasting.



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## Business Scenario: Motor Vehicle Accidents

Date	Injuries	Vehicles	Drivers	...	DV Ratio
MAR1990					
APR1990					
...					



Date	Injuries	Vehicles	Drivers	...	DV Ratio
JAN2000					
FEB2000					
...					

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In this practice, you perform the following steps:

1. Append the **Mvainjuries00** table to the **Mvainjuries90** table.
2. Calculate **DV Ratio** as the ratio of **Drivers** to **Vehicles**.

The plan creates a new CAS table (**Mvainjuries**) that is used in a later section.



## Practice

---

### 1. Creating a Forecasting Data Source

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise3.1**.
  - 1) Navigate to the **SAS Content/Courses/YVA283/Advanced/Exercises** folder.
  - 2) Right-click the **VA2-Exercise3.1** data plan and select **Prepare data**.  
The plan opens in SAS Data Studio.
- c. View the source table properties and answer the following question:  
How many columns are in the source table?  
**Answer:** \_\_\_\_\_
- d. Append the **MVAINJURIES00** data source to the source table (**MVAINJURIES90**).  
**Note:** The **MVAINJURIES00** data source is defined for the Public CAS server but is not currently loaded.
- e. Answer the following question:  
How many columns are in the **MVAINJURIES00** table?  
**Answer:** \_\_\_\_\_
- f. Add a new column (**DVRatio**) to the result table that computes the ratio of **Drivers** to **Vehicles**.  
**Note:** Make sure that you change the type and label of the new column as necessary.  
**Note:** The resulting table should have 10 columns and 202 rows of data.
- g. Save the plan in **My Folder**. Remember to update the Library location to your CAS server / Public library.
- h. Return to SAS Drive.

**End of Practices**

## 3.2 Forecasting

### Objectives

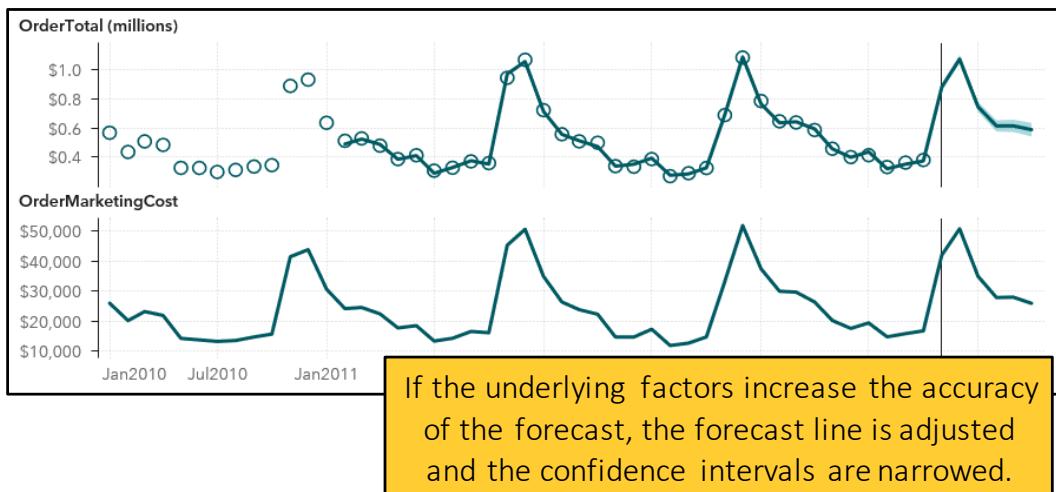
- Describe the process of creating a forecast in SAS Visual Analytics.
- Describe the process of adding underlying factors to a forecast.
- Describe what-if analysis (scenario analysis and goal seeking).

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### Underlying Factors

Underlying factors are additional measures that improve the accuracy of the forecast.



The forecasting model evaluates the additional measures to determine whether they contribute to the accuracy of the forecast. If the additional measures do not increase the accuracy of the forecast, then they are not applied to the forecast object. If the additional measures do increase the accuracy of the forecast, then the forecast line is adjusted, and the confidence bands are narrowed.

## Forecasting: What-If Analysis

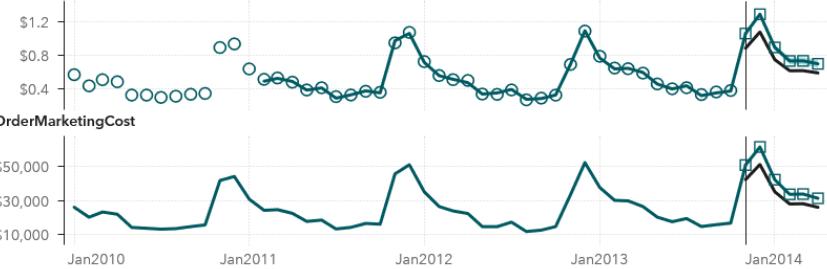
Use *scenario analysis* to forecast hypothetical scenarios by specifying the future values for one or more underlying factors.

Use *goal seeking* to specify a target value for your forecasted measure to determine the values for the underlying factors required to achieve that target.

### What-If Analysis

Chart Table

OrderTotal (millions)



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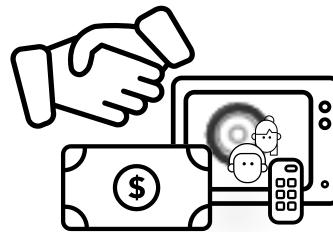
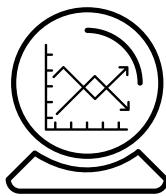
To perform What-If analysis for a forecast, measures need to be added to the Underlying factors role and found to contribute to the forecast.

## Business Scenario: Sales



The Sales team at Orion Star has asked for a forecast of sales for the next year.

They would like to see whether marketing costs or market penetration, or both, will improve the forecast. They would also like to know how much the underlying factors would need to change to meet their sales goal (a 10% increase).



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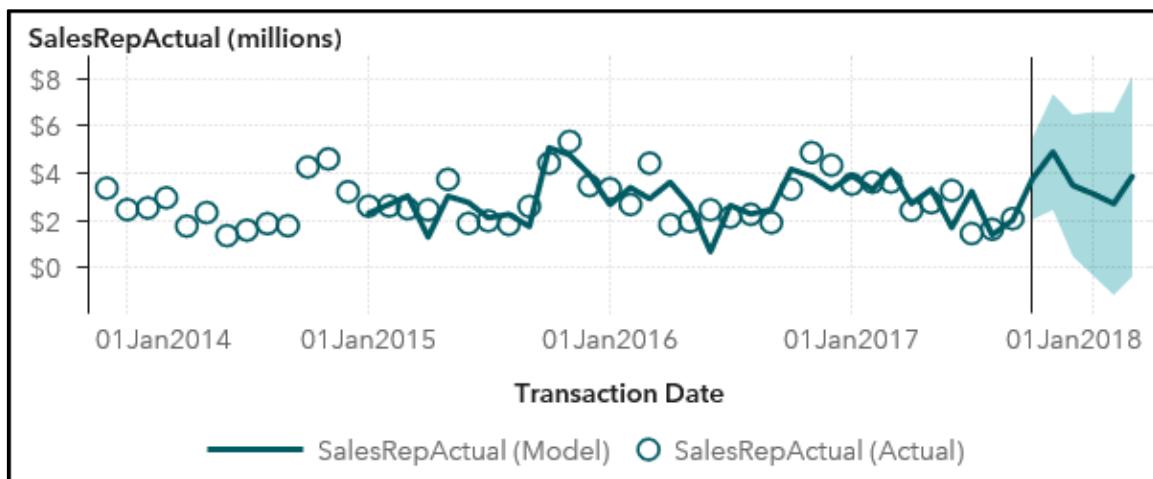


## Analyzing a Forecasting Data Source

This demonstration illustrates how to add a forecast, underlying factors, and goal seeking using SAS Visual Analytics.

1. From the browser window, sign in to SAS Viya for Learners.
2. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
3. Right-click **VA2- Demo3.2** and select **Edit**.  
The report opens in SAS Visual Analytics.
4. Create a forecast.
  - a. In the canvas, click the **Forecasting** object to select it.
  - b. In the right pane, click **Roles**.
  - c. For the Time axis role, select **Add  $\Rightarrow$  Transaction Date**.
  - d. For the Measure role, click **Frequency** and select **SalesRepActual**.

The forecasting object should resemble the following:



Historical values for **SalesRepActual** are displayed as markers, and historical predicted values (using the selected forecasting algorithm) are displayed as a line.

- e. In the upper right corner of the forecasting object, click (**Maximize**) to view details about the forecast.
- f. At the bottom of the chart, verify that **Results** is selected.

- g. Scroll through the table to view the forecasted values for **SalesRepActual**.

Dependent Variables Results					
Transaction Date	SalesRepActual (Model)	SalesRepActual (Actual)	Lower Confidence I...	Upper Confidence I...	
01Aug2017	\$1,384,966.77	\$1,628,960.76	.	.	.
01Sep2017	\$2,011,920.97	\$2,074,657.61	.	.	.
01Oct2017	\$3,758,104.30	.	\$2,033,637.33	\$5,482,571.27	
01Nov2017	\$4,888,167.63	.	\$2,449,403.05	\$7,326,932.20	
01Dec2017	\$3,478,785.87	.	\$491,921.46	\$6,465,650.28	

Historical predicted values and future predicted values are calculated using the forecasted algorithm selected for the data. For future values, a lower and upper confidence interval is also calculated.

- h. At the bottom of the chart, click **Dependent Variables Results** to view details about the forecasting algorithm.

Dependent Variables Results	
Dependent Variable	Algorithm
SalesRepActual	ARIMA: SalesRepActual ~ P = (12) D = (1,12) NOINT

**SalesRepActual** is forecast using an ARIMA algorithm.

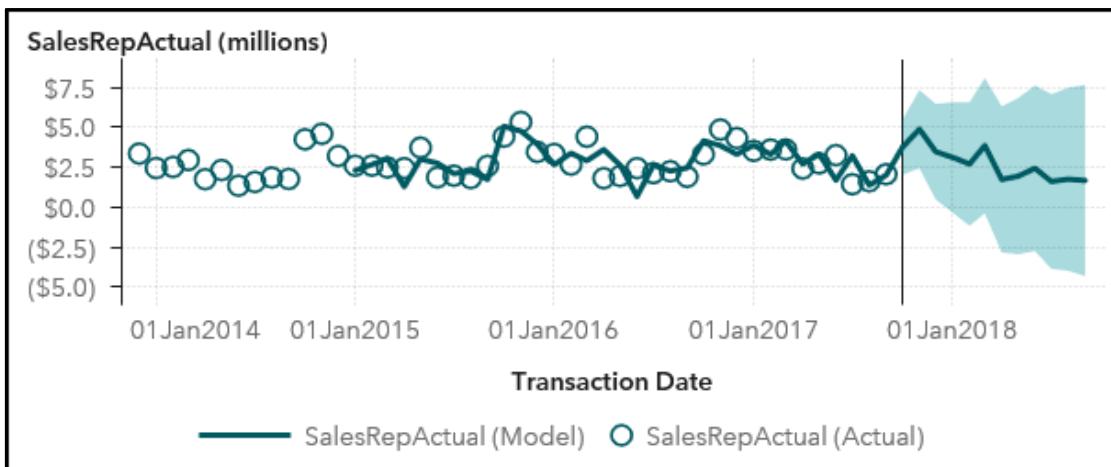
The P=(12) indicates the autoregressive term in the model. This means that the forecasted value for the next period of **SalesRepActual** depends on the values for **SalesRepActual** from the last 12 periods.

The D=(1,12) indicates the changes performed on the data to make the forecasted value (**SalesRepActual**) stationary. In this case, a 1-lag difference is needed (the change of **SalesRepActual** from the previous period to this period). The 12 indicates that the forecast is affected by the large changes in **SalesRepActual** from the past 12 periods.

NOINT indicates that no integer is used in the model of **SalesRepActual**.

2. Modify options for the forecasting object.
  - a. In the right pane, click **Options**.
  - b. In the Forecast group, for the **Forecast horizon** field, enter **12**.

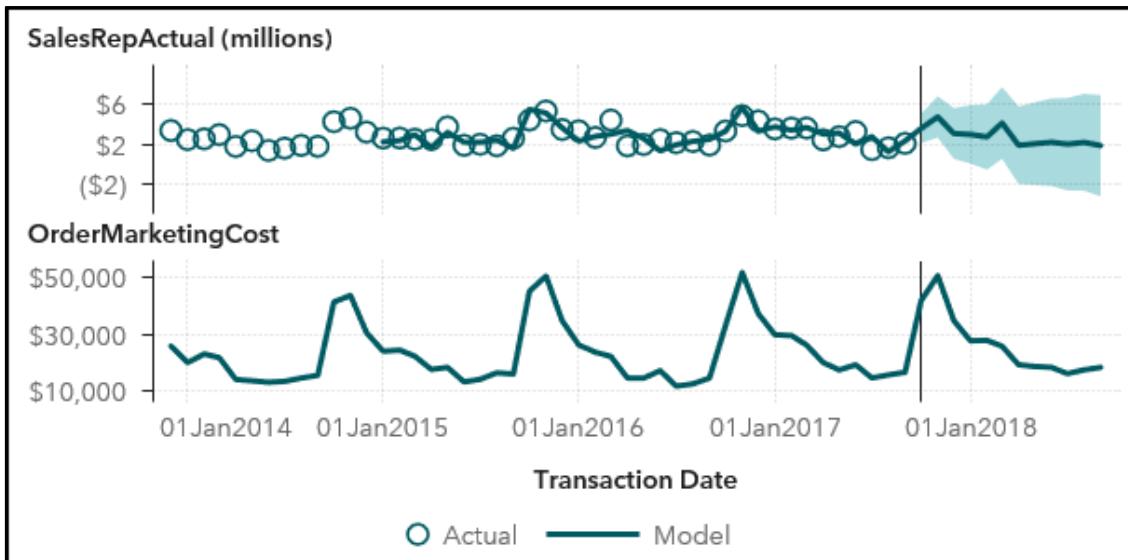
The updated forecast should resemble the following:



Notice that when we forecast further into the future, the confidence interval increases (and dips into negative values).

3. Add underlying factors to the forecast.
  - a. In the right pane, click **Roles**.
  - b. For the Underlying factors role, click **Add**.
    - 1) Select the following data items:  
**MarketPenetration**  
**OrderMarketingCost**
    - 2) Click **OK**.

The updated forecast should resemble the following:



Visual Analytics evaluates the additional measures to determine whether they contribute to the accuracy of the forecast. In this case, **OrderMarketingCost** was found to increase the accuracy of the forecast (as indicated by the narrower confidence interval), so it was added to the model. On the other hand, **MarketPenetration**, was **not** found to increase the accuracy of the forecast, so it was **not** added to the model.

- At the bottom of the chart, verify that **Dependent Variables Results** is selected.

**Algorithm**

```
ARIMA: SalesRepActual ~ P = (12) D = (1,12) NOINT + INPUT: Dif(1,12) OrderMarketingCost
```

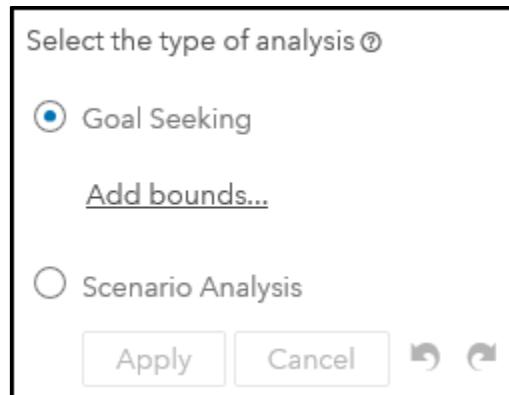
The forecasting algorithm is updated to reflect the underlying factor (**OrderMarketingCost**).

**SalesRepActual** is forecast using an ARIMA algorithm.

The Dif(1,12) indicates that the model requires second-order differencing of **OrderMarketingCost** to make the series stationary: one difference term at lag 1 and the other at lag 12.

- In the upper right corner of the forecasting object, click  (**Restore**).
- Perform goal seeking.
    - In the right pane, click **Roles**.
    - For the Forecast role, click **What If**.

The What-If Analysis window appears.
  - On the right side of the window, verify that **Goal Seeking** is selected.



**Note:** It is possible to add bounds for the underlying factors when goal seeking is performed. This ensures that the forecasted values for the underlying factors are not higher (or lower) than acceptable values.

- In the upper left corner of the window, click  (**Menu**) and select **Set series values**.

The Set Series Values window appears.

- For the **Change all future values for the selected series** field, verify that **Forecast: SalesRepActual** is specified.

**Note:** We are performing goal seeking, so we must set desired values for the forecasted measure (**SalesRepActual**).

- For **Adjust series value**, select **By percentage**.

- 3) In the **By percentage** field, enter **10** and press Enter.

**Set Series Values**

Change all future values for the selected series:

Forecast: SalesRepActual ▾

Set all values to:

Adjust series values

By constant value:

By percentage:

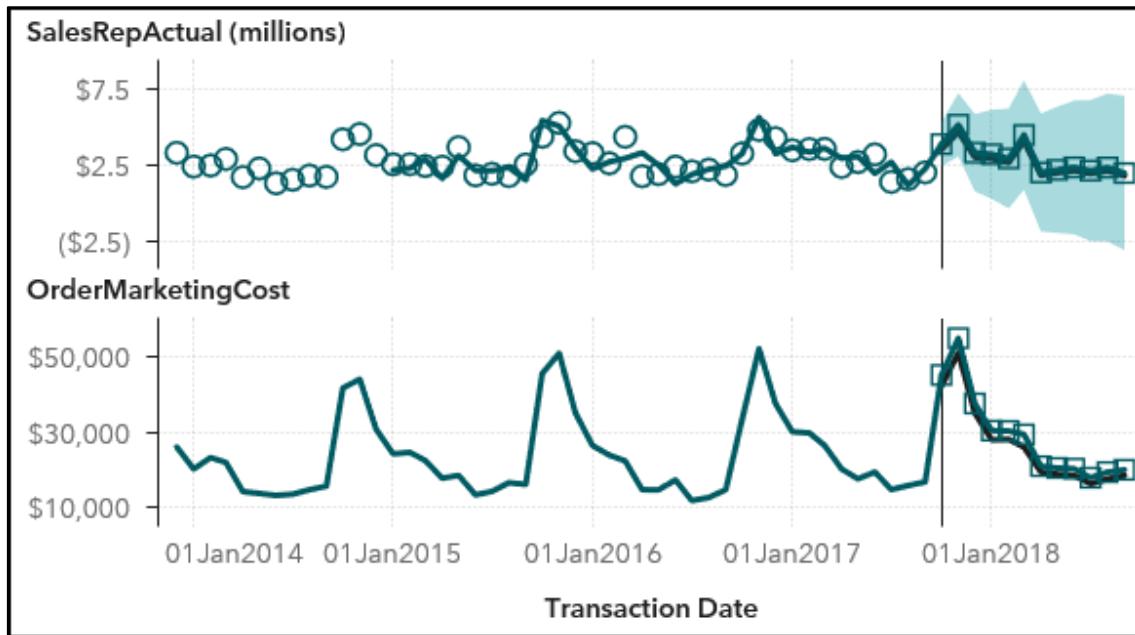
Progressively by:

- 4) Click **OK**.

As an alternative, you can drag the markers in the chart to set the target values for the forecasted measure or you can enter values directly in the table cells.

- e. On the right side of the window, click **Apply**.

The adjustment is applied to the forecasted measure, and the updated values for the underlying factor are displayed.



To increase sales rep actual by 10%, marketing costs must increase as well.

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

The results are applied to the forecasting object in the report.

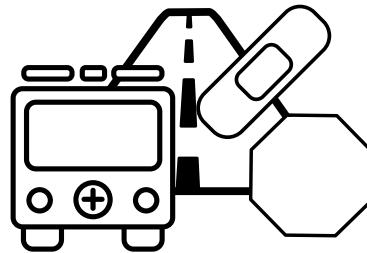
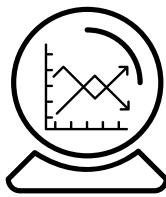
5. In the upper right corner, click  (**Menu**) and select **Save As**.
6. Navigate to **My Folder**.
7. Click **Save**.

**End of Demonstration**

## Business Scenario: Motor Vehicle Accidents

The California Highway Patrol (CHP) has asked for a forecast of injuries from motor vehicle accidents for the next two years.

They would like to see how tourism or the driver-to-vehicle ratio, or both, will improve the forecast. Then they would like to see how a constant increase in the underlying factor will impact the forecast of injuries.



Sas

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## Practice

---

### 2. Analyzing a Forecasting Data Source

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise3.2**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises** folder.
  - 2) Right-click **VA2-Exercise3.2** and select **Edit**.
- c. Create a forecast by assigning the following data items to the specified roles:

<b>Time axis</b>	<b>Date</b>
<b>Measure</b>	<b>Injuries from Motor Vehicle Accidents</b>

- d. View details about the forecast and answer the following question:

Which algorithm is selected for the forecast?

**Answer:** \_\_\_\_\_

- e. Modify options for the forecasting object to change the forecast horizon to two years.
- f. Add the following measures to the Underlying factors role in the forecast:

**Tourism Index (Difference from previous period)**

**DV Ratio**

Which measures, if any, were selected as underlying factors and applied to the forecast?

**Answer:** \_\_\_\_\_

Which algorithm is now selected for the forecast?

**Answer:** \_\_\_\_\_

- g. Perform scenario analysis on the forecast by increasing the underlying factor by a constant value of 10.

How does increasing the underlying factor impact the forecast?

**Answer:** \_\_\_\_\_

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

**End of Practices**

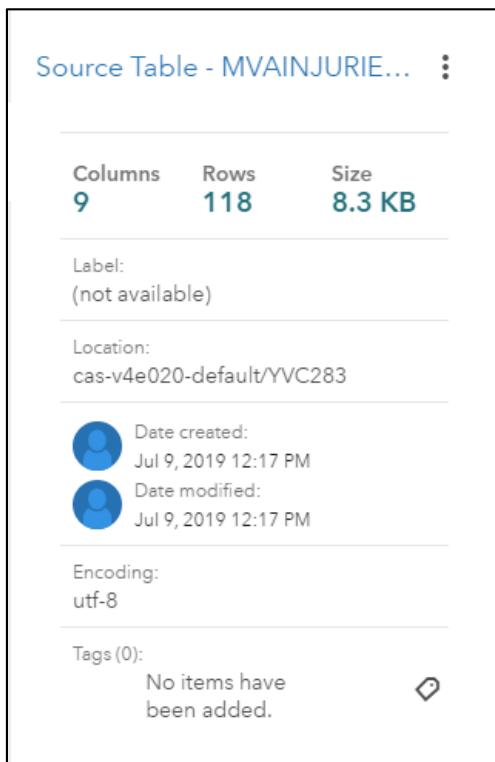
## 3.3 Solutions

---

### Solutions to Practices

#### 1. Creating a Forecasting Data Source

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise3.1**.
  - 1) Navigate to the **SAS Content/Courses/YVA283/Advanced/Exercises** folder.
  - 2) Right-click the **VA2-Exercise3.1** data plan and select **Prepare data**.
- c. View the source table properties and answer the question.
  - 1) In the left pane, click  (**Properties for the source table**) to show details about the source table.



Source Table - MVAINJURIE...

Columns	Rows	Size
9	118	8.3 KB

Label:  
(not available)

Location:  
cas-v4e020-default/YVC283

Date created:  
Jul 9, 2019 12:17 PM

Date modified:  
Jul 9, 2019 12:17 PM

Encoding:  
utf-8

Tags (0):  
No items have  
been added.

- 2) Answer the question:

How many columns are in the source table?

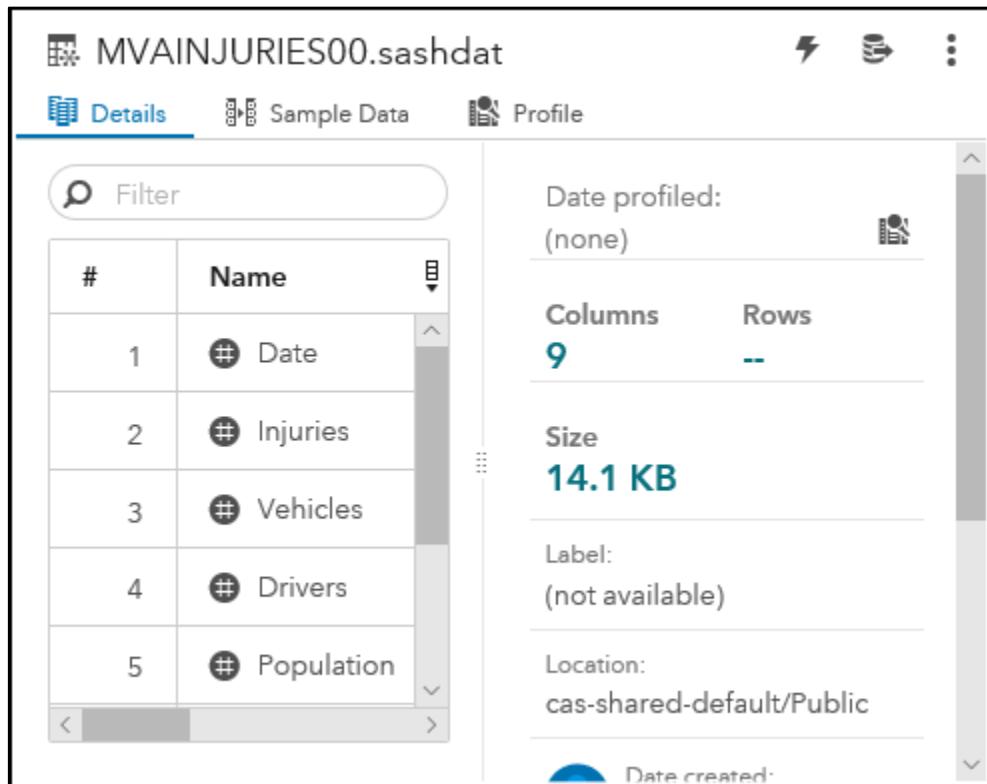
**Answer: Nine columns**

- d. Append the **MVAINJURIES00** data source to the source table (**MVAINJURIES90**).
  - 1) In the left pane, click  (**Transforms**).
  - 2) In the Multi-input Transforms group, double-click **Append** to add the transform to the plan.
  - 3) In the main portion of the window, next to the **Append table** field, click **Browse**.

- In the Choose Data window, at the top of the window, click **Data Sources**.
- Next to the **cas-v4exxx-default** server, click  **(Down one level)**.
- Next to the **YVA283** library, click  **(Down one level)**.
- Scroll through the list and select **MVAINJURIES00**.

**Note:** IF the **MVAINJURIES00** table is not listed, then select the **mvainjuries00.sas7bdat** table and click  **(Load into memory)**.

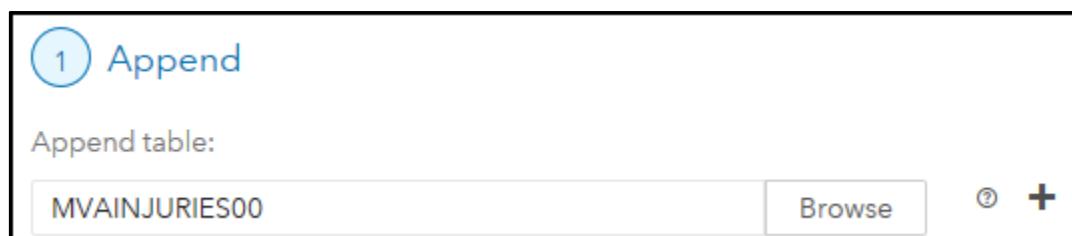
Details about the table appear on the right side of the window.



The screenshot shows the 'MVAINJURIES00.sashdat' table details. The 'Details' tab is selected. The table has 9 columns and 5 rows of data. The columns are labeled '#', 'Name', and have entries for Date, Injuries, Vehicles, Drivers, and Population. The table also includes a 'Filter' section and a 'Profile' section on the right. The profile section displays the following information: Date profiled: (none), Columns: 9, Rows: --, Size: 14.1 KB, Label: (not available), Location: cas-shared-default/Public, and Date created: [date].

- Click **OK** to add the data source to the plan.

The Append transform should resemble the following:



The screenshot shows the Data Transform Plan with an 'Append' step. The step is numbered 1 and titled 'Append'. The 'Append table:' field contains 'MVAINJURIES00'. There are 'Browse' and '+' buttons next to the table name.

- In the upper right corner of the plan, click **Run** to execute the append.
- Answer the following question:  
How many columns are in the **MVAINJURIES00** table?  
**Answer: Nine columns**

- f. Add a new column (**DVRatio**) to the result table that computes the ratio of **Drivers** to **Vehicles**.

- 1) In the left pane, click  (Transforms), if necessary.
- 2) In the Custom Transforms group, double-click **Calculated column** to add the transform to the plan.
- 3) In the **Expression** field, enter **Drivers/Vehicles**.  
**Note:** The '*Column name*' syntax is not required because the column names do not contain spaces.
- 4) Below the **Expression** field, click **Create new column**.
- 5) In the **Create new column** field, enter **DVRatio**.
- 6) Click **Options for new columns**.
  - a) In the Options for New Columns window, for the **Name of new column** field, verify that **DVRatio** is specified.
  - b) For the **Type** field, select **Double**.
  - c) For the **Length** field, verify that **8** is specified.
  - d) In the **Label** field, enter **DV Ratio**.



- e) Click **OK** to close the Options for New Columns window.
- 7) In the upper right corner of the plan, click **Run** to create the new column.

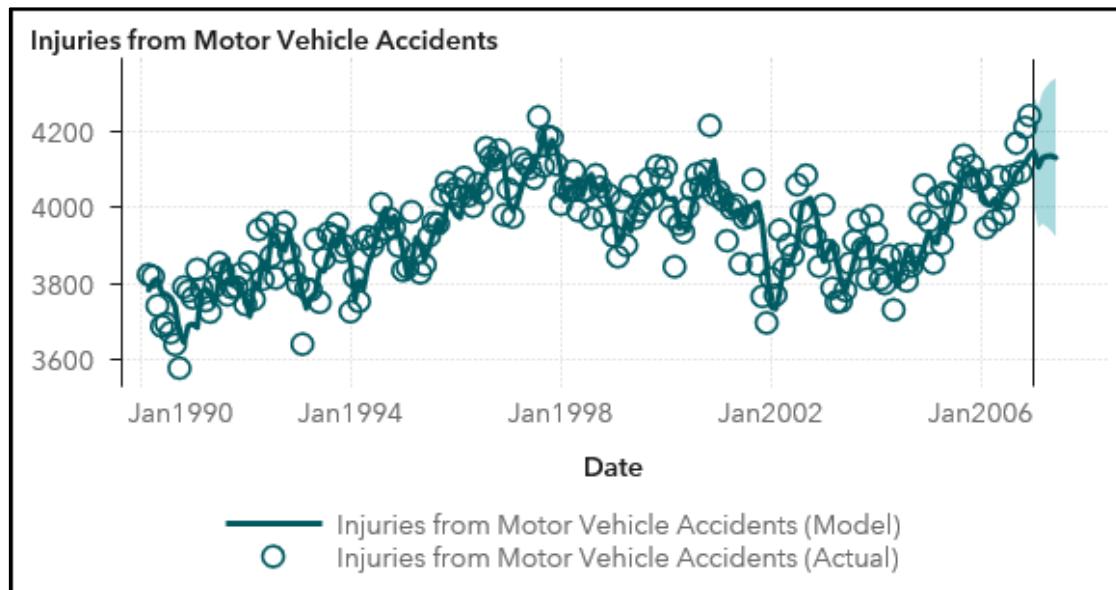
The **DVRatio** column is added to the Table view.

 DVRatio
1.5209347088
1.5207981743
1.5207338302
1.5207406596

- g. Save the plan in **My Folder**.
- 1) In the upper right corner, click  (Menu) and select **Save As**.
  - 2) Navigate to **My Folder**.

- 3) In the lower right, click  (Library).
  - 4) Next to the **cas-v4exxx-default** server, click  (Down one level).
  - 5) Click **Public**.
  - 6) Click **Select**.
  - 7) Click **Save**.
- h.** Return to SAS Drive.
- 1) In the upper left corner, click  (Show applications menu) and select **SAS Drive** to return to SAS Drive.
- 2. Analyzing a Forecasting Data Source**
- a.** From the browser window, sign in to SAS Viya for Learners.
  - b.** Open **VA2-Exercise3.2**.
- 1) Navigate to the **SAS Content/Courses/YVA283/Advanced/Exercises** folder.
  - 2) Right-click the **VA2-Exercise3.2** report and select **Edit**.
- The report opens in SAS Visual Analytics.
- c.** Create a forecast by assigning data items to the appropriate roles.
- 1) In the canvas, click the **Forecasting** object to select it.
  - 2) In the right pane, click **Roles**.
  - 3) For the Time axis role, select **Add  $\Rightarrow$  Date**.
  - 4) For the Measure role, click **Frequency** and select **Injuries from Motor Vehicle Accidents**.

The forecasting object should resemble the following:



- d. View details about the forecast and answer the question.
- 1) In the upper right corner of the forecasting object, click  (Maximize) to view details about the forecast.
  - 2) At the bottom of the chart, click **Dependent Variables Results** to view details about the forecasting algorithm.

Which algorithm is selected for the forecast?

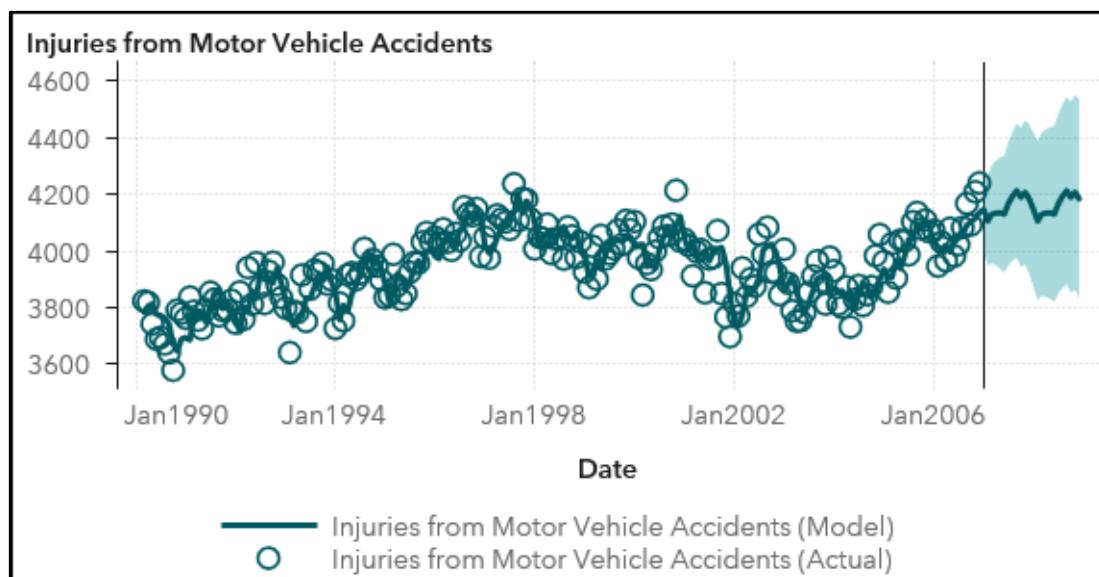
**Answer:** Seasonal Exponential Smoothing

Results	Dependent Variables Results
Dependent Variable	Algorithm
Injuries from Motor Vehicle Accidents	Seasonal Exponential Smoothing

- e. Modify options for the forecasting object to change the forecast horizon to two years.

- 1) In the right pane, click **Options**.
- 2) In the Forecast group, in the **Forecast horizon** field, enter **24**.

The updated forecast should resemble the following:



- f. Add the measures to the Underlying factors role in the forecast.

- 1) In the right pane, click **Roles**.
- 2) For the Underlying factors role, click **Add**.
  - a) Select the following data items:

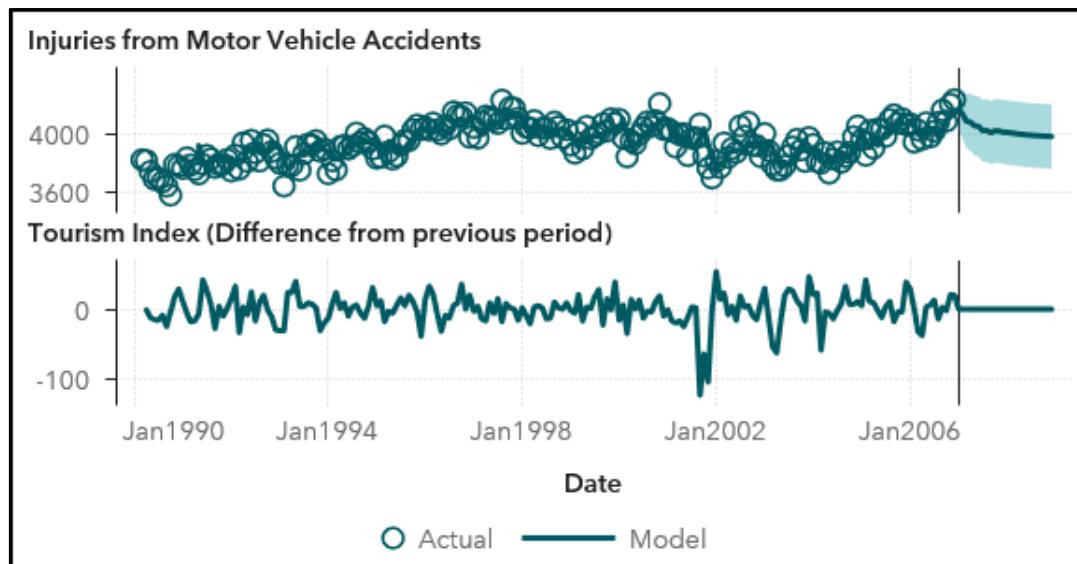
**Tourism Index (Difference from previous period)**

**DV Ratio**

- b) Click **OK**.

Which measures, if any, were selected as underlying factors and applied to the forecast?

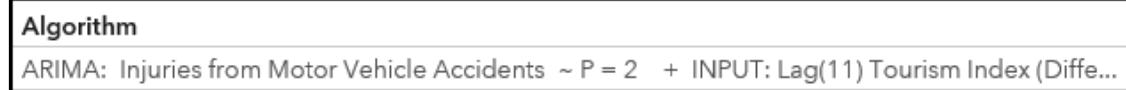
**Answer: Tourism Index (Difference from previous period)**



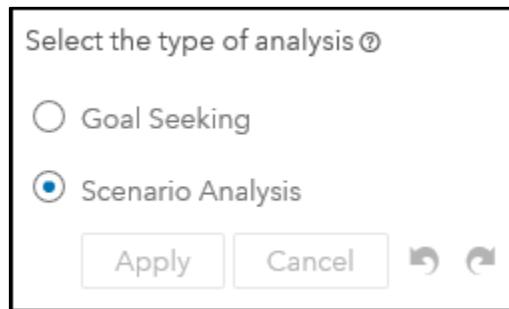
- 3) At the bottom of the chart, click **Dependent Variables Results** to view details about the forecasting algorithm.

Which algorithm is now selected for the forecast?

**Answer: ARIMA**



- 4) In the upper right corner of the forecasting object, click (**Restore**).
- g.** Perform scenario analysis on the forecast by increasing the underlying factor by a constant value of 10.
- 1) In the right pane, click **Roles**.
  - 2) For the Forecast role, click **What If**. The What-If Analysis window appears.
  - 3) On the right side of the window, select **Scenario Analysis**.



- 4) In the upper left corner of the window, click (**Menu**) and select **Set series values**. The Set Series Values window appears.
- 5) For the **Change all future values for the selected series** field, verify that **Forecast: Tourism Index (Difference from previous period)** is specified.

**Note:** You are performing scenario analysis, so you must set desired values for the underlying factor (**Tourism Index**).

- 6) For **Adjust series value**, select **By constant value**.
- 7) In the **By constant value** field, enter **10** and press Enter.

The Set Series Values window should resemble the following:

Set Series Values

Change all future values for the selected series:  
Forecast: Tourism Index (Difference from previous peri... ▾)

Set all values to: 1.03219201790546

By constant value: 10

By percentage:

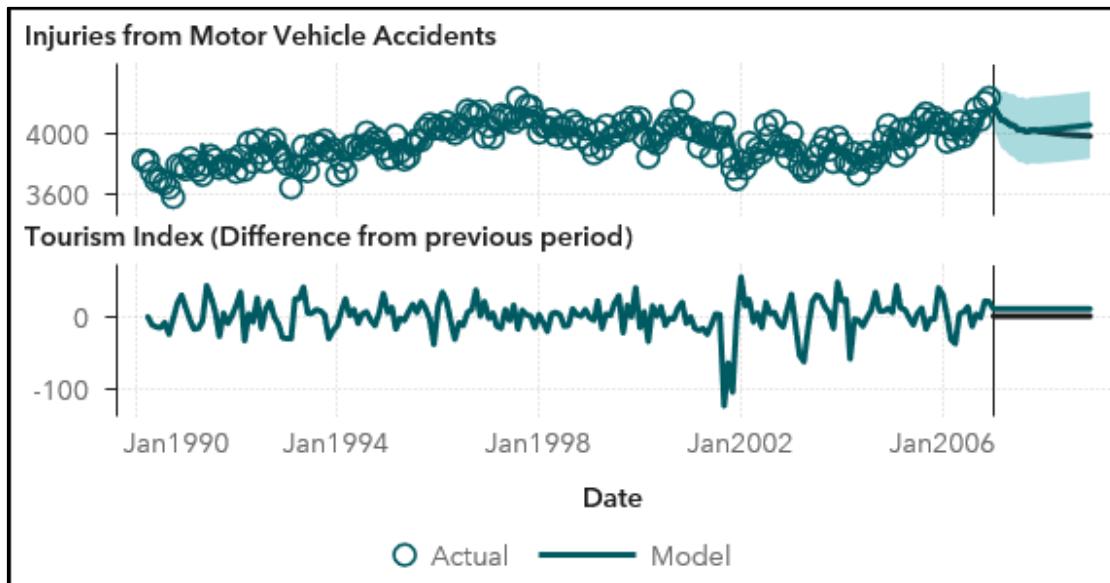
Progressively by:

- 8) Click **OK**.

As an alternative, you can drag the markers in the chart to set the target values for the underlying factor or you can enter values directly in the table cells.

- 9) On the right side of the window, click **Apply**.
- 10) Click **Close** to save the results.

The results are applied to the forecasting object in the report.



- 11) Answer the following questions:

How does increasing the underlying factor impact the forecast?

**Answer:** Increasing the number of tourists increases the number of injuries from motor vehicle accidents near the end of the next year.

- h. Save the report to My Folder.

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

**End of Solutions**

## Practice Review

### 3.1 Creating a Forecasting Data Source – Solution

How many columns are in the source table?

**Nine columns**

Source Table - MVAINJURI...		
	Columns	Rows
	<b>9</b>	<b>118</b>
		Size <b>8.3 KB</b>

MVAJNURIES00				
		Details	Sample Data	Profile
<input type="button" value="Filter"/>		Date profiled: (none)		
#	Name	Columns <b>9</b>	Rows <b>84</b>	
1	Date			

How many columns are in the MVAJNURIES00 table?

**Nine columns**

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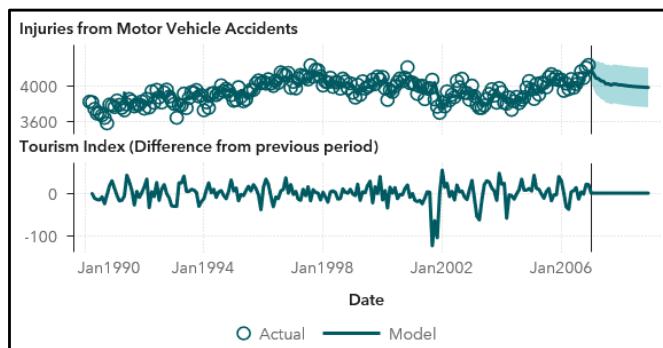


### 3.2 Analyzing a Forecasting Data Source – Solution

Which algorithm is selected for the forecast?

**Seasonal Exponential Smoothing**

Results		Dependent Variables Results
Dependent Variable	Algorithm	
Injuries from Motor Vehicle Accidents	Seasonal Exponential Smoothing	



Which measures, if any, were selected as underlying factors and applied to the forecast?

**Tourism Index (Difference from previous period)**

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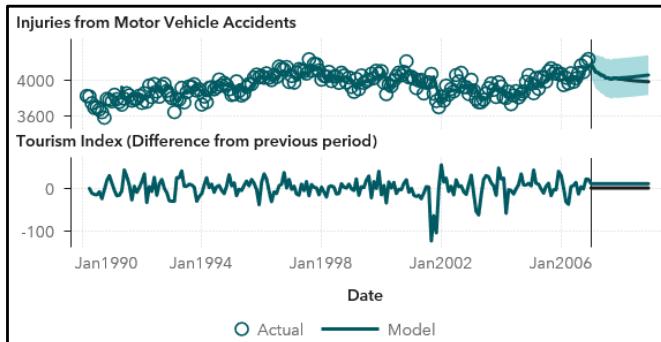


## 3.2 Analyzing a Forecasting Data Source – Solution

Which algorithm is now selected for the forecast?

**ARIMA**

Algorithm  
ARIMA: Injuries from Motor Vehicle Accidents ~ P = 2 + INPUT: Lag(11) Tourism Index (Diffe...



How does increasing the underlying factor impact the forecast?

**Increasing the number of tourists increases the number of injuries from motor vehicle accidents near the end of the next year.**

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# Lesson 4      Performing Network Analysis

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<b>4.2</b>	<b>Creating a Network Analysis Object.....</b>	<b>4-17</b>
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# 4.1 Restructuring Data for Network Analysis

## Objectives

- Discuss when to use network analysis objects in SAS Visual Analytics.
- Describe the structure of the table needed for network analysis.

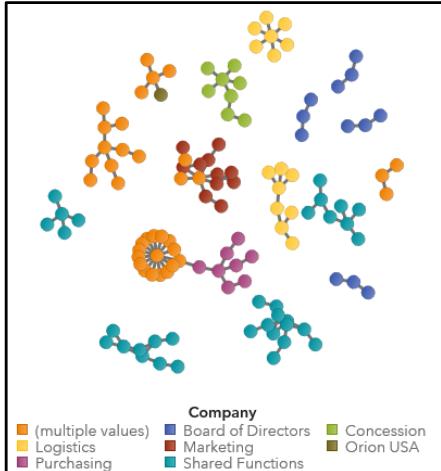
3



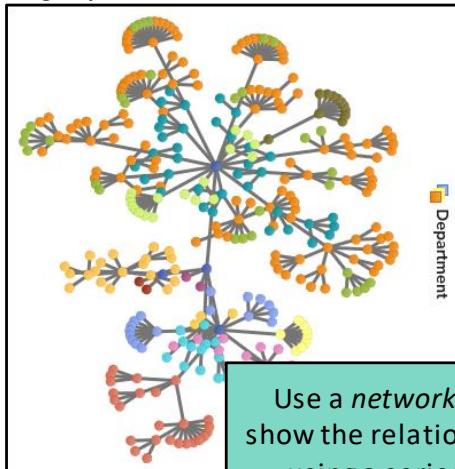
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## Objects: Analytics (Network)

Hierarchical



Ungrouped



Use a *network analysis* object to show the relationship between data using a series of linked nodes.

4



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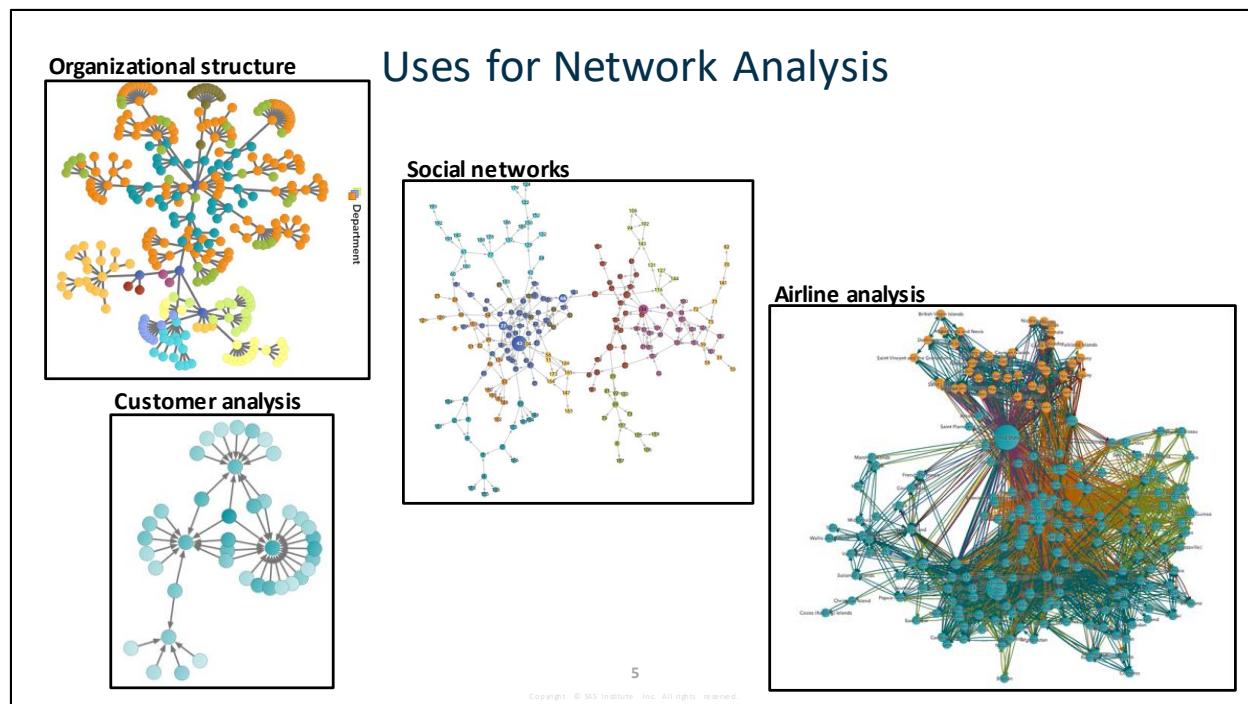
<b>Network analysis</b>	<p>A network analysis displays the relationships between the values of categories or hierarchy levels by using a series of linked nodes. The following types of network analysis objects can be created:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; padding: 5px;"><b>Hierarchical</b></td><td>A hierarchical network diagram creates a hierarchical structure using arranged levels of category data items.</td></tr> <tr> <td style="padding: 5px;"><b>Ungrouped</b></td><td>An ungrouped network diagram creates a series of linked nodes from a source node to a target node. A node is created for each value of the source data item, and a link is created from each source node to the node that corresponds to the value of the target data item. Vertices and link lines in the network diagram represent connections and help illuminate types of relationships between groups of entities. Ungrouped network diagrams can be used to interpret a structure of a network by looking at the clustering of nodes, how densely the nodes are connected, and how the diagram layout is arranged. Ungrouped network diagrams can either be undirected (which displays only connections between entities) or directed (which shows the direction of the relationship using arrows).</td></tr> </table>	<b>Hierarchical</b>	A hierarchical network diagram creates a hierarchical structure using arranged levels of category data items.	<b>Ungrouped</b>	An ungrouped network diagram creates a series of linked nodes from a source node to a target node. A node is created for each value of the source data item, and a link is created from each source node to the node that corresponds to the value of the target data item. Vertices and link lines in the network diagram represent connections and help illuminate types of relationships between groups of entities. Ungrouped network diagrams can be used to interpret a structure of a network by looking at the clustering of nodes, how densely the nodes are connected, and how the diagram layout is arranged. Ungrouped network diagrams can either be undirected (which displays only connections between entities) or directed (which shows the direction of the relationship using arrows).
<b>Hierarchical</b>	A hierarchical network diagram creates a hierarchical structure using arranged levels of category data items.				
<b>Ungrouped</b>	An ungrouped network diagram creates a series of linked nodes from a source node to a target node. A node is created for each value of the source data item, and a link is created from each source node to the node that corresponds to the value of the target data item. Vertices and link lines in the network diagram represent connections and help illuminate types of relationships between groups of entities. Ungrouped network diagrams can be used to interpret a structure of a network by looking at the clustering of nodes, how densely the nodes are connected, and how the diagram layout is arranged. Ungrouped network diagrams can either be undirected (which displays only connections between entities) or directed (which shows the direction of the relationship using arrows).				

**Note:** The network analysis object uses a multi-dimensional force-directed algorithm to layout nodes and links. It attempts to minimize edge length and crossings of links for maximum readability.

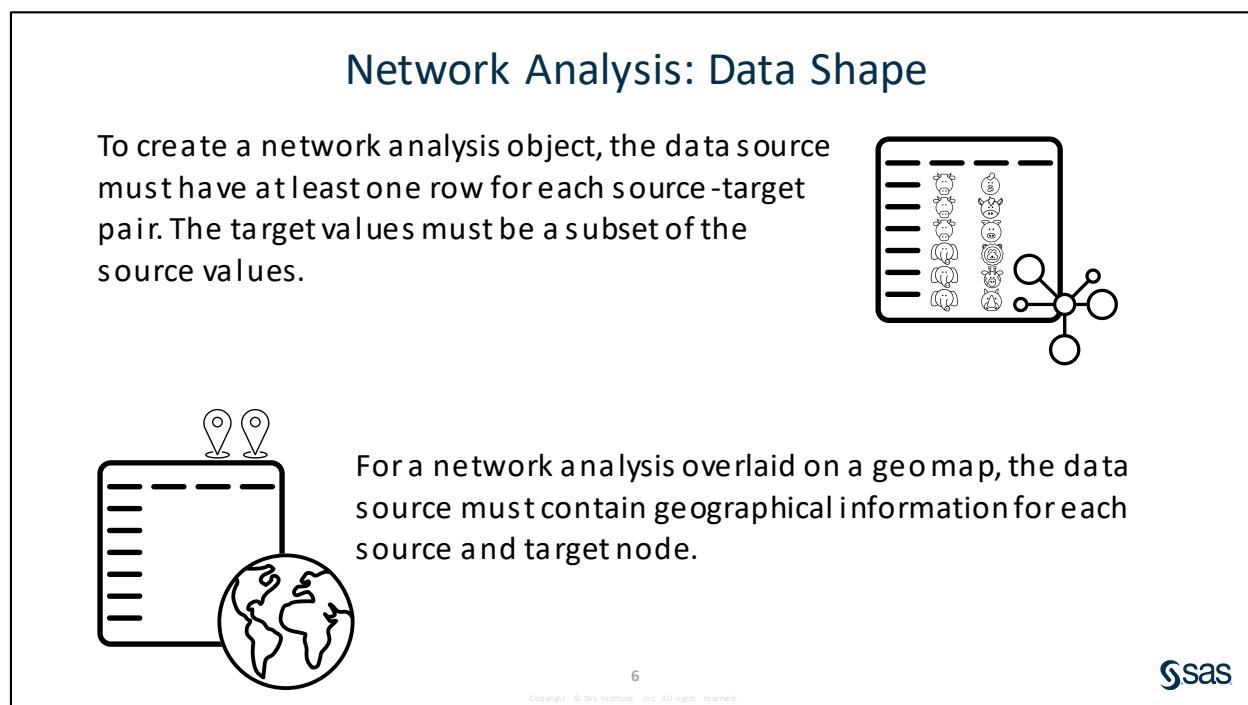
**Note:** If a network analysis object uses geographic data items, the network can be overlaid on a map.

A network consists of nodes (or vertices) and edges (or links). Links can indicate any type of relationship:

<b>Directed</b>	A directed (or asymmetric) relationship indicates that there is a direction to the relationship: node A is related to node B, but node B is not necessarily related to node A. For example, the follows relationship on Twitter is a directed relationship.
<b>Undirected</b>	An undirected (or symmetric) relationship indicates that there is no direction to the relationship: node A is related to node B, which implies node B is related to node A. For example, the friends relationship on Facebook is an undirected relationship. That is, the relationship is mutual.



Social network analysis can analyze a variety of different social structures, including social media, kinship, disease transmission, and criminal and terrorist networks.



## Network Analysis: Data Shape

Begin	Begin_Lat	Begin_Lon	End	End_Lat	End_Lon
A1			A2		
A2			A3		
A3			A4		
A4			A5		
A5					

Terminal value

7

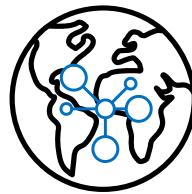
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**Note:** To represent terminal (target-only) values in an ungrouped network analysis, you can add rows to your data where the terminal value is the value for the source data item and the target data item is missing.

## Business Scenario: Hurricanes

The National Oceanic and Atmospheric Administration (NOAA) has asked for a report that shows the path of hurricanes.

Currently, we have a table that contains the location of each hurricane at certain times, but the data is not formatted correctly. We will need to split columns and add custom code to produce the desired map.

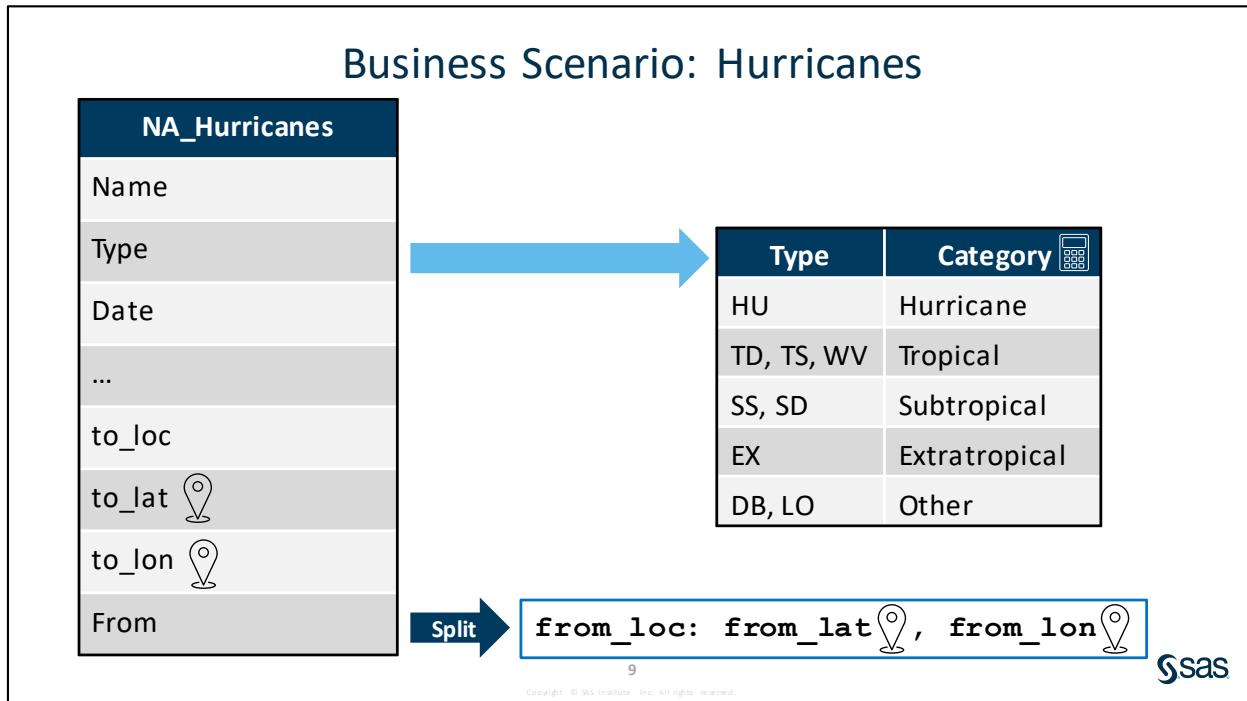


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**Note:** The hurricane data is used by permission of National Oceanic and Atmospheric Administration (NOAA). Please note that NOAA offers no warranty regarding the data. See the disclaimer here: <http://www.noaa.gov/disclaimer>.

**Note:** As an alternative to creating a data plan in SAS Data Studio, users can create a data view in Visual Analytics that performs the necessary steps for this demonstration.



In the demonstration, we perform the following steps:

1. Split a column into three separate columns (one for the from location, one for the from latitude, and one for the from longitude).
2. Convert character columns to double.
3. Remove unnecessary columns.
4. Add custom code to create a new column.

The plan creates a new CAS table (**Hurricanes\_Prep**) that is used in a later section.

## Splitting Columns

To split a column based on the first delimiter that appears in each cell, choose the **Quick Split** option. To specify the delimiter, choose the **Split** option.

Data	Quick Split		Split (comma)	
Winston-Salem, NC	Winston	Salem, NC	Winston-Salem	NC
Potter, Harry	Potter	Harry	Potter	Harry
San Antonio, TX	San	Antonio, TX	San Antonio	TX
221B Baker St, London	221B	Baker St, London	221B Baker St	London
toto@oz.com	toto@oz	com	toto@oz.com	

A column can be split based on the following delimiters:

! \$ % & ( ) \* + , - . / ; < |

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**Note:** If your computer uses ASCII characters, the ^ character is also available. For ASCII environments that do not contain the ^ character, the ~ character is available instead.

**Note:** If your computer uses EBCDIC characters, the ? character is also available.

For the Split option, you can choose to split data on a delimiter, before a delimiter, after a delimiter, on multiple delimiters, or on a fixed length.

## Custom Code: DATA Step

You can use the Code transform to perform actions on a table that cannot be accomplished by other transforms.

```
data {{_dp_outputTable}} (caslib={{_dp_outputCaslib}});
  set {{_dp_inputTable}} (caslib={{_dp_inputCaslib}});
  length Category $15;
  if Type = 'HU' then Category='Hurricane';
  else if Type in ('TD' 'TS' 'WV')
    then Category='Tropical';
  else if Type in ('SS' 'SD')
    then Category='Subtropical';
  else if Type='EX' then Category='Extratropical';
  else Category='Other';
run;
```

Because session table names can change during processing,  
you must use variables for tables and caslibs.

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For more information about DATA step, see *Dictionary of SAS® DATA Step Statements*.

**Note:** You can also create custom code using CASL. For more information about CASL, see “Getting Started with CASL” in the *SAS® 9.4 and SAS® Viya® 3.4 Programming Documentation*.



## Creating a Network Analysis Data Source

This demonstration illustrates how to explore a data source and use transforms (Split, Convert Column, Remove, and Code) to create a network analysis data source in SAS Data Studio.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2- Demo4.1**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2- Demo4.1** and select **Prepare data**.

The plan opens in SAS Data Studio.

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

Source Table - NA\_HURRIC...

Columns	Rows	Size
<b>14</b>	<b>22.4 K</b>	<b>11.4 MB</b>

Label:  
(not available)

Location:  
cas-v4e010-default/YVA283

The table contains 14 columns and 22.4K rows of data.

4. In the bottom pane, click **Table**, if necessary.  
Scroll to the right to locate the **to\_loc**, **to\_lat**, **to\_lon**, and **From** columns.

⚠ to_loc	⌚ to_lat	⌚ to_lon	⚠ From
1-2	17.7	-56.3	1-1:17.1,-55.5
1-3	18.2	-57.4	1-2:17.7,-56.3
1-4	19	-58.6	1-3:18.2,-57.4
1-5	20	-60	1-4:19,-58.6

For network analysis, we need a source data item and a target data item. In our table, **to\_loc** is the source data item, and **to\_lat** and **to\_lon** contain mapping coordinates for the location.

However, **From** is in the following format: *from\_loc: from\_lat, from\_lon*. We need to split this column into three separate columns to create a network diagram.

- View the Split transform that has been added to the plan.

1 Split

Source column: From

Split data: On a delimiter

Delimiter: Other

Name of new column 1: :

Name of new column 2: from\_loc

The two new columns (**from\_loc** and **from\_lat\_long**) are added to the Table view from the Split transform.

⚠ from_loc	⚠ from_lat_long
1-1	17.1,-55.5
1-2	17.7,-56.3
1-3	18.2,-57.4
1-4	19,-58.6

Now we need to split the **from\_lat\_long** column into two new columns that contain the latitude and longitude, respectively. We also need to convert the new columns to doubles (measures) for use in Visual Analytics.

- Add additional transforms to the plan.

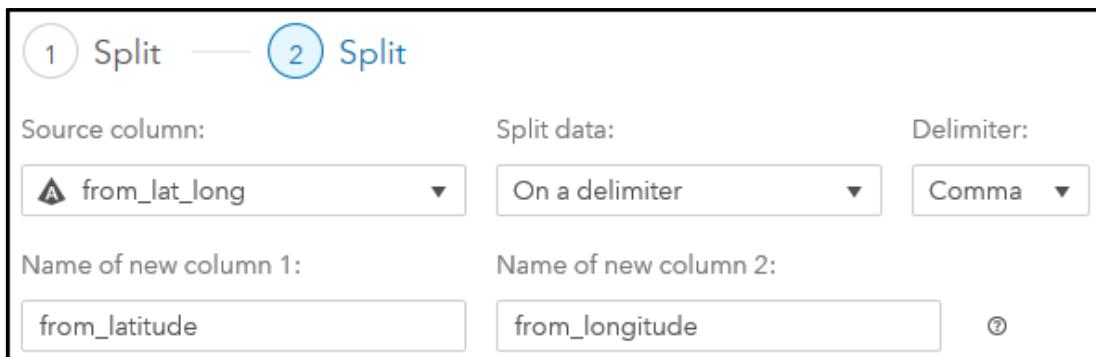
- In the left pane, click (**Transforms**) to view available transforms.
- In the Column Transforms group, double-click **Split** to add the transform to the plan a second time.
  - For the **Source column** field, select **from\_lat\_long**.
  - For the **Split data** field, verify that **On a delimiter** is specified.
  - For the **Delimiter** field, verify that **Comma** is specified.
  - For the **Name of new column 1** field, enter **from\_latitude**.

This is the left column created from the split. Remember that we still need to convert this value to a double (measure), so we give it a temporary name for now.

- For the **Name of new column 2** field, enter **from\_longitude**.

This is the right column created from the split. Remember that we still need to convert this value to a double (measure), so we give it a temporary name for now.

The Split transform should resemble the following:



6) Click **Options for new columns**.

- For the **from\_latitude** column, enter **20** in the **Length** field.
- For the **from\_longitude** column, enter **20** in the **Length** field.

Name of new column:	Type:	Length:
from_latitude	Char ▾	20
Name of new column:	Type:	Length:
from_longitude	Char ▾	20

From this window, we cannot change the type of the columns. We will add a Convert column transform to change the type to double (measure).

- In the bottom right corner of the window, click **OK**.
- In the upper right corner of the plan, click **Run** to execute the transform.

The two new columns (**from\_latitude** and **from\_longitude**) are added to the Table view.

from_lat_long	from_latitude	from_longitude
25.3,-92.2	25.3	-92.2
25.7,-91.5	25.7	-91.5
26.4,-91.1	26.4	-91.1
27.8,-91.2	27.8	-91.2

Both columns were created as character columns, but they need to be double for creating a geography data item.

- In the left pane, in the Column Transforms group, double-click **Convert Column** to add the transform to the plan.
  - Convert the **from\_latitude** column to double.
    - For the **Source column** field, verify that **from\_latitude** is specified.

- b) For the **Conversion** field, verify that **DOUBLE** is specified.
- c) For the **Informat or format** field, verify that **BEST16.** is specified.
- d) In the **New column** field, enter **from\_lat**.
- e) For the **Length** field, verify that **8** is specified.
- f) For the **Format** field, verify that **BEST16.** is specified.

The Convert Column transform should resemble the following:

The screenshot shows the 'Convert Column' transform configuration. The 'Source column' is set to 'from\_latitude'. The 'Conversion' type is 'DOUBLE'. The 'Informat or format' is 'BEST16.'. The 'New column' is 'from\_lat'. The 'Length' is '8' and the 'Format' is 'BEST16.'. There are additional buttons for help (?) and add (+) at the bottom right.

- 2) Convert the **from\_longitude** column to double.
- a) Click **+** (Add) to add an additional column to the transform.
- b) For the **Source column** field, select **from\_longitude**.
- c) For the **Conversion** field, verify that **DOUBLE** is specified.
- d) For the **Informat or format** field, verify that **BEST16.** is specified.
- e) In the **New column** field, enter **from\_lon**.
- f) For the **Length** field, verify that **8** is specified.
- g) For the **Format** field, verify that **BEST16.** is specified.

The Convert Column transform should resemble the following:

The screenshot shows the 'Convert Column' transform configuration. The 'Source column' is set to 'from\_longitude'. The 'Conversion' type is 'DOUBLE'. The 'Informat or format' is 'BEST16.'. The 'New column' is 'from\_lon'. The 'Length' is '8' and the 'Format' is 'BEST16.'. There are additional buttons for help (?) and add (+) at the bottom right.

- 3) In the upper right corner of the plan, click **Run** to execute the transform.

Two new columns (**from\_lat** and **from\_lon**) with the type DOUBLE are added to the Table view.

⊕ from_lat	⊕ from_lon
39.3	-23
38.4	-22.7
37.6	-22.6
36.7	-22.4

- d. In the left pane, in the Column Transforms group, double-click **Remove** to add the transform to the plan.
  - 1) For the **Source column** field, select **From**.
  - 2) Click **+ (Add)** to add an additional column to the transform.
  - 3) For the **Source column** field, select **from\_lat\_long**.
  - 4) Click **+ (Add)** to add an additional column to the transform.
  - 5) For the **Source column** field, select **from\_latitude**.
  - 6) Click **+ (Add)** to add an additional column to the transform.
  - 7) For the **Source column** field, select **from\_longitude**.

The Remove transform should resemble the following:

Source column:

From

Source column:

from\_lat\_long

Source column:

from\_latitude

Source column:

from\_longitude

- 8) In the upper right corner of the plan, click **Run** to execute the transform.

The columns are removed from the Table view.

- e. In the Table view, examine the **Type** column.

▲ Type
EX
EX
EX
EX

This column keeps track of the type of storm at each stage. It has values such as *HU* for categories of hurricanes, *TD* (tropical depression), *TS* (tropical storm), *WV* (tropical wave), *SS* (subtropical storm), *SD* (subtropical depression), *EX* (extratropical cyclone), *DB* (disturbance), and *LO* (other type).

- f. In the left pane, in the Custom Transforms group, double-click **Code** to add the transform to the plan.
- 1) On the toolbar above the code editor, click  ([How do I create custom code?](#)) to view information about using the transform.

### Creating Custom Code

You can create custom code to perform actions or transformations on a table. To create custom code, choose the code language from the drop-down menu, and then enter the code in the text box. The following code languages are available: **CASL** or **DATA step**.

#### CAUTION:

You must use variables in place of table and caslib names. Errors will occur if you use literal values. This is because session table names can change during processing.

The following variables are available:

`_dp_inputCaslib`, `_dp_inputTable`,  
`_dp_outputCaslib`, and `_dp_outputTable`. For DATA step only, variables must be enclosed in braces, for example, `data {{_dp_outputTable}} (caslib={{_dp_outputCaslib}});`

For more information about creating custom code, see [Creating Custom Code in SAS Data Studio: User's Guide](#).

Notice that you must use specific variables to represent the input table and caslib and the output table and caslib.

- 2) On the toolbar above the code editor, verify that **DATA step** is specified.



- 3) In the code editor, enter the following after the SET statement:

```
length Category $15;
if Type = 'HU' then Category='Hurricane';
else if Type in ('TD' 'TS' 'WV') then Category='Tropical';
else if Type in ('SS' 'SD') then Category='Subtropical';
else if Type='EX' then Category='Extratropical';
else Category='Other';
```

This code creates a new variable (**Category**) that categorizes each hurricane by type.

- 4) In the upper right corner of the plan, click **Run** to execute the transform.

The new column (**Category**) is added to the Table view.

Category
Tropical
Tropical
Tropical
Tropical

7. Save the plan and the result table.

- a. In the upper right corner of the plan, click (More) and select **Save as**.
  - 1) Navigate to **My Folder**.
  - 2) In the lower right, click (Library).
  - 3) Next to the **cas-v4exxx-default** server, click (Down one level).
  - 4) Click **Public**.
  - 5) Click **Select**.
- b. Click **Save**.
- c. If necessary, click **Yes** to replace the existing plan.
8. In the upper left corner, click (Show applications menu) and select **SAS Drive** to return to SAS Drive.

**End of Demonstration**

## 4.2 Creating a Network Analysis Object

### Objectives

- Describe the process of creating a network analysis object.
- Discuss using network analysis with the map component.

14

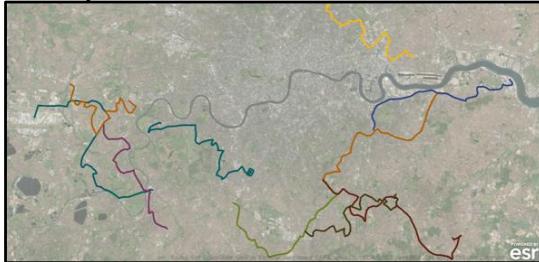


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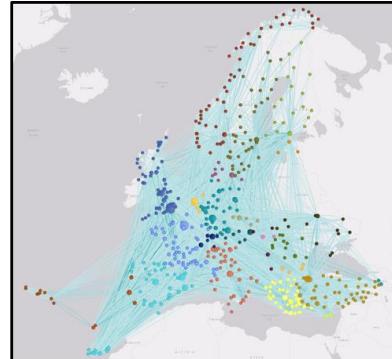
### Network Analysis: Maps

If both the source and target nodes are geographic data items, the network analysis object can be overlaid on a geographic map.

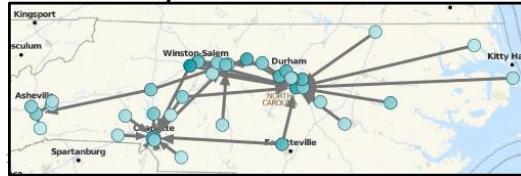
Delivery routes



Airline connections



Customer analysis



## Business Scenario: Hurricanes

The National Oceanic and Atmosphere Administration (NOAA) has asked for a report that shows the path of hurricanes.

They would like to see a map that shows the path of any selected hurricanes, the windspeed, and the category (hurricane, tropical, subtropical, extratropical).





## Practice

---

### 1. Analyzing a Network Analysis Data Source

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2- Exercise4.2**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise4.2** and select **Edit**.
- c. Assign the following data items to the specified roles for the network analysis object:

<b>Source</b>	<b>from_loc</b>
<b>Target</b>	<b>to_loc</b>
<b>Size</b>	<b>MaxWind</b>
<b>Color</b>	<b>Category</b>

- d. Modify options for the network analysis object:

<b>Type</b>	Ungrouped
<b>Link Direction</b>	Target
<b>Map background</b>	<selected>

- e. Answer the following questions:

Which states did Hurricane Matthew hit in 2016? What was the maximum wind speed? How was Hurricane Matthew categorized?

**Answer:** \_\_\_\_\_

Which states did Hurricane Nicole hit in 2016? What was the maximum wind speed? How was Hurricane Nicole categorized?

**Answer:** \_\_\_\_\_

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

### Alternate (Optional)

### 2. Creating a Report Data View for Network Analysis

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2- Exercise4.2 (Alternate)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise4.2 (Alternate)** and select **Edit**.
- c. Create a new character data item, **from\_loc**, that consists of the first portion of **From**.

Hint: **From** is in the following format: *from\_loc: from\_lat, from\_lon*. Make sure that the new data item consists of the values from the first character up to, but not including, the **:** (colon). Be aware that the length of the value is not consistent throughout the table.

- d. Create a new measure data item, **from\_lat**, that consists of the middle portion of **From**.

Hint: **From** is in the following format: *from\_loc: from\_lat, from\_lon*. Make sure that the new data item consists of the values between the colon (:) to the comma (,). Be aware that the length of the value is not consistent throughout the table.

Hint: The **Parse** operator (in the **Text (simple)** group) can be used to convert a character string to a numeric value.

- e. Create a new measure data item, **from\_lon**, that consists of the last portion of **From**.

Hint: **From** is in the following format: *from\_loc: from\_lat, from\_lon*. Make sure that the new data item consists of the values after the comma (,) to the last character. Be aware that the length of the value is not consistent throughout the table.

Hint: The **Parse** operator (in the **Text (simple)** group) can be used to convert a character string to a numeric value.

- f. Hide the data item **From** from the Data pane.

- g. Create a new category data item, **Category**, by assigning the following labels to the values:

Category (label)	Type (value)
Hurricane	<i>HU</i>
Tropical	<i>TD</i>
	<i>TS</i>
	<i>WV</i>
Subtropical	<i>SS</i>
	<i>SD</i>
Extratropical	<i>EX</i>
Other	<i>DB</i>
	<i>LO</i>

- h. Save the data changes as a data view (**NA\_HURRICANES\_View**). Do **not** make the data view the default.

**Note:** A data view that is not specified as the default, can be applied to the CAS table after the table has been added to a report by clicking  (Actions) and selecting **Data views**. Multiple data views can be added to a table and are additive when applied, meaning each data view applied adds data changes to the report.

**Note:** An administrator has an option (**Shared data view**) that makes the view available to other users, not just the user who created the view.

- i. Save the report to **My Folder**.

**End of Practices**

## 4.3 Solutions

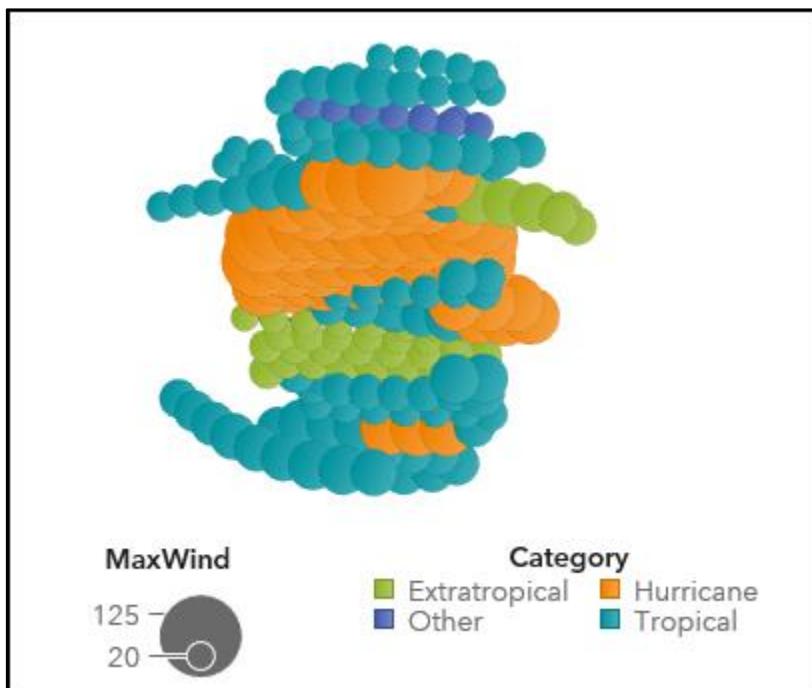
---

### Solutions to Practices

#### 1. Analyzing a Network Analysis Data Source

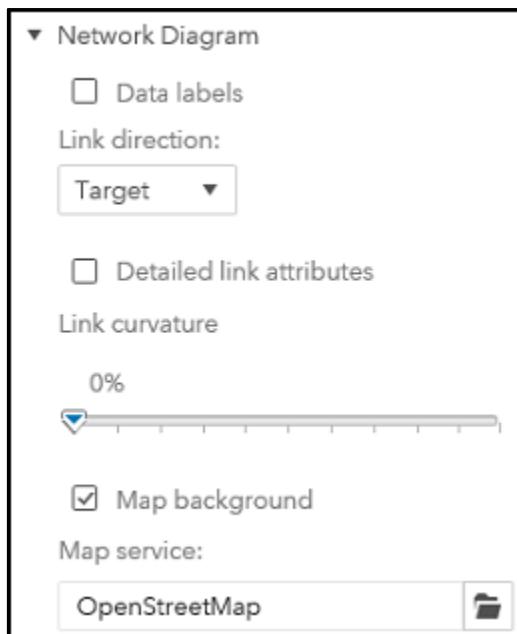
- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2- Exercise4.2**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise4.2** and select **Edit**.
  - c. Assign data items to the specified roles for the network analysis object.
    - 1) In the canvas, click the network analysis object to select it.
    - 2) In the right pane, click **Roles**.
    - 3) For the Source role, select **Add  $\Rightarrow$  from\_loc**.
    - 4) For the Target role, select **Add  $\Rightarrow$  to\_loc**.
    - 5) For the Size role, select **Add  $\Rightarrow$  MaxWind**.
    - 6) For the Color role, select **Add  $\Rightarrow$  Category**.

The network analysis object should resemble the following:

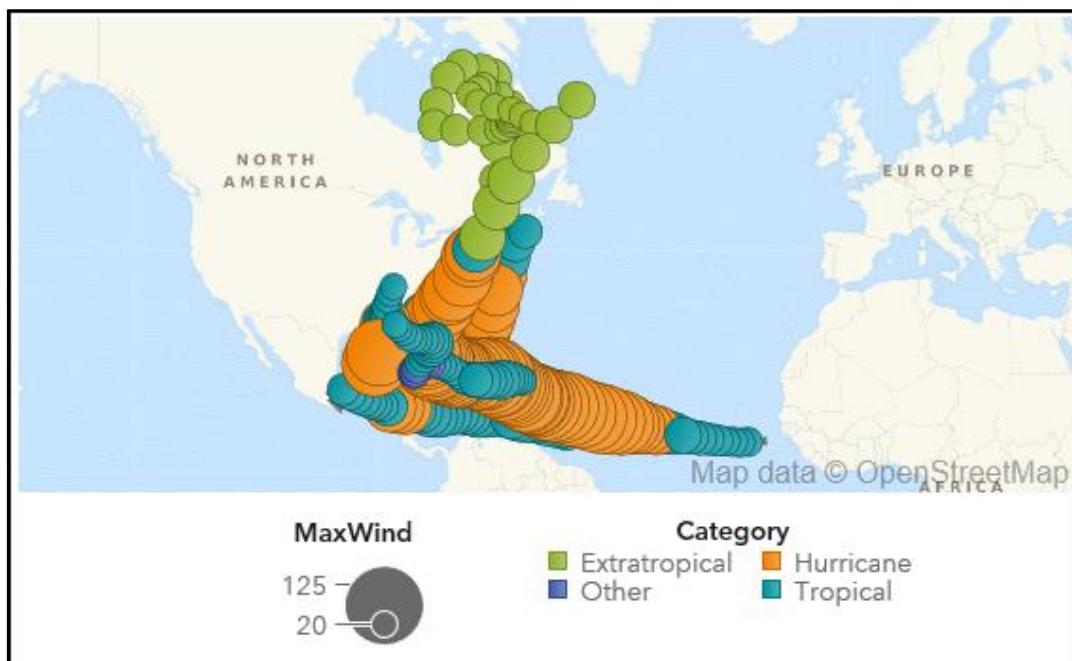


- d. Modify options for the network analysis object.
  - 1) In the right pane, click **Options**.
  - 2) In the General group, for **Type**, verify that **Ungrouped** is selected.
  - 3) In the Network Diagram group, for the **Link direction** field, select **Target**.
  - 4) Select **Map background**.

The Network Diagram group should resemble the following:



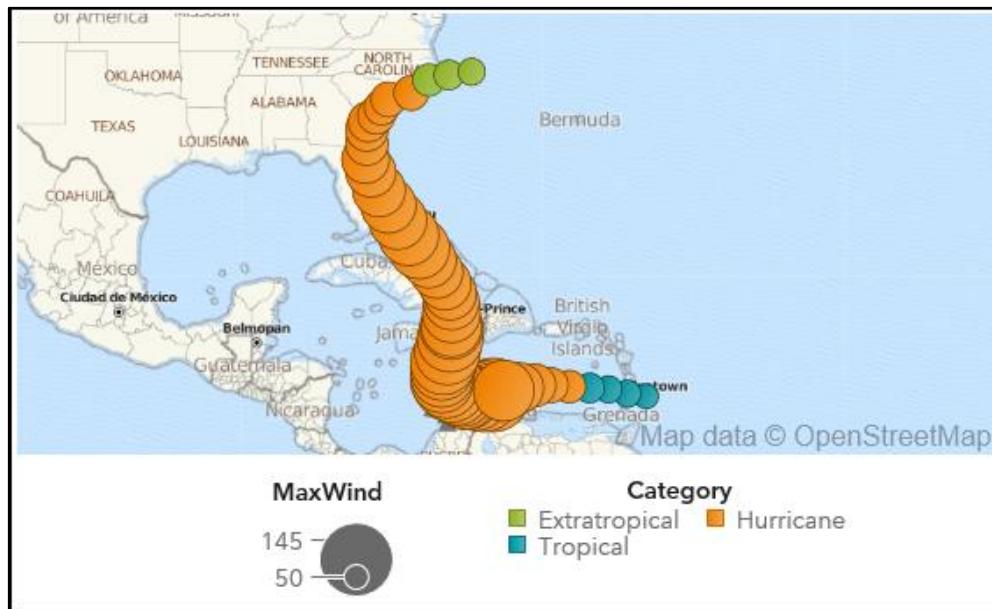
The network analysis object should resemble the following:



- e. Answer the following questions:

Which states did Hurricane Matthew hit in 2016? What was the maximum wind speed? How was Hurricane Matthew categorized?

**Answer:** Hurricane Matthew hit Florida, Georgia, South Carolina, and North Carolina. The maximum wind speed was 145 mph. Hurricane Matthew was categorized as Tropical, Hurricane, and Extratropical.



- At the top of the page, in the slider control, click (Select a date).
- At the top of the window, click 1960 and select 2016.
- Click OK.

The slider control should resemble the following:

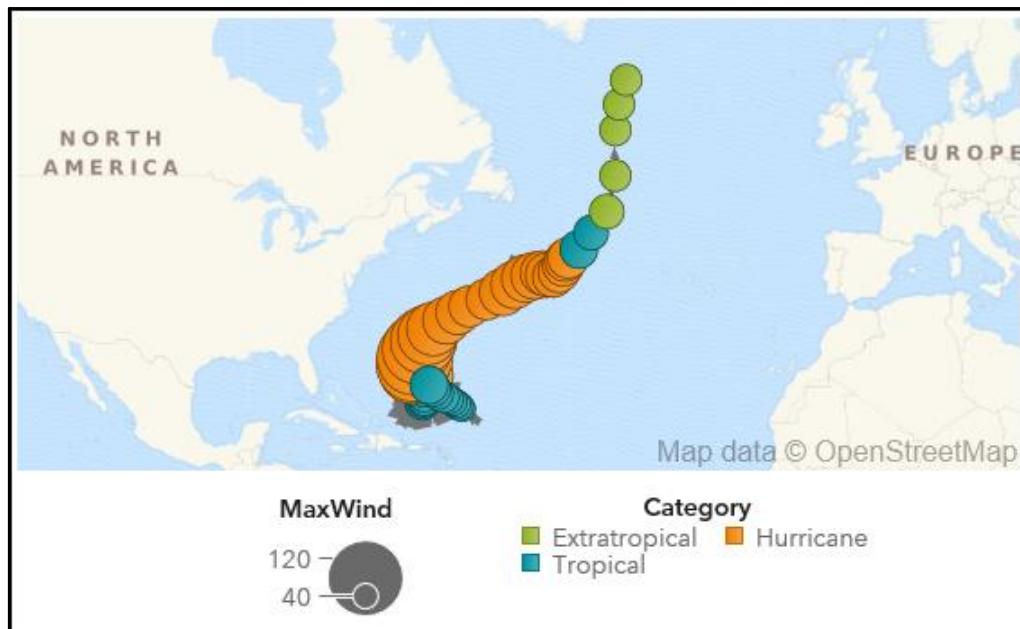
Select a year:

20161950
2016

- On the left, in the list control, select MATTHEW.

Which states did Hurricane Nicole hit in 2016? What was the maximum wind speed? How was Hurricane Nicole categorized?

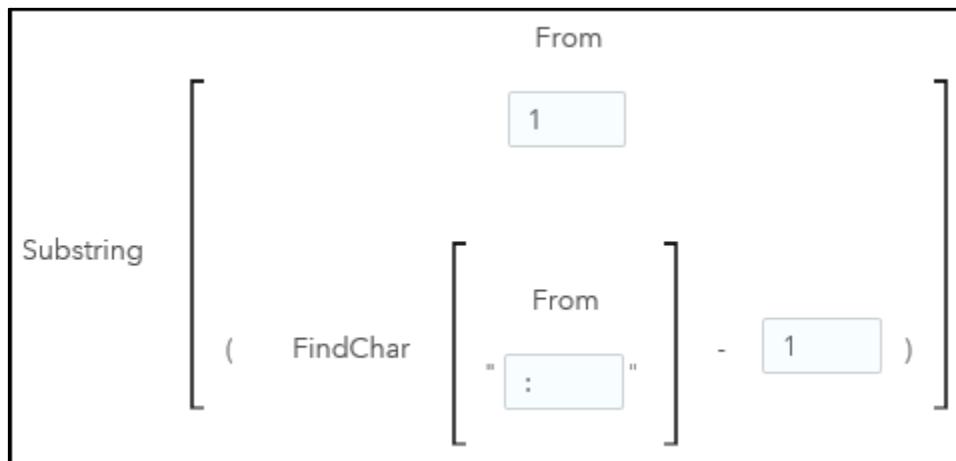
**Answer:** Hurricane Nicole hit no states in the US. The maximum wind speed was 120 mph. Hurricane Nicole was categorized as Tropical, Hurricane, and Extratropical.



- On the left, in the list control, clear **MATTHEW**.
  - Select **NICOLE**.
- f. Save the report in **My Folder**.
- 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
  - 2) Navigate to **My Folder**.
  - 3) Click **Save**.
2. Creating a Report Data View for Network Analysis
- a. From the browser window, sign in to SAS Viya for Learners.
  - b. Open **VA2- Exercise4.2 (Alternate)**.
    - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
    - 2) Right-click **VA2- Exercise4.2 (Alternate)** and select **Edit**.
  - c. Create a new character data item, **from\_loc**, that consists of the first portion of **From**.
    - 1) In the left pane, click **Data**, if necessary.
    - 2) On the Data pane, select **New data item**  $\Rightarrow$  **Calculated item**.
      - a) In the **Name** field, enter **from\_loc**.
      - b) For the **Result Type** field, select **Character**.
      - c) On the left side of the window, click **Operators**.
      - d) Expand **Text (advanced)**.
      - e) Double-click the **Substring** operator to add it to the expression.
      - f) For the Substring operator, right-click the **string** field and select **Replace with**  $\Rightarrow$  **From**.

- g) For the Substring operator, in the first **number** field in the expression, enter **1**.
- h) On the left side of the window, expand **Numeric (simple)**.
- i) Drag the **x-y** operator to the second **number** field in the Substring operator.
- j) On the left side of the window, expand **Text (advanced)**, if necessary.
- k) Drag the **FindChar** operator to the **number** field on the left side of the minus sign.
- l) For the FindChar operator, right-click the first **string** field and select **Replace with**  $\Rightarrow$  **From**.
- m) For the FindChar operator, for the second **string** field, enter **:** (colon).
- n) In the **number** field on the right of the minus sign, enter **1**.

The expression should resemble the following:



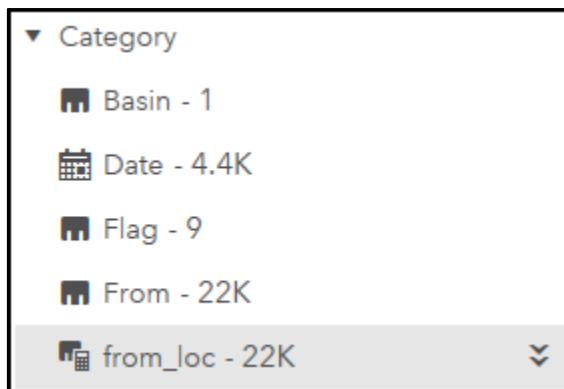
- o) In the lower right corner of the window, click **Preview**.

The preview should resemble the following:

from_loc	From
1-8	1-8:22,-63.2
1-9	1-9:22.7,-63.8
1-10	1-10:23.1,-64.6

- p) In the lower right corner of the window, click **Close** to close the Preview window.
- q) In the lower right corner of the window, click **OK** to create the new calculated item.

The Data pane should resemble the following:



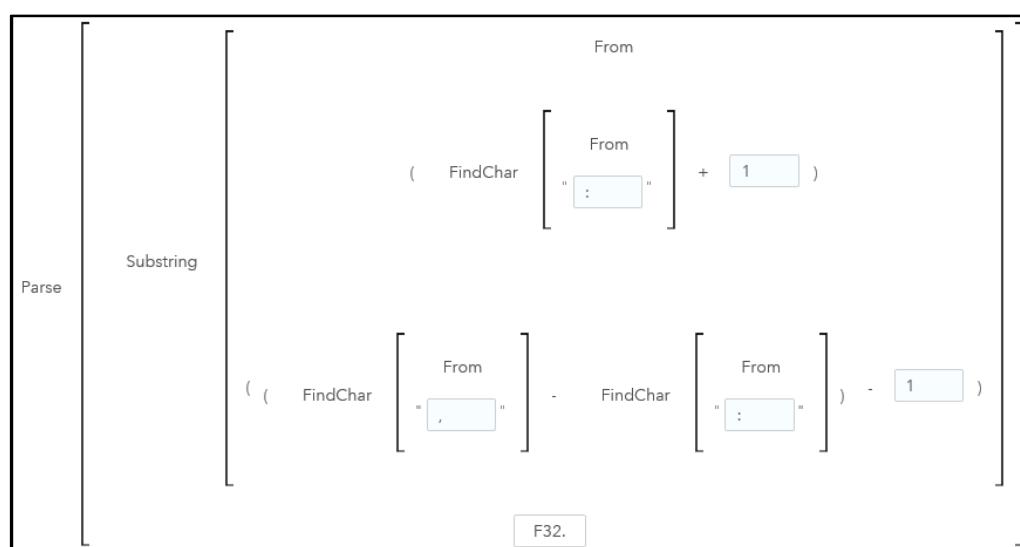
- d. Create a new measure data item, **from\_lat**, that consists of the middle portion of **From**.
  - 1) On the Data pane, select **New data item**  $\Rightarrow$  **Calculated item**.
  - 2) In the **Name** field, enter **from\_lat**.
  - 3) For the **Result Type** field, verify that **Automatic (Numeric)** is selected.
  - 4) On the left side of the window, click **Operators**.
  - 5) Expand **Text (advanced)**.
  - 6) Double-click the **Substring** operator to add it to the expression.
  - 7) For the Substring operator, right-click the **string** field and select **Replace with**  $\Rightarrow$  **From**.
  - 8) On the left side of the window, expand **Numeric (simple)**.
  - 9) Drag the **x+y** operator to the first **number** field in the Substring operator.
  - 10) On the left side of the window, expand **Text (advanced)**, if necessary.
  - 11) Drag the **FindChar** operator to the **number** field on the left of the plus sign.
  - 12) For the FindChar operator, right-click the first **string** field and select **Replace with**  $\Rightarrow$  **From**.
  - 13) For the FindChar operator, for the second **string** field, enter : (colon).
  - 14) In the **number** field on the right of the plus sign, enter 1.
  - 15) On the left side of the window, expand **Numeric (simple)**, if necessary.
  - 16) Drag the **x-y** operator to the second **number** field in the Substring operator.
  - 17) Drag the **x-y** operator to the **number** field on the left of the minus sign.
  - 18) On the left side of the window, expand **Text (advanced)**, if necessary.
  - 19) Drag the **FindChar** operator to the **number** field on the left of the first minus sign.
  - 20) For the FindChar operator, right-click the first **string** field and select **Replace with**  $\Rightarrow$  **From**.
  - 21) For the FindChar operator, for the second **string** field, enter , (comma).
  - 22) On the left side of the window, drag the **FindChar** operator to the **number** field on the right of the first minus sign.
  - 23) For the FindChar operator, right-click the first **string** field and select **Replace with**  $\Rightarrow$  **From**.

- 24) For the FindChar operator, for the second **string** field, enter : (colon).
- 25) For the **number** field on the right of the second minus sign, enter 1.
- 26) On the left side of the window, expand **Text (simple)**.
- 27) Drag the **Parse** operator to the outside of the expression.



- 28) For the Parse operator, click **No format specified**.
  - a) For the format, select **F**.
  - b) For the **Width** field, verify that **32** is specified.
  - c) Click **OK**.

The expression should resemble the following:



- 29) In the lower right corner of the window, click **Preview**.

The preview should resemble the following:

from_lat	From
17.10	1-1:17.1,-55.5
17.70	1-2:17.7,-56.3
18.20	1-3:18.2,-57.4
19.00	1-4:19,-58.6
20.00	1-5:20,-60
20.70	1-6:20.7,-61.1
21.30	1-7:21.3,-62.2

- 30) In the lower right corner of the window, click **Close** to close the Preview window.
- 31) In the lower right corner of the window, click **OK** to create the new calculated item.

The Data pane should resemble the following:

The screenshot shows the SAS Data pane with a single measure item listed. The measure is named "from\_lat". The pane has a header "Measure" with a dropdown arrow, and below it is a list item "from\_lat". To the right of the list item is a small downward-pointing arrow indicating more options.

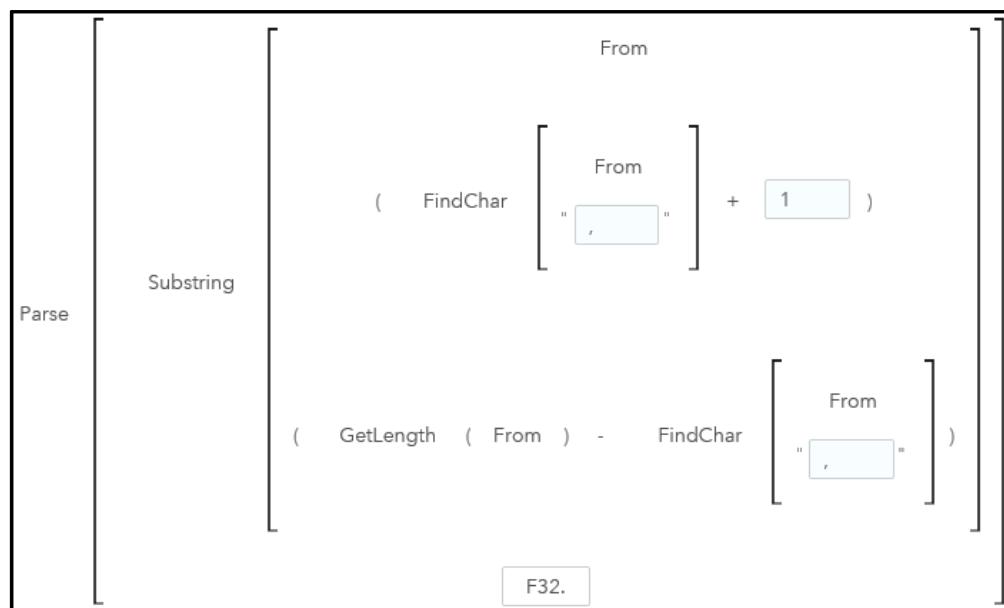
- e. Create a new measure data item, **from\_lon**, that consists of the last portion of From.
  - 1) On the Data pane, select **New data item**  $\Rightarrow$  **Calculated item**.
  - 2) In the **Name** field, enter **from\_lon**.
  - 3) For the **Result Type** field, verify that **Automatic (Numeric)** is selected.
  - 4) On the left side of the window, click **Operators**.
  - 5) Expand **Text (advanced)**.
  - 6) Double-click the **Substring** operator to add it to the expression.
  - 7) For the Substring operator, right-click the **string** field and select **Replace with**  $\Rightarrow$  **From**.
  - 8) On the left side of the window, expand **Numeric (simple)**.
  - 9) Drag the **x+y** operator to the first **number** field in the Substring operator.
  - 10) On the left side of the window, expand **Text (advanced)**, if necessary.
  - 11) Drag the **FindChar** operator to the **number** field on the left of the plus sign.
  - 12) For the FindChar operator, right-click the first **string** field and select **Replace with**  $\Rightarrow$  **From**.
  - 13) For the FindChar operator, for the second **string** field, enter **,** (comma).
  - 14) In the **number** field on the right of the plus sign, enter **1**.

- 15) On the left side of the window, expand **Numeric (simple)**, if necessary.
- 16) Drag the **x-y** operator to the second **number** field in the Substring operator.
- 17) On the left side of the window, expand **Text (advanced)**, if necessary.
- 18) Drag the **GetLength** operator to the **number** field on the left of the minus sign.
- 19) For the GetLength operator, right-click the **string** field and select **Replace with**  $\Rightarrow$  **From**.
- 20) On the left side of the window, drag the **FindChar** operator to the **number** field on the right of the minus sign.
- 21) For the FindChar operator, right-click the first **string** field and select **Replace with**  $\Rightarrow$  **From**.
- 22) For the FindChar operator, for the second **string** field, enter , (comma).
- 23) On the left side of the window, expand **Text (simple)**.
- 24) Drag the **Parse** operator to the outside of the expression.



- 25) For the Parse operator, click **No format specified**.
  - a) For the format, select **F**.
  - b) For the **Width** field, verify that **32** is specified.
  - c) Click **OK**.

The expression should resemble the following:



- 26) In the lower right corner of the window, click **Preview**.

The preview should resemble the following:

from_lon	From
-55.50	1-1:17.1,-55.5
-56.30	1-2:17.7,-56.3
-57.40	1-3:18.2,-57.4
-58.60	1-4:19,-58.6
-60.00	1-5:20,-60
-61.10	1-6:20.7,-61.1

- 27) In the lower right corner of the window, click **Close** to close the Preview window.  
 28) In the lower right corner of the window, click **OK** to create the new calculated item.

The Data pane should resemble the following:

- ▼ Measure
  - Frequency
  - from\_lat
  - from\_lon

f. Hide the data item **From** from the Data pane.

- 1) On the Data pane, at the bottom of the pane, click **Clear selection**, if necessary.
- 2) In the Category group, right-click **From** and select **Hide**.

The Data pane should resemble the following:

The screenshot shows a tree view in the Data pane. A single node labeled "Category" is expanded, revealing eight child nodes: "Basin - 1", "Date - 4.4K", "Flag - 9", "from\_loc - 22K", "Hem\_EW - 2", "Hem\_NS - 1", "Name - 288", and "to\_loc - 22K". The "Type - 9" node is also present under the "Category" node.

g. Create a new category data item, **Category**, by assigning labels to the values.

- 1) On the Data pane, select **New data item**  $\Rightarrow$  **Custom category**.
- 2) In the **Name** field, enter **Category**.
- 3) For the **Based on** field, select **Type**.
- 4) Select **Value Group 1** to edit the group name.
  - a) Type **Hurricane** and press Enter.
  - b) In the left pane, click **HU** and drag it to the **Drag values here** area on the right.

The screenshot displays the Data pane with two main sections: "Values of Type" on the left and "Value Groups" on the right. In the "Values of Type" section, there is a "Filter" input field and four checkboxes labeled "DB", "EX", "HU", and "LO". The "HU" checkbox is currently selected. In the "Value Groups" section, there is a collapsed group named "Hurricane". Below it, a blue horizontal bar contains the text "Drag values here" with a small icon. A gray rectangular box labeled "HU" is positioned over this bar, indicating it has been dragged from the "Values of Type" list.

- 5) On the right side of the Value Groups area, click  (Add) to add a new group.
  - a) Select **Value Group 1** to edit the group name.
  - b) Type **Tropical** and press Enter.
  - c) In the left pane, select the following values:  
**TD**  
**TS**  
**WV**
  - d) Drag the selected values to the **Drag values here** area on the right.
- 6) On the right side of the Value Groups area, click  (Add) to add a new group.
  - a) Select **Value Group 1** to edit the group name.
  - b) Type **Subtropical** and press Enter.
  - c) In the left pane, select the following values:  
**SS**  
**SD**
  - d) Drag the selected values to the **Drag values here** area on the right.
- 7) On the right side of the Value Groups area, click  (Add) to add a new group.
  - (1) Select **Value Group 1** to edit the group name.
  - (2) Type **Extratropical** and press enter.
  - (3) In the left pane, click **EX** and drag to the **Drag values here** area on the right.

The Value Groups area should resemble the following:

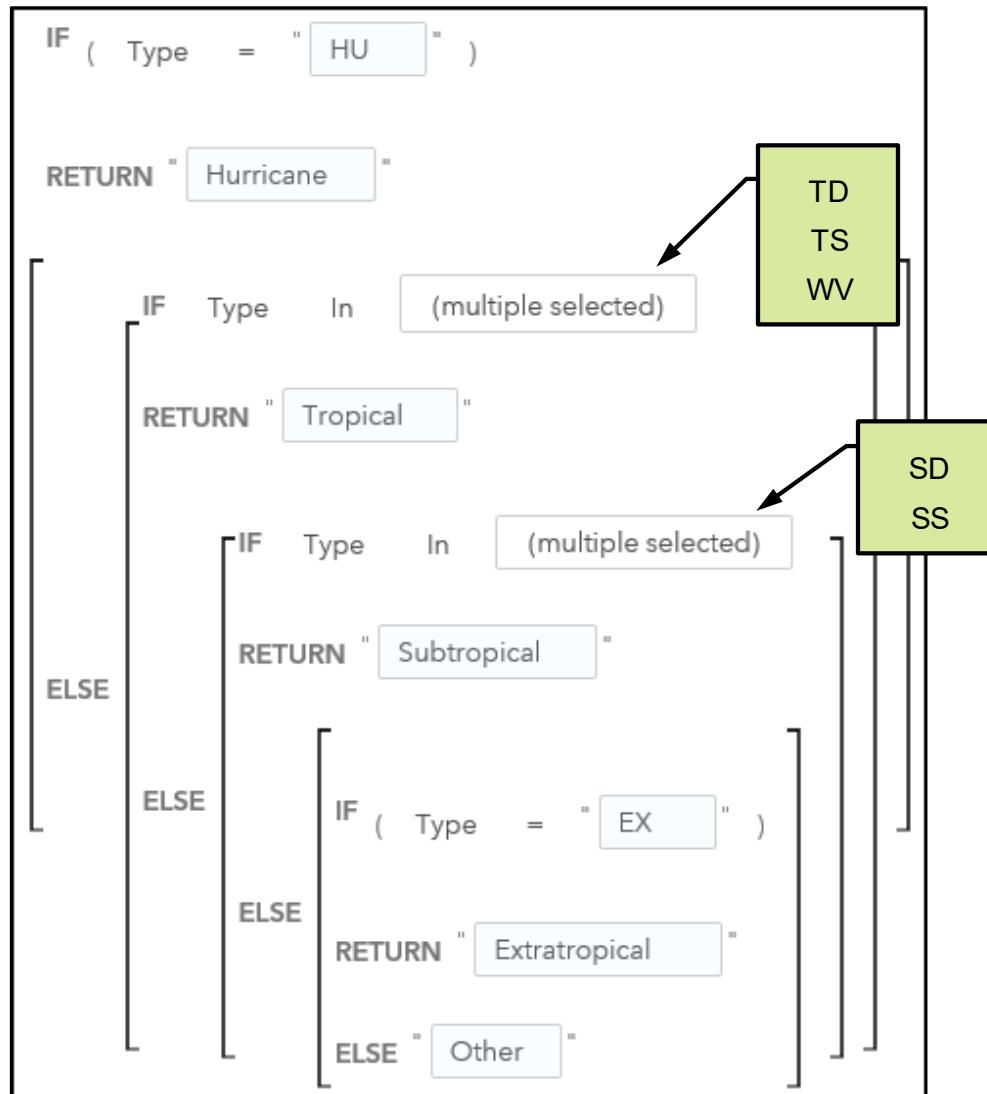
Value Groups	
▼ Hurricane	HU
▼ Tropical	TD
	TS
	WV
▼ Subtropical	SD
	SS
▼ Extratropical	EX
+ Click or drag values here to add a value group	

- 8) In the Remaining values area, for the **Group as** field, verify that **Other** is specified.

Remaining Values:	
<input type="radio"/> Show as is	<input type="radio"/> Show as missing
<input checked="" type="radio"/> Group as:	Other

- 9) In the lower right corner of the window, click **OK** to create the new custom category.

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



The Data pane should resemble the following:



- Save the data changes as a data view (**NA\_HURRICANES\_View**). Do not make the data view the default.
  - On the Data pane, click (Actions) and select **Save data view**.
  - In the **Name** field, enter **NA\_HURRICANES\_View**.

- 3) In the **Description** field, enter the following:

**Calculate: from\_loc, from\_lat, and from\_lon as a subset of From**

**Hide: From**

**Calculate: Category by grouping values of Type**

**Note:** It is a best practice to apply a description that describes all data changes that have been applied.

The Save Data View window should resemble the following:

Name: NA\_HURRICANES\_View

Description: Calculate: from\_loc, from\_lat, and from\_lon as a subset of From

Default data view

- 4) Click **Save** to create the data view.

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

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

**End of Solutions**

## Practice Review

### 4.1 Analyzing a Network Analysis Data Source – Solution

Which states did Hurricane Matthew hit in 2016?

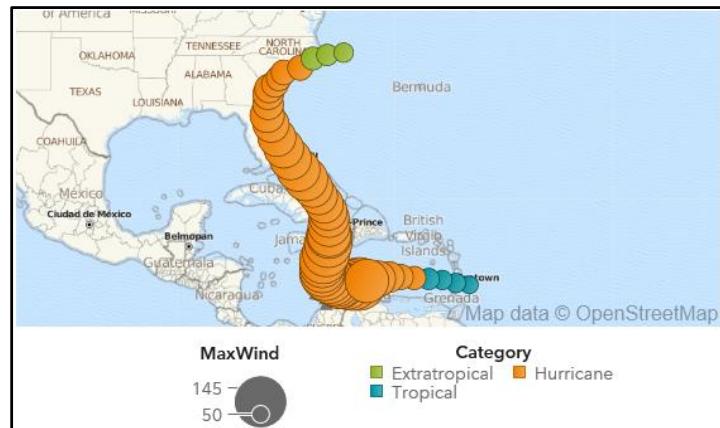
**Florida, Georgia, South Carolina, and North Carolina**

What was the maximum wind speed?

**145 mph**

How was Hurricane Matthew categorized?

**Tropical, Hurricane, and Extratropical**



### 4.1 Analyzing a Network Analysis Data Source – Solution

Which states did Hurricane Nicole hit in 2016?

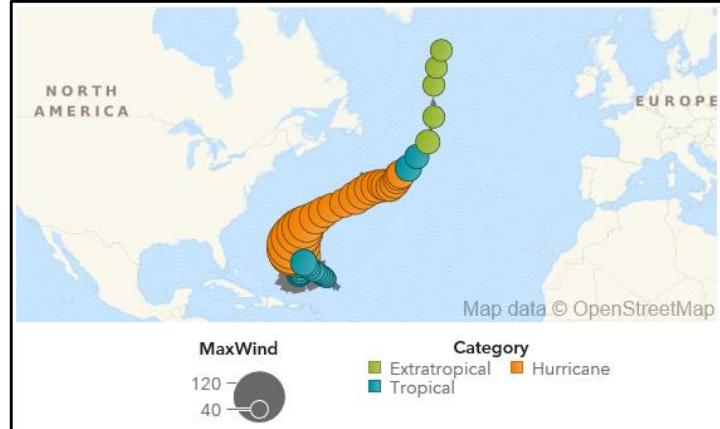
**None**

What was the maximum wind speed?

**120 mph**

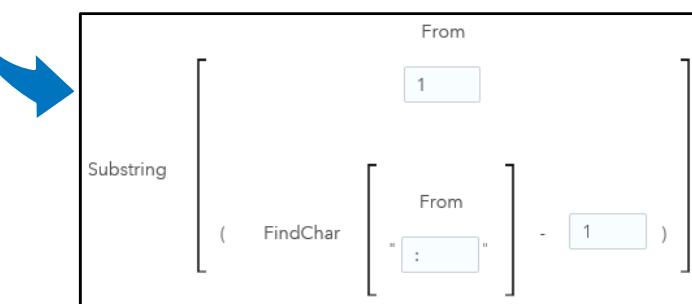
How was Hurricane Nicole categorized?

**Tropical, Hurricane, and Extratropical**



## 4.2 Creating a Report Data View for Network Analysis – Solution

**from\_loc: from\_lat, from\_lon**

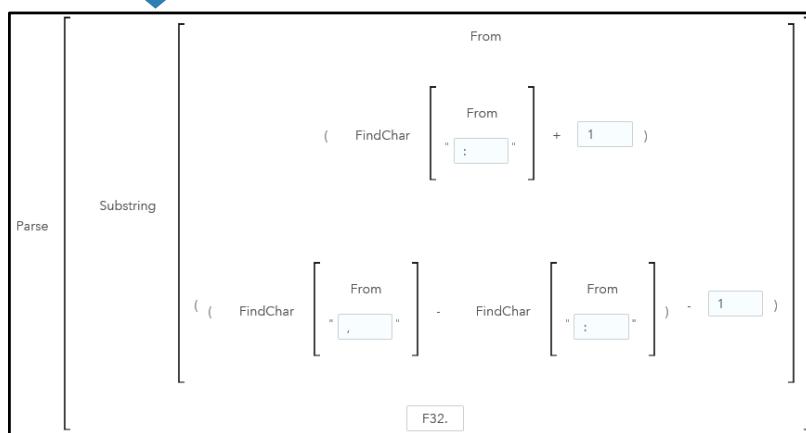


20



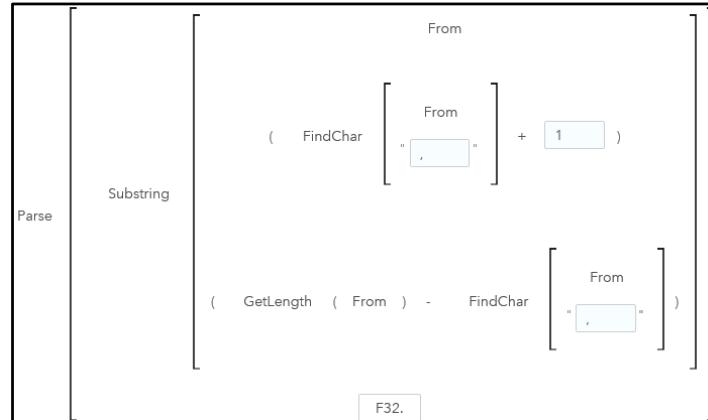
## 4.2 Creating a Report Data View for Network Analysis – Solution

**from\_loc: from\_lat, from\_lon**



## 4.2 Creating a Report Data View for Network Analysis – Solution

`from_loc: from_lat, from_lon`



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## 4.2 Creating a Report Data View for Network Analysis – Solution

### Category (custom category)

#### Value Groups

▼ Hurricane

HU

▼ Tropical

TD

TS

WV

▼ Subtropical

SD

SS

▼ Extratropical

EX

#### Remaining Values:

Show as is  Show as missing  Group as: Other

- OR -

### Category (calculated item)

```
IF ( Type = "HU" )
```

```
RETURN "Hurricane"
```

TD  
TS  
WV

```
IF Type In (multiple selected)
```

SD  
SS

```
RETURN "Tropical"
```

```
ELSE IF Type In (multiple selected)
```

```
RETURN "Subtropical"
```

```
ELSE IF ( Type = "EX" )
```

```
RETURN "Extratropical"
```

```
ELSE "Other"
```

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# Lesson 5      Performing Path Analysis

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	Solutions to Practice.....	5-20
	Practice Review.....	5-25



# 5.1 Path Analysis

## Objectives

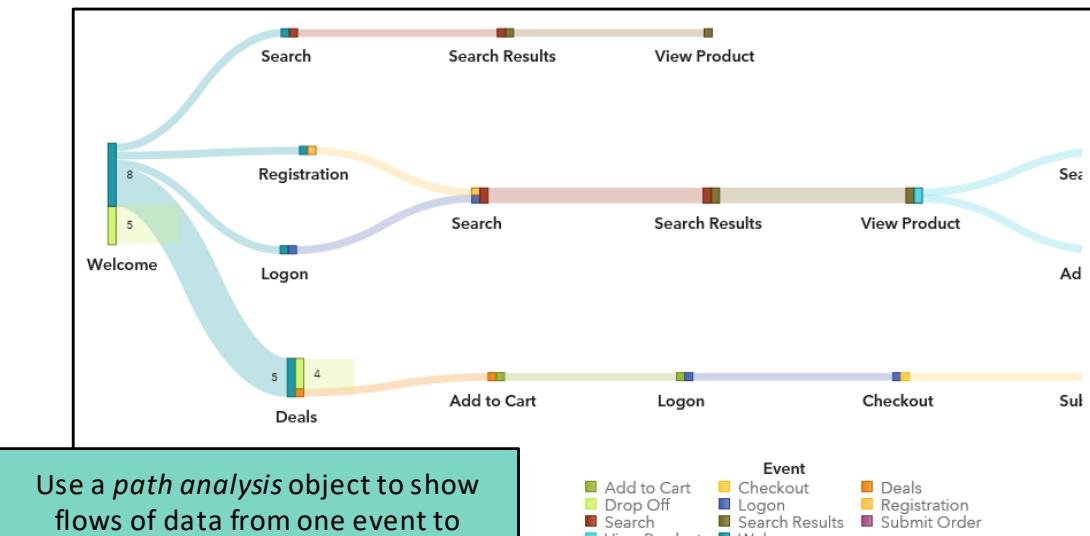
- Discuss when to use path analysis in SAS Visual Analytics.
- Describe the structure of the table needed for path analysis.

2



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## Objects: Analytics (Path)



3



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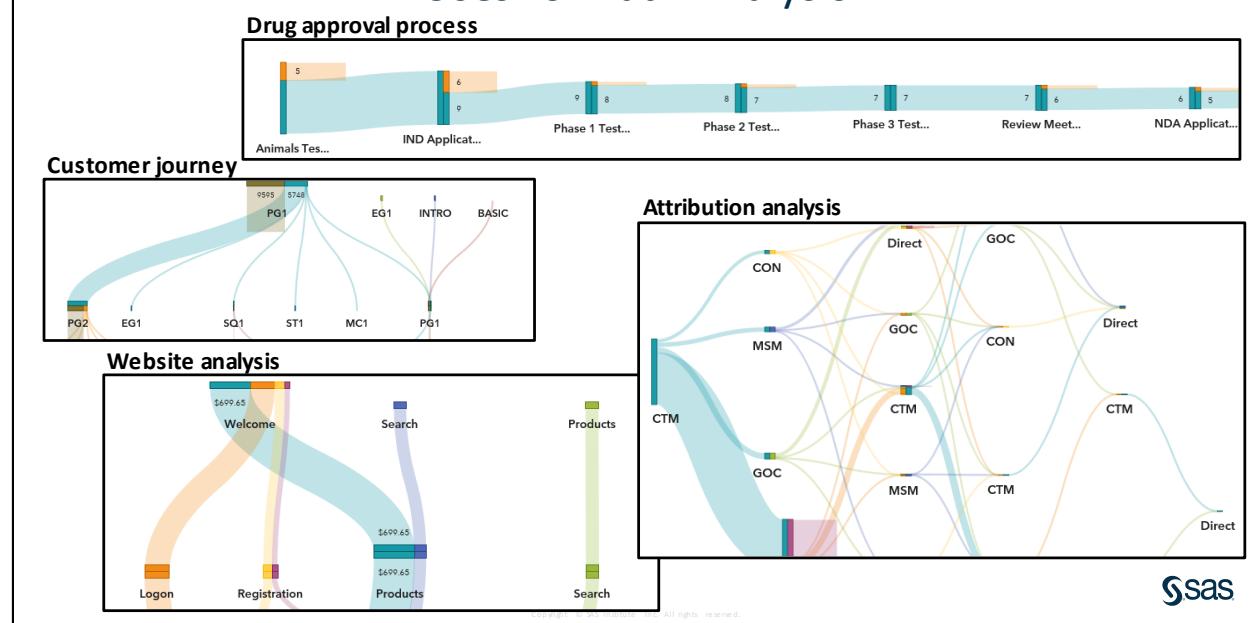
## Path analysis

A path analysis object displays flows of data from one event to another as a series of paths. In a path analysis object, the nodes contain the events for each path. The same event can appear in multiple nodes in the diagram, depending on their location in the path. The links between nodes can be sized to either represent the frequency of the path or the value of a weight. The links can be colored to show each path in a different color or each event in a different color, or to indicate drop-off links (where the path ended and other paths continued). Coloring links by path is useful if you have a small number of paths and want to follow each separately. Coloring links by event makes it easier to see multiples of the same event throughout the diagram. Coloring links by drop off makes it easier to see where paths frequently end.

**Note:** The measure assigned to the Weight role (if any) must have one of the following aggregation types: sum, average, minimum, or maximum.

**Note:** For a path analysis that is colored by event or by drop-off and where the Weight measure has an aggregation other than sum, the links at each node overlap because the link widths are not additive.

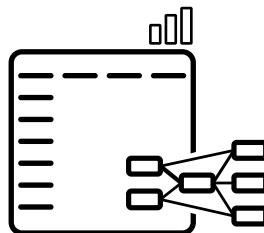
## Uses for Path Analysis



## Path Analysis: Data Shape

To create a path analysis object, the data source must have one row for each identifier-event pair.

Each row should also have a datetime data item or measure that orders the events for any given identifier.



5



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**Note:** If the link width in the path analysis object represents a weight value, then any paths that do not have a value greater than zero are hidden.

## Path Analysis: Data Shape

Identifier	ID	Page	Time	Purchase
	1	Welcome	100	.
	1	Deals	101	.
	1	Add to Cart	102	.
	1	Checkout	103	.
	1	Submit Order	104	.
	1	Order Receipt	105	12.75

Event

6



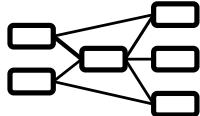
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## Business Scenario: Website



The web design team at Orion Star has requested an analysis of visits to the website.

They would like to see what types of pages were visited by customers and in what order. They also want to view pages visited by customers who made purchases.



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## Analyzing a Path Analysis Data Source

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This demonstration illustrates how to create a path analysis object in a report.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2- Demo5.1**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2- Demo5.1** and select **Edit**.
- The report opens in SAS Visual Analytics.
3. View the structure of the table.
  - a. At the top of the canvas, click the **Details** tab to view the page.

<b>id</b>	<b>page</b>	<b>time</b>	<b>purchase</b>
3	Add to Cart	127	.
3	Add to Cart	128	.
3	Add to Cart	129	.
3	Add to Cart	130	.
3	Checkout	131	.
3	Submit Order	132	.
3	Order Receipt	133	\$6.50
4	Products	130	.
4	Books	131	.
4	Music	132	.
5	Books	140	.

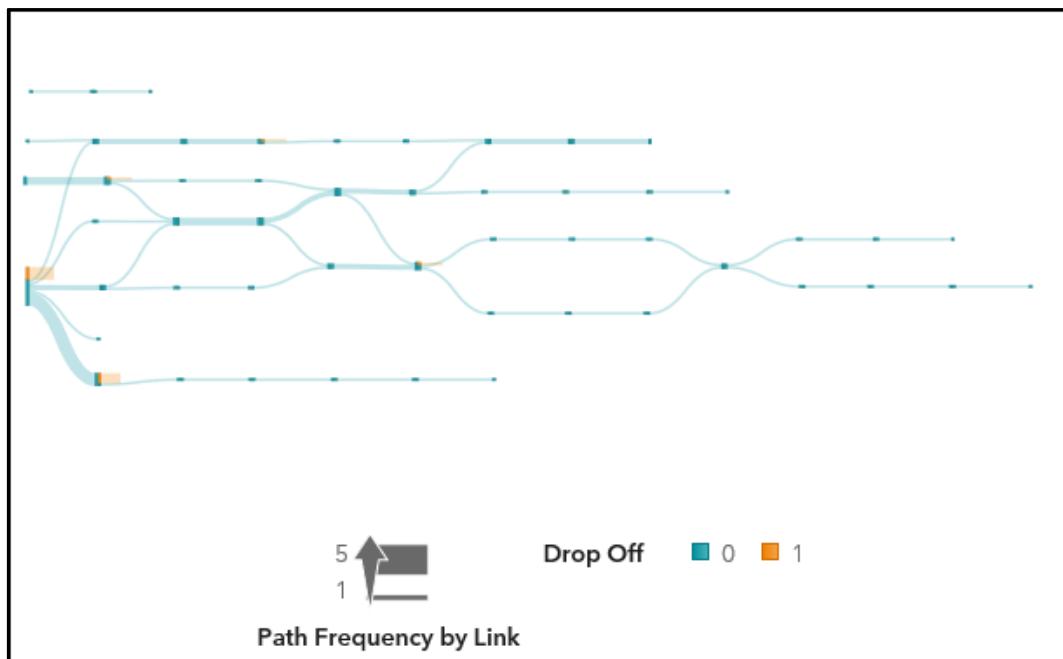
This table contains details about visits to a website. Each row represents a page visit for each unique visitor.

The **id** field represents the unique visitors to the website, the **page** field represents the pages visited, and the **time** field represents the time at which each visitor visited each of the pages (ordinally).

The **purchase** field is missing if a visitor did not make a purchase on the visit. If the visitor did make a purchase, the field contains the purchase amount for the Order Receipt page.

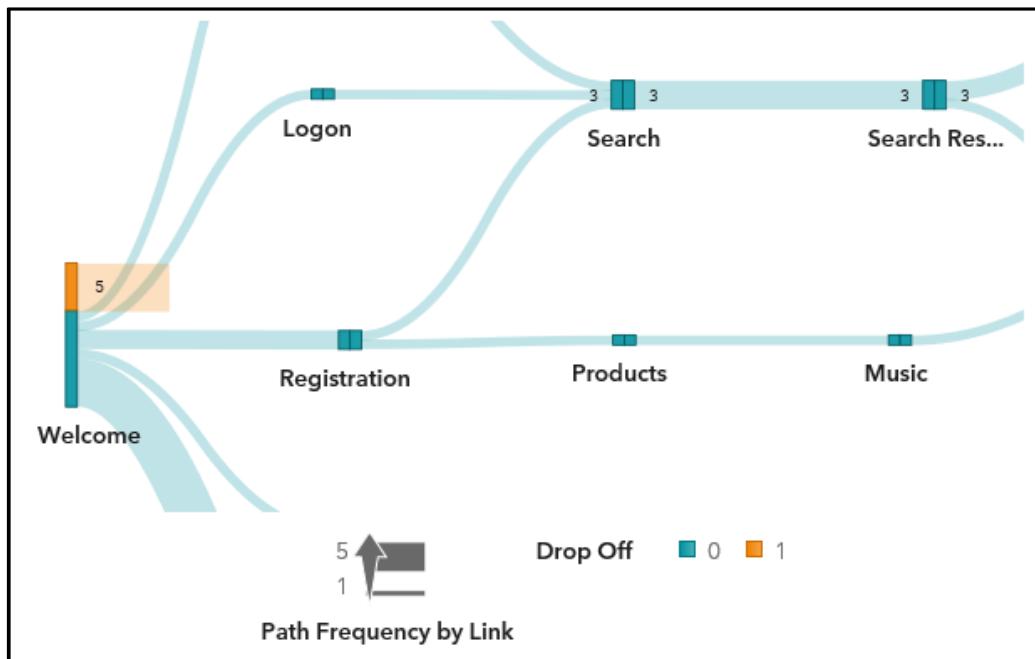
- b. Click the **Path Analysis** tab.
4. Create a path analysis object.
  - a. On the canvas, click the **Path Analysis** object to select it.
  - b. In the right pane, click **Roles**.
  - c. For the Event role, select **Add**  $\Rightarrow$  **page**.
  - d. For the Sequence order role, select **Add**  $\Rightarrow$  **time**.
  - e. For the Transaction identifier role, select **Add**  $\Rightarrow$  **id**.

The path analysis object should resemble the following:



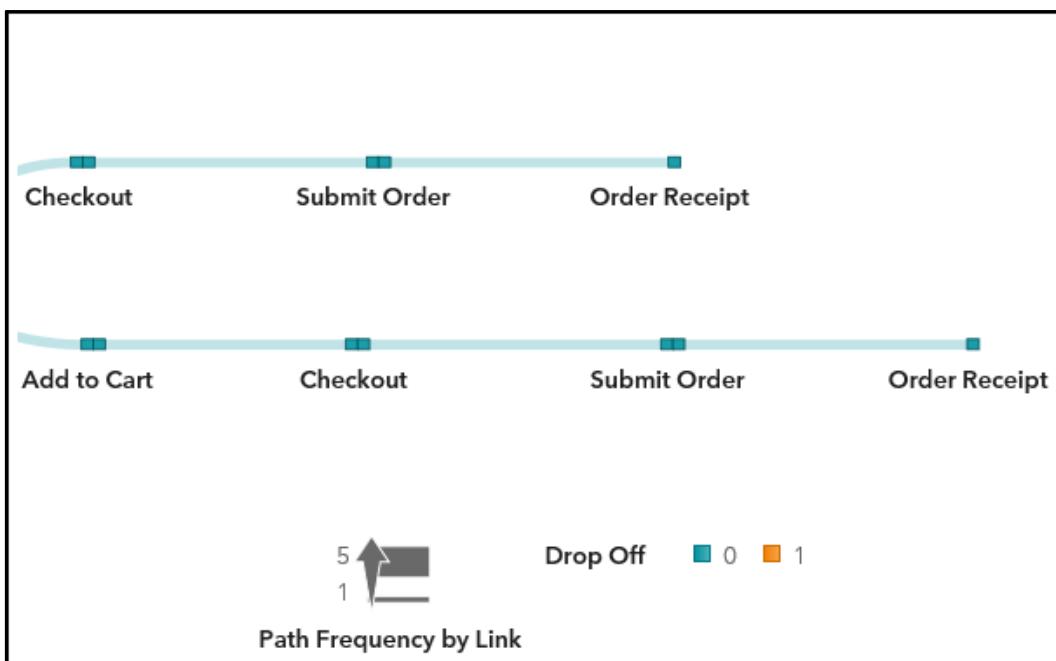
- f. Scroll in to the beginning on the diagram (on the left) to view additional details.

**Note:** Use the scroll wheel on your mouse to zoom on the path analysis object.



This indicates that of the 15 visitors who entered our website through the Welcome page, 5 immediately left the website. The remaining 10 continued using different paths.

- g. Scroll to the right to view terminal nodes for the diagram.

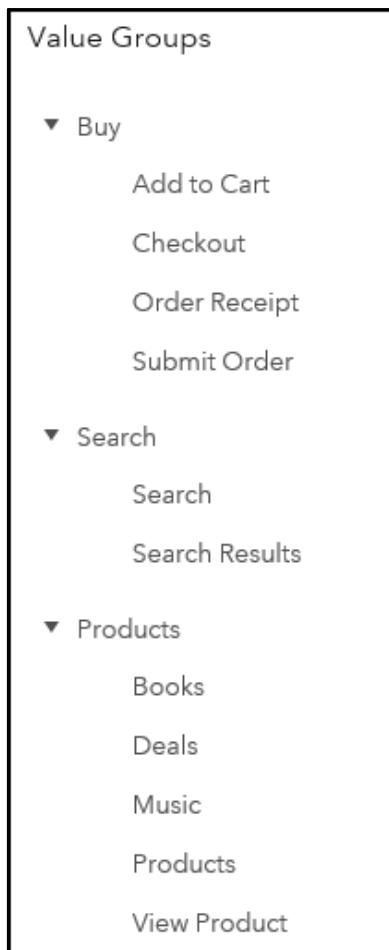


When a customer makes a purchase, he or she views specific pages: Add to Cart, Checkout, Submit Order, and Order Receipt.

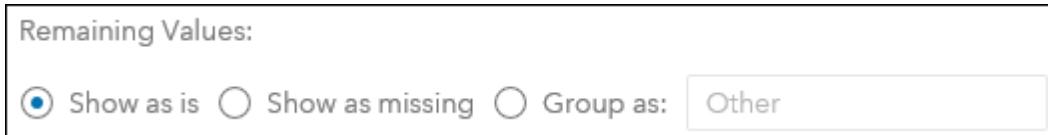
We can group the nodes into main events to get a better view of the typical flow through our website. We can group these nodes with a custom category.

5. View the custom category of grouped events.
  - a. In the left pane, click **Data**.
  - b. In the Category group, right-click **Grouped Pages** and select **Edit**.

The Value Groups should resemble the following:

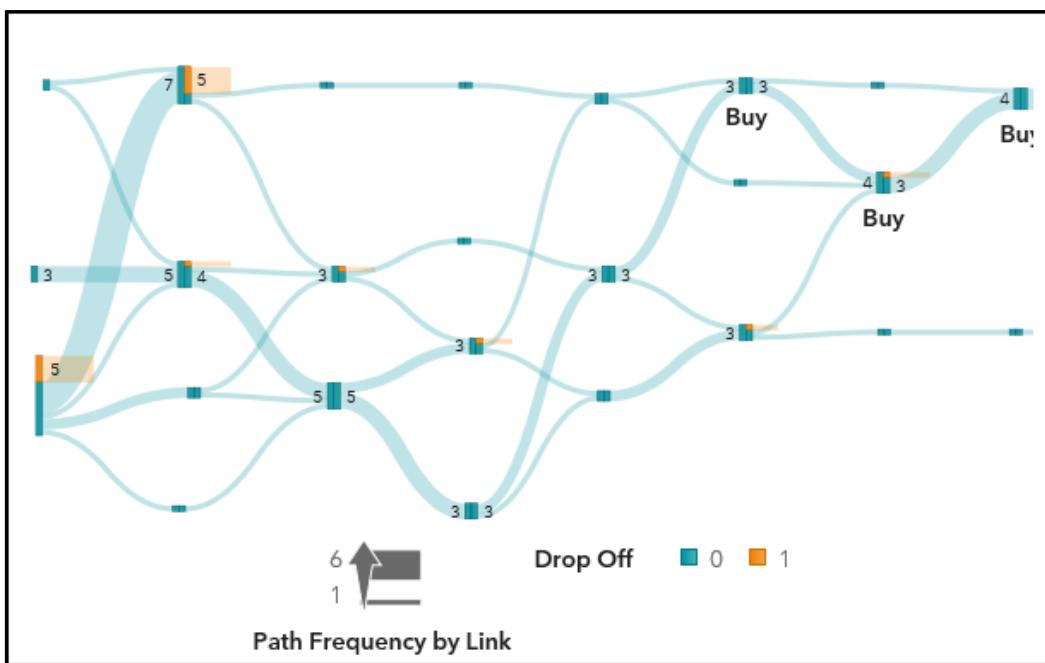


- c. In the Remaining Values section (at the bottom of the window), verify that **Show as is** is selected.



- d. Click **Cancel** to close the custom category without saving any changes.
6. Modify roles for path analysis object.
- In the canvas, select the path analysis object to make it active, if necessary.
  - In the right pane, click **Roles**.
  - For the Event role, select **page** ⇒ **Grouped Pages**.

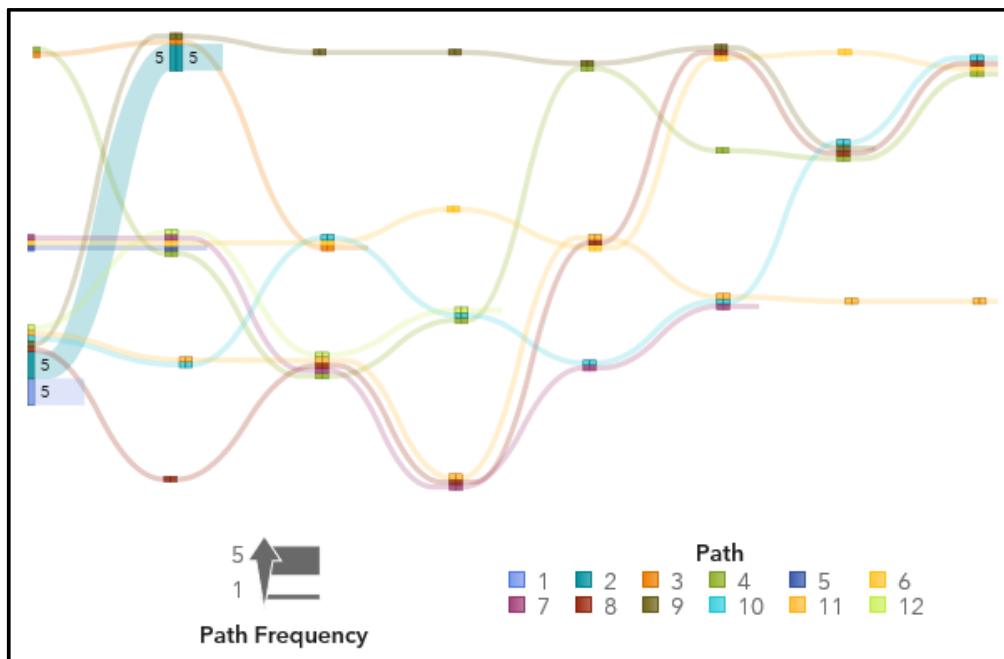
The path analysis object is updated to use the new custom category:



7. Modify options for the path analysis object.
  - a. In the right pane, click **Options**.
  - b. In the Path Analysis group, for the **Link color** field, select **Path**.



The path analysis object should resemble the following:

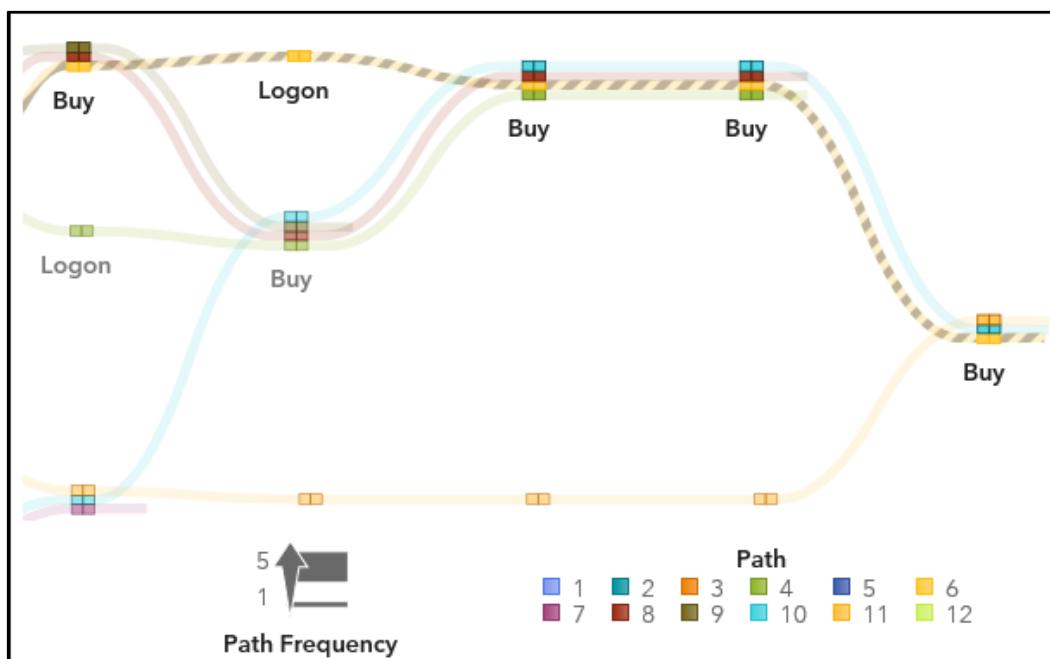


Each unique path now has a specific color.

- In the legend, click **path 6**.

The path is highlighted in the path analysis object.

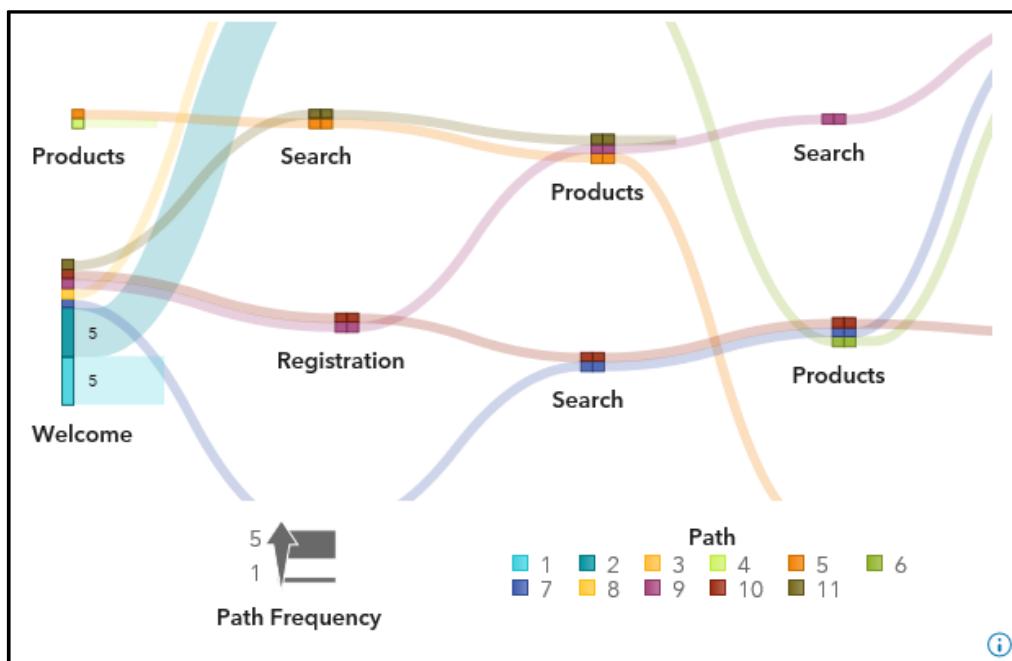
- Scroll in and view the end of the path.



Because a visitor must view specific pages to purchase a product, this path contains subsequent nodes with the same value.

- e. In the Options pane, select **Compress**.

The path analysis object is updated to combine duplicate nodes.



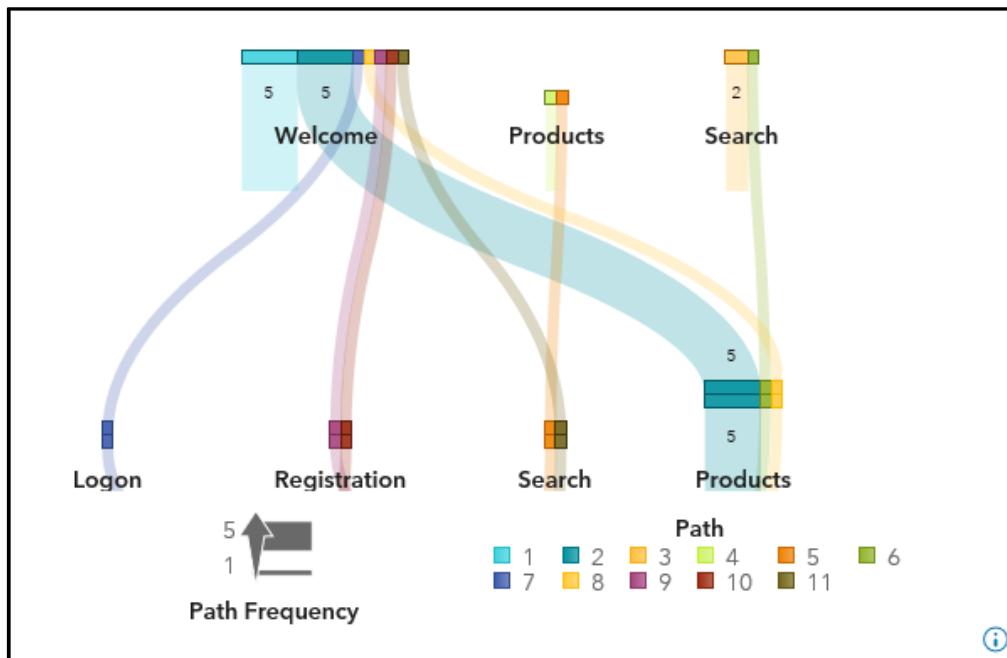
- f. In the lower right corner of the object, place your mouse pointer on

An artificial sequence order was generated for 9 paths that contains simultaneous events.

When we compress the path analysis, similar events are grouped together.

- g. On the Options pane, in the Path Display group, select **Vertical layout**.

The orientation of the path analysis object is updated.



8. View paths for customers who have made a purchase.
- In the path analysis object, scroll to the bottom and select a terminal **Buy** node.
  - Right-click the node and select **New path filter from selection**  $\Rightarrow$  **Include only**  $\Rightarrow$  **Paths containing the selected events on any node**.

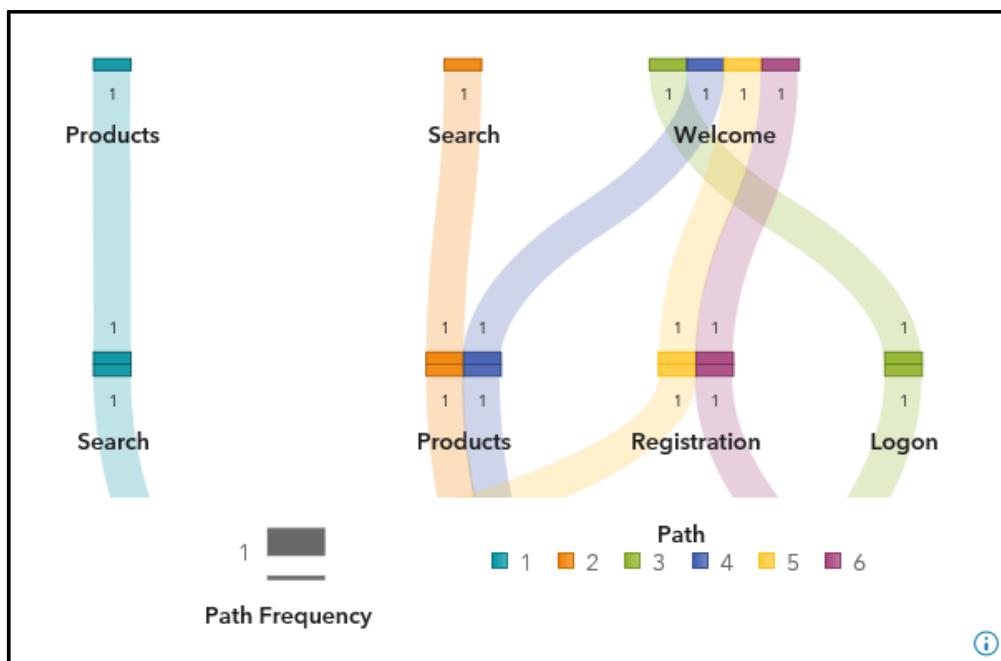
A note is displayed.

Your selection has been converted to a filter. X

- c. In the right pane, click **Filters**.

A new path filter condition was created and added to the path analysis object.

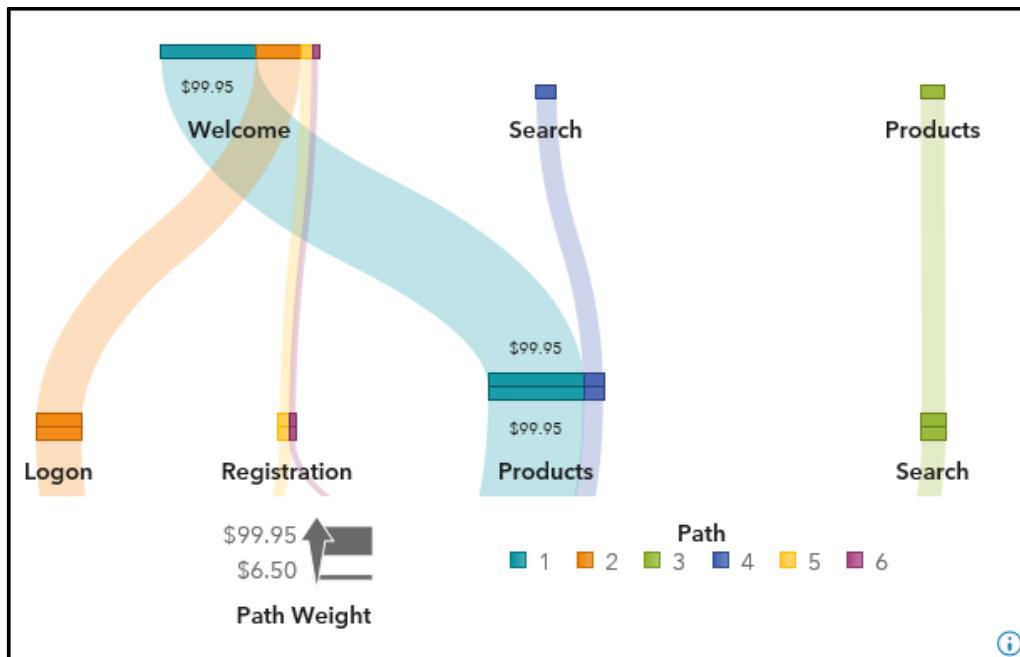
The path analysis object should resemble the following:



Because the path analysis object shows only those paths where a customer made a purchase, we can now size each path by the purchase amount.

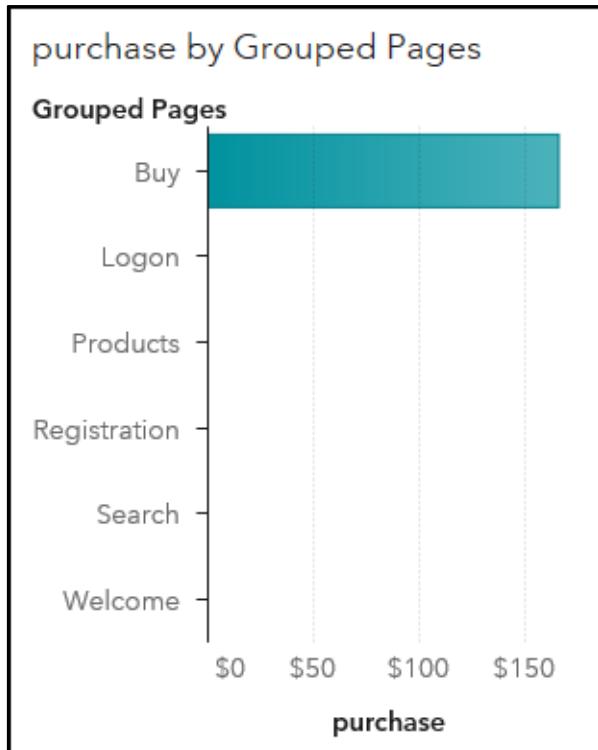
- In the right pane, click **Roles**.
- For the Weight role, select **Frequency  $\Rightarrow$  purchase**.

Each path is now sized by the purchase amount.



9. Create a visualization for all visitors who started on the Welcome page.
  - a. In the path analysis object, select the **Welcome** node.
  - b. Right-click in the path analysis object and select **Create Bar Chart from selection**  $\Rightarrow$  **Include only**  $\Rightarrow$  **Selected full paths**.
  - c. Drag the bar chart to the right of the path analysis object.

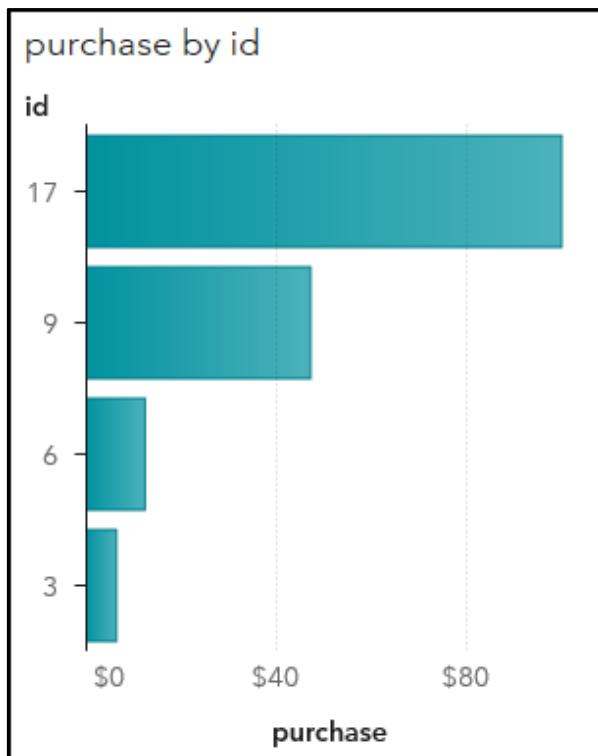
The bar chart should resemble the following:



This bar chart shows the pages where customers made a purchase. Not surprisingly, the total amount from the purchases is indicated by the length of the bar for the Buy pages. A better chart would show purchase by customer.

- d. In the canvas, verify that the bar chart is selected.
- e. In the right pane, click **Roles**.
- f. For the Category role, click **Grouped Pages**  $\Rightarrow$  **id**.

The bar chart should resemble the following:



The bar chart now shows the total purchase amount by customer. Total purchase amounts span from \$6.50 to \$99.95.

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

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

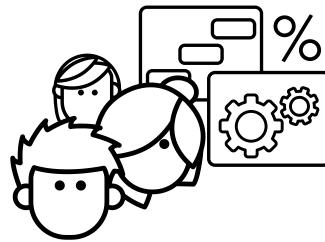
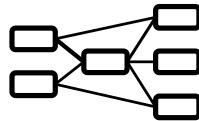
**End of Demonstration**

## Business Scenario: Training Path



The Education Division at SAS has requested an analysis of courses attended by students.

They would like to see which courses were taken by customers and in what order they attended the courses. Specifically, they are interested in the 20 most common paths for customers who have taken the course SAS® Programming 1: Essentials (PG1).



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## Practice

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### 1. Analyzing a Path Analysis Data Source

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2- Exercise5.1**.
- Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- Right-click **VA2- Exercise5.1** and select **Edit**.

- c. View data item properties and answer the following question:

How many unique courses did students attend?

**Answer:** \_\_\_\_\_

- d. Assign the following data items to the specified roles for the path analysis object:

Event	Course Code
Sequence order	Event Delivered (End) Date
Transaction identifier	Student ID

- e. Answer the following question:

What information is displayed when you place your mouse pointer on in the lower right corner of the object? What do you think this means?

**Answer:** \_\_\_\_\_

- f. Modify options for the path analysis object to color each link by event and to show only the top 20 paths. Also change the display to a vertical layout.

- g. Answer the following questions:

With which course do a majority of students begin?

**Answer:** \_\_\_\_\_

Of those students who start with PG1, how many have not taken another class?

**Answer:** \_\_\_\_\_

Of those students who start with PG1, what is the next course that most are likely to take? How many students take this course?

**Answer:** \_\_\_\_\_

Are there any students who take PG1 twice? How many students do this? Why might this be the case?

**Answer:** \_\_\_\_\_

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

**End of Practices**

## 5.2 Solutions

---

### Solutions to Practice

#### 1. Analyzing a Path Analysis Data Source

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2- Exercise5.1**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise5.1** and select **Edit**.
- c. View data item properties and answer the question.
  - 1) In the left pane, click **Data**.
  - 2) Answer the following question:

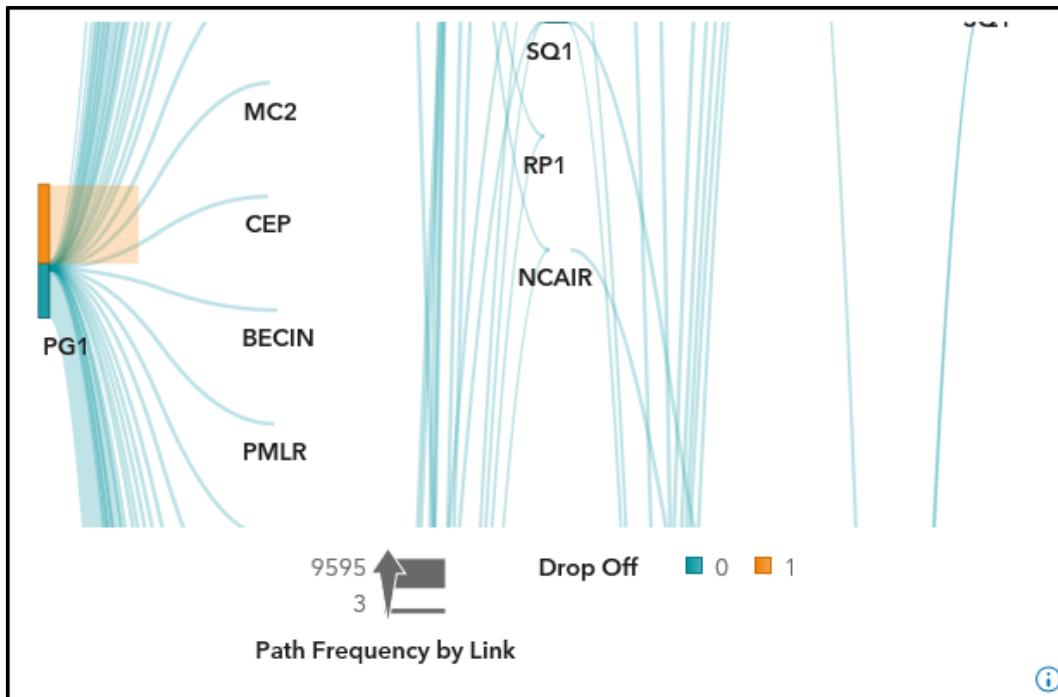
How many unique courses did students attend?

**Answer:** 391 unique courses, including PG1



- d. Assign the following data items to the specified roles for the path analysis object:
  - 1) In the canvas, click the path analysis object to select it, if necessary.
  - 2) In the right pane, click **Roles**.
  - 3) For the Event role, select **Add**  $\Rightarrow$  **Course Code**.
  - 4) For the Sequence order role, select **Add**  $\Rightarrow$  **Event Delivered (End) Date**.
  - 5) For the Transaction identifier role, select **Add**  $\Rightarrow$  **Student ID**.

The path analysis object should resemble the following:



There are too many paths to perform a good analysis. Next, modify options to focus only on a subset of this information.

- e. Answer the following question:

What information is displayed when you place your mouse pointer on in the lower right corner of the object? What do you think this means?

**Answer:** There are five paths that contain simultaneous events. This means that there are students who attend multiple classes that start on the same day.

An artificial sequence order was generated for 5 paths that contains simultaneous events.

Some training packages include access to an instructor-led class and a self-paced e-learning class. There could be simultaneous events if students activated the e-learning on the day on which the instructor-led class started.

- f. Modify options for the path analysis object to color each link by event and to show only the top 20 paths. Also change the display to a vertical layout.

- 1) In the right pane, click **Options**.
- 2) In the Path Analytics group, for the **Link color** field, select **Event**.

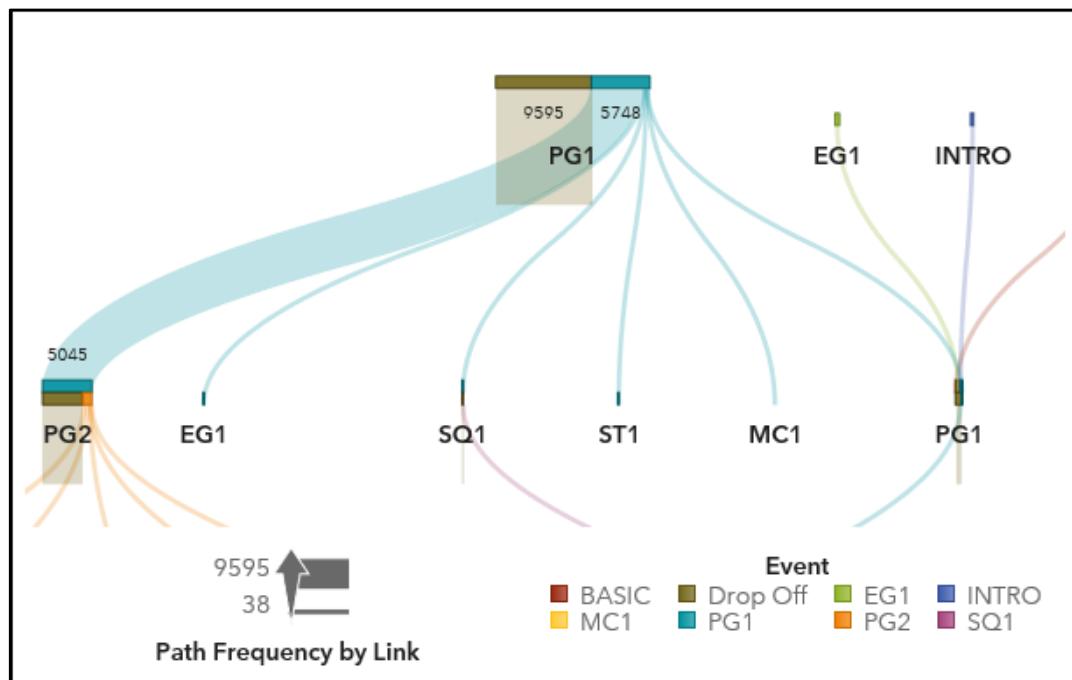
3) For the **Path ranking direction** field, verify that **Top** is specified.

4) In the **Path ranking count** field, enter **20**.

Path ranking direction:
Top ▾
Path ranking count: *
▼ 20 ▲

5) In the Path Display group, select **Vertical layout**.

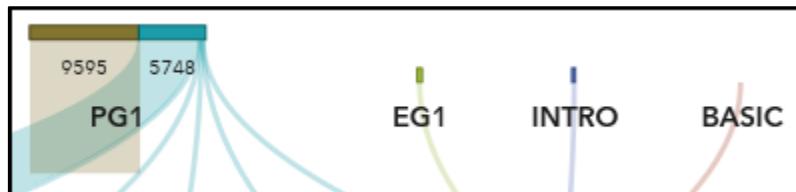
The path analysis object should resemble the following:



g. Answer the following questions:

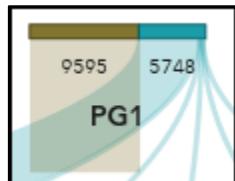
With which course do a majority of students begin?

**Answer: PG1 (SAS Programming 1)**



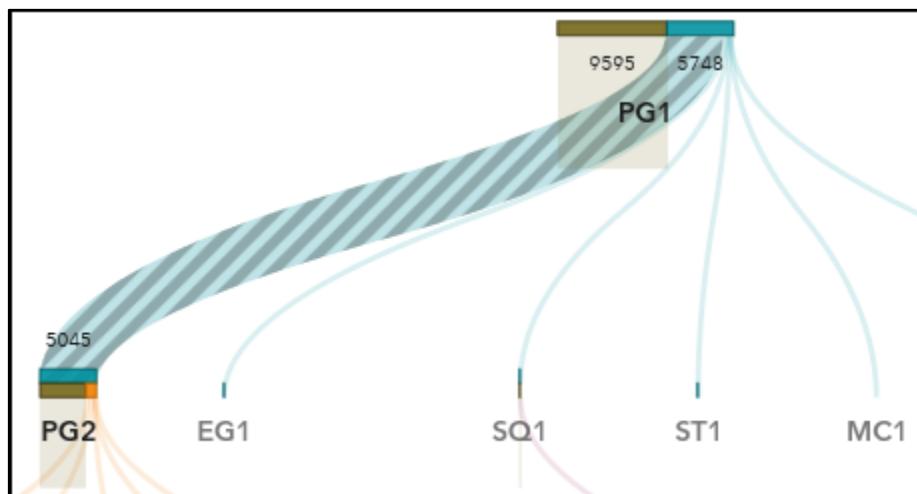
Of those students who start with PG1, how many have not taken another class?

**Answer: 9,595 students**



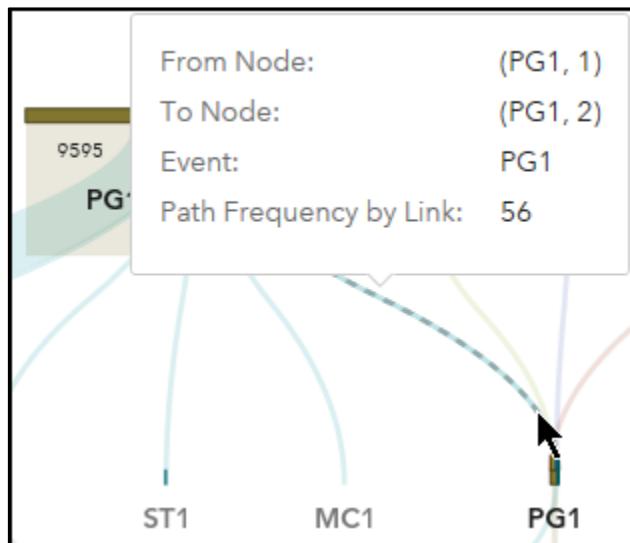
Of those students who start with PG1, what is the next course most are likely to take? How many students take this course?

**Answer: PG2 (SAS Programming 2). 5,045 students take PG2 after PG1.**



Are there any students who take PG1 twice? How many students do this? Why might this be the case?

**Answer: Yes. 56 students have taken PG1 twice.**



**There could be a number of reasons why students take PG1 twice. For example:**

- Students could take the class and not use the tool and forget the material.
- Students could retake the class as a refresher course.
- Students could start with the free e-learning version of the course and switch to an instructor-based course later.
- Students could take the class initially for a project and then retake to course with the intent of attempting the certification.

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

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

**End of Solutions**

## Practice Review

### 5.1 Analyzing a Path Analysis Data Source – Solution

How many unique courses did students attend?

**391 unique courses, including PG1**



What information is displayed when you place your mouse pointer on in the lower right corner of the object?

**Five paths that contain simultaneous events. This means that there are students who attend multiple classes that start on the same day.**

An artificial sequence order was generated for 5 paths that contains simultaneous events.



What do you think this means?

Some training packages include access to an instructor-led class and a self-paced e-learning class. There could be simultaneous events if students activated the e-learning on the day on which the instructor-led class started.

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Sas

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### 5.1 Analyzing a Path Analysis Data Source – Solution

With which course do a majority of students begin?

**PG1 (SAS Programming 1)**



Of those students who start with PG1, how many have not taken another class?

**9,595 students**

12

Sas

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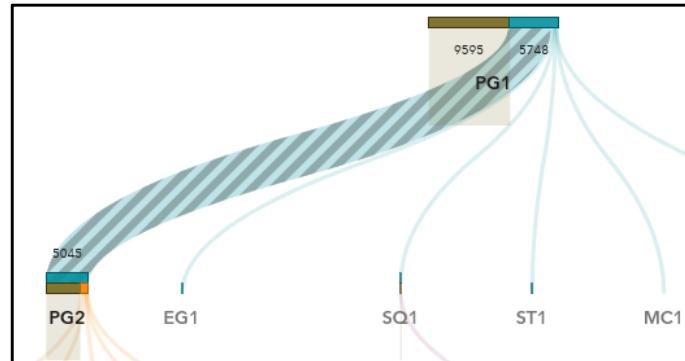
## 5.1 Analyzing a Path Analysis Data Source – Solution

Of those students who start with PG1, what is the next course that most are likely to take?

**PG2 (SAS Programming 2)**

How many students take this course?

**5,045 students**



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## 5.1 Analyzing a Path Analysis Data Source – Solution

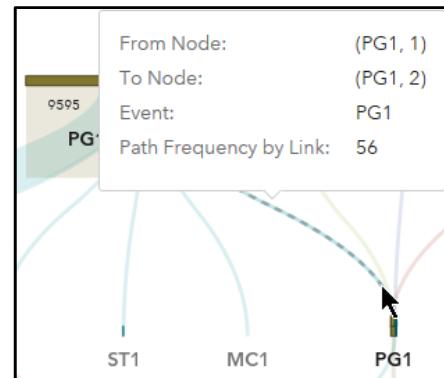
Are there any students who take PG1 twice? Yes

How many students do this? **56 students**

Why might this be the case?

**There could be a number of reasons why students take PG1 twice. For example:**

- **do not use the tool and forget the material**
- **retake it as a refresher course**
- **start the free e-learning course and switch to an instructor-led course later**
- **take class initially for a project and then retake for certification attempt**



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# Lesson 6      Performing Text Analytics

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Practice.....	6-18
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Solutions to Activities and Questions.....	6-22
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# 6.1 Text Analytics

## Objectives

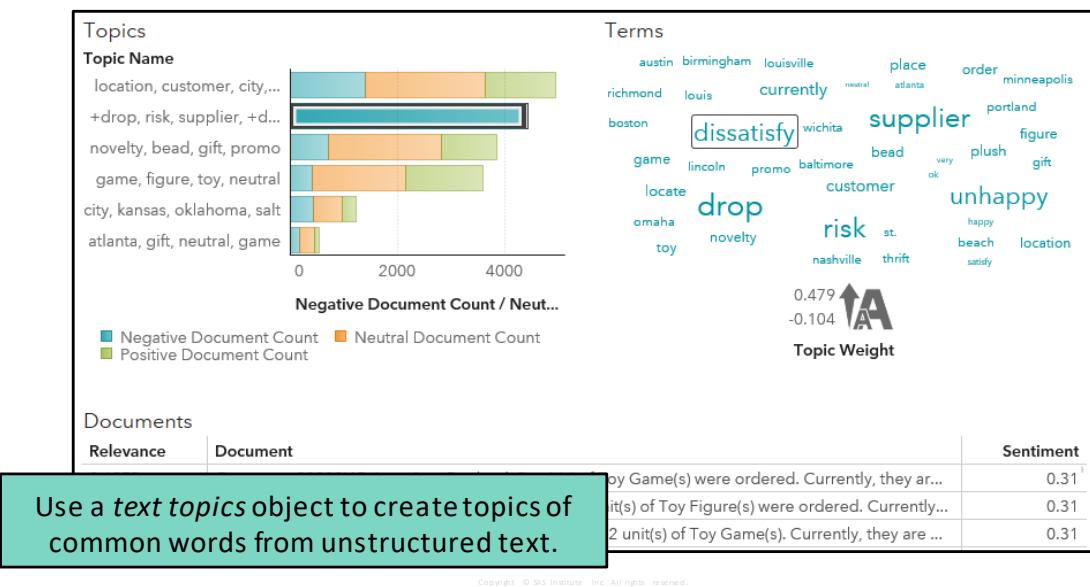
- Discuss when to use text topics in SAS Visual Analytics.
- Describe the structure of the table needed for text analytics.
- Describe how text analytics works.
- Describe how sentiment analysis works.

2



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## Objects: Analytics (Text Topics)



**Text topics**

A text topics object displays a set of words from a character data item (unstructured text). The size of each word in the cloud indicates the importance (topic term weight) of the word. A text topics object analyzes each value in a document collection as a text document that can contain multiple words. Words that often appear together in the document collection are identified as *topics*. For the selected topic, the text topics object displays the terms with the greatest topic term weight values. The topic term weight indicates the importance of the term within the topic. A text topics object can also display whether the documents in a topic express positive, negative, or neutral sentiment.

**Note:** To enable text topics, you must set a unique row identifier for your data source (a data item that contains a unique value for each row of your data source).

**Note:** Depending on the number of rows in your data source and the length of the values in your document collection, it might require a significant amount of time to display a text topics object.

**Note:** The data source for a text topics object must have UTF-8 encoding. If the data source has a different encoding, then some characters might not be displayed properly, and an error message might appear.

**Note:** Text topics objects in SAS Visual Analytics use a different algorithm than SAS Text Miner. Your results might be different from the results that SAS Text Miner produces.

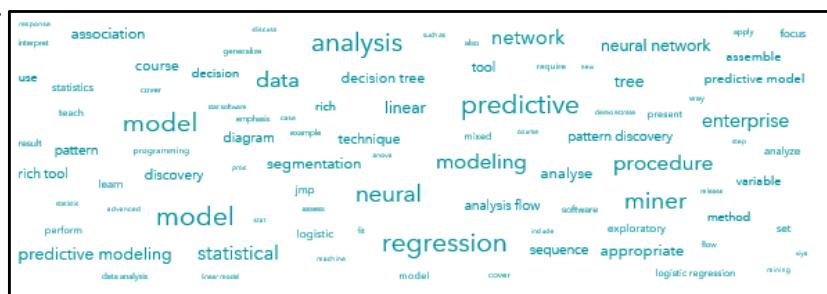
**Note:** You can export model score code from the text topics object by right-clicking the object and selecting **Export Model**. This creates a SAS program that includes all data items used by the model and that can be applied to new data sets in a SAS programming environment.

**Note:** If SAS Visual Text Analytics is licensed at your site, you have additional options for contextual extraction, sentiment analysis, and categorization in SAS Model Studio. For example, you can use Visual Text Analytics to drop terms that are not useful for analysis, create a custom sentiment model, and create custom categories from selected topics.

# Uses for Text Analytics

Text analytics can be useful in analyzing unstructured text, such as the following:

- Customer reviews of products
  - Facebook posts and comments
  - Tweets from Twitter
  - Job descriptions
  - News headlines



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

**Note:** Words are typically sized based on the importance of the word. However, the length of the word and the size of the letters that make up the word can make a single word look more (or less) important than an equally sized word.

## 6.01 Activity

## Sign into SAS Viya for Learners.

## Edit the **VA2-Activity6.01** report

(in the **/SAS Content/Courses/YVA283/Advanced** folder).

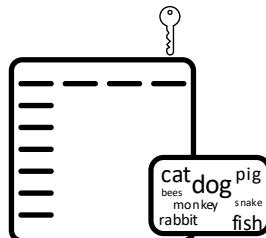
What two things are needed for the text topics object?

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

## Text Analytics: Data Shape

To create a text topics object, the data source must have a data item that contains unstructured text (document collection).

In addition, the data source must have a data item that is unique for each row of the data source.



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When you create a text topics object in Visual Analytics, the appropriate stop list (specified by your language choice) is loaded into CAS. The stop list can be previewed using the Data bar in Environment Manager.

TERM	ROLE
withal	PN
within	ADV
within	PPOS
within	PN
without	ADV
without	CONJ
without	PPOS

If your data source does not contain a unique row identifier, you can create one using the Unique identifier transform, in the Row Transforms group, in SAS Data Studio. For more information about the Unique identifier transform, see “Generating a Unique Identifier” in the *SAS® Viya® 3.4: Data Preparation* documentation.

## Text Analytics: Data Shape

Order	OrderNote
00001NL6	00004RPC in Boise placed an order. 16 unit(s) of Toy Figure(s) were ordered. 00004RPC is neutral with us.
000024X0	00002L9N in Birmingham placed an order. 8 unit(s) of Toy Figure(s) were ordered. They are unhappy. They are at risk of dropping us as a supplier.
0000291E	This order is for 00004RPF located in Boise. They ordered 1 unit(s) of Toy Game(s). Currently, they are pleased.

## How It Works: Text Analytics

When you create a text topics object in Visual Analytics, the following steps occur:

- Unstructured text is parsed into individual terms.
- Terms are compared with the stop list, if available.
- Any terms found in the stop list are removed from analysis.
- Remaining terms are analyzed to determine topics.

A *stop list* is a table of common words that are ignored in text analytics.

**Note:** If the stop list is not loaded when text analytics is performed, it is loaded automatically using just-in-time loading.

The following table lists common phrases used with text analytics:

<b>Documents</b>	Unstructured text. These are displayed in the documents list table and are a single row in the data source.
<b>Terms</b>	Words or phrases. These are displayed in the terms word cloud.
<b>Topics</b>	Words that often appear together in documents. These are displayed in the topics bar chart.
<b>Topic term weight</b>	Indicates the importance of the word in the topic.
<b>Term roles</b>	Identifies terms by their parts of speech (noun, verb, adjective), identifies groups of nouns as single terms, and identifies text entities (names, address, phone numbers).
<b>Stem words</b>	Different forms of a given word. For example, <i>sell</i> is the stem word of the following: <i>sell, sells, selling, sold</i> .

## How It Works: Sentiment Analysis

When you perform sentiment analysis in Visual Analytics, the following steps occur:

- Relevant terms are scored.
  - Positive words are given a score of 1.
  - Neutral words are given a score of 0.5.
  - Negative words are given a score of 0.
- Scores are aggregated for each document to determine overall sentiment.

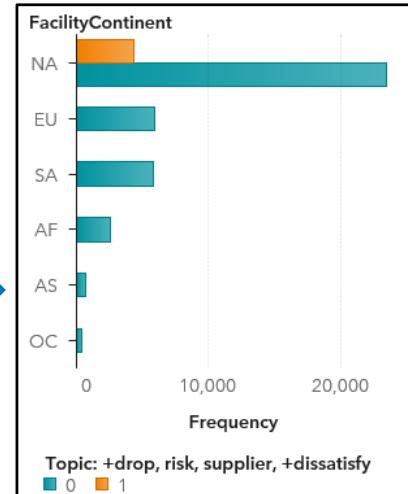
A total sentiment score above 0.5 represents a positive sentiment, a score equal to 0.5 represents a neutral sentiment, and a score below 0.5 represents a negative sentiment.

## Text Analytics: Derive Topics

You can create derived data items to further analyze the topics produced from text analytics.

Topics:  
+drop, risk, supplier, +dissatisfy:  
Topic: +drop, risk, supplier, +dissatisfy

▼ Derived (Text Topics: July 30, 2018 0...  
■ Topic: +drop, risk, supplier... - 2



The value of the derived topic is either 1 (if the document is included in the topic) or 0 (if the document is not included in the topic). In addition, you can derive a data item that contains the relevance of the document in the topic.

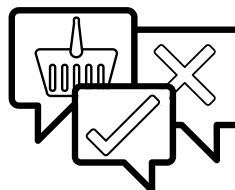
## Business Scenario: Orders



The Customer Loyalty team at Orion Star has requested an analysis of notes taken when a customer placed an order.

They would like to see a list of common topics and analyze the sentiment of the notes. In addition, the Customer Complaint Department is interested in those orders that produced notes with negative sentiment.

cat  
bees dog pig  
monkey snake  
rabbit fish





## Analyzing a Text Analysis Data Source

---

This demonstration illustrates how to create a text topics object in a report.

1. From the browser window, sign in to SAS Viya for Learners.
  2. Open **VA2- Demo6.1**.
    - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
    - b. Right-click **VA2- Demo6.1** and select **Edit**.
- The report opens in SAS Visual Analytics.
3. View the structure of the table.
    - a. At the top of the canvas, click the **Details** tab.

Order	▲ OrderNote
00001NL6	00004RPC in Boise placed an order. 16 unit(s) of Toy Figure(s) were ordered. 00004RPC is neutral with us.
000024X0	00002L9N in Birmingham placed an order. 8 unit(s) of Toy Figure(s) were ordered. They are unhappy. They are at risk of dropping us as a supplier.
0000291E	This order is for 00004RPF located in Boise. They ordered 1 unit(s) of Toy Game(s). Currently, they are pleased.
00003MNR	000052GF in Pittsburgh placed an order. 5 unit(s) of Toy Figure(s) were ordered. They are dissatisfied. We are at risk of being dropped as their supplier.
00003NDE	

This table contains details about orders. Each row represents an order placed by a customer.

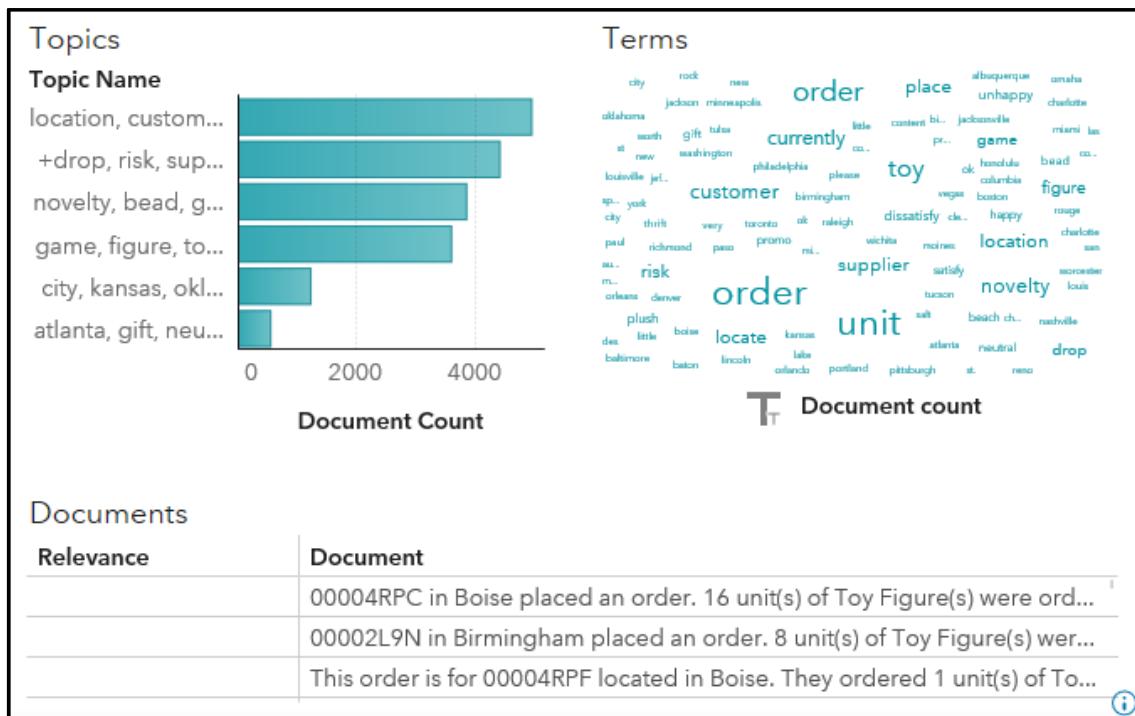
The **Order** field represents the unique order number, and the **OrderNote** field contains a comment about the order (if any).

- b. Click the **Text Topics** tab.
4. View a text topics object.
  - a. In the left pane, click **Data**.

Order - 43K

The **Order** column is specified as a unique identifier column for the text topics object.

- b. On the canvas, click the text topics object to select it, if necessary.



The bar chart in the upper left corner shows the topics identified from the **OrderNote** field and lists the document count for each topic.

The word cloud in the upper right corner shows the relevant terms for all documents.

The table at the bottom shows the relevance and document details.

- c. In the lower right corner of the text topics object, place your mouse pointer on

Only the top 1000 documents have been returned.

- d. In the upper right corner of the text topics object, click (**Maximize**) to view details.  
e. At the bottom of the object, verify that **Topics** is selected for the details table.

Topics	Terms
Topic Name	Document Count
location, customer, city, novelty	4944
+drop, risk, supplier, +dissatisfy	4404
novelty, bead, gift, promo	3847
game, figure, toy, neutral	3591

Each topic is listed, as well as the number of documents in that topic.

**Note:** Additional details, such as the number of negative, neutral, and positive documents, are displayed if sentiment analysis is enabled.

Topic Name	Negative Document Count	Neutral Document Count	Positive Document Count	Document Count
location, customer, city, novelty	1412	2228	1304	4944
+drop, risk, supplier, +dissatisfy	4374	30	0	4404
novelty, bead, gift, promo	719	2095	1033	3847
game, figure, toy, neutral	410	1751	1430	3591

- f. In the details table, click **Terms**.

Term	Document count
order	23195
unit	23195
order	15340
toy	13650

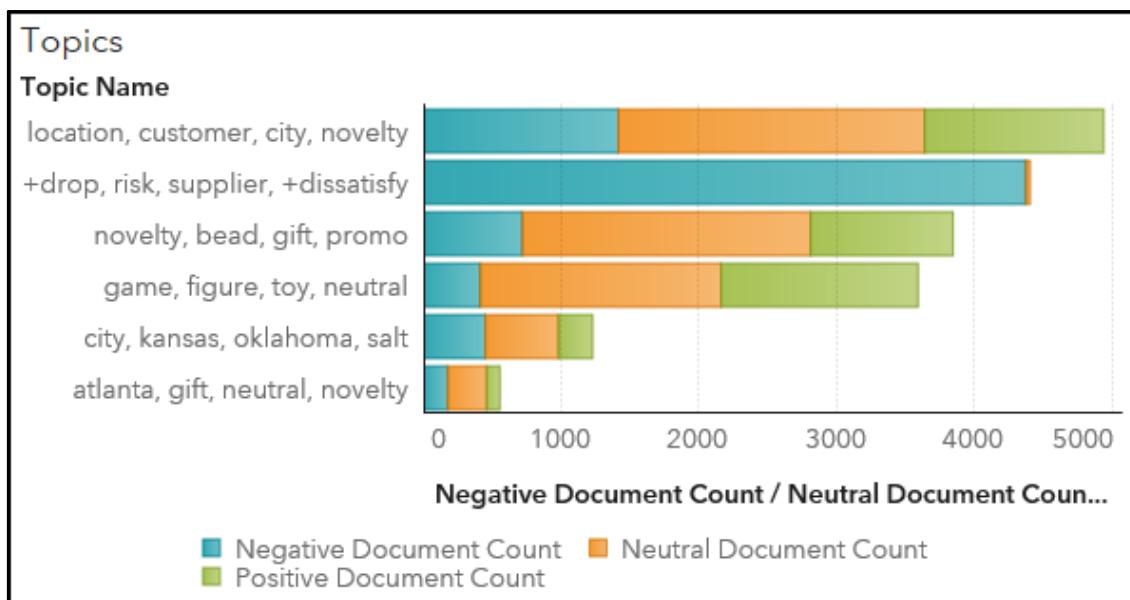
All terms are listed, as well as the number of documents in which the term appears.

**Note:** Additional details, such as the role of the term, are displayed if certain advanced options are enabled.

Term	Document count	Role
order	23195	Verb
unit	23195	Noun
order	15340	Noun
toy	13650	Proper noun

- g. In the upper right corner of the text topics object, click  (Restore).
5. Modify options for the text topics object.
- In the right pane, click **Options**.
  - For the General group, select **Analyze document sentiment**.

The bar chart updates to show each topic grouped by sentiment:



In sentiment analysis, each word in the document is assigned a value based on the connotation of that word. For example, a word like *bad* evokes a negative connotation, whereas a word like *good* evokes a positive connotation. The values are aggregated for the entire document to determine a sentiment score for the document.

A sentiment score of less than 0.5 indicates a negative document, a score of 0.5 indicates a neutral document, and a score greater than 0.5 indicates a positive document.

## 6. View details about a topic.

- In the bar chart, click the bar for the **+drop, risk, supplier, +dissatisfy** topic.

The word cloud updates to show terms in that topic:



- In the word cloud, click the **dissatisfy** term.

The table at the bottom updates to show the documents that contain that term and their associated sentiment.

Documents		Sentiment
Relevance	Document	
0.6053	Customer: 00002I65, Location: Portland. 3 unit(s) of Toy Game(s) wer...	0.31
0.6006	This order is for 00002GOK located in Portland. 18 unit(s) of Toy Figur...	0.31
0.5997	00001KF1 in Portland placed an order. They ordered 2 unit(s) of Toy ...	0.31

We might want to provide some context to these negative documents. We can do this by adding additional data items to the text topics object.

- c. In the right pane, click **Roles**.
- d. For the Document details role, select **Add**  $\Rightarrow$  **OrderTotal**  $\Rightarrow$  **OK**.

The total order amount is added to the Documents table to put each negative comment into perspective.

Documents		Sentiment	OrderTotal
Relevance	Document		
0.6053	Customer: 00002I65, Location: Portland. 3 unit(s) of Toy ...	0.31	901
0.6006	This order is for 00002GOK located in Portland. 18 unit(s...)	0.31	1,310
0.5997	00001KF1 in Portland placed an order. They ordered 2 u...	0.31	222

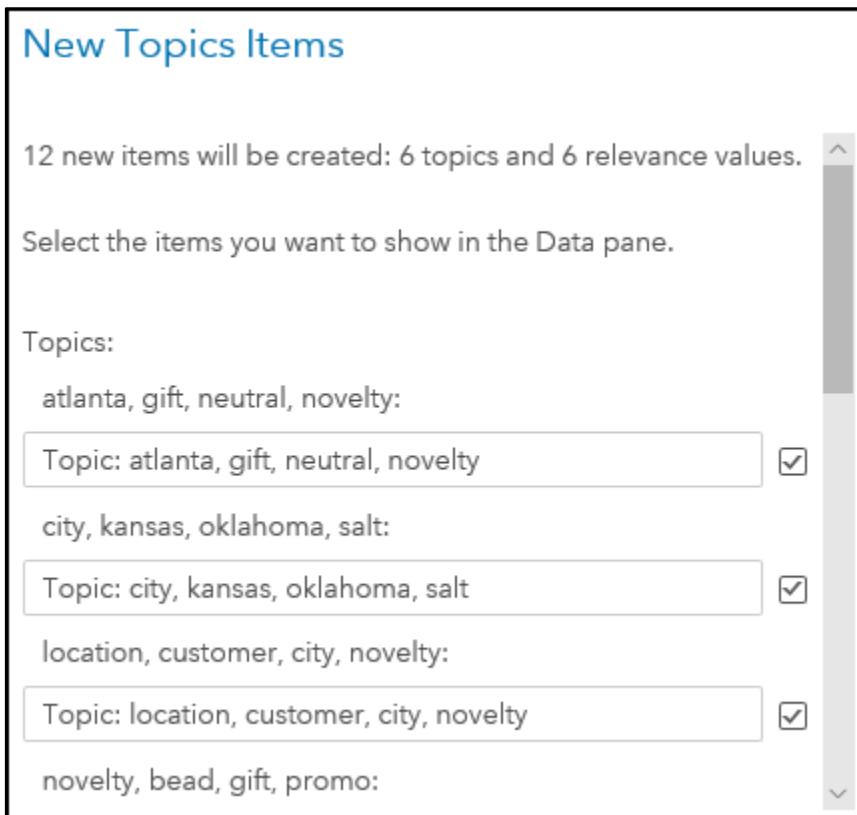
- e. Select the first row in the Documents table (with **OrderTotal=901**).
- f. Right-click the row and select **View full document**.

A new window displays the text of the full document.

Customer: 00002I65, Location: Portland. 3 unit(s) of Toy Game(s) were ordered.  Currently, they are dissatisfied with us as their supplier. They are at risk of dropping us as a supplier.	901
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----

- g. Click **Close**.

7. Derive new data items for topics.
- a. Right-click the text topics object and select **Derive topics**.



Twelve items can be created, two for each topic created from text analytics: one for topics and one for relevance.

Deriving topics from the text topics object creates a derived data item whose value is 1 (if the document for that row appears in the topic) or 0 (if the document for that row does not appear in the topic).

Deriving relevance from the text topics object creates a derived data item whose value is equal to the relevance of the document in the topic.

- b. In the New Topics Items window, clear all check boxes except the one next to **Topic: +drop, risk, supplier, +dissatisfy**.
- c. Click **OK**.
- d. In the left pane, click **Data**.

A new group is added to the Data pane.

▼ Derived (Text Topics: July 30, 2018 0...

■ Topic: +drop, risk, supplier... - 2

- e. In the left pane, click **Objects**.
- f. Drag the **Bar Chart** object, from the Graphs group, to the right side of the canvas.

- g. In the right pane, click **Roles**.
- h. For the Category role, select **Add**  $\Rightarrow$  **FacilityContinent**.
- i. For the Measure role, select **Frequency**  $\Rightarrow$  **OrderTotal**.
- j. For the Group role, select **Add**  $\Rightarrow$  **Topic: +drop, risk, supplier, +dissatisfy**.

The bar chart should resemble the following:



It seems as if all of our comments in the **+drop, risk, supplier, +dissatisfy** topic come from NA (North America).

8. Save the report in **My Folder**.
  - a. In the upper right corner, click (**Menu**) and select **Save As**.
  - b. Navigate to **My Folder**.
  - c. Click **Save**.

**End of Demonstration**

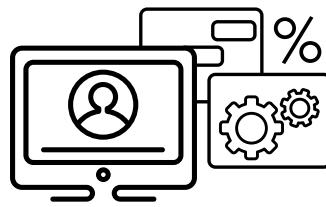
## Business Scenario: Course Descriptions



The Education Division at SAS has requested analysis of course descriptions.

They would like to see a list of common topics and analyze the sentiment of each course description.

cat    dog    pig  
bees                 monkey    snake  
                    rabbit      fish





## Practice

---

### 1. Analyzing a Text Analysis Data Source

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2- Exercise6.1**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise6.1** and select **Edit**.

- c. View data item properties and answer the following question:

Which data item would be the unique identifier column? The document collection?

**Answer:** \_\_\_\_\_

- d. Assign the appropriate data items to the roles for the text topics object.

- e. Add sentiment analysis.

- f. Answer the following questions:

Which sentiment (negative, neutral, or positive) is assigned to a majority of course descriptions?

**Answer:** \_\_\_\_\_

How many documents are in the **visual, analytics, sas, +teach** topic?

**Answer:** \_\_\_\_\_

What are the top two terms for all topics? Does that make sense given the data?

**Answer:** \_\_\_\_\_

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

**End of Practices**

## 6.2 Solutions

---

### Solutions to Practices

#### 1. Analyzing a Text Analysis Data Source

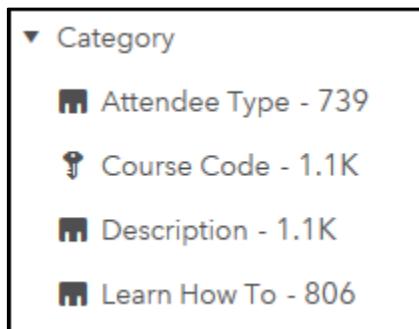
- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2- Exercise6.1**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2- Exercise6.1** and select **Edit**.

The report opens in SAS Visual Analytics.
- c. View data item properties and answer the question.
  - 1) In the left pane, click **Data**.
  - 2) Answer the following question:

Which data item would be the unique identifier column? The document collection?

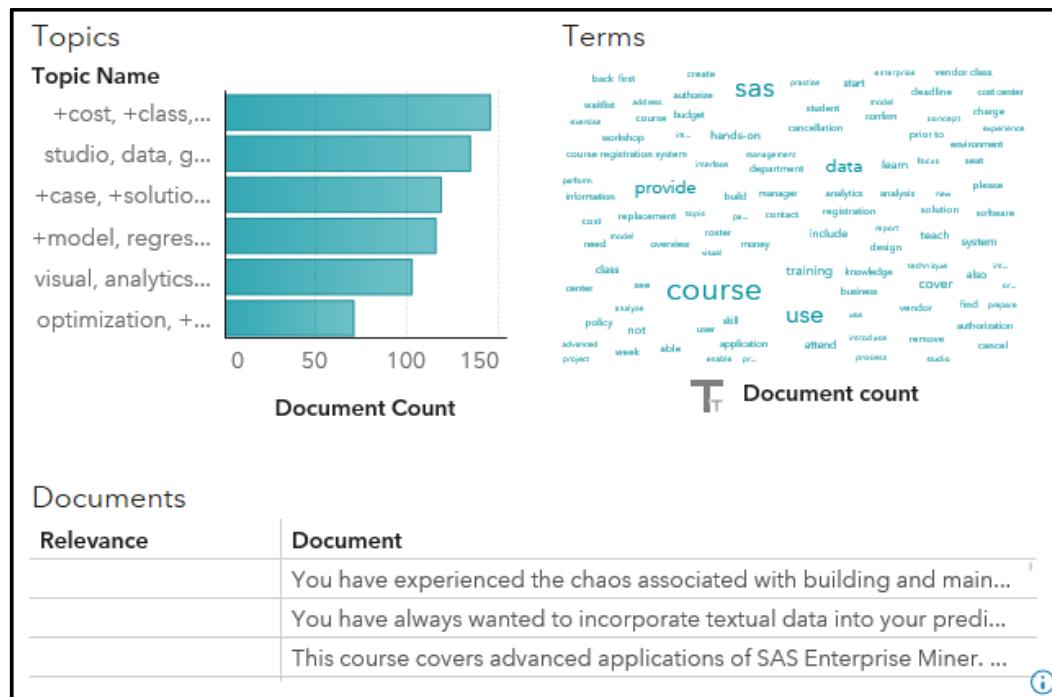
**Answer:** Course Code would be the unique identifier column because it has many unique values and acts as an identifier for the course information.

Description would be the document collection because it contains unstructured text.



- d. Assign the appropriate data items to the roles for the text topics object.
  - 1) In the text topics object, for the **Select a language** field, select **English**.
  - 2) Click **Please specify a unique row identifier**.
  - 3) Select **Course Code**.
  - 4) In the right pane, click **Roles**.
  - 5) For the Document collection role, select **Add** ⇒ **Description**.

The text topics object should resemble the following:



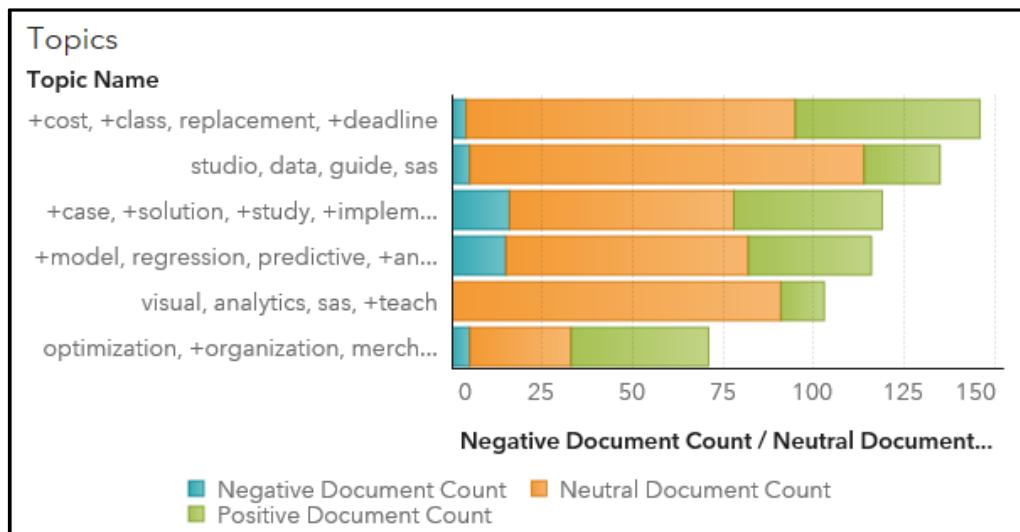
e. Add sentiment analysis.

- 1) In the right pane, click **Options**.
- 2) In the General group, select **Analyze document sentiment**.

f. Answer the following questions:

Which sentiment (negative, neutral, or positive) is assigned to a majority of course descriptions?

**Answer: Neutral**



- View the bar chart to see each topic grouped by sentiment.

How many documents are in the **visual, analytics, sas, +teach** topic?

**Answer:** 103

Topics	Terms			
Topic Name	Negative...	Neutral...	Positive...	Document...
visual, analytics, sas, +teach	0	91	12	103

- In the upper right corner of the text topics object, click  (Maximize) to view details.
- At the bottom of the object, verify that Topics is selected for the details table.
- In the upper right corner of the text topics object, click  (Restore).

What are the top two terms for all topics? Does that make sense given the data?

**Answer:** course and sas. This makes sense because these are descriptions for SAS courses.

Topics	Terms
Term	Document count
course	862
sas	764

- In the upper right corner of the text topics object, click  (Maximize) to view details.
- At the bottom of the object, select Terms for the details table.
- In the upper right corner of the text topics object, click  (Restore).

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

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

**End of Solutions**

## Solutions to Activities and Questions

### 6.01 Activity – Correct Answer

What two things are needed for the text topics object?

This data item contains a value that is unique for each row of the data source.



This determines which stop list is used for text analytics.

Please identify the language of the data source.

Select a language ▾

Please specify a unique row identifier

## Practice Review

### 6.1 Analyzing a Text Analysis Data Source – Solution

Which data item would be the unique identifier column?

**Course Code, because it has many unique values and acts as an identifier for the course information**

Category
Attendee Type - 739
Course Code - 1.1K
Description - 1.1K
Learn How To - 806

Which data item would be the document collection?

**Description, because it contains unstructured text**

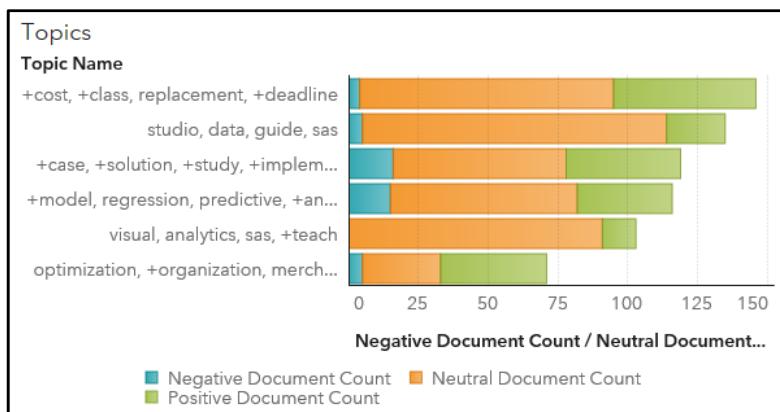
16


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### 6.1 Analyzing a Text Analysis Data Source – Solution

Which sentiment (negative, neutral, or positive) is assigned to a majority of course descriptions?

**Neutral**



17


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## 6.1 Analyzing a Text Analysis Data Source – Solution

How many documents are in the **visual, analytics, sas, +teach** topic?

**103**

Topics	Terms			
Topic Name	Negative...	Neutral...	Positive...	Document...
visual, analytics, sas, +teach	0	91	12	103

What are the top two terms for all topics?

**course and sas**

Does that make sense given the data?

**Yes, because these are descriptions for SAS courses**

Topics	Terms
Term	Document count
course	862
sas	764



# Lesson 7 Creating Advanced Data Items

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# 7.1 Creating Calculated Items

## Objectives

- List the types of data items that can be created in SAS Visual Analytics.
- Describe the process of creating a numeric calculated item.
- Describe the process of creating a character calculated item.
- Describe the process of creating a date calculated item.

3



## Creating Data Items

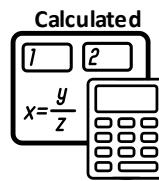
The following data items can be created in Visual Analytics:



Duplicate



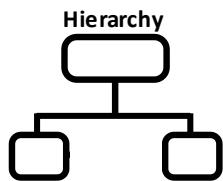
Distinct count



Calculated



Geography



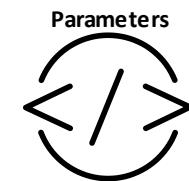
Hierarchy



Custom category



Derived items



Parameters

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4



Duplicate	<p>Both measures and categories can be duplicated (copied) in Visual Analytics. Duplicating measures enables you to compare the data using different aggregations in a table or graph or change the classification to a category for grouping other values in tables or graphs. Duplicating datetime values enables you to apply different formats to the values for use in tables or graphs. Duplicating calculated items enables you to make variations to a calculation. For more information about duplicating data items, see “Working with Data Items in a Report” in the <i>SAS® Visual Analytics 8.3: Working with Report Data</i> documentation.</p>				
Distinct count	<p>A distinct count counts the number of distinct values of a category data item as an aggregated measure. This means that the calculation changes depending on the other data items available in the graph. For example, you can see the number of orders placed for each gender or the number of orders placed for each country by creating a distinct count from Order ID. For more information about creating distinct counts, see “Working with Data Items in a Report” in the <i>SAS® Visual Analytics 8.3: Working with Report Data</i> documentation.</p> <p><b>Note:</b> If the category contains missing values, the distinct count is increased by 1. A configuration setting can modify this behavior.</p>				
Calculated	<p>The following types of calculated items can be created:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; padding: 5px;"><b>Calculated item</b></td><td style="width: 80%; padding: 5px;">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.</td></tr> <tr> <td style="padding: 5px;"><b>Aggregated measure</b></td><td style="padding: 5px;">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.</td></tr> </table> <p>For more information about creating calculated data items, see “Working with Calculated Items in a Report” in the <i>SAS® Visual Analytics 8.3: Working with Report Data</i> documentation. For more information about operators, see “Reference: Operators for Data Expressions” in the <i>SAS® Visual Analytics 8.3: Working with Report Data</i> documentation.</p>	<b>Calculated item</b>	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.	<b>Aggregated measure</b>	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.
<b>Calculated item</b>	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.				
<b>Aggregated measure</b>	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.				
Geography	<p>A geography data item is a category whose values are mapped to geographical locations or regions. Geography data items can be used with geo maps and other report objects. Geography data items can be created using predefined roles (for example, country names), by associating latitude and longitude coordinates with the values (custom), or by associating polygon data from a separate data source with map regions (custom). For more information about creating geography data items, see “Working with Geography Data Items” in the <i>SAS® Visual Analytics 8.3: Working with Report Data</i> documentation.</p>				

Hierarchy	<p>A hierarchy is a defined arrangement of category data items based on a parent-child relationship. In many cases, the levels of the hierarchy are arranged with the more general information at the top (for example, year) and the more specific information at the bottom (for example, month). Hierarchies enable you to add drill-down functionality to graphs and tables. Hierarchies that consist of all geographic data items are considered geographic hierarchies and can be used in geo maps.</p> <p><b>Note:</b> You can create a date hierarchy from a date data item. By default, a date hierarchy has levels for year, quarter, month, and day. By default, a date hierarchy <b>created from a datetime data item</b> has levels for year, quarter, month, day, hour, minute, and second. For more information about hierarchies, see “Working with Hierarchies in a Report” in the SAS® Visual Analytics 8.3: <i>Working with Report Data</i> documentation.</p>														
Custom category	<p>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 8.3: <i>Working with Report Data</i> documentation.</p>														
Derived items	<p>Derived data items are aggregated measures that display values for the measure and the formula type on which the derived item is based. The following types of derived items can be created from category data items:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;"><b>Distinct count</b></td><td style="padding: 5px;">Displays the number of distinct values for the selected category. For more information, see the distinct count definition above.</td></tr> <tr> <td style="padding: 5px;"><b>Count</b></td><td style="padding: 5px;">Displays the number of nonmissing values for the selected category.</td></tr> <tr> <td style="padding: 5px;"><b>Number missing</b></td><td style="padding: 5px;">Displays the number of missing values for the selected category.</td></tr> </table> <p>The following types of derived data items can be created from measure data items:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;"><b>Cumulative total</b></td><td style="padding: 5px;">Displays a running total of all the values for the measure on which it is based.</td></tr> <tr> <td style="padding: 5px;"><b>Data suppression</b></td><td style="padding: 5px;">Obscures aggregated data if individual data values could easily be inferred. Data suppression replaces all values for the measure on which it is based with an asterisk (*) unless a value represents the aggregation of a specified minimum number of values. For more information, see “Reference: Operators for Data Expressions” in the SAS® Visual Analytics 8.3: <i>Working with Report Data</i> documentation</td></tr> <tr> <td style="padding: 5px;"><b>Difference from previous period</b></td><td style="padding: 5px;">Displays the difference between the value for the current time period and the value for the previous time period.</td></tr> <tr> <td style="padding: 5px;"><b>Difference from previous parallel period</b></td><td style="padding: 5px;">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> </table>	<b>Distinct count</b>	Displays the number of distinct values for the selected category. For more information, see the distinct count definition above.	<b>Count</b>	Displays the number of nonmissing values for the selected category.	<b>Number missing</b>	Displays the number of missing values for the selected category.	<b>Cumulative total</b>	Displays a running total of all the values for the measure on which it is based.	<b>Data suppression</b>	Obscures aggregated data if individual data values could easily be inferred. Data suppression replaces all values for the measure on which it is based with an asterisk (*) unless a value represents the aggregation of a specified minimum number of values. For more information, see “Reference: Operators for Data Expressions” in the SAS® Visual Analytics 8.3: <i>Working with Report Data</i> documentation	<b>Difference from previous period</b>	Displays the difference between the value for the current time period and the value for the previous time period.	<b>Difference from previous parallel period</b>	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.
<b>Distinct count</b>	Displays the number of distinct values for the selected category. For more information, see the distinct count definition above.														
<b>Count</b>	Displays the number of nonmissing values for the selected category.														
<b>Number missing</b>	Displays the number of missing values for the selected category.														
<b>Cumulative total</b>	Displays a running total of all the values for the measure on which it is based.														
<b>Data suppression</b>	Obscures aggregated data if individual data values could easily be inferred. Data suppression replaces all values for the measure on which it is based with an asterisk (*) unless a value represents the aggregation of a specified minimum number of values. For more information, see “Reference: Operators for Data Expressions” in the SAS® Visual Analytics 8.3: <i>Working with Report Data</i> documentation														
<b>Difference from previous period</b>	Displays the difference between the value for the current time period and the value for the previous time period.														
<b>Difference from previous parallel period</b>	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.														

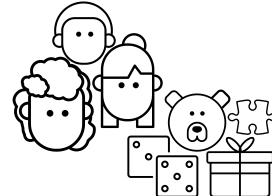
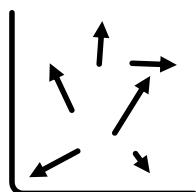
	<b>Moving average</b>	Displays a moving average (rolling average) for the measure on which it is based. The moving average calculates the average for each value with the specified number of preceding values
	<b>Percent difference from previous period</b>	Displays the percentage difference between the value for the current time period and the value for the previous time period.
	<b>Percent difference from previous parallel period</b>	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.
	<b>Percent of subtotals</b>	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.  <b>Note:</b> The Percent of subtotals derived item is available for use only in crosstabs.  <b>Note:</b> The Percent of subtotals derived item is relative to the subset of data that is selected by your filters and ranks.
	<b>Percent of total – sum</b>	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.  <b>Note:</b> The Percent of total – sum derived item is relative to the subset of data that is selected by your filters and ranks.
	<b>Period to date</b>	Displays the aggregated value for the current time period and all of the previous time periods within a larger time interval.
	<b>Year to date</b>	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).
	<b>Year to date growth</b>	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).

	<b>Year over year growth</b>	<p>Displays the percentage difference between the current time period and an equivalent time period from the previous year. The year-over-year calculation subsets the data for each year using today's date (where today is evaluated each time you view the report).</p>
		<p>For more information about derived items, see "Working with Data Items in a Report" in the <i>SAS® Visual Analytics 8.3: Working with Report Data</i> documentation.</p>
<b>Parameters</b>		<p>A parameter is a variable whose value can be changed and that can be referenced by other report objects. Parameters can be used in control objects in Visual Analytics. When the value of the control changes, the parameter is updated with that value, and any report objects that reference that parameter are updated as well. Parameters can be used in calculations, display rules, filters, ranks, URLs, and text objects. For more information about parameters, see "Working with Parameters in Reports" in the <i>SAS® Visual Analytics 8.3: Working with Report Data</i> documentation.</p>

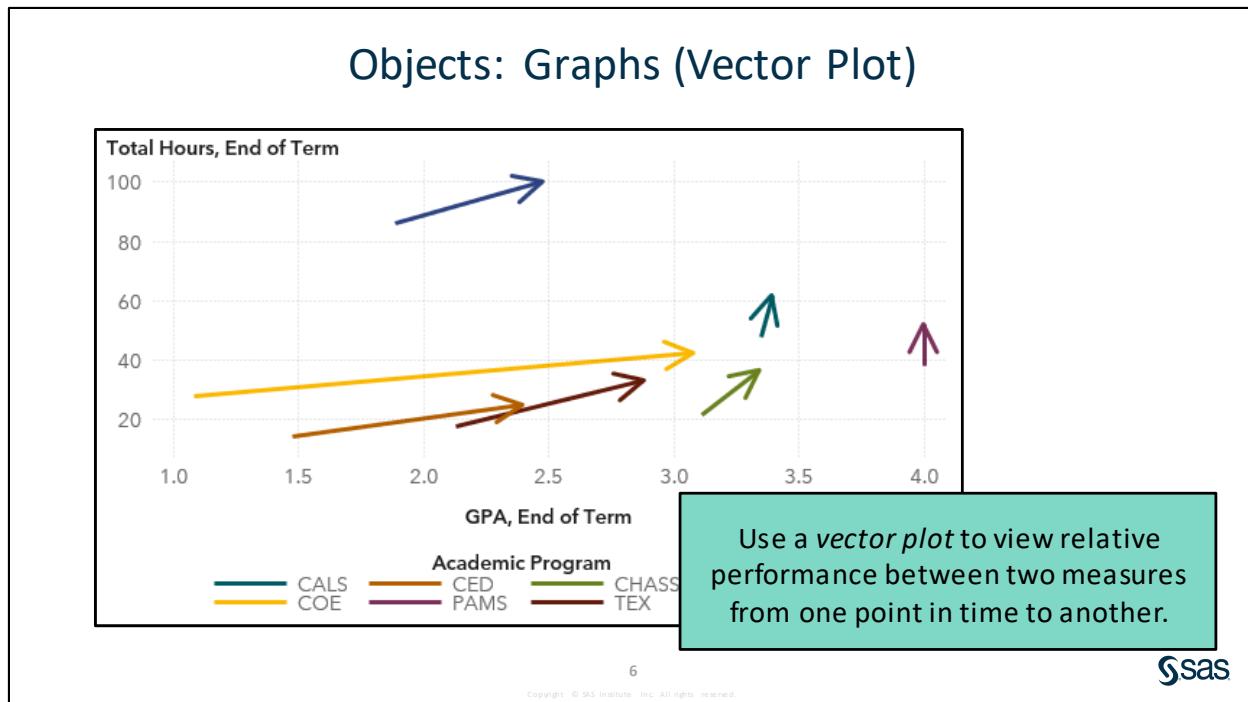
## Business Scenario: Toy Customers

The head of Manufacturing at Insight Toy Company has requested an analysis of changes in product quality and customer satisfaction.

Specifically, he wants to understand how these metrics change from January to December for each product line. We need to create four new data items to calculate each metric in the specified months.



sas

**Vector plot**

A vector plot shows the change in the value of two measures using directed line segments (vectors) to represent both the direction and magnitude of the change at each point. Each set of measures shows information about the starting point and the ending point.

## 7.01 Activity

Given the classification and values of **Transaction Date**, **Customer Satisfaction**, and **Product Quality**, how would you find the product quality for January?

- ▼ Category
  - 📅 Transaction Date - 12
- ▼ Measure
  - ❖ Customer Satisfaction
  - ❖ Product Quality

Transaction Date	Customer Satisfaction	Product Quality	Product Quality (January)
Jan2017	50%	87%	87%
Feb2017	49%	87%	.
Mar2017	50%	87%	.
Apr2017	46%	87%	.
May2017	47%	87%	.
Jun2017	47%	87%	.
Jul2017	45%	87%	.
Aug2017	45%	87%	.
Sep2017	45%	86%	.
Oct2017	47%	87%	.
Nov2017	47%	86%	.
Dec2017	47%	86%	.

Sas



## Creating a Numeric Calculated Item

This demonstration illustrates how to create a numeric calculated item and a vector plot in a report.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2-Demo7.1a**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2-Demo7.1a** and select **Edit**.

The report opens in SAS Visual Analytics.

3. View roles available for the vector plot and the data items available in the table.
  - a. In the canvas, click the vector plot to select it, if necessary.
  - b. In the right pane, click **Roles**.

The screenshot shows the 'Roles' pane in SAS Visual Analytics. It contains four expandable sections: 'X axis\*', 'Y axis\*', 'X Origin\*', and 'Y Origin\*'. Each section has a blue plus sign icon followed by the word 'Add'.

- ▼ X axis\*
- + Add
- ▼ Y axis\*
- + Add
- ▼ X Origin\*
- + Add
- ▼ Y Origin\*
- + Add

The vector plot requires two groups of measures: one set for the X axis and one set for the Y axis. For each set, a measure is required for the start time (origin) and a measure is required for the end time.

- c. In the left pane, click **Data**.

The screenshot shows the Data pane with two main sections: Category and Measure. Under Category, there are three items: Product Brand - 2, Product Line - 8, and Transaction Date - 12. Under Measure, there are six items: Customer Satisfaction, Customer Satisfaction (December), Customer Satisfaction (January), Frequency, Product Quality, and Product Quality (December). Each item has a small icon next to it.

**Transaction Date** is in the format MMMYYYY. We have customer order information for one year. For the vector plot, we would like to compare **Product Quality** and **Customer Satisfaction** for two points during the year: January and December.

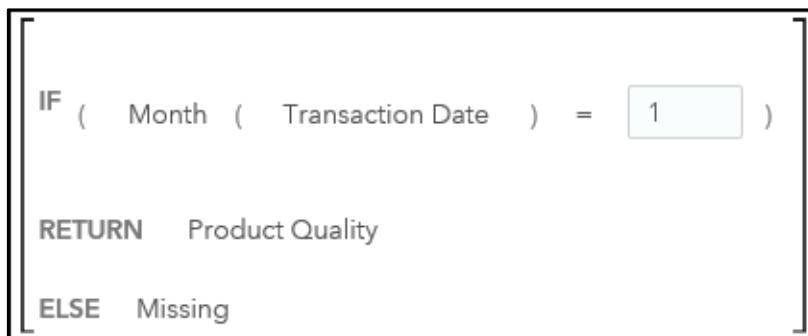
We have already calculated **Customer Satisfaction** at both time points (January and December) and **Product Quality** for December. We still need to calculate **Product Quality** for January.

4. Calculate Product Quality for January.
  - a. On the Data pane, select **New data item**  $\Rightarrow$  **Calculated item**.
  - b. In the **Name** field, enter **Product Quality (January)**.
  - c. For the **Result Type** field, verify that **Automatic (Numeric)** is selected.
  - d. For the **Format** field, click **(Edit)**.
    - 1) In the Format window, select **Percent**.
    - 2) For the **Width** field, verify that **12** is specified.
    - 3) For the **Decimals** field, verify that **2** is specified.
    - 4) Click **OK**.
  - e. On the left side of the window, click **Operators**.
 

Data Items	Operators
------------	-----------
  - f. Expand the **Boolean** group.

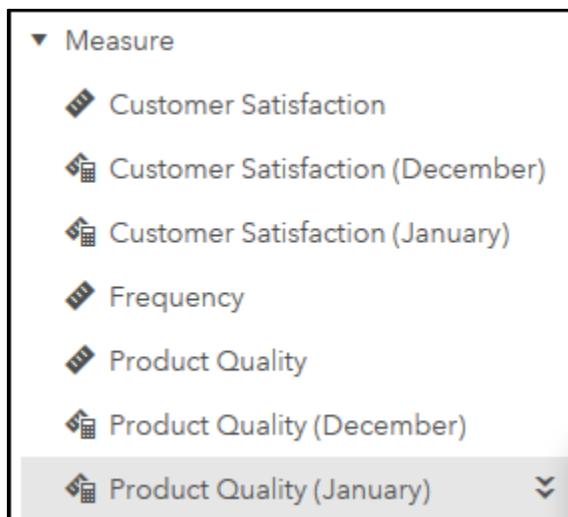
- g. Double-click the **IF...ELSE** operator to add it to the expression.
- h. Expand the **Comparison** group.
- i. Drag **x=y** to the **condition** field in the expression.
- j. Expand the **Date and Time** group.
- k. Drag **Month** to the **number** field on the left of the equal sign.
- l. Right-click the **No selection** field in the expression and select **Replace with**  $\Rightarrow$  **Transaction Date**.
- m. Enter **1** in the **number** field on the right of the equal sign.
- n. Right-click the **number** field for the **RETURN** operator and select **Replace with**  $\Rightarrow$  **Product Quality**.
- o. Right-click the **number** field for the **ELSE** operator and select **Replace with**  $\Rightarrow$  **Missing Value**.

The expression should resemble the following:



- p. In the lower right corner of the window, click **OK**.

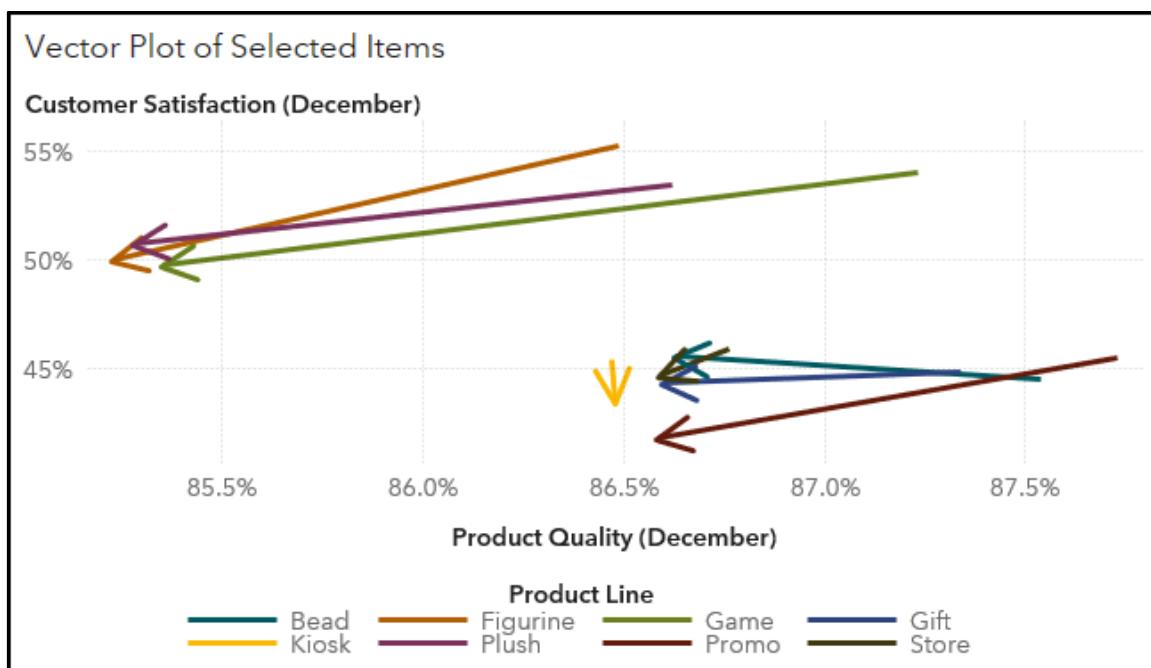
The new data item is added to the Data pane.



- q. Next to **Product Quality (January)**, click (**Edit properties**).
- r. For the **Aggregation** field, select **Average**.

5. Assign data items to the vector plot.
  - a. In the canvas, click the vector plot to select it.
  - b. In the right pane, click **Roles**, if necessary.
  - c. For the X axis role, select **Add**  $\Rightarrow$  **Product Quality (December)**.
  - d. For the Y axis role, select **Add**  $\Rightarrow$  **Customer Satisfaction (December)**.
  - e. For the X Origin role, select **Add**  $\Rightarrow$  **Product Quality (January)**.
  - f. For the Y Origin role, select **Add**  $\Rightarrow$  **Customer Satisfaction (January)**.
  - g. For the Group role, select **Add**  $\Rightarrow$  **Product Line**.
  - h. For the Data tip values role, click **Add**.
  - i. Select **Product Brand** and click **OK**.

The vector plot should resemble the following:



The grouping of arrows in the upper left corner are product lines in the Toy brand. For these product lines, there is a negative change in both quality and satisfaction over the year.

The grouping of arrows in the lower right corner are product lines in the Novelty brand. For these product lines, most have also declined (in both quality and satisfaction) over the year. On the other hand, the Kiosk product line has a marginal improvement in **Product Quality** but still a reduction in **Customer Satisfaction**. We might need to further analyze the products to determine why **Customer Satisfaction** is trending down.

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

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

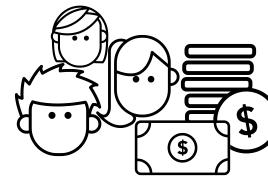
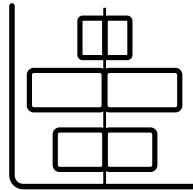
**End of Demonstration**

## Business Scenario: Employees



The head of Human Resources at Orion Star has requested an analysis of salaries.

Specifically, she wants to understand how salaries differ by gender and job title. You need to create three new data items: one that displays gender (male or female) and two that calculate salary for each gender.



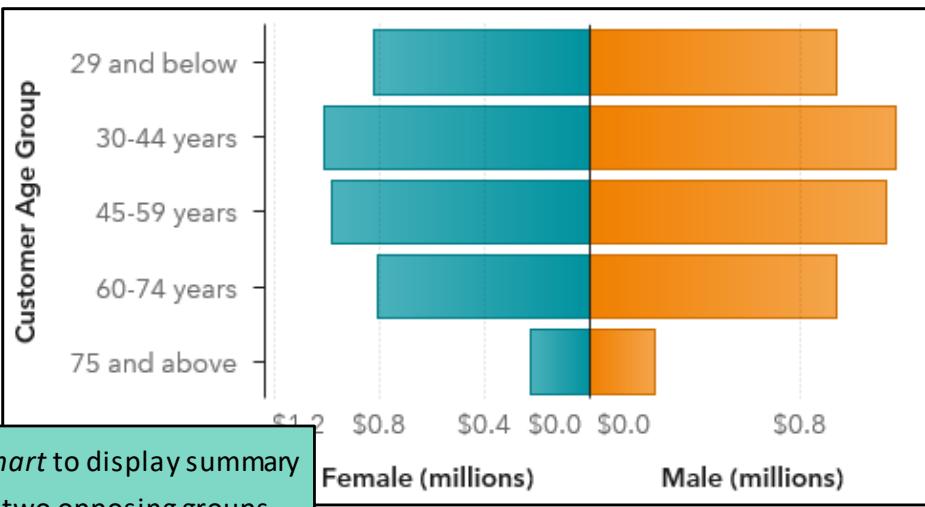
Sas

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As a challenge, you need to calculate employee tenure. For retired employees, we want to know how many years they worked for the company as of their retirement date. For current employees, we want to know how many years they have worked for the company as of today's date.

## Objects: Graphs (Butterfly Chart)



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### Butterfly chart

A butterfly chart (also known as a *tornado chart*) displays two bars with a shared category axis, where the baselines of the two bar charts are located in the center of the chart.



## Practice

---

### 1. Creating a Numeric Calculated Item

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2-Exercise7.1a**.
  - Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - Right-click **VA2-Exercise7.1a** and select **Edit**.
- Create a new data item, **Salary (Female)**, that averages salaries for female employees.  
Hint: **Employee Gender** has the values *Male* and *Female* and can be used to calculate the new data item.
- Assign the following data items to the specified roles for the butterfly chart:

Category	Job Title
Measure (bar)	Salary (Female)
Measure (bar 2)	Salary (Male)

- Answer the following questions:

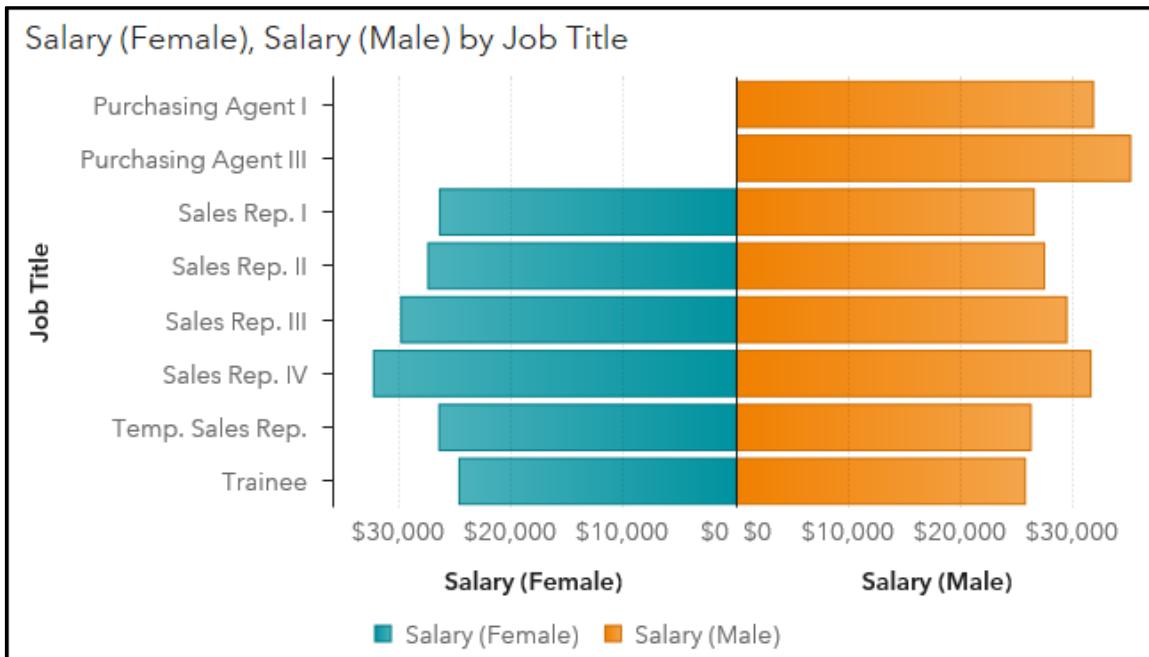
Are there any jobs that do not have female employees?

**Answer:** \_\_\_\_\_

Are there any jobs in which females make more than males (on average)?

**Answer:** \_\_\_\_\_

The butterfly chart should resemble the following:



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

### Challenge (Optional)

#### 2. Creating an Advanced Numeric Calculated Column

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2-Exercise7.1a**.
- 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- 2) Right-click **VA2-Exercise7.1a** and select **Edit**.
- Create a new data item, **Employee Tenure**, that calculates how many years each employee has been with the company.

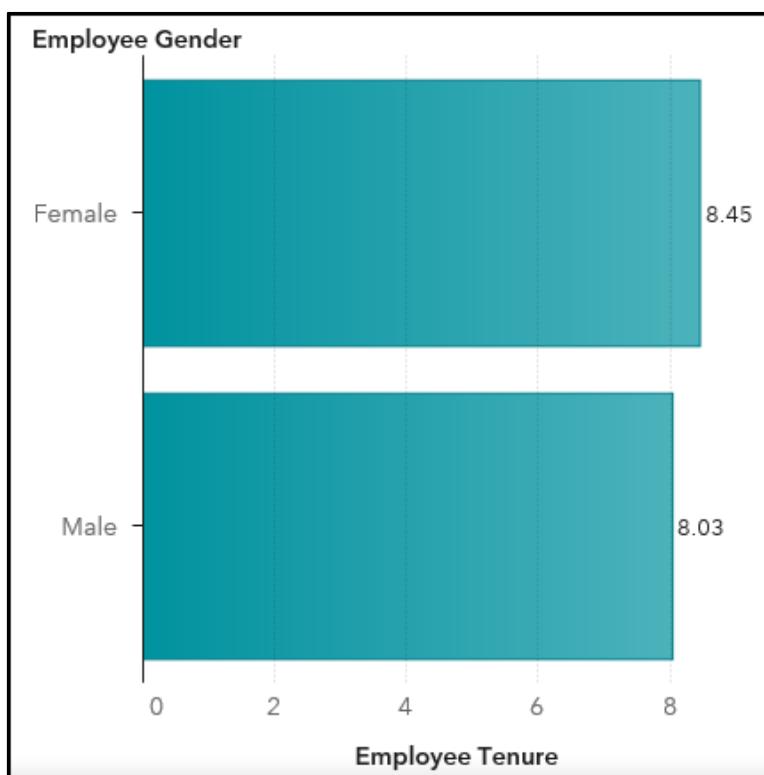
Hint: For retired employees, we want the number of years at the time of retirement. For active employees, we want the number of years as of today's date.

- Answer the following question:

What is the average employee tenure for male retired male employees? For female retired employees?

**Answer:** \_\_\_\_\_

The bar chart should resemble the following:



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

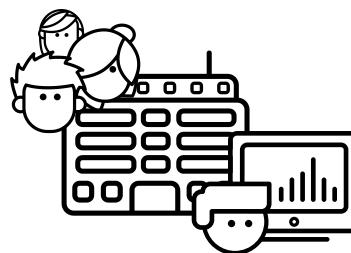
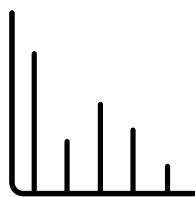
**End of Practices**

## Business Scenario: Students



The Education Division at SAS has asked for a report that shows the profit generated by area.

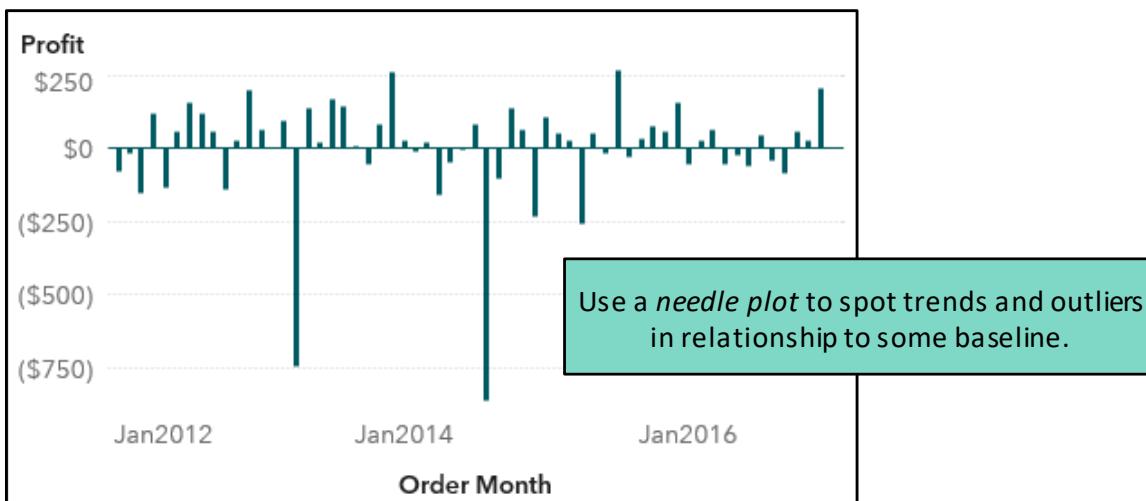
Specifically, they would like to see profit by area code to determine how many areas generate a minimum of \$50,000 in profit and which areas do not meet the minimum. We need to create a new data item that displays area codes.



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## Objects: Graphs (Needle Plot)



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### Needle plot

A needle plot displays vertical line segments (needles) connected to a horizontal baseline. The horizontal baseline can be at zero (shown above for profit) or can be at some other value (above which signals improvement and below which signals decline). Measures can be assigned to both the vertical and horizontal axis. Needle plots are often used in clinical trials to indicate the effect of drugs on various patients.

## 7.02 Activity

Which Text (advanced) operator returns the portion of the text at the specified position?

Hendersonville (828)

- ▼ Text (advanced)
  - # FindChar
  - # FindString
  - # GetLength
  - ▲ GetWord
  - ▲ RemoveBlanks
  - ▲ RemoveChars
  - ▲ RemoveWord
  - ▲ Replace
  - ▲ ReplaceWord
  - ▲ Reverse
  - ▲ Substring
  - ▲ Update
  - ▲ URLDecode
  - ▲ URLEncode



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## 7.03 Activity

Given the values of **City** and the Text (advanced) operators, how would you extract area codes?

City
Hendersonville (828)
Wingate (704/980)
A&T State University (336)
Asheville (828)
Black Mountain (828)
Bowman Gray School of Med (336)
Cary (919/984)
Chapel Hill (919/984)
Charlotte (704/980)

- ▼ Text (advanced)
  - # FindChar
  - # FindString
  - # GetLength
  - ▲ GetWord
  - ▲ RemoveBlanks
  - ▲ RemoveChars
  - ▲ RemoveWord
  - ▲ Replace
  - ▲ ReplaceWord
  - ▲ Reverse
  - ▲ Substring
  - ▲ Update
  - ▲ URLDecode
  - ▲ URLEncode



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## Creating a Character Calculated Item

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This demonstration illustrates how to create a character calculated item and a needle plot in a report.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2-Demo7.1b**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2-Demo7.1b** and select **Edit**.

The report opens in SAS Visual Analytics.

3. In the canvas, view the list table.

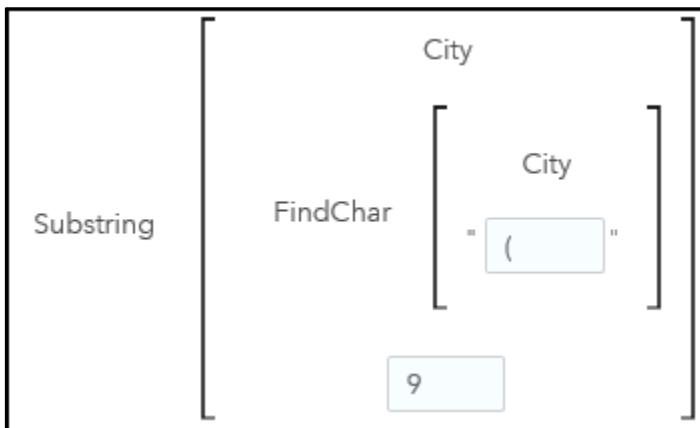
City	▲	Profit
Hendersonville (828)		\$2,250
Wingate (704/980)		\$3,000
A&T State University (336)		\$14,250
Asheville (828)		\$14,250
Black Mountain (828)		\$3,000
Bowman Gray School of Med (336)		\$35,250
Cary (919/984)		\$27,750
Chapel Hill (919/984)		\$23,250
Charlotte (704/980)		\$29,250

**City** contains the area code of the location in parentheses. Some cities share an area code (for example, Asheville and Black Mountain in the list table above). For the needle plot, we would like to view total profit for each area code.

4. Calculate area codes.
  - a. In the left pane, click **Data**.
  - b. Select **New data item** ⇒ **Calculated item**.
  - c. In the **Name** field, enter **Area Codes**.
  - d. For the **Result Type** field, select **Character**.
  - e. On the left side of the window, click **Operators**.
  - f. Expand the **Text (advanced)** group.
  - g. Double-click the **Substring** operator to add it to the expression.
  - h. Right-click the **string** field in the expression and select **Replace with** ⇒ **City**.
  - i. On the left side of the window, expand the **Text (advanced)** group, if necessary.
  - j. Drag the **FindChar** operator to the first **number** field in the expression.
  - k. Right-click the first **string** field for the FindChar operator and select **Replace with** ⇒ **City**.
  - l. Enter **(** in the second **string** field for the FindChar operator.

- m. Enter **9** in the last **number** field in the expression.

The expression should resemble the following:



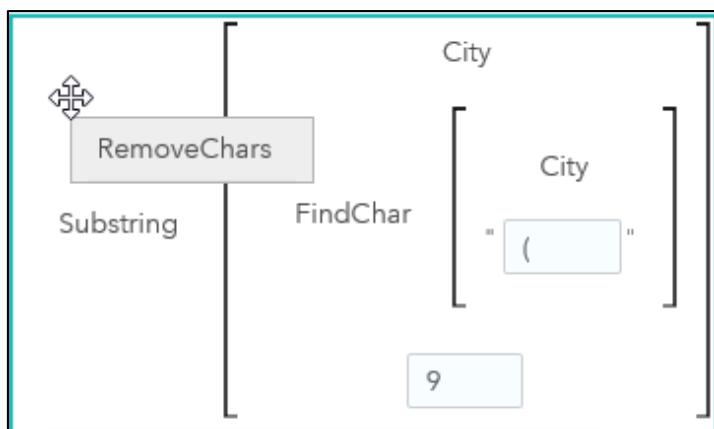
- n. In the bottom right corner of the window, click **Preview**.

Area Codes	City
(336)	Winston Salem (336)
(336)	Winston-Salem (336)
(336)	Bowman Gray School of Med (336)
(336)	Elon College (336)
(919/984)	Mebane (919/984)
(910)	Troy (910)
(336)	Greensboro (336)

We need to remove the parentheses from the new data item, **Area Codes**. The **RemoveChars** operator can do this.

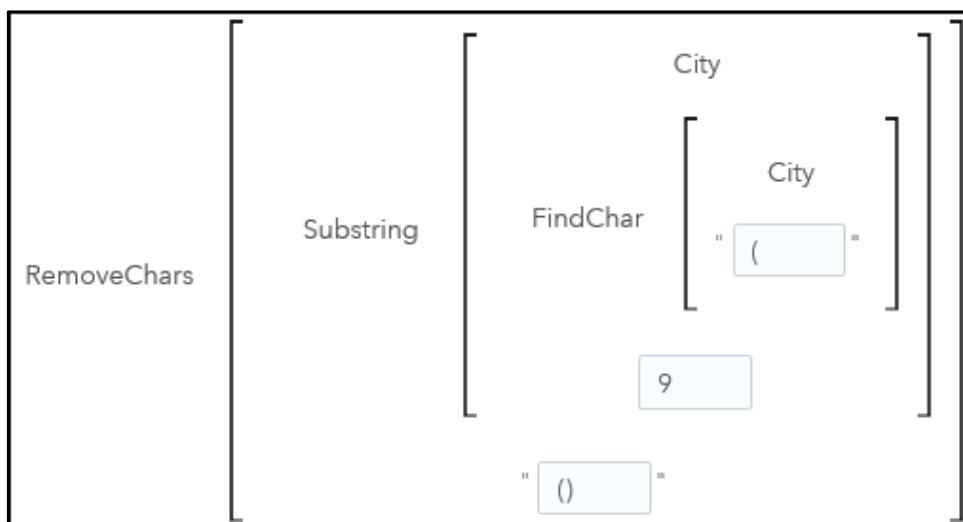
- o. Click **Close** to close the Preview Result window.  
 p. On the left side of the window, expand the **Text (advanced)** group, if necessary.

- q. Drag the **RemoveChars** operator to the outside of the expression.



- r. Enter **()** in the **string** field for the RemoveChars operator.

The expression should resemble the following:



- s. In the bottom right corner of the window, click **Preview**.

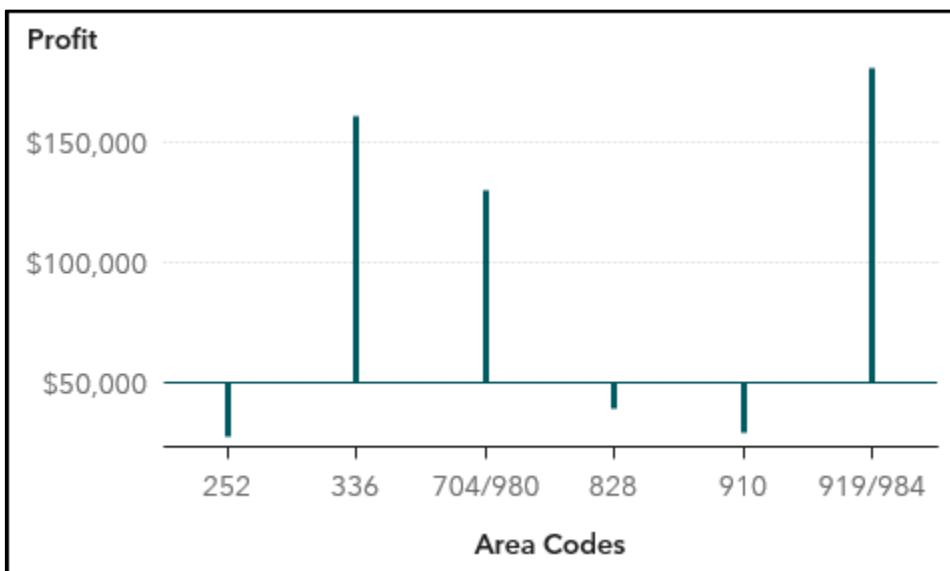
Area Codes	City
336	Winston Salem (336)
336	Winston-Salem (336)
336	Bowman Gray School of Med (336)
336	Elon College (336)
919/984	Mebane (919/984)
910	Troy (910)
336	Greensboro (336)

- t. Click **Close** to close the Preview Result window.
  - u. In the lower right corner of the window, click **OK**.
- The new data item is added to the Data pane.

5. Assign data items to the needle plot.

  - a. In the canvas, click the needle plot to select it.
  - b. In the right pane, click **Roles**, if necessary.
  - c. For the X axis role, select **Add**  $\Rightarrow$  **Area Codes**.
  - d. For the Y axis role, select **Add**  $\Rightarrow$  **Profit**.

The needle plot should resemble the following:



A majority of our profit comes from the area codes 336 and 919/984. Three area codes generate profit below the \$50,000 minimum (252, 828, and 910).

6. Save the report in **My Folder**.
  - a. To save the report, click  (Menu) in the upper right corner and select **Save As**.
  - b. Navigate to **My Folder**.
  - c. Click **Save**.

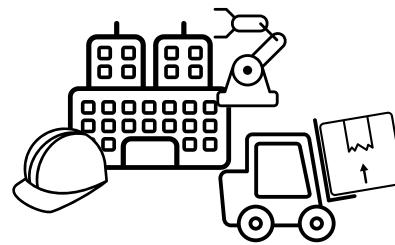
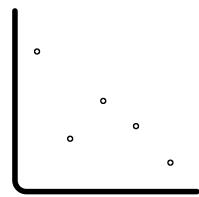
**End of Demonstration**

## Business Scenario: Facilities



The head of Operations for Orion Star has requested an analysis of the products produced in the facilities in North and South America.

Specifically, she wants to see the number of products produced by each distinct unit at each facility. You need to create a new data item that creates a new product code from the facility and the unit codes.

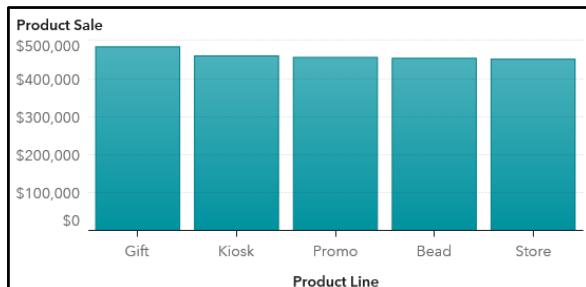


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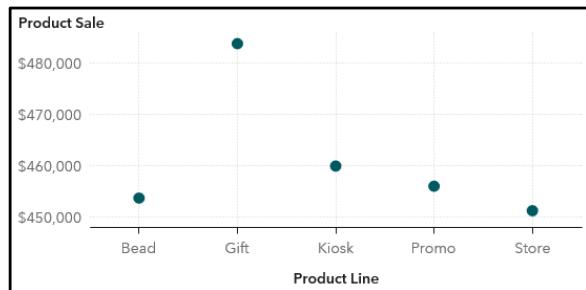
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## Objects: Graphs (Dot Plot)



Use a *dot plot* to compare summarized data where values are relatively close.



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**Dot plot**

A dot plot displays data for each value of a category data item using dots. The position of each dot on the response axis represents the summarized value of the measure. Dot plots are similar to bar charts but minimize the amount of *chart junk* (visual elements in graphs that are not necessary to understand the graph or that distract from the main message of the graph). Dot plots are often preferred because bar charts can distort the values if the area of the bars is compared and not the height. Dot plots can also be a good alternative to a bar chart to highlight differences between values that are close together. By starting the vertical axis at a nonzero value (as shown above), you can more easily compare the differences than you could with a bar chart.

## 7.04 Activity

Which Text (simple) operator combines two text strings into one string?

- ▼ Text (simple)
  - ▲ Concatenate
  - Contains
  - EndsWith
  - ▲ Format
  - ▲ LowerCase
  - NotContains
  - # Parse
  - StartsWith
  - ▲ UpCase

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## Practice

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### 3. Creating a Character Calculated Item

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.1b**.
- 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- 2) Right-click **VA2-Exercise7.1b** and select **Edit**.
- c. Create a new data item, **Product Code**, that takes the following form:

*<first eight characters of Facility> – <first three characters of Unit>*

Facility	Unit	▲ Product Code
MXMEXICO0038	NBD000020	MXMEXICO-NBD
MXTIJUAN0036	NBD000020	MXTIJUAN-NBD
USATLANT0025	NBD000020	USATLANT-NBD
USAUSTIN0011	NBD000020	USAUSTIN-NBD
USBALTIM0032	NBD000020	USBALTIM-NBD
USCHARLE0030	NBD000020	USCHARLE-NBD
USCHARLO0028	NBD000020	USCHARLO-NBD
USJACKSO0020	NBD000020	USJACKSO-NBD

- d. Assign the following data items to the specified roles for the dot plot:

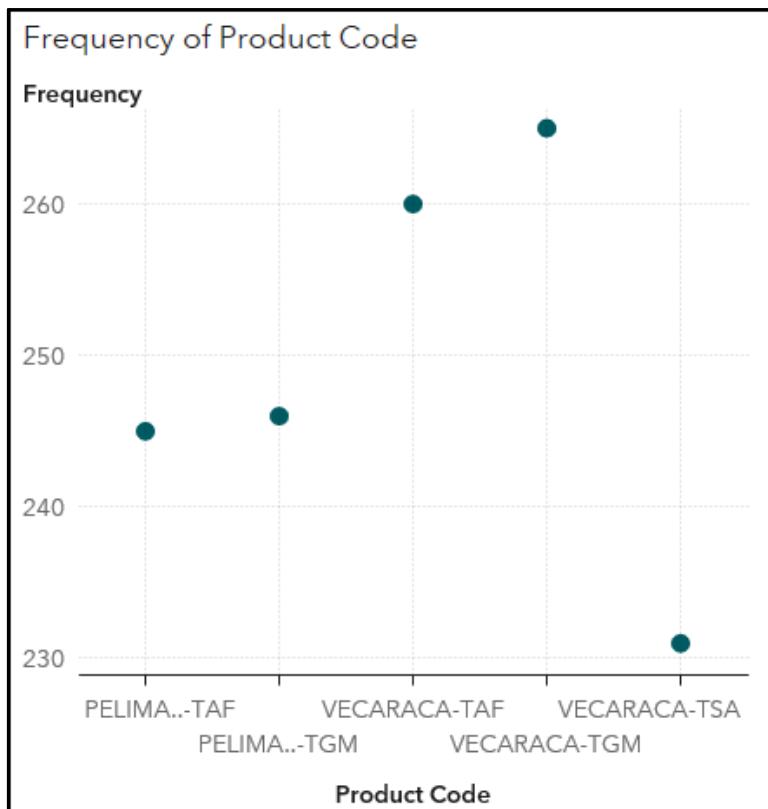
Category	Product Code
Measure	Frequency
Data tip values	Facility City

- e. Add a rank to the dot plot to show the top five products by frequency.
- f. Answer the following question:

Where are the top five products produced?

**Answer:** \_\_\_\_\_

The dot plot should resemble the following:



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

### Challenge (Optional)

#### 4. Creating a Date Calculated Item

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2-Exercise7.1b (Challenge)**.
  - Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - Right-click **VA2-Exercise7.1b (Challenge)** and select **Edit**.
- Create a new data item, **Facility Closing Date**, that is 20 years after the facility opened (on December 31).
- Assign the following data items to the specified roles for the dot plot:

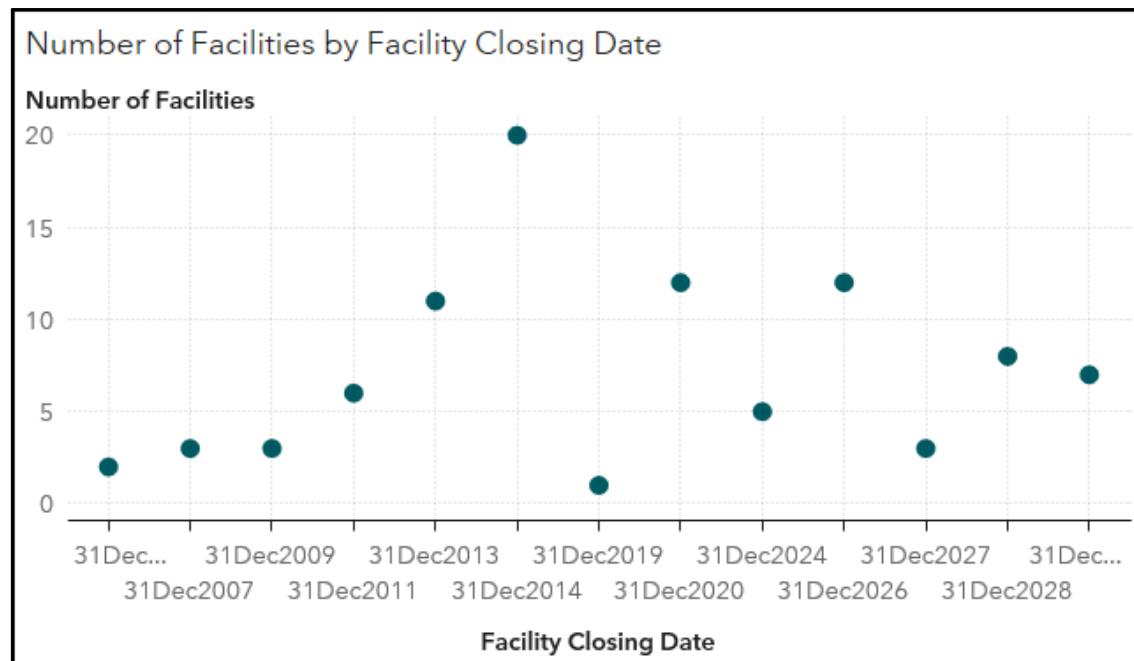
Category	Facility Closing Date
Measure	Number of Facilities

- Answer the following question:

When will the next set of facilities be closed? How many will be closed on that date?

**Answer:** \_\_\_\_\_

The dot plot should resemble the following:



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

**End of Practices**

## 7.2 Creating Aggregated Measures

### Objectives

- Discuss the difference between calculated items and aggregated measures.
- Describe the process of creating an aggregated measure.
- Discuss the parameters in an aggregated (periodic) operator.
- Describe the process of creating a periodic aggregated measure.
- Discuss the parameters in an aggregated (advanced) operator.
- Describe the process of creating an advanced aggregated measure.

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### 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



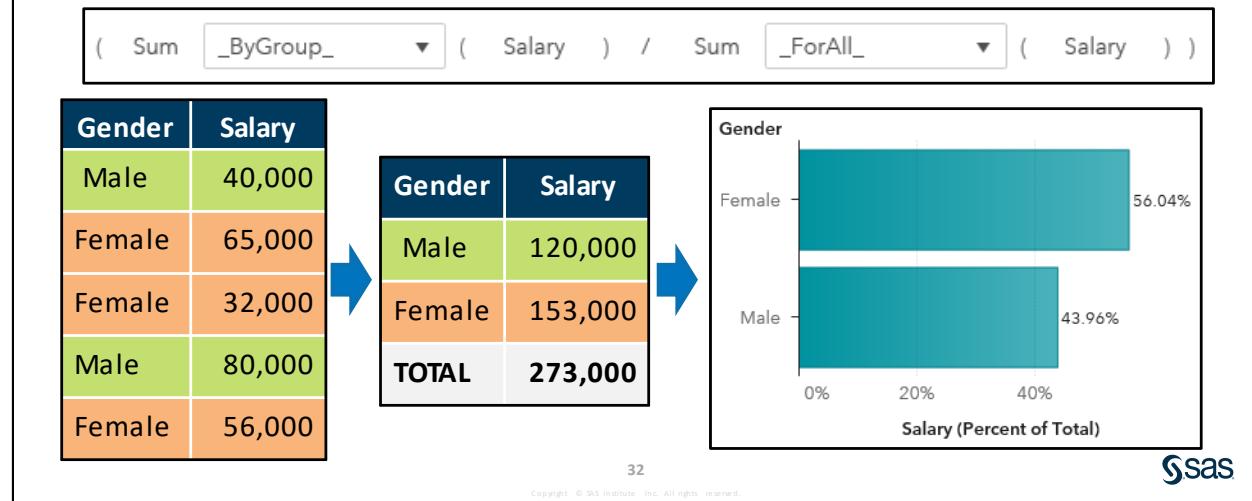
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## Aggregated Measure: Example

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

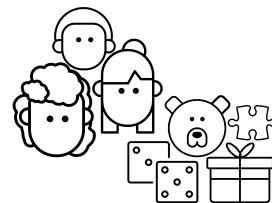


**Note:** Distinct counts and derived data items are special types of aggregated measures.

## Business Scenario: Toy Customers

The head of Manufacturing at Insight Toy Company has requested a region geo map that shows sales information.

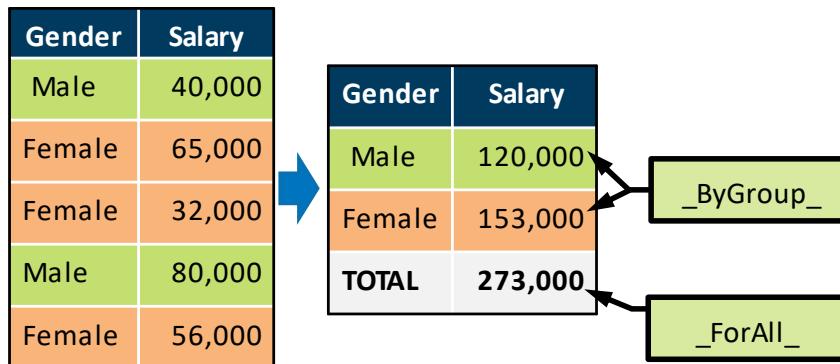
Because geo region maps should be used when there is an even distribution of values within each region, we need to create an aggregated measure that calculates sales by customer.



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## Aggregated Measure: Aggregation Context

( Sum \_ByGroup\_ ▾ ( Salary ) / Sum \_ForAll\_ ▾ ( Salary ) )





## Creating an Aggregated Measure

---

This demonstration illustrates how to create an aggregated measure and a region geo map in a report.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2-Demo7.2a**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2-Demo7.2a** and select **Edit**.

The report opens in SAS Visual Analytics.
3. View details table for the geo map.
  - a. In the upper right corner of the geo map, click (**Maximize**).
  - b. In the details table at the bottom of the window, click **Product Sale** twice to sort in descending order.

<b>Customer Country</b>	<b>Product Sale</b>	<b>Number of Customers</b>
US	\$3,570,181	4,295
GB	\$352,500	716
ES	\$337,595	543
BR	\$203,929	663

The country with the highest sales (US) also has the highest number of customers. Region geo maps should be used with measures that are evenly distributed within each region. We need to create a new aggregated measure that takes the total sales for the region and divides by the number of customers.

- c. In the upper right corner of the geo map, click (**Restore**).
4. Calculate a new aggregated measure, Sales by Customer.
  - a. In the left pane, click **Data**.
  - b. Select **New data item**  $\Rightarrow$  **Calculated item**.
  - c. In the **Name** field, enter **Sales by Customer**.
  - d. For the **Result Type** field, select **Aggregated Measure**.
  - e. On the left side of the window, click **Operators**.
  - f. Expand **Numeric (simple)**.
  - g. Double-click the **x/y** operator to add it to the expression.
  - h. Expand **Aggregated (simple)**.
  - i. Drag **Sum** to the **number** field on the left of the division sign.
  - j. Verify that **\_ByGroup\_** is specified for the Sum operator.

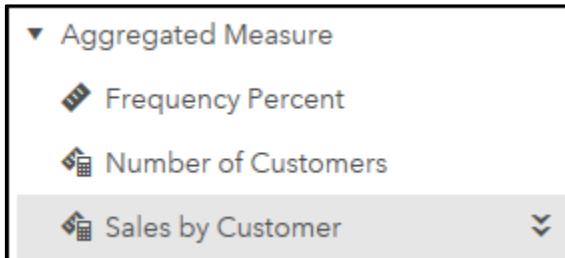
- k. Right-click the **number** field for the Sum operator and select **Replace with**  $\Rightarrow$  **Product Sale**.
- l. On the left side of the window, drag **Distinct** to the **number** field on the right of the division sign.
- m. Verify that **\_ByGroup\_** is specified for the Distinct operator.
- n. Right-click the **number** field for the Distinct operator and select **Replace with**  $\Rightarrow$  **Customer**.

The expression should resemble the following:



- o. In the upper right corner of the window, for the **Format** field, click (**Edit**).
  - 1) In the Format window, expand **Currency (basic)**.
  - 2) Select **Dollar**.
  - 3) For the **Width** field, verify that **12** is specified.
  - 4) For the **Decimals** field, verify that **2** is specified.
  - 5) Click **OK**.
- p. Click **OK** to create the new aggregated measure.

The Data pane should resemble the following:



- 5. Modify the geo map to use the new aggregated measure.
  - a. In the canvas, click the geo map to select it.
  - b. In the right pane, click **Roles**.
  - c. For the Color role, select **Product Sale**  $\Rightarrow$  **Sales by Customer**.

The geo map should resemble the following:



- d. In the upper right corner of the geo map, click (Maximize).
- e. In the details table at the bottom of the window, click **Sales by Customer** twice to sort in descending order.

Customer Country	Sales by Customer	Number of Customers
SE	\$935.91	147
US	\$831.24	4,295
ES	\$621.72	543
VE	\$531.81	309

If we look at sales by customer, Sweden ranks first and United States ranks second. Now there is an even distribution of the values in the coordinate geo map, and we can more accurately compare countries.

- f. In the upper right corner of the geo map, click (Restore).
6. Save the report in **My Folder**.
    - a. To save the report, click (Menu) in the upper right corner and select **Save As**.
    - b. Navigate to **My Folder**.
    - c. Click **Save**.

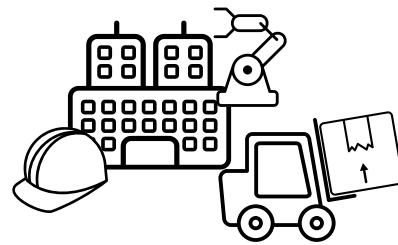
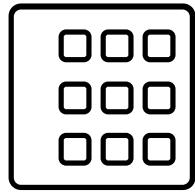
**End of Demonstration**

## Business Scenario: Facilities



The head of Operations for Orion Star has requested a report that details unit efficiencies.

Specifically, she wants to see the yield rate for each unit. You need to create an aggregated measure that calculates yield using the production and capacity values for each unit.



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## Practice

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### 5. Creating an Aggregated Measure

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.2a**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.2a** and select **Edit**.
- c. Create a new aggregated measure (**Yield Rate**) that has the following expression:  
***Total production for each group / Total capacity for each group***
- d. Add **Yield Rate** to the crosstab.

The crosstab should resemble the following:

Unit	▲	Unit Actual	Unit Capacity	Yield Rate
Total		176007	429427	40.99%
NBD000020		31	348	8.91%
NBD000028		743	2784	26.69%
NBD000036		1541	2964	51.99%
NBD000044		1773	3048	58.17%
NBD000066		929	1980	46.92%
NBD000094		36	408	8.82%
NBD000111		936	2004	46.71%
NBD000163		933	1956	47.70%

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

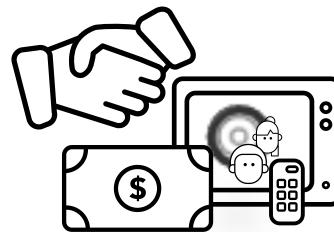
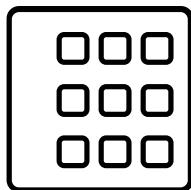
**End of Practices**

## Business Scenario: Sales



The Sales team at Orion Star has asked for a report that shows details about orders.

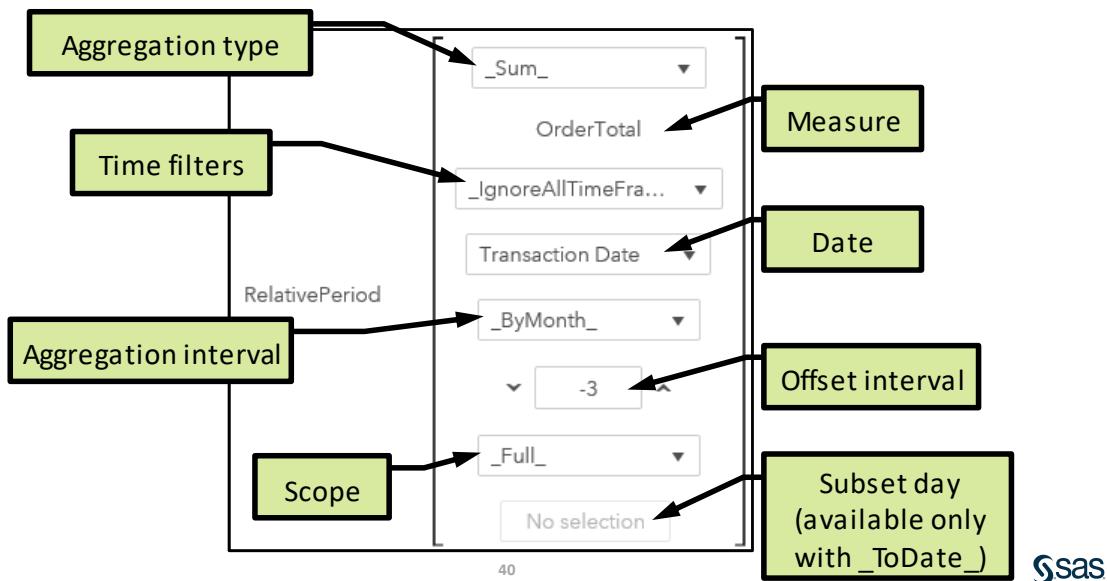
Specifically, they would like to view a three-month change in order totals for different time periods. We need to create a periodic aggregated measure that uses the available information to show the change in order totals.



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## Aggregated (Periodic) Operators: RelativePeriod



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The `RelativePeriod` operator returns aggregated values for a period of time that is relative to the current period.

**Note:** The following values for the time filters parameter are available:

<code>_ApplyAllFilters_</code>	Applies all filters (object, prompt, actions) before the measure is calculated.
<code>_IgnoreAllTimeFrameFilters_</code>	Applies (object) filters based on the same date data item after the measure is calculated.
<code>_IgnoreInteractiveTimeFrameFilters_</code>	Applies all (object, prompt, actions) filters based on the same date data item after the measure is calculated.

**Note:** For the date parameter, only date data items whose formats specify a year are available.

**Note:** For the aggregation interval parameter, `_Inferred_` automatically selects an interval based on the object that displays the aggregated item.

**Note:** The scope parameter specifies how much of each period is aggregated. The following values are available:

<code>_Full_</code>	Aggregates values for the entire period.
<code>_ToDate_</code>	Aggregates values up to a specific day within a period.
<code>_ToToday_</code>	Aggregates values up to the equivalent of today's position in the current interval. The value for today is evaluated dynamically whenever the aggregated measure is viewed in a report.

For more information about aggregated (periodic) operators, see “Reference: Operators for Data Expressions” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

### Business Scenario: Sales



Transaction Date	OrderTotal
Jan2014	\$434,318.80
Feb2014	\$507,457.78
Mar2014	\$483,017.52
Apr2014	\$324,288.42
May2014	\$323,937.28
...	

3M change (Apr2014)

=

Offset interval:0

-

Offset interval:-3



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## 7.05 Activity

Sign in to SAS Viya for Learners.

Edit the **VA2-Activity7.05** report ([/SAS Content/Courses/YVA283/Advanced](#)).

Which format is used for **Order Date**?

Which aggregation interval is used for **Aggregate Profit**?

What happens if you change the aggregation interval for **Aggregate Profit** to **\_ByMonth\_**?



## Creating a Periodic Aggregated Measure

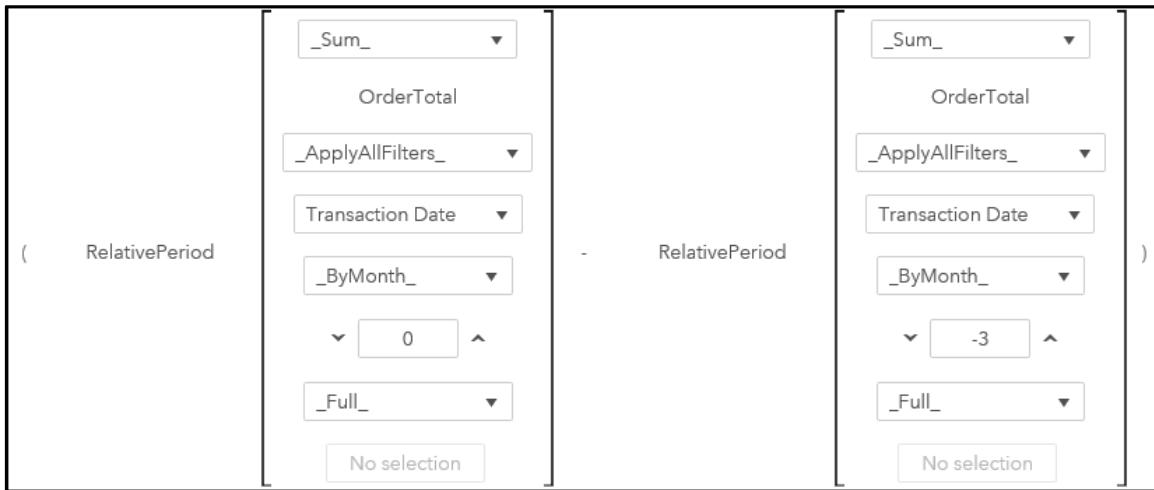
---

This demonstration illustrates how to create and modify a periodic aggregated measure.

1. From the browser window, sign in to SAS Viya for Learners.
  2. Open **VA2-Demo7.2b**.
    - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
    - b. Right-click **VA2-Demo7.2b** and select **Edit**.
- The report opens in SAS Visual Analytics.
3. Create a new periodic aggregated measure, Order Total (3M change).
    - a. In the left pane, click **Data**.
    - b. Select **New data item**  $\Rightarrow$  **Calculated item**.
    - c. In the **Name** field, enter **Order Total (3M change)**.
    - d. For the **Result Type** field, select **Aggregated Measure**.
    - e. On the left side of the window, click **Operators**.
    - f. Expand **Numeric (simple)**.
    - g. Double-click the **x-y** operator to add it to the expression.
    - h. Expand **Aggregated (periodic)**.
    - i. Drag **RelativePeriod** to the **Number** field on the left of the minus sign.
    - j. For the Aggregation Type operator, verify that **\_Sum\_** is specified.
    - k. Right-click the **number** field for the Measure operator and select **Replace with**  $\Rightarrow$  **OrderTotal**.
    - l. For the Time Filters operator, select **\_ApplyAllFilters\_**.
    - m. For the Date operator, select **Transaction Date**.
    - n. For the Aggregation Interval operator, select **\_ByMonth\_**.
    - o. For the Offset Interval operator, verify that **0** is specified.
    - p. For the Scope operator, verify that **\_Full\_** is specified.
    - q. Right-click the **RelativePeriod** operator and select **Copy**.
    - r. Right-click in the **number** field on the right of the minus sign and select **Paste**.

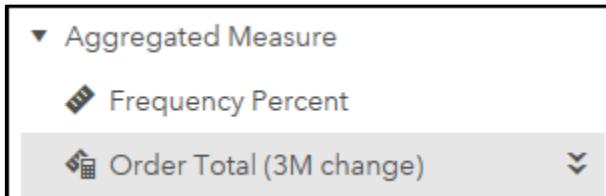
- s. For the Offset Interval operator, on the right of the minus sign, enter **-3**.

The expression should resemble the following:



- t. In the upper right corner of the window, for the **Format** field, click (**Edit**).
- 1) In the Format window, expand **Currency (basic)**.
  - 2) Select **Dollar**.
  - 3) For the **Width** field, verify that **12** is specified.
  - 4) For the **Decimals** field, verify that **2** is specified.
  - 5) Click **OK**.
- u. Click **OK** to create the new periodic aggregated measure.

The Data pane should resemble the following:



4. Modify the crosstab to use the new periodic aggregated measure.
- a. In the canvas, click the crosstab to select it.
  - b. In the right pane, click **Roles**.
  - c. For the Measures role, click **Add**.
  - d. Select **Order Total (3M change)** and click **OK**.

The crosstab should resemble the following:

Transaction Date ▲	OrderTotal	Order Total (3M change)
Dec2013	\$567,120.92	.
Jan2014	\$434,318.80	.
Feb2014	\$507,457.78	.
Mar2014	\$483,017.52	(\$84,103.40)
Apr2014	\$324,288.42	(\$110,030.38)
May2014	\$323,937.28	(\$183,520.50)
Jun2014	\$296,352.29	(\$186,665.23)
Jul2014	\$310,416.38	(\$13,872.03)

5. Filter the crosstab to view details since January 2016 and modify the periodic aggregated measure.

- a. For the slider control, click  on the left side of the slider control.

- 1) Click  (Select a month and year).
- 2) For the **Month** field, select **January**.
- 3) For the **Year** field, enter **2016**.

Month:	Year:
<input style="width: 100px; height: 25px; border: 1px solid black; padding: 2px;" type="button" value="January"/>	<input style="width: 100px; height: 25px; border: 1px solid black; padding: 2px;" type="text" value="2016"/>

- 4) Click **OK**.

The crosstab should resemble the following:

Transaction Date ▲	OrderTotal	Order Total (3M change)
Jan2016	\$556,871.22	.
Feb2016	\$507,799.87	.
Mar2016	\$498,377.75	.
Apr2016	\$336,489.84	(\$220,381.38)
May2016	\$332,398.02	(\$175,401.85)
Jun2016	\$385,458.01	(\$112,919.74)
Jul2016	\$267,465.31	(\$69,024.54)
Aug2016	\$287,697.00	(\$44,701.02)
Sep2016	\$323,612.95	(\$61,845.06)

Even though the table contains details for **Order Total** in previous months, we specified **\_ApplyAllFilters\_** for the calculation, which applies the filters first before calculating the aggregated measure.

- b. In the left pane, click **Data**.
- c. Right-click **Order Total (3M change)** and select **Edit**.
  - 1) For the filters operator on the left of the minus sign, select **\_IgnoreInteractiveTimeFrameFilters\_**.
  - 2) For the filters operator on the right of the minus sign, select **\_IgnoreInteractiveTimeFrameFilters\_**.

The expression should resemble the following:



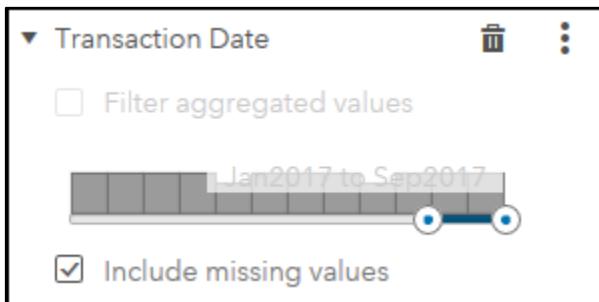
- 3) Click **OK** to apply the changes.

The crosstab should resemble the following:

Transaction Date ▲	OrderTotal	Order Total (3M change)
Jan2016	\$556,871.22	(\$389,696.66)
Feb2016	\$507,799.87	(\$563,339.01)
Mar2016	\$498,377.75	(\$224,858.13)
Apr2016	\$336,489.84	(\$220,381.38)
May2016	\$332,398.02	(\$175,401.85)
Jun2016	\$385,458.01	(\$112,919.74)
Jul2016	\$267,465.31	(\$69,024.54)
Aug2016	\$287,697.00	(\$44,701.02)
Sep2016	\$323,612.95	(\$61,845.06)

The **\_IgnoreInteractiveTimeFrameFilters\_** option ignores any interactive filters from prompts and actions that are based on the same date data item used in the calculation.

6. Add a filter to the crosstab to view information about 2017 and modify the periodic aggregated measure.
- In the canvas, click the crosstab to select it, if necessary.
  - In the right pane, click **Filters**.
  - Select **New filter**  $\Rightarrow$  **Transaction Date**.
  - On the left of the filter, drag  to **Jan2017**.



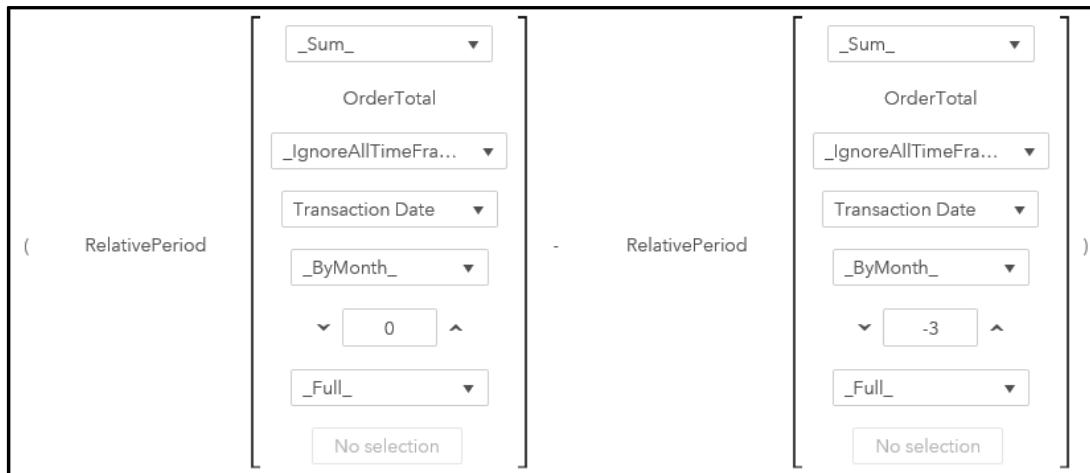
The crosstab should resemble the following:

Transaction Date ▲	OrderTotal	Order Total (3M change)
Jan2017	\$646,284.69	.
Feb2017	\$638,150.34	.
Mar2017	\$586,158.30	.
Apr2017	\$456,879.14	(\$189,405.55)
May2017	\$399,074.94	(\$239,075.40)
Jun2017	\$412,108.99	(\$174,049.30)
Jul2017	\$330,220.11	(\$126,659.03)
Aug2017	\$361,144.14	(\$37,930.81)

The `_IgnoreInteractiveTimeFrameFilters_` option ignores only interactive filters before the calculation is performed. Filters specified on the Filters pane are not interactive (that is, report viewers cannot modify them).

- In the left pane, click **Data**.
- Right-click **Order Total (3M change)** and select **Edit**.
  - For the filters operator on the left of the minus sign, select `_IgnoreAllTimeFrameFilters_`.
  - For the filters operator on the right of the minus sign, select `_IgnoreAllTimeFrameFilters_`.

The expression should resemble the following:



- 3) Click **OK** to apply the changes.

The crosstab should resemble the following:

Transaction Date ▲	<b>OrderTotal</b>	<b>Order Total (3M change)</b>
Jan2017	\$646,284.69	(\$42,765.73)
Feb2017	\$638,150.34	(\$448,414.02)
Mar2017	\$586,158.30	(\$200,214.63)
Apr2017	\$456,879.14	(\$189,405.55)
May2017	\$399,074.94	(\$239,075.40)
Jun2017	\$412,108.99	(\$174,049.30)
Jul2017	\$330,220.11	(\$126,659.03)
Aug2017	\$361,144.14	(\$37,930.81)

The `_IgnoreAllTimeFrameFilters_` option ignores all filters that are based on the same date data item used in the calculation.

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

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

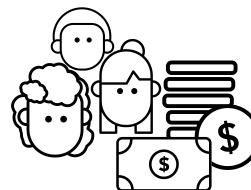
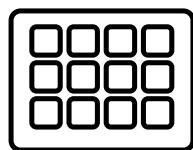
**End of Demonstration**

## Business Scenario: Customers



The Sales team at Orion Star has asked for a report that shows details about profit.

Specifically, they would like to view a running total for profit over the fiscal year (which starts in March). You need to create a periodic aggregated measure that presents this information.



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## Business Scenario: Customers



Order Date	Profit	Cumulative Profit
Mar2012	\$84,893.31	\$84,893.31
Apr2012	\$94,871.27	\$179,764.57
May2012	\$118,248.93	298,013.50
..		
Jan2013	\$145,229.98	\$1,355,873.26
Feb2013	\$118,856.68	\$1,474,729.94

Starting point

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We start by creating a cumulative profit using the default starting point (January). Then we modify the aggregated measure to calculate the cumulative profit for the fiscal year (beginning in March).



## Practice

---

### 6. Creating a Periodic Aggregated Measure

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.2b**.
- 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- 2) Right-click **VA2-Exercise7.2b** and select **Edit**.
- c. Create a new periodic aggregated measure (**Cumulative Profit**) that calculates a running total for **Profit** over the year.
- d. Add **Cumulative Profit** to the list table.

Order Date ▲	Profit	Cumulative Profit
Jan2012	\$118,773.87	\$118,773.87
Feb2012	\$106,735.22	\$225,509.10
Mar2012	\$84,893.31	\$310,402.41
Apr2012	\$94,871.26	\$405,273.68
May2012	\$118,248.93	\$523,522.61
Jun2012	\$159,343.43	\$682,866.04
Jul2012	\$140,479.12	\$823,345.15
Aug2012	\$151,644.75	\$974,989.91
Sep2012	\$74,120.37	\$1,049,110.28
Oct2012	\$80,908.90	\$1,130,019.18
Nov2012	\$98,421.95	\$1,228,441.13
Dec2012	\$207,711.25	\$1,436,152.38
Jan2013	\$145,229.98	\$145,229.98
Feb2013	\$118,856.68	\$264,086.66

- e. Modify **Cumulative Profit** to calculate a running total for the fiscal year (starting in March).

The list table should resemble the following:

Order Date ▲	Profit	Cumulative Profit
Jan2012	\$118,773.87	\$118,773.87
Feb2012	\$106,735.22	\$225,509.10
Mar2012	\$84,893.31	\$84,893.31
Apr2012	\$94,871.26	\$179,764.57
May2012	\$118,248.93	\$298,013.50
Jun2012	\$159,343.43	\$457,356.94
Jul2012	\$140,479.12	\$597,836.05
Aug2012	\$151,644.75	\$749,480.81
Sep2012	\$74,120.37	\$823,601.18
Oct2012	\$80,908.90	\$904,510.08
Nov2012	\$98,421.95	\$1,002,932.03
Dec2012	\$207,711.25	\$1,210,643.28

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

### Challenge (Optional)

#### 7. Adding Scopes to an Aggregation

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.2b (Challenge)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.2b (Challenge)** and select **Edit**.
- c. Answer the following questions:

What is the expression for **Average Salary**?

**Answer:** \_\_\_\_\_

What is the average salary for all employees?

**Answer:** \_\_\_\_\_

- d. Management would like to see the total salary for all employees in the crosstab. Edit the **Average Salary** aggregated measure to add the following scope:

**Grand total: <total salary for all employees>**



**Note:** All aggregated measures must have a base expression.

**Note:** Scopes enable you to apply different expressions for different crossings of categories. The expression for each scope is applied only when that exact crossing of categories is displayed in an object. Wherever that exact crossing of categories is not displayed, the base expression is applied.

The crosstab should resemble the following:

Gender ▲	Female	Male	Total
Job Title ▲	Average Salary	Average Salary	Average Salary
Purchasing Agent I	.	\$31,760.00	\$31,760.00
Purchasing Agent III	.	\$35,070.00	\$35,070.00
Sales Rep. I	\$26,319.38	\$26,497.18	\$26,417.79
Sales Rep. II	\$27,346.86	\$27,395.74	\$27,373.58
Sales Rep. III	\$29,743.80	\$29,384.31	\$29,533.29
Sales Rep. IV	\$32,189.62	\$31,531.09	\$31,880.51
Temp. Sales Rep.	\$26,370.86	\$26,208.78	\$26,287.57
Trainee	\$24,586.50	\$25,710.33	\$25,260.80
<b>Total</b>	<b>\$27,607.23</b>	<b>\$27,586.63</b>	<b>\$17,854,545.00</b>

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

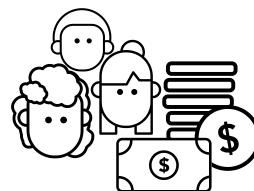
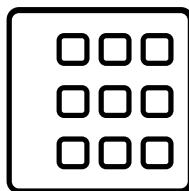
**End of Exercises**

## Business Scenario: Customers



The Annual Report team asked for a report that shows the quantity ordered by each customer group and country.

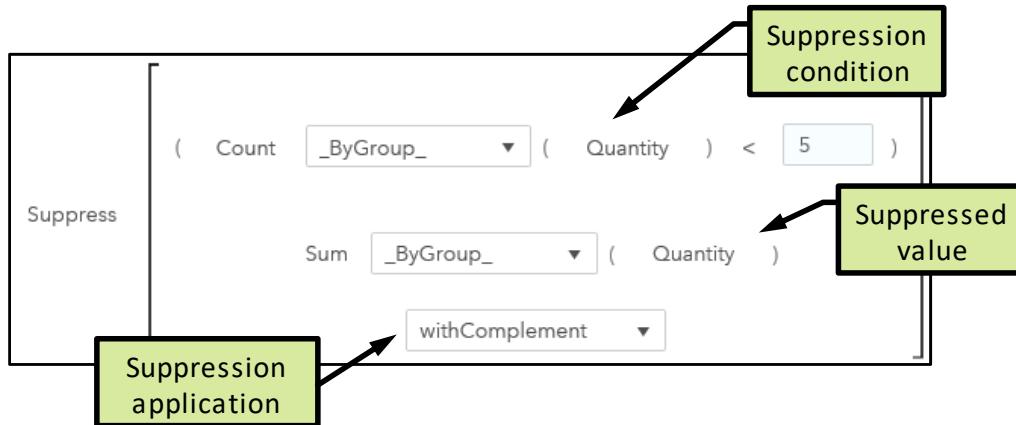
Specifically, they would like to view total amounts in the table only if the total quantity ordered by that subgroup is more than five. We need to create an aggregated measure that shows the requested information.



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## Aggregated (Advanced) Operators: Suppress



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The Suppress operator hides aggregated values if the specified condition is true. Hidden values are displayed as an asterisk (\*) within objects and are evaluated as normal for the purposes of calculating totals and subtotals. Suppressed data is commonly used to protect the identity of individuals in aggregated data when some aggregations are sparse. For example, suppose your data contains test scores by school district for various demographics. If one of your demographic categories is represented by only a single student, the value would represent the score for that student. Data suppression hides the test score for that student so that his or her test score is not publicized.

**Note:** The data item used in the suppression condition and the suppressed value does not have to be the same. For example, you can suppress total profit (suppressed value) for all countries where the number of orders is less than 10 (suppression condition).

When using suppressed data, keep the following best practices in mind:

- Never use the unsuppressed version of the data item in your report, even in filters and ranks. You can hide the unsuppressed version using the Data pane.
- Avoid using suppressed data in any object that is the source or target of a filter action. Filtering can sometimes make it possible to infer the value of suppressed data.
- Avoid assigning hierarchies to objects that contain suppressed data. Expanding or drilling down on a hierarchy can sometimes make it possible to infer the value of suppressed data.

**Note:** The suppression application parameter can have one of the following values:

<b>withoutComplement</b>	Only values that meet the suppression condition are suppressed.
<b>withComplement</b>	Values that do not meet the suppression condition might be suppressed if the hidden value can be inferred by totals, subtotals, or other cell values.

For more information about aggregated (advanced) operators, see “Reference: Operators for Data Expressions” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

### Business Scenario: Customers



Customer Group Name	Internet/Catalog Customers		Orion Club Gold members		...
Customer Country	Freq	Quantity	Freq	Quantity	
Austria	170	281	780	1,256	
Belgium	1,434	2,468	12,616	21,279	
Czech Republic	4	*	15	21	
Estonia	2	*	18	31	
...					



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## Creating an Advanced Aggregated Measure

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This demonstration illustrates how to create an advanced aggregated measure that suppresses data values based on some condition.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2-Demo7.2c**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2-Demo7.2c** and select **Edit**.

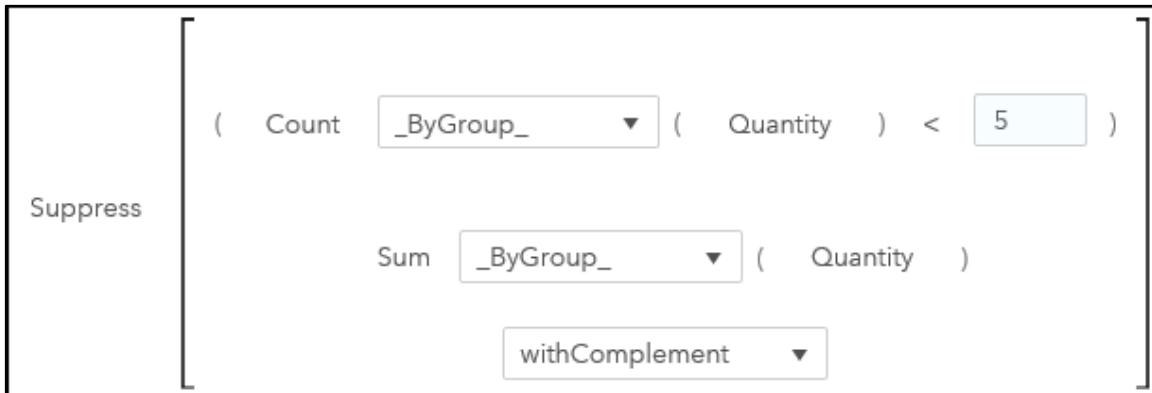
The report opens in SAS Visual Analytics.
3. View display rules for the crosstab.
  - a. In the canvas, click the **Crosstab** object to select it.
  - b. In the right pane, click **Rules**.

If **Freq** is less than 5, the number is red and bold in the crosstab.

4. Create a new advanced aggregated measure, **Quantity (Suppress)**.
  - a. In the left pane, click **Data**.
  - b. Select **New data item**  $\Rightarrow$  **Calculated item**.
  - c. In the **Name** field, enter **Quantity (Suppress)**.
  - d. For the **Result Type** field, select **Aggregated Measure**.
  - e. On the left side of the window, click **Operators**.
  - f. Expand **Aggregated (advanced)**.
  - g. Double-click **Suppress** to add it to the expression.
  - h. Expand **Comparison**.
  - i. Drag **x<y** to the **condition** area in the expression.
  - j. Expand **Aggregated (simple)**.
  - k. Drag **Count** to the **number** field on the left of the less than sign.
  - l. For the Count operator, verify that **\_ByGroup\_** is specified.
  - m. Right-click the **number** field for the Count operator and select **Replace with**  $\Rightarrow$  **Quantity**.
  - n. Enter **5** in the **number** field on the right of the less than sign.
  - o. On the left side of the window, expand **Aggregated (simple)** on the left side of the window, if necessary.

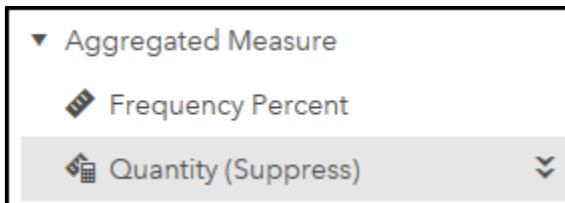
- p. Drag **Sum** to the **number** field in the Suppress operator.
- q. For the Sum operator, verify that **\_ByGroup\_** is specified.
- r. Right-click the **number** field for the Sum operator and select **Replace with**  $\Rightarrow$  **Quantity**.
- s. For the Suppress operator, verify that **withComplement** is specified.

The expression should resemble the following:



- t. In the upper right corner of the window, for the **Format** field, click (**Edit**).
  - 1) In the Format window, verify that **Comma** is selected as the format.
  - 2) For the **Width** field, verify that **12** is specified.
  - 3) For the **Decimals** field, enter **0**.
  - 4) Click **OK**.
- u. Click **OK** to create the new periodic aggregated measure.

The Data pane should resemble the following:



- 5. Modify the crosstab to use the advanced aggregated measure.
  - a. In the canvas, click the crosstab to select it.
  - b. In the right pane, click **Roles**.
  - c. For the Measures role, select **Quantity**  $\Rightarrow$  **Quantity (Suppress)**.

The crosstab should resemble the following:

Customer Group Name ▲		Internet/Catalog Customers		Orion Club Gold members	
Customer Country ▲		Freq	Quantity (Suppress)	Freq	Quantity (Suppress)
Andorra		.	*	35	69
Australia		6,106	9,895	30,307	47,472
Austria		170	281	780	1,256
Belgium		1,434	2,468	12,616	21,279
Benin		.	*	4	*
Bulgaria		1	*	6	8
Canada		405	749	1,762	3,325
China		.	*	.	*

When the frequency is less than 5 (including missing values), quantity values are suppressed. For Bulgaria, the quantity is suppressed for internet/catalog customers but not for Orion Club Gold members.

- d. In the right pane, click **Options**.
- e. In the Totals and Subtotals group, select **Totals**.

The crosstab should resemble the following:

Customer Group Name ▲		Total	Internet/Catalog Customers		Orion Club Gold members	
Customer Country ▲		Quantity (Suppress)	Freq	Quantity (Suppress)	Freq	Quantity (Suppress)
Total		1,597,317	76,965	134,343	483,438	808,676
Andorra		144	.	*	35	*
Australia		94,728	6,106	9,895	30,307	47,472
Austria		2,438	170	281	780	1,256
Belgium		42,109	1,434	2,468	12,616	21,279
Benin		20	.	*	4	*
Bulgaria		25	1	*	6	*
Canada		6,470	405	749	1,762	3,325
China		*	*	*	*	*

When totals are added, it might be possible to infer a hidden value for a group. The withComplement option hides additional values, so hidden values cannot be inferred.

- 6. Modify the advanced aggregated measure.
  - a. In the left pane, click **Data**.
  - b. Right-click **Quantity (Suppress)** and select **Edit**.

- c. For the Suppress operator, select **withoutComplement**.

The expression should resemble the following:

```

    Suppress
      ( Count _ByGroup_ < 5 )
      Sum _ByGroup_ ( Quantity )
    withoutComplement
  
```

- d. Click **OK** to apply the changes.

The crosstab should resemble the following:

Customer Group Name ▲	Total	Internet/Catalog Customers		Orion Club Gold members	
Customer Country ▲	Quantity (Suppress)	Freq	Quantity (Suppress)	Freq	Quantity (Suppress)
Total	1,597,317	76,965	134,343	483,438	808,676
Andorra	144	.	*	35	69
Australia	94,728	6,106	9,895	30,307	47,472
Austria	2,438	170	281	780	1,256
Belgium	42,109	1,434	2,468	12,616	21,279
Benin	20	.	*	4	*
Bulgaria	25	1	*	6	8
Canada	6,470	405	749	1,762	3,325
China	*	.	*	.	*

The **withoutComplement** option does not hide additional values when a hidden value can be inferred.

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

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

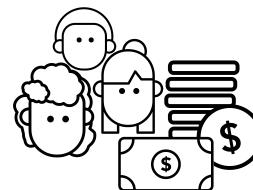
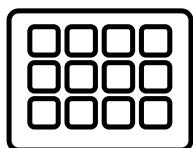
**End of Demonstration**

## Business Scenario: Customers



The Sales team at Orion Star has asked for a report that shows details about profit.

Specifically, they would like to view a running total for profit over each country. You need to create an aggregated measure that presents this information.



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## Business Scenario: Customers



Starting point

Order Date	Profit	Aggregate Profit
Andorra	\$223.60	\$223.60
Australia	\$461,983.93	\$462,207.53
Austria	\$7,873.73	\$470,081.26
Belgium	\$189,299.53	\$659,380.79
Benin	\$81.00	\$659,461.79
...		

The AggregateCells operator will calculate a running total for a category data item.

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## Practice

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### 8. Creating an Advanced Aggregated Measure

- a. From the browser window, sign in to SAS Viya for Learners.
  - b. Open **VA2-Exercise7.2c**.
    - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
    - 2) Right-click **VA2-Exercise7.2c** and select **Edit**.
  - c. In the list table, replace **Order Date** with **Customer Country**.
- Note:** The Cumulative operator works only with date or datetime data items.
- d. Create a new advanced aggregated measure (**Aggregate Profit**) that calculates a running total for **Profit** over the countries.
- Hint: Use the AggregateCells operator to create the new aggregated measure.
- e. In the list table, replace **Cumulative Profit** with **Aggregate Profit**.
  - f. Answer the following question:

What is the total profit for all countries?

**Answer:** \_\_\_\_\_

The list table should resemble the following:

Customer Country ▲	Profit	Aggregate Profit
Andorra	\$223.60	\$223.60
Australia	\$461,983.93	\$462,207.53
Austria	\$7,873.73	\$470,081.26
Belgium	\$189,299.53	\$659,380.79
Benin	\$81.00	\$659,461.79
Bulgaria	\$105.80	\$659,567.59
Canada	\$60,103.96	\$719,671.55
China	\$20.60	\$719,692.15
Croatia	\$528.40	\$720,220.55
Czech Republic	\$246.40	\$720,466.95

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

### Challenge (Optional)

#### 9. Working with the CumulativePeriod Scope Parameter (\_ToDate\_)

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.2c (Challenge 1)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.

- 2) Right-click **VA2-Exercise7.2c (Challenge 1)** and select **Edit**.
- c. Answer the following question:  
What is the cumulative profit for Dec2012? Does this match the total profit for 2012 in the Yearly list table?

**Answer:** \_\_\_\_\_

- d. Edit the **Cumulative Period (First Quarter)** data item to aggregate profit through the first quarter only.
- e. Answer the following question:

What is the cumulative profit for Mar2012? Does this match the new total profit for 2012 in the Yearly list table?

**Answer:** \_\_\_\_\_

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

## 10. Working with the First Operator

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.2c (Challenge 2)**.
- 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.2c (Challenge 2)** and select **Edit**.
- c. Create a new aggregated measure (**First Month**) that calculates the order total for the first month of the year only.
- d. Add the new aggregated measure to the Yearly list table.
- e. Answer the following question:

What is the order total for Jan2014? Does this match the order total for 2014 in the Yearly list table?

**Answer:** \_\_\_\_\_

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

**End of Practices**

# 7.3 Solutions

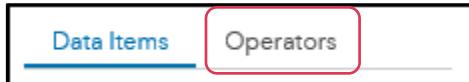
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## Solutions to Practices

### 1. Creating a Numeric Calculated Item

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.1a**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.1a** and select **Edit**.

The report opens in SAS Visual Analytics.
- c. Create a new data item, **Salary (Female)**, that averages salaries for female employees.
  - 1) In the left pane, click **Data**, if necessary.
  - 2) In the Data pane, select **New data item**  $\Rightarrow$  **Calculated item**.
  - 3) In the **Name** field, enter **Salary (Female)**.
  - 4) For the **Result Type** field, verify that **Automatic (Numeric)** is selected.
  - 5) For the **Format** field, click  (**Edit**).
    - a) In the Format window, expand **Currency (basic)**.
    - b) Select **Dollar**.
    - c) For the **Width** field, verify that **12** is specified.
    - d) For the **Decimals** field, verify that **2** is specified.
    - e) Click **OK**.
  - 6) On the left side of the window, click **Operators**.



- 7) Expand the **Boolean** group.
- 8) Double-click the **IF...ELSE** operator to add it to the expression.
- 9) Expand the **Comparison** group.
- 10) Drag **In** to the **condition** field in the expression.
- 11) Right-click the **string** field for the IF operator and select **Replace with**  $\Rightarrow$  **Employee Gender**.
- 12) Click **(none selected)**.
  - a) In the Select Data Values window, double-click **Female** to move it to the Selected items list on the right.
  - b) Click **OK**.
- 13) Right-click the **number** field for the RETURN operator and select **Replace with**  $\Rightarrow$  **Salary**.

- 14) Right-click the **number** field for the ELSE operator and select **Replace with**  $\Rightarrow$  **Missing Value**.

The expression should resemble the following:

```
IF Employee Gender In Female
RETURN Salary
ELSE Missing
```

- 15) In the lower right corner of the window, click **OK**.

The new data item is added to the Data pane.

▼ Measure

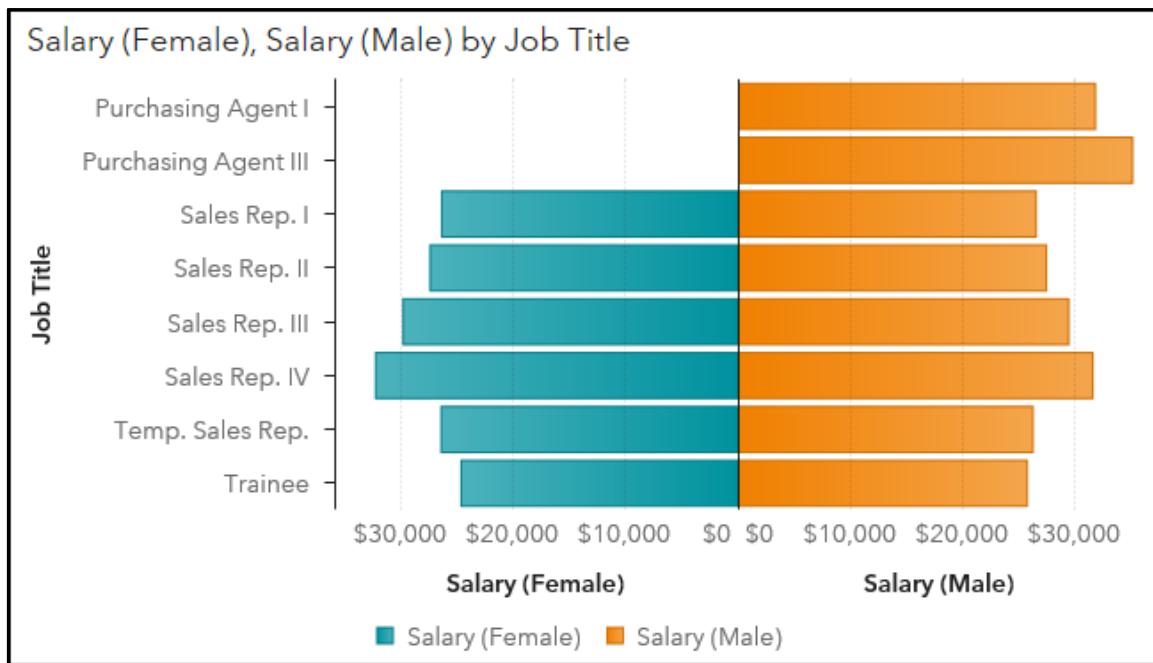
- Frequency
- Salary
- Salary (Female)
- Salary (Male)

- 16) Next to **Salary (Female)**, click **(Edit properties)**.

- 17) For the **Aggregation** field, select **Average**.

- d. Assign data items to the specified roles for the butterfly chart.
- 1) In the canvas, click the butterfly chart to select it.
  - 2) In the right pane, click **Roles**, if necessary.
  - 3) For the Category role, select **Add**  $\Rightarrow$  **Job Title**.
  - 4) For the Measure (bar) role, select **Add**  $\Rightarrow$  **Salary (Female)**.
  - 5) For the Measure (bar 2) role, select **Add**  $\Rightarrow$  **Salary (Male)**.

The butterfly chart should resemble the following:



- e. Answer the following questions:

Are there any jobs that do not have female employees?

**Answer: Yes, Purchasing Agent I and Purchasing Agent III have no female employees.**

Are there any jobs in which females make more than males (on average)?

**Answer: Yes, females in Sales Rep. III, Sales Rep. IV, and Temp. Sales Rep. make more (on average) than their male counterparts.**

Job Title	Salary (Female)	Salary (Male)
Purchasing Agent I	\$0	\$31,760.00
Purchasing Agent III	\$0	\$35,070.00
Sales Rep. I	\$26,319.38	\$26,497.18
Sales Rep. II	\$27,346.86	\$27,395.74
Sales Rep. III	\$29,743.80	\$29,384.31
Sales Rep. IV	\$32,189.62	\$31,531.09
Temp. Sales Rep.	\$26,370.86	\$26,208.78
Trainee	\$24,586.50	\$25,710.33

- In the upper right corner of the butterfly chart, click (Maximize) to view details.
- View the details table below the butterfly chart.

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

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

**2. Creating an Advanced Numeric Calculated Column**

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

b. Open **VA2-Exercise7.1a**.

- 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- 2) Right-click **VA2-Exercise7.1a** and select **Edit**.

The report opens in SAS Visual Analytics.

c. Create a new data item, **Employee Tenure**, that calculates how many years each employee has been with the company.

- 1) In the left pane, click **Data**.
- 2) Select **New data item**  $\Rightarrow$  **Calculated item**.
- 3) In the **Name** field, enter **Employee Tenure**.
- 4) For the **Result Type** field, verify that **Automatic (Numeric)** is selected.
- 5) On the left side of the window, click **Operators**.
- 6) Expand **Boolean**.
- 7) Double-click **IF...ELSE** to add it to the expression.
- 8) In the Operators area, expand **Comparison**.
- 9) Drag **Missing** to the **condition** field in the expression.
- 10) Right-click the **number** field for the Missing operator and select **Replace with**  $\Rightarrow$  **Employee Termination Date**.
- 11) On the left side of the window, expand **Numeric (advanced)**.
- 12) Drag **Floor** to the RETURN portion of the expression.
- 13) On the left side of the window, expand **Numeric (simple)**.
- 14) Drag **x/y** to the **number** field on the RETURN portion of the expression.
- 15) Drag **x-y** to the **number** field on the left of the division (/) sign.
- 16) On the left side of the window, expand **Numeric (advanced)**, if necessary.
- 17) Drag **TreatAs** to the **number** field on the left of the minus (-) sign.
- 18) For the TreatAs operator, verify that **\_Number\_** is selected.
- 19) On the left side of the window, expand **Date and Time**.
- 20) Drag **DatePart** to the **number** field for the TreatAs operator.
- 21) Drag **Now** to the **No selection** field for the DatePart operator.
- 22) On the left side of the window, expand **Numeric (advanced)**, if necessary.
- 23) Drag **TreatAs** to the **number** field on the right of the minus (-) sign.

- 24) For the TreatAs operator, verify that **\_Number\_** is selected.
- 25) Right-click the **number** field for the TreatAs operator and select **Replace with**  $\Rightarrow$  **Employee Hire Date**.
- 26) Enter **365.35** in the **number** field on the right of the division (/) sign.
- 27) Right-click the expression for the RETURN portion of the expression and select **Copy**.
- 28) Right-click the **number** field for the ELSE portion of the expression and select **Paste**.
- 29) Right-click **DatePart(Now())** for the ELSE portion of the expression and select **Replace with**  $\Rightarrow$  **Employee Termination Date**.

The expression should resemble the following:

```

IF      Employee
       Termination Date   Missing

RETURN Floor ( ( TreatAs [ _Number_ ]
                  DatePart ( Now () ) ) - TreatAs [ _Number_
                                                Employee Hire Date ] )
                           / 365.25 ) )

ELSE Floor ( ( TreatAs [ _Number_
                           Employee
                           Termination Date ] ) - TreatAs [ _Number_
                                                Employee Hire Date ] )
                           / 365.25 ) )

```

30) Click **OK** to create the new data item.

The Data pane should resemble the following:

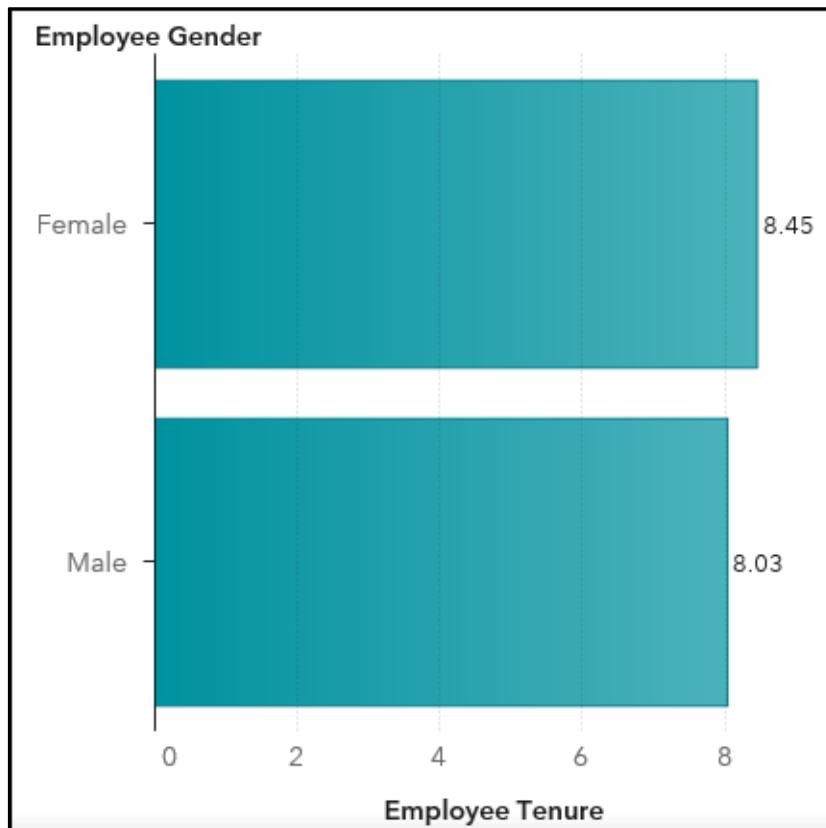
Measure

- Employee Tenure
- Frequency
- Salary

d. Answer the following question:

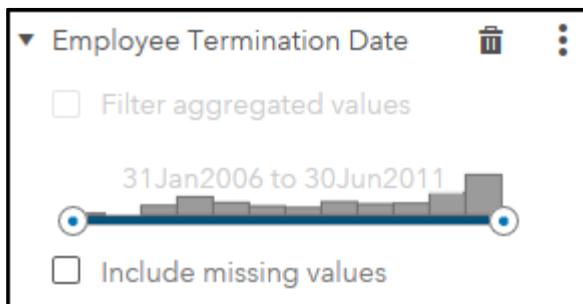
What is the average employee tenure for male retired employees? For female retired employees?

**Answer:** The average employee tenure for male retired employees is 8.03 years. The average employee tenure for female retired employees is 8.45 years.



- In the left pane, click **Data**.
- Next to **Employee Tenure**, click (Edit properties).
- For the Aggregation field, select **Average**.
- Select **Employee Gender** and **Employee Tenure** and drag them to the right of the butterfly chart.
- In the right pane, click **Filters**.
- Select **New filter** **Employee Termination Date**.

- **Clear Include missing values.**



- In the right pane, click Options.
- In the Bar area, select Data labels.

e. Save the report in My Folder

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

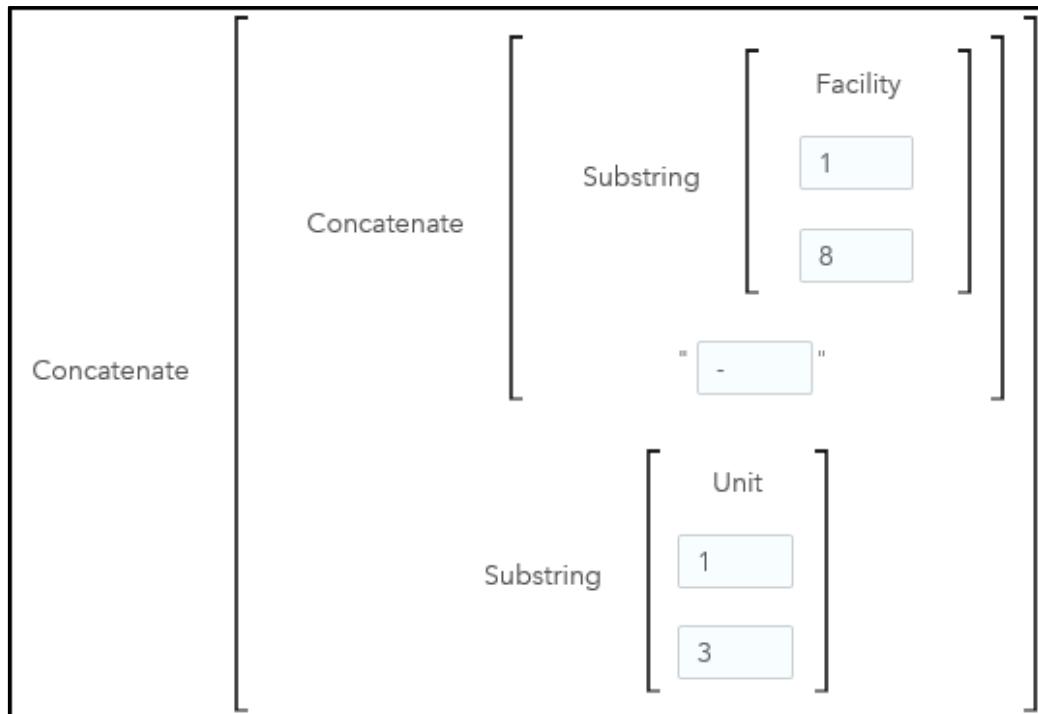
### 3. Creating a Character Calculated Item

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2-Exercise7.1b**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.1b** and select **Edit**.

The report opens in SAS Visual Analytics.
- Create a new data item, **Product Code**.
  - 1) In the left pane, click **Data**.
  - 2) Select **New data item**  $\Rightarrow$  **Calculated item**.
    - a) In the **Name** field, enter **Product Code**.
    - b) For the **Result Type** field, select **Character**.
    - c) On the left side of the window, click **Operators**.
    - d) Expand **Text (simple)**.
    - e) Double-click **Concatenate** to add it to the expression.
    - f) Double-click **Concatenate** again to add it to the expression a second time.
    - g) Expand **Text (advanced)**.
    - h) Drag **Substring** to the first **string** field in the expression.
    - i) Right-click the **string** field for the Substring operator and select **Replace with**  $\Rightarrow$  **Facility**.
    - j) Enter **1** in the first **number** field for the Substring operator.
    - k) Enter **8** in the second **number** field for the Substring operator.
    - l) Enter **-** in the next **string** field of the expression.

- m) On the left side of the window, expand **Text (advanced)**, if necessary.
- n) Drag **Substring** to the last **string** field in the expression.
- o) Right-click the **string** field for the Substring operator and select **Replace with ⇒ Unit**.
- p) Enter **1** in the first **number** field for the Substring operator.
- q) Enter **3** in the second **number** field for the Substring operator.

The expression should resemble the following:



- r) In the lower right corner of the window, click **Preview**.

Product Code	Facility	Unit
USOLYMPI-TGM	USOLYMPI0074	TGM000031
USOLYMPI-TGM	USOLYMPI0074	TGM000200
USOLYMPI-TAF	USOLYMPI0074	TAF000117
USOLYMPI-NBD	USOLYMPI0074	NBD000214
USOLYMPI-NPR	USOLYMPI0074	NPR000099
USOLYMPI-NPR	USOLYMPI0074	NPR000159
USOLYMPI-TAF	USOLYMPI0074	TAF000059

- s) Click **Close** to close the Preview Result window.

- t) Click **OK** to create the new data item.

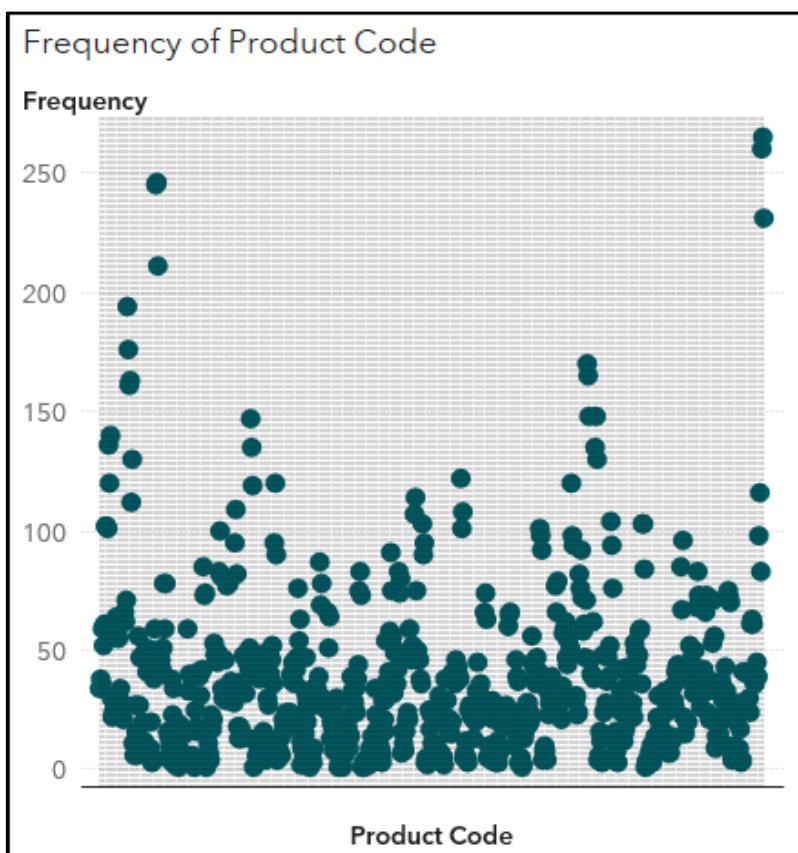
The Data pane should resemble the following:

The screenshot shows the SAS Data pane with a list of categories. The categories are: Facility - 93, Facility City - 92, Product Code - 674 (which is highlighted with a gray background), and Unit - 146.

- d. Assign the data items to the specified roles for the dot plot.

  - 1) In the canvas, click the dot plot to select it.
  - 2) In the right pane, click **Roles**, if necessary.
  - 3) For the Category role, select **Add**  $\Rightarrow$  **Product Code**.
  - 4) For the Measure role, verify that **Frequency** is selected.
  - 5) For the Data tip values role, click **Add**.
  - 6) Select **Facility City** and click **OK**.

The dot plot should resemble the following:

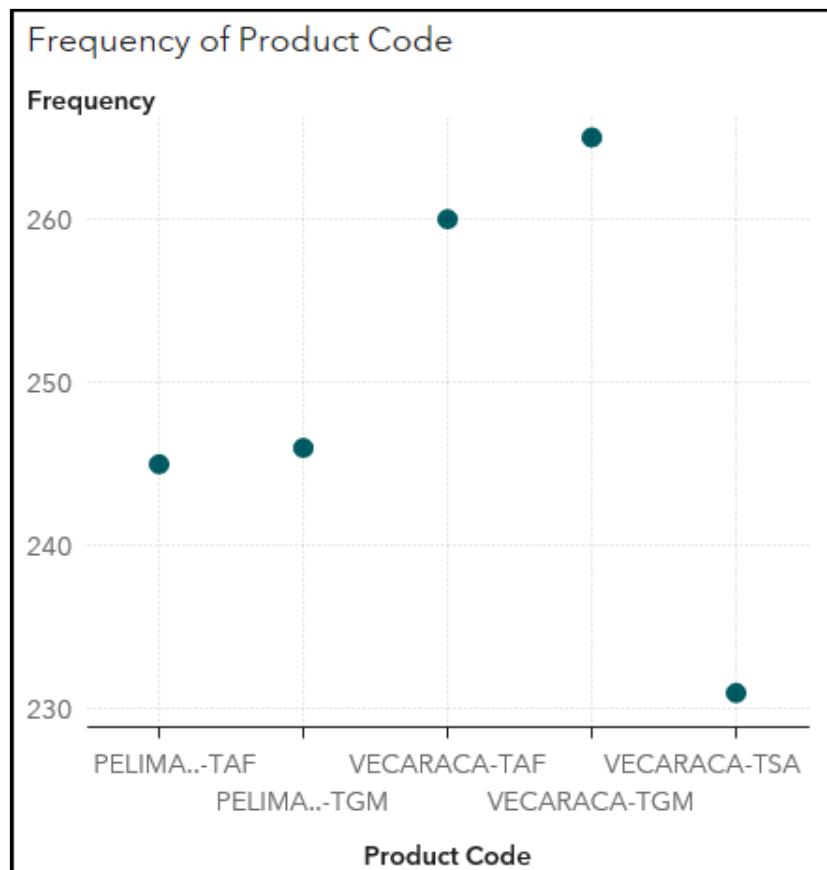


- e. Add a rank to the dot plot to show the top five products by frequency.

  - 1) In the right pane, click **Ranks**.

- 2) Select **New rank**  $\Rightarrow$  **Product Code**.
- 3) Verify that **Top count** is selected.
- 4) In the **Count** field, enter **5**.
- 5) For the **By** field, verify that **Frequency** is selected.

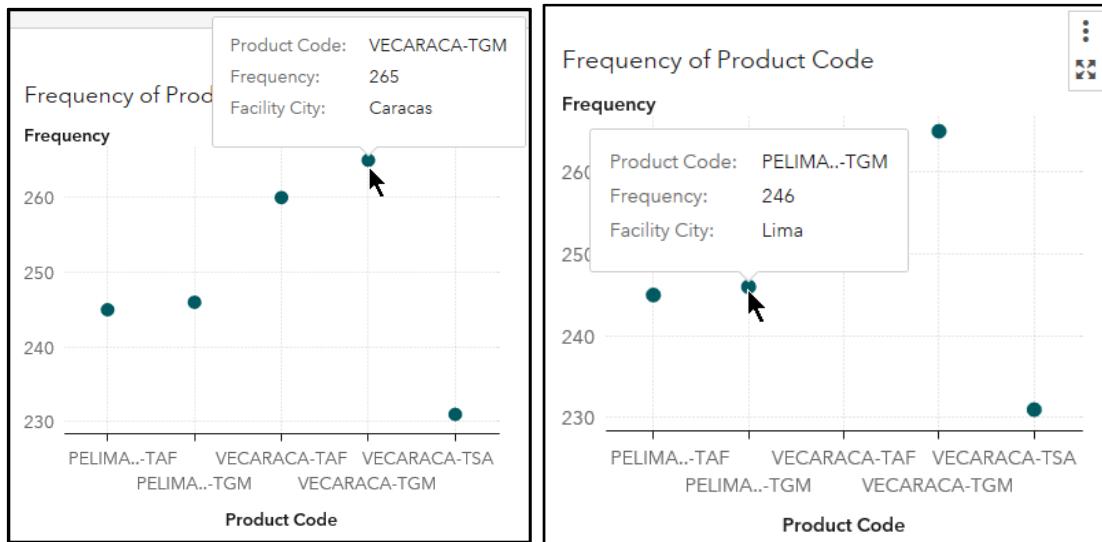
The dot plot should resemble the following:



- f. Answer the following question:

Where are the top five products produced?

**Answer: Caracas and Lima**



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

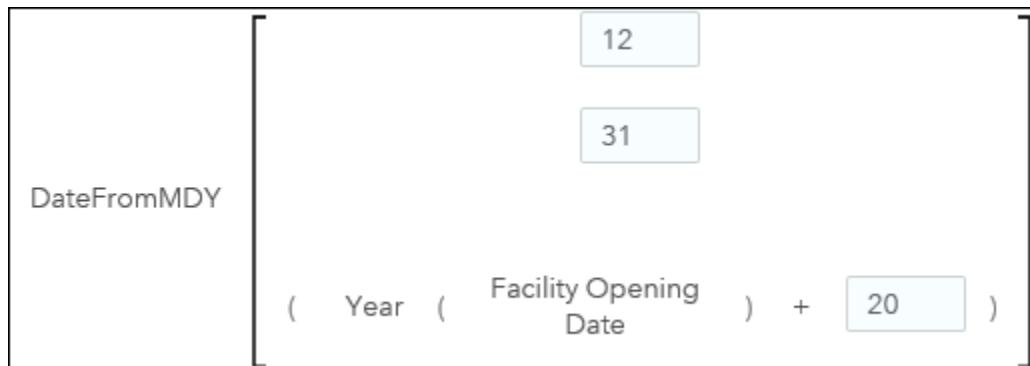
- 1) To save the report, click  (Menu) in the upper right corner and select **Save As**.
- 2) Navigate to **My Folder**.
- 3) Click **Save**.

**4. Creating a Date Calculated Item**

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.1b (Challenge)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.1b (Challenge)** and select **Edit**.
 The report opens in SAS Visual Analytics.
- c. Create a new data item, **Facility Closing Date**, that is 20 years after the facility opened (on December 31).
  - 1) In the left pane, click **Data**.
  - 2) Select **New data item**  $\Rightarrow$  **Calculated item**.
    - a) In the **Name** field, enter **Facility Closing Date**.
    - b) For the **Result Type** field, select **Date**.
    - c) On the left side of the window, click **Operators**.
    - d) Expand **Date and Time**.
    - e) Double-click **DateFromMDY** to add it to the expression.
    - f) Enter **12** in the first **number** field.
    - g) Enter **31** in the second **number** field.
    - h) On the left side of the window, expand **Numeric (simple)**.
    - i) Drag **x+y** to the third **number** field in the expression.
    - j) On the left side of the window, expand **Date and Time**, if necessary.

- k) Drag **Year** to the **number** field on the left of the plus (+) sign.
- l) Right-click the **No selection** field for the Year operator and select **Replace with**  $\Rightarrow$  **Facility Opening Date**.
- m) Enter **20** in the **number** field on the right of the plus (+) sign.

The expression should resemble the following:



- n) In the lower right corner of the window, click **Preview**.

Facility Closing Date	Facility Opening Date
31Dec2020	01/01/2000

- o) Click **Close** to close the Preview Result window.
- p) Click **OK** to create the new data item.

The Data pane should resemble the following:

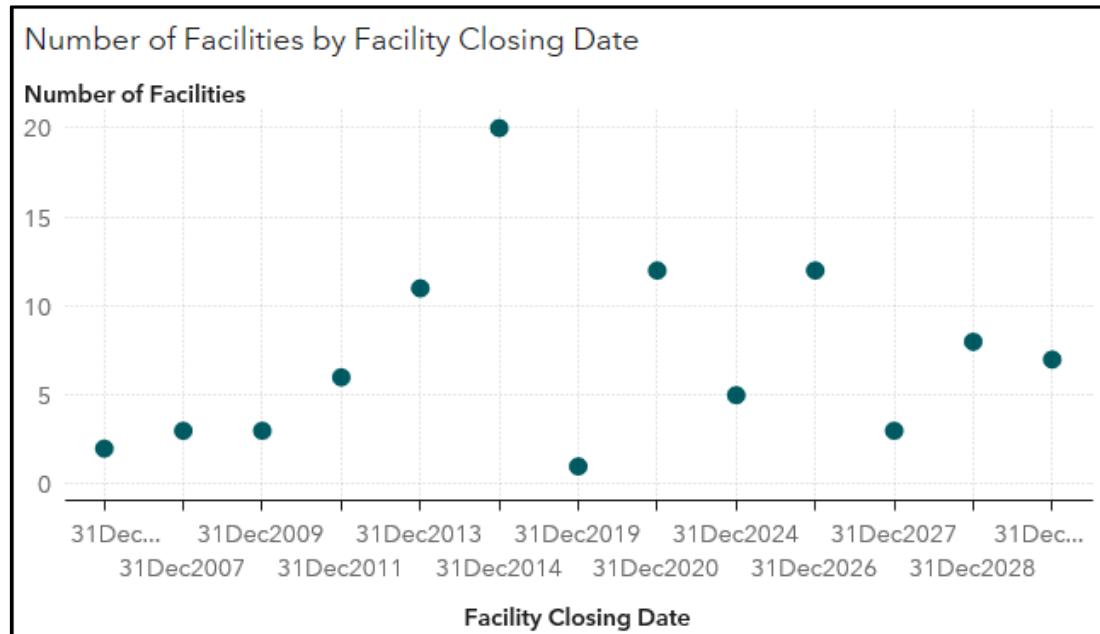
The screenshot shows the Data pane with the 'Category' section expanded. It contains two items:

- Facility Closing Date - 13
- Facility Opening Date - 13

- d. Assign data items to the specified roles for the dot plot.
- 1) In the canvas, click the dot plot to select it.

- 2) In the right pane, click **Roles**, if necessary.
- 3) For the Category role, select **Add  $\Rightarrow$  Facility Closing Date**.

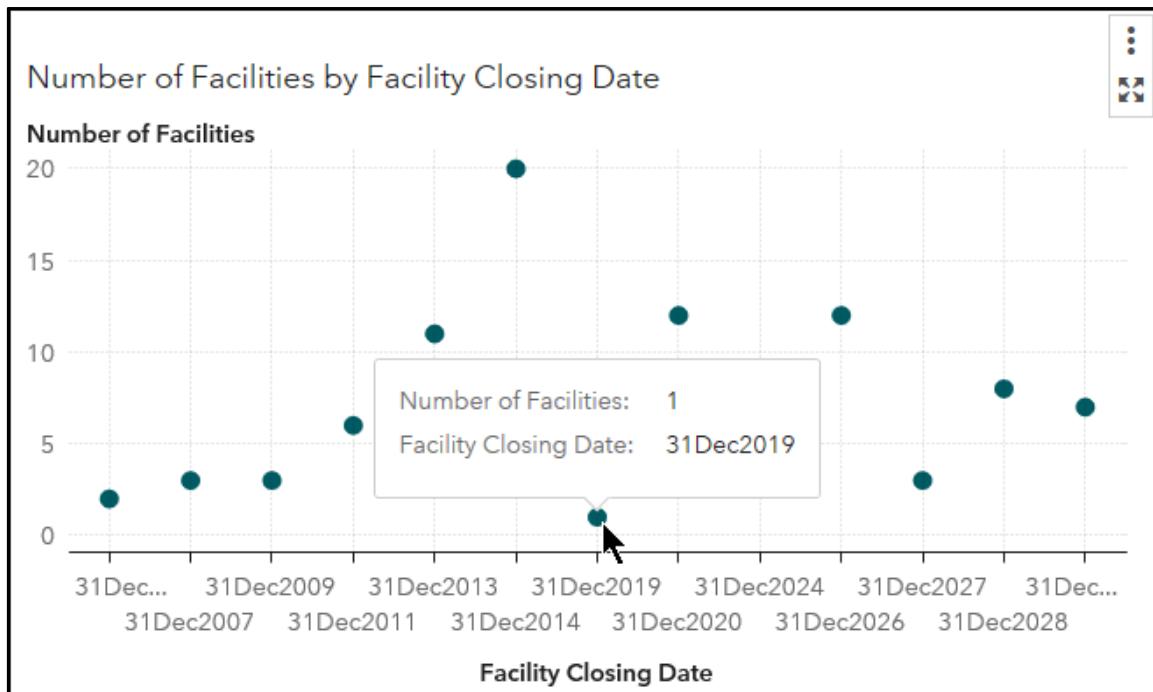
The dot plot should resemble the following:



- e. Answer the following question:

When will the next set of facilities be closed? How many will be closed on that date?

**Answer: On December 31, 2019, one facility will be closed.**



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

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

**5. Creating an Aggregated Measure**

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

b. Open **VA2-Exercise7.2a**.

- 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- 2) Right-click **VA2-Exercise7.2a** and select **Edit**.

The report opens in SAS Visual Analytics.

c. Create a new aggregated measure (**Yield Rate**).

- 1) In the left pane, click **Data**.
- 2) Select **New data item**  $\Rightarrow$  **Calculated item**.
  - a) In the **Name** field, enter **Yield Rate**.
  - b) For the **Result Type** field, select **Aggregated Measure**.
  - c) On the left side of the window, click **Operators**.
  - d) Expand **Numeric (simple)**.
  - e) Double-click the **x/y** operator to add it to the expression.
  - f) Expand **Aggregated (simple)**.
  - g) Drag **Sum** to the **number** field on the left of the division (/) sign.
  - h) For the Sum operator, verify that **\_ByGroup\_** is specified.
  - i) Right-click the **number** field for the Sum operator on the left of the division (/) sign and select **Replace with**  $\Rightarrow$  **Unit Actual**.
  - j) On the left side of the window, drag **Sum** to the **number** field on the right of the division (/) sign.
  - k) For the Sum operator, verify that **\_ByGroup\_** is specified.
  - l) Right-click the **number** field for the Sum operator on the right of the division (/) sign and select **Replace with**  $\Rightarrow$  **Unit Capacity**.

The expression should resemble the following:

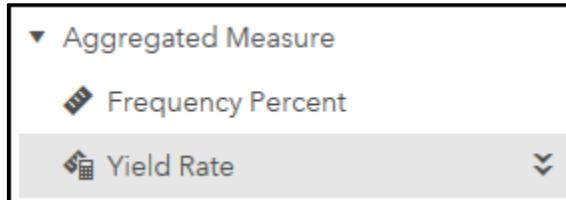
The screenshot shows the formula editor with the following expression:  

$$( \text{Sum } \text{_ByGroup\_} ) / ( \text{Sum } \text{_ByGroup\_} ) ( \text{Unit Capacity} ) )$$

- m) In the upper right corner of the window, for the **Format** field, click  (**Edit**).
  - (1) In the Format window, select **Percent**.
  - (2) For the **Width** field, verify that **12** is specified.
  - (3) For the **Decimals** field, verify that **2** is specified.
  - (4) Click **OK**.

- n) Click **OK** to create the new aggregated measure.

The Data pane should resemble the following:



- d. Add **Yield Rate** to the crosstab.

- 1) In the canvas, click the crosstab to select it.
- 2) In the right pane, click **Roles**.
- 3) For the **Measures** role, click **Add**.
- 4) Select **Yield Rate** and click **OK**.

The crosstab should resemble the following:

Unit	▲	Unit Actual	Unit Capacity	Yield Rate
Total		176007	429427	40.99%
NBD000020		31	348	8.91%
NBD000028		743	2784	26.69%
NBD000036		1541	2964	51.99%
NBD000044		1773	3048	58.17%
NBD000066		929	1980	46.92%
NBD000094		36	408	8.82%
NBD000111		936	2004	46.71%
NBD000163		933	1956	47.70%

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

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

## 6. Creating a Periodic Aggregated Measure

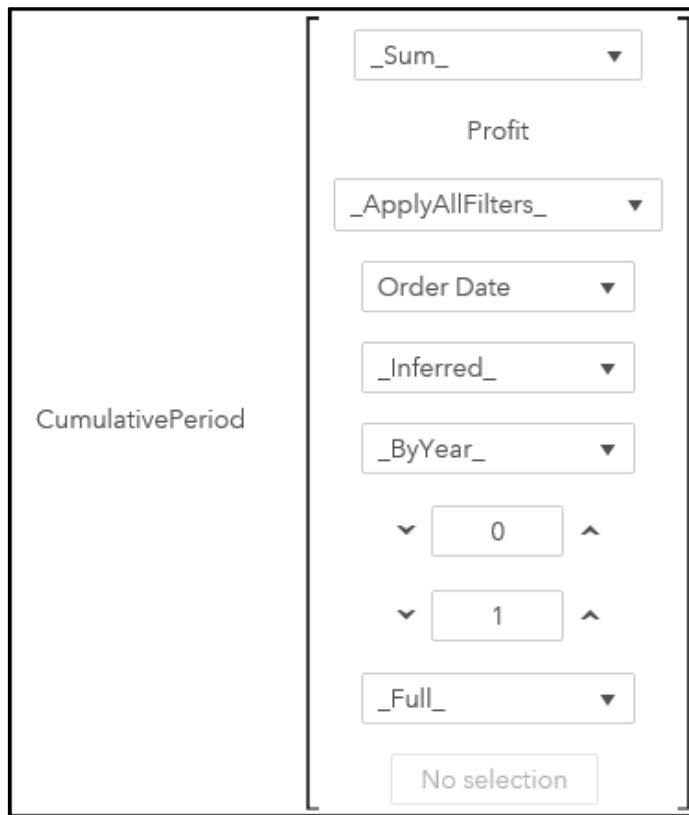
- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.2b**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.2b** and select **Edit**.

The report opens in SAS Visual Analytics.

- c. Create a new periodic aggregated measure (**Cumulative Profit**) that calculates a running total for **Profit** over the year.
- 1) In the left pane, click **Data**.
  - 2) Select **New data item**  $\Rightarrow$  **Calculated item**.
    - a) In the **Name** field, enter **Cumulative Profit**.
    - b) For the **Result Type** field, select **Aggregated Measure**.
    - c) On the left side of the window, click **Operators**.
    - d) Expand **Aggregated (periodic)**.
    - e) Double-click **CumulativePeriod** to add it to the expression.
    - f) For the aggregation type operator, verify that **\_Sum\_** is specified.
    - g) Right-click **number** field for the CumulativePeriod operator and select **Replace with**  $\Rightarrow$  **Profit**.
    - h) For the Time Filters operator, select **\_ApplyAllFilters\_**.
    - i) For the Date operator, select **Order Date**.
    - j) For the Inner Interval operator, verify that **\_Inferred\_** is specified.
    - k) For the Outer Interval operator, select **\_ByYear\_**.
    - l) For the Outer Interval Offset operator, verify that **0** is specified.
    - m) For the Outer Period Starting Point operator, verify that **1** is specified.

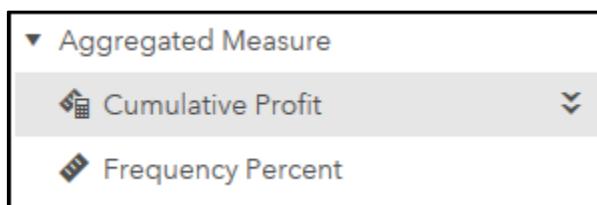
- n) For the Measure Intervals operator, verify that **\_Full\_** is specified.

The expression should resemble the following:



- o) In the upper right corner of the window, for the **Format** field, click (Edit).
- (1) In the Format window, expand **Currency (basic)**.
  - (2) Select **Dollar**.
  - (3) For the **Width** field, verify that **12** is specified.
  - (4) For the **Decimals** field, verify that **2** is specified.
  - (5) Click **OK**.
- p) Click **OK** to create the new periodic aggregated measure.

The Data pane should resemble the following:



- d. Add **Cumulative Profit** to the list table.

- 1) In the canvas, click the list table to select it.
- 2) In the right pane, click **Roles**.
- 3) For the Columns role, click **Add**.

- 4) Select **Cumulative Profit** and click **OK**.

The list table should resemble the following:

Order Date ▲	Profit	Cumulative Profit
Jan2012	\$118,773.87	\$118,773.87
Feb2012	\$106,735.22	\$225,509.10
Mar2012	\$84,893.31	\$310,402.41
Apr2012	\$94,871.26	\$405,273.68
May2012	\$118,248.93	\$523,522.61
Jun2012	\$159,343.43	\$682,866.04
Jul2012	\$140,479.12	\$823,345.15
Aug2012	\$151,644.75	\$974,989.91
Sep2012	\$74,120.37	\$1,049,110.28
Oct2012	\$80,908.90	\$1,130,019.18
Nov2012	\$98,421.95	\$1,228,441.13
Dec2012	\$207,711.25	\$1,436,152.38
Jan2013	\$145,229.98	\$145,229.98
Feb2013	\$118,856.68	\$264,086.66

**Cumulative Profit** is a running total of the **Profit** values for the year. In January of each year, the running total resets.

- e. Modify **Cumulative Profit** to calculate a running total for the fiscal year (starting in March).
- 1) In the left pane, click **Data**.
  - 2) Right-click **Cumulative Profit** and select **Edit**.
    - a) For the outer period starting point operator, enter **3**.

The expression should resemble the following:

- b) Click **OK** to apply the changes.

The crosstab should resemble the following:

Order Date ▲	Profit	Cumulative Profit
Jan2012	\$118,773.87	\$118,773.87
Feb2012	\$106,735.22	\$225,509.10
Mar2012	\$84,893.31	\$84,893.31
Apr2012	\$94,871.26	\$179,764.57
May2012	\$118,248.93	\$298,013.50
Jun2012	\$159,343.43	\$457,356.94
Jul2012	\$140,479.12	\$597,836.05
Aug2012	\$151,644.75	\$749,480.81
Sep2012	\$74,120.37	\$823,601.18
Oct2012	\$80,908.90	\$904,510.08
Nov2012	\$98,421.95	\$1,002,932.03
Dec2012	\$207,711.25	\$1,210,643.28

In March of each year, the running total resets after the outer period starting point is changed.

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

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

## 7. Adding Scopes to an Aggregation

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.2b (Challenge)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.2b (Challenge)** and select **Edit**.

The report opens in SAS Visual Analytics.

- c. Answer the following questions:

What is the expression for **Average Salary**?

**Answer:** `Avg[_ByGroup_](Salary)`



- In the left pane, click **Data**.
- Right-click **Average Salary**, in the **Aggregated Measure group**, and select **Edit**.
- Click **Cancel** to close the **Edit Calculated Item window**.

What is the average salary for all employees?

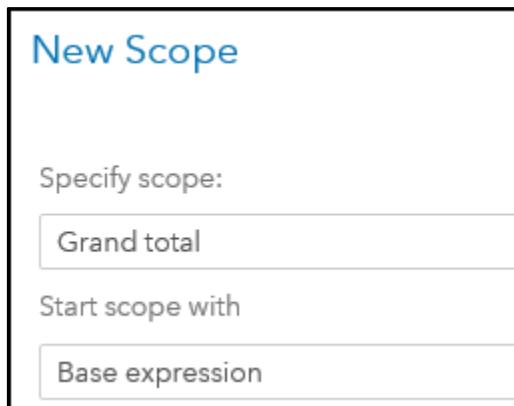
**Answer:** The average salary for all employees is \$27,595.90.

Gender ▲	Female	Male	Total
Job Title ▲	Average Salary	Average Salary	Average Salary
Purchasing Agent I	.	\$31,760.00	\$31,760.00
Purchasing Agent III	.	\$35,070.00	\$35,070.00
Sales Rep. I	\$26,319.38	\$26,497.18	\$26,417.79
Sales Rep. II	\$27,346.86	\$27,395.74	\$27,373.58
Sales Rep. III	\$29,743.80	\$29,384.31	\$29,533.29
Sales Rep. IV	\$32,189.62	\$31,531.09	\$31,880.51
Temp. Sales Rep.	\$26,370.86	\$26,208.78	\$26,287.57
Trainee	\$24,586.50	\$25,710.33	\$25,260.80
Total	\$27,607.23	\$27,586.63	\$27,595.90

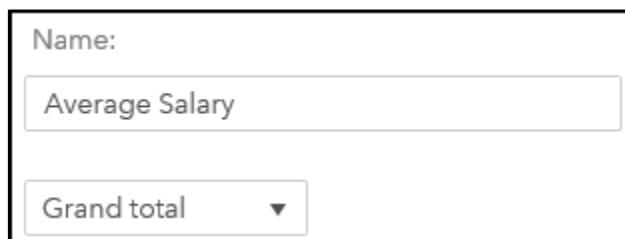
- d. Management would like to see the total salary for all employees in the crosstab. Edit the **Average Salary** aggregated measure to add the scope.

- 1) In the left pane, click **Data**.
- 2) Right-click **Average Salary**, in the Aggregated Measure group, and select **Edit**.

- a) In the upper right portion of the window, click **+** (Add) to add a scope.
- (1) In the New Scope window, for the **Specify scope** field, select **Grand total**.
  - (2) For the **Start scope with** field, select **Base expression**.



- (3) Click **OK** to add the scope.
- b) In the upper left portion of the window, verify that **Grand total** is specified.



- c) In the expression, right-click **Avg** and select **Replace Operator with**  $\Rightarrow$  **Sum**.

The expression should resemble the following:



- d) Click **OK** to save the changes to the aggregated measure.

The crosstab should resemble the following:

Gender ▲	Female	Male	Total
Job Title ▲	Average Salary	Average Salary	Average Salary
Purchasing Agent I	.	\$31,760.00	\$31,760.00
Purchasing Agent III	.	\$35,070.00	\$35,070.00
Sales Rep. I	\$26,319.38	\$26,497.18	\$26,417.79
Sales Rep. II	\$27,346.86	\$27,395.74	\$27,373.58
Sales Rep. III	\$29,743.80	\$29,384.31	\$29,533.29
Sales Rep. IV	\$32,189.62	\$31,531.09	\$31,880.51
Temp. Sales Rep.	\$26,370.86	\$26,208.78	\$26,287.57
Trainee	\$24,586.50	\$25,710.33	\$25,260.80
Total	\$27,607.23	\$27,586.63	\$17,854,545.00

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

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

**8. Creating an Advanced Aggregated Measure**

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

- b.** Open **VA2-Exercise7.2c**.

- 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- 2) Right-click **VA2-Exercise7.2c** and select **Edit**.

The report opens in SAS Visual Analytics.

- c.** In the list table, replace **Order Date** with **Customer Country**.

- 1) In the canvas, click the list table to select it.
- 2) In the right pane, click **Roles**.
- 3) For the Columns role, select **Order Date**  $\Rightarrow$  **Customer Country**.

The list table should resemble the following:

Customer Country	Profit	Cumulative Profit
Andorra	\$223.60	.
Australia	\$461,983.93	.
Austria	\$7,873.73	.
Belgium	\$189,299.53	.
Benin	\$81.00	.
Bulgaria	\$105.80	.
Canada	\$60,103.96	.
China	\$20.60	.
Croatia	\$528.40	.
Czech Republic	\$246.40	.

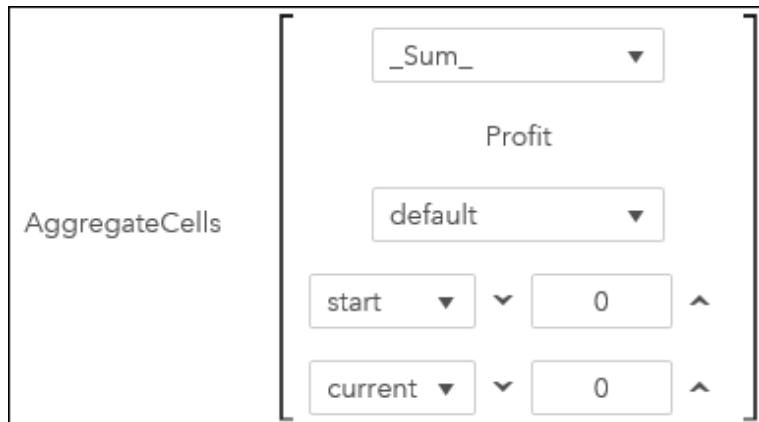
The Cumulative operator works only with date or datetime data items.

- d.** Create a new advanced aggregated measure (**Aggregate Profit**) that calculates a running total for **Profit** over the countries.

- 1) In the left pane, click **Data**.
- 2) Select **New data item**  $\Rightarrow$  **Calculated item**.
  - a) In the **Name** field, enter **Aggregate Profit**.
  - b) In the **Result Type** field, select **Aggregated Measure**.
  - c) On the left side of the window, click **Operators**.
  - d) Expand **Aggregated (tabular)**.

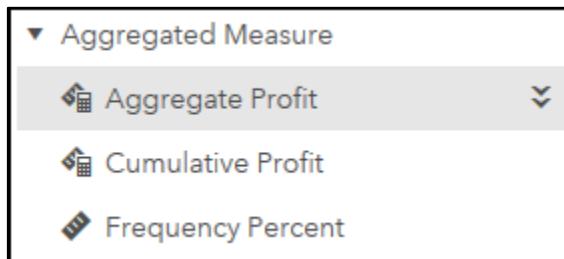
- e) Double-click **AggregateCells** to add it to the expression.
- f) For the aggregation type operator, verify that **\_Sum\_** is specified.
- g) Right-click the **number** field for the measure operator and select **Replace with**  $\Rightarrow$  **Profit**.
- h) For the direction of aggregation operator, verify that **default** is specified.
- i) For the starting point of aggregation, select **start** and **0**.
- j) For the ending point of aggregation, verify that **current** and **0** are specified.

The expression should resemble the following:



- k) In the upper right corner of the window, for the **Format** field, click (**Edit**).
  - (1) In the Format window, expand **Currency (basic)**.
  - (2) Select **Dollar**.
  - (3) For the **Width** field, verify that **12** is specified.
  - (4) For the **Decimals** field, verify that **2** is specified.
  - (5) Click **OK**.
- l) Click **OK** to create the new periodic aggregated measure.

The Data pane should resemble the following:



- e. In the list table, replace **Cumulative Profit** with **Aggregate Profit**.
  - 1) In the canvas, click the list table to select it, if necessary.
  - 2) In the right pane, click **Roles**.

- 3) For the Columns role, select **Cumulative Profit**  $\Rightarrow$  **Aggregate Profit**.

The list table should resemble the following:

Customer Country	Profit	Aggregate Profit
Andorra	\$223.60	\$223.60
Australia	\$461,983.93	\$462,207.53
Austria	\$7,873.73	\$470,081.26
Belgium	\$189,299.53	\$659,380.79
Benin	\$81.00	\$659,461.79
Bulgaria	\$105.80	\$659,567.59
Canada	\$60,103.96	\$719,671.55
China	\$20.60	\$719,692.15
Croatia	\$528.40	\$720,220.55
Czech Republic	\$246.40	\$720,466.95

- f. Answer the following question:

What is the total profit for all countries?

**Answer: The total profit for all countries is \$8,259,406.82.**

- Scroll down to the bottom of the list table.

United Arab Emirates	\$544.17	\$5,336,061.08
United Kingdom	\$861,804.13	\$6,197,865.21
United States	\$2,061,541.60	\$8,259,406.82

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

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

## 9. Working with the CumulativePeriod Scope Parameter (\_ToDate\_)

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.2c (Challenge 1)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.2c (Challenge 1)** and select **Edit**.

The report opens in SAS Visual Analytics.

- c. Answer the following question:

What is the cumulative profit for Dec2012? Does this match the total profit for 2012 in the Yearly list table?

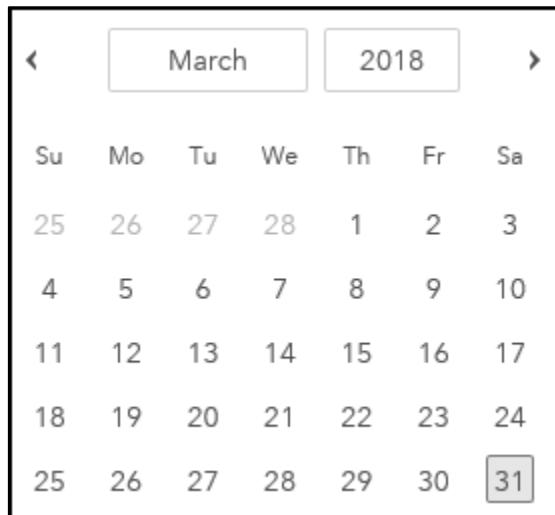
**Answer:** The cumulative profit for Dec2012 is \$1,436,152.38. This matches the total profit for 2012 in the Yearly list table.

Monthly			Yearly	
Order Date ▲	Profit	Cumulative Profit	Order ▲	Cumulative Profit (First Quarter)
Year				
Jan2012	\$118,773.87	\$118,773.87	2012	\$1,436,152.38
Feb2012	\$106,735.22	\$225,509.10	2013	\$1,519,419.04
Mar2012	\$84,893.31	\$310,402.41	2014	\$1,844,998.11
Apr2012	\$94,871.26	\$405,273.68	2015	\$1,595,887.21
May2012	\$118,248.93	\$523,522.61	2016	\$1,862,950.08
Jun2012	\$159,343.43	\$682,866.04		
Jul2012	\$140,479.12	\$823,345.15		
Aug2012	\$151,644.75	\$974,989.91		
Sep2012	\$74,120.37	\$1,049,110.28		
Oct2012	\$80,908.90	\$1,130,019.18		
Nov2012	\$98,421.95	\$1,228,441.13		
Dec2012	\$207,711.25	\$1,436,152.38		

- d. Edit the **Cumulative Period (First Quarter)** data item to aggregate profit through the first quarter only.

- 1) In the left pane, click **Data**.
- 2) Right-click **Cumulative Period (First Quarter)**, in the Aggregated Measure group, and select **Edit**.
  - a) In the expression, change the scope parameter to **\_ToDate\_**.
  - b) Click the date parameter for **\_ToDate\_** (currently, today's date).

- c) Select the date for the end of the first quarter of any year and click **OK**. For example, select March 31, 2018.



**Note:** The year selected does not matter for the `_ToDate_` scope parameter.

The expression should resemble the following:

- d) Click **OK** to save the changes to the calculated item.

- e. Answer the following question:

What is the cumulative profit for Mar2012? Does this match the new total profit for 2012 in the Yearly list table?

**Answer:** The cumulative profit for Mar2012 is \$310,402.41. This matches the new total profit for 2012 in the Yearly list table.

Monthly			Yearly	
Order Date ▲	Profit	Cumulative Profit	Order Year ▲	Cumulative Profit (First Quarter)
Jan2012	\$118,773.87	\$118,773.87	2012	\$310,402.41
Feb2012	\$106,735.22	\$225,509.10	2013	\$361,030.11
Mar2012	\$84,893.31	\$310,402.41	2014	\$426,582.28
Apr2012	\$94,871.26	\$405,273.68	2015	\$366,985.47
May2012	\$118,248.93	\$523,522.61	2016	\$379,563.16
Jun2012	\$159,343.43	\$682,866.04		
Jul2012	\$140,479.12	\$823,345.15		
Aug2012	\$151,644.75	\$974,989.91		
Sep2012	\$74,120.37	\$1,049,110.28		
Oct2012	\$80,908.90	\$1,130,019.18		
Nov2012	\$98,421.95	\$1,228,441.13		
Dec2012	\$207,711.25	\$1,436,152.38		

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

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

## 10. Working with the First Operator

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise7.2c (Challenge 2)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise7.2c (Challenge 2)** and select **Edit**.  
The report opens in SAS Visual Analytics.
- c. Create a new aggregated measure (**First Month**) that calculates the order total for the first month of the year only.
  - 1) In the left pane, click **Data**.
  - 2) Select **New data item** ⇒ **Calculated Item**.
    - a) In the **Name** field, enter **First Month**.
    - b) For the **Result Type** field, select **Aggregated Measure**.

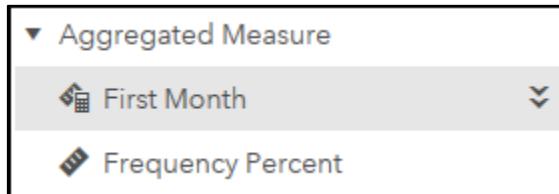
- c) In the upper right corner of the window, for the **Format** field, click  (Edit).
- (1) In the Format window, expand **Currency (basic)**.
  - (2) Select **Dollar**.
  - (3) For the **Width** field, verify that **12** is specified.
  - (4) In the **Decimals** field, enter **0**.
  - (5) Click **OK**.
- d) On the left side of the window, click **Operators**.
- e) Expand **Aggregated (advanced)**.
- f) Double-click the **First** operator to add it to the expression.
- g) For the Aggregation Context operator, verify that **\_ByGroup\_** is selected.
- h) For the Measure operator, select **Order Total**.
- i) For the Sequence Data operator, select **Transaction Month**.
- j) For the Missing Values Treatment operator, verify that **\_IncludeMissing\_** is selected.

The expression should resemble the following:



- k) Click **OK** to create the new calculated item.

The Data pane should resemble the following:



- d. Add the new aggregated measure to the Yearly list table.
- 1) In the canvas, click the Yearly list table to select it.
  - 2) In the right pane, click **Roles**.
  - 3) For the Columns role, click **Add**.

- 4) Select **First Month** and click **OK**.

The list table should resemble the following:

Yearly	
Transaction Year ▲	First Month
2014	\$434,319
2015	\$511,635
2016	\$556,871
2017	\$646,285

- e. Answer the following question:

What is the order total for Jan2014? Does this match the order total for 2014 in the Yearly list table?

**Answer:** The order total for Jan2014 is \$434,319. This matches the new first month order total for 2014 in the Yearly list table.

Monthly		Yearly	
Transaction Month ▲	OrderTotal	Transaction Year ▲	First Month
Jan2014	\$434,319	2014	\$434,319
Feb2014	\$507,458	2015	\$511,635
Mar2014	\$483,018	2016	\$556,871
Apr2014	\$324,288	2017	\$646,285
May2014	\$323,937		
Jun2014	\$296,352		
Jul2014	\$310,416		
Aug2014	\$333,703		
Sep2014	\$343,443		
Oct2014	\$890,684		
Nov2014	\$933,817		
Dec2014	\$635,950		

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

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

**End of Solutions**

## Solutions to Activities and Questions

### 7.01 Activity – Correct Answer

Given the classification and values of **Transaction Date**, **Customer Satisfaction**, and **Product Quality**, how would you find the product quality for January?

- ▼ Category
  - 📅 Transaction Date - 12
  
- ▼ Measure
  - 📊 Customer Satisfaction
  - 📊 Product Quality

```
IF Month(Transaction Date) = 1
RETURN Product Quality
ELSE Missing
```

Transaction Date	Customer Satisfaction	Product Quality	Product Quality (January)
Jan2017	50%	87%	87%
Feb2017	49%	87%	.
Mar2017	50%	87%	.
Apr2017	46%	87%	.
May2017	47%	87%	.
Jun2017	47%	87%	.
Jul2017	45%	87%	.
Aug2017	45%	87%	.
Sep2017	45%	86%	.
Oct2017	47%	87%	.
Nov2017	47%	86%	.
Dec2017	47%	86%	.

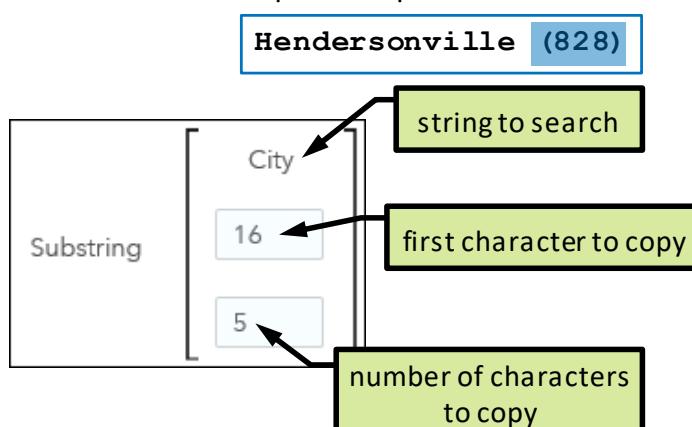


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### 7.02 Activity – Correct Answer

Which Text (advanced) operator returns the portion of the text at the specified position?



- ▼ Text (advanced)
  - ⊕ FindChar
  - ⊕ FindString
  - ⊕ GetLength
  - △ GetWord
  - △ RemoveBlanks
  - △ RemoveChars
  - △ RemoveWord
  - △ Replace
  - △ ReplaceWord
  - △ Reverse
  - △ Substring
  - △ Update
  - △ URLDecode
  - △ URLEncode



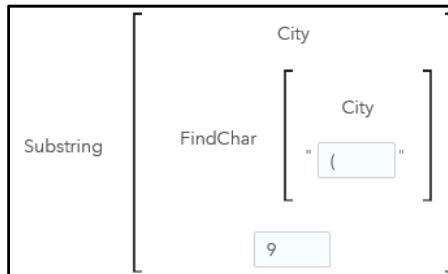
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## 7.03 Activity – Correct Answer

Given the values of **City** and the **Text (advanced)** operators, how would you extract area codes?

City
Hendersonville (828)
Wingate (704/980)
A&T State University (336)
Asheville (828)
Black Mountain (828)
Bowman Gray School of Med (336)
Cary (919/984)
Chapel Hill (919/984)
Charlotte (704/980)



- ▼ Text (advanced)
- ⊕ FindChar
- ⊕ FindString
- ⊕ GetLength
- ▲ GetWord
- ▲ RemoveBlanks
- ▲ RemoveChars
- ▲ RemoveWord
- ▲ Replace
- ▲ ReplaceWord
- ▲ Reverse
- ▲ Substring
- ▲ Update
- ▲ URLDecode
- ▲ URLEncode



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## 7.04 Multiple Choice Activity – Correct Answer

Which **Text (simple)** operator combines two text strings into one string?

▼ Text (simple)
▲ Concatenate
⊕ Contains
⊕ EndsWith
▲ Format
▲ LowerCase
⊕ NotContains
⊕ Parse
⊕ StartsWith
▲ UpCase



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## 7.05 Activity – Correct Answer

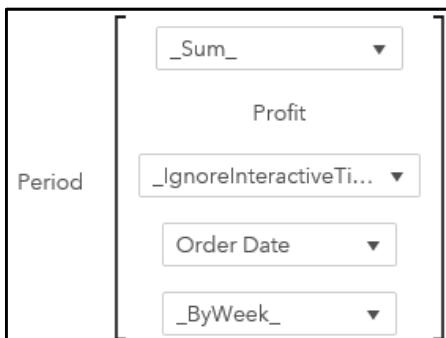
Which format is used for **Order Date**?

**Year, Week (WEEKV5)**

Order Date - 262

Name: Order Date

Format: Year, Week (WEEKV5) 



Which aggregation interval is used for  
**Aggregate Profit?**  
**\_ByWeek\_**

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## 7.05 Activity – Correct Answer

What happens if you change the aggregation interval for **Aggregate Profit** to **\_ByMonth\_**?

**Aggregate Profit shows the total monthly profit.**

Order Date ▲	Profit	Aggregate Profit
11W52	\$414.18	\$118,773.87
12W01	\$27,072.48	\$118,773.87
12W02	\$23,302.93	\$118,773.87
12W03	\$28,760.36	\$118,773.87
12W04	\$29,552.18	\$118,773.87
12W05	\$28,049.85	\$118,773.87
12W06	\$26,425.87	\$106,735.22
12W07	\$26,997.73	\$106,735.22
12W08	\$26,635.66	\$106,735.22
12W09	\$19,353.84	\$106,735.22
12W10	\$18,734.91	\$84,893.31

January

February

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## Practice Review

### 7.1 Creating a Numeric Calculated Item – Solution

Are there any jobs that do not have female employees?

**Purchasing Agent I and Purchasing Agent III**

Are there any jobs in which females make more than males (on average)?

**Females in Sales Rep. III, Sales Rep. IV, and Temp. Sales Rep. make more (on average) than their male counterparts.**

Job Title	Salary (Female)	Salary (Male)
Purchasing Agent I	.	\$31,760.00
Purchasing Agent III	.	\$35,070.00
Sales Rep. I	\$26,319.38	\$26,497.18
Sales Rep. II	\$27,346.86	\$27,395.74
Sales Rep. III	\$29,743.80	\$29,384.31
Sales Rep. IV	\$32,189.62	\$31,531.09
Temp. Sales Rep.	\$26,370.86	\$26,208.78
Trainee	\$24,586.50	\$25,710.33

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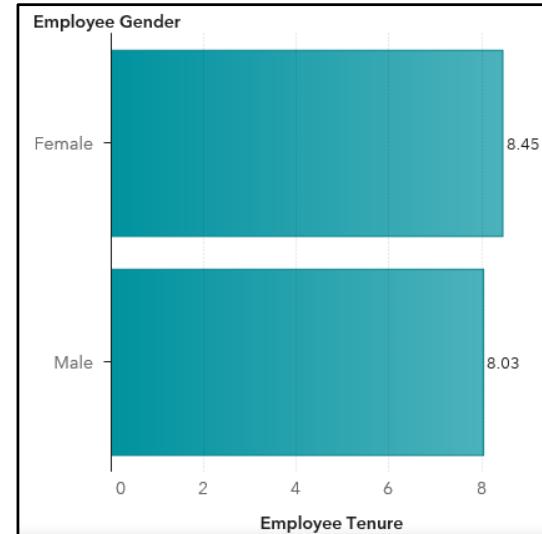
### 7.2 Creating an Advanced Numeric Calculated Column (Optional) – Solution

What is the average employee tenure for male retired employees?

**8.03 years**

For female retired employees?

**8.45 years**



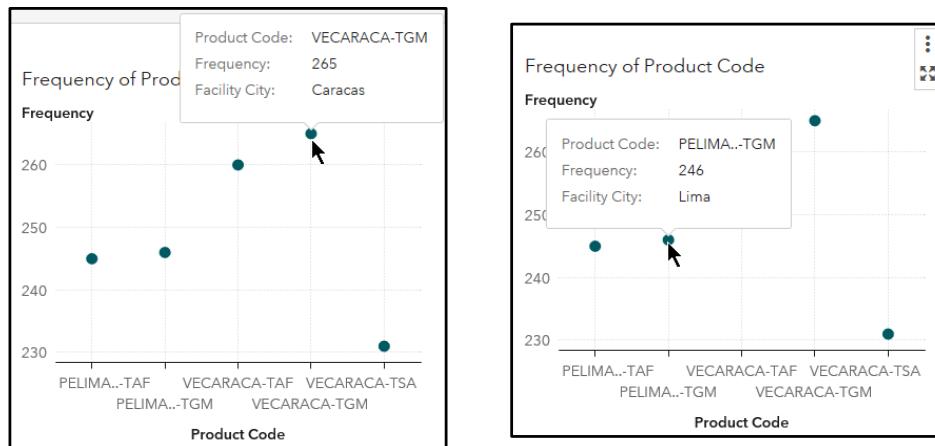
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## 7.3 Creating a Character Calculated Item – Solution

Where are the top five products produced?

**Caracas and Lima**

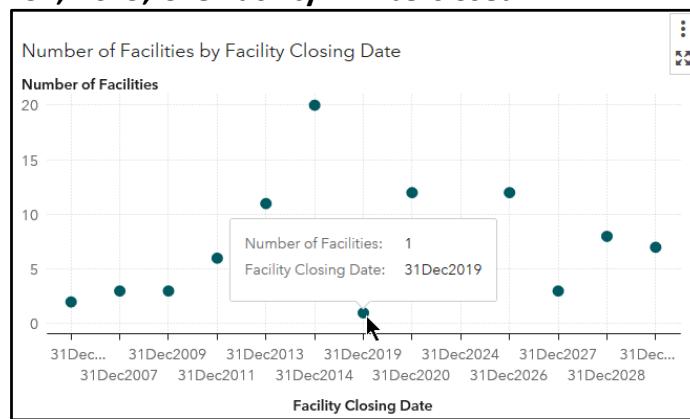


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## 7.4 Creating a Date Calculated Item (Optional) – Solution

When will the next set of facilities be closed? How many will be closed on that date?

**On December 31, 2019, one facility will be closed.**



## 7.5 Creating an Aggregated Measure – Solution

The calculation should resemble the following:

```
( Sum _ByGroup_ ▾ ( Unit Actual ) / Sum _ByGroup_ ▾ ( Unit Capacity ) )
```

The crosstab should resemble the following:

Unit	Unit Actual	Unit Capacity	Yield Rate
Total	176007	429427	40.99%
NBD000020	31	348	8.91%
NBD000028	743	2784	26.69%
NBD000036	1541	2964	51.99%
NBD000044	1773	3048	58.17%
NBD000066	929	1980	46.92%
NBD000094	36	408	8.82%
NBD000111	936	2004	46.71%
NBD000163	933	1956	47.70%

## 7.6 Creating a Periodic Aggregated Measure – Solution

The calculation should resemble the following:

Selects interval based on level displayed in object

CumulativePeriod

Order Date ▲	Profit	Cumulative Profit
Jan2012	\$118,773.87	\$118,773.87
Feb2012	\$106,735.22	\$225,509.10
Mar2012	\$84,893.31	\$84,893.31
Apr2012	\$94,871.26	\$179,764.57
May2012	\$118,248.93	\$298,013.50
Jun2012	\$159,343.43	\$457,356.94
Jul2012	\$140,479.12	\$597,836.05
	\$151,644.75	\$749,480.81
	\$74,120.37	\$823,601.18
Oct2012	\$80,908.90	\$904,510.08
Nov2012	\$98,421.95	\$1,002,932.03
Dec2012	\$207,711.25	\$1,210,643.28

## 7.7 Adding Scopes to an Aggregation (Optional) – Solution

What is the expression for **Average Salary**?

Avg  ( Salary )

What is the average salary for all employees?

**\$27,595.90**

Gender ▲	Female	Male	Total
Job Title ▲	Average Salary	Average Salary	Average Salary
Purchasing Agent I	.	\$31,760.00	\$31,760.00
Purchasing Agent III	.	\$35,070.00	\$35,070.00
Sales Rep. I	\$26,319.38	\$26,497.18	\$26,417.79
Sales Rep. II	\$27,346.86	\$27,395.74	\$27,373.58
Sales Rep. III	\$29,743.80	\$29,384.31	\$29,533.29
Sales Rep. IV	\$32,189.62	\$31,531.09	\$31,880.51
Temp. Sales Rep.	\$26,370.86	\$26,208.78	\$26,287.57
Trainee	\$24,586.50	\$25,710.33	\$25,260.80
Total	\$27,607.23	\$27,586.63	\$27,595.90

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## 7.7 Adding Scopes to an Aggregation (Optional) – Solution

Name:

Average Salary

Result Type:

Aggregated Measure

Format:

DOLLAR12

Add scope

Base expression ▾

Base expression

Grand total

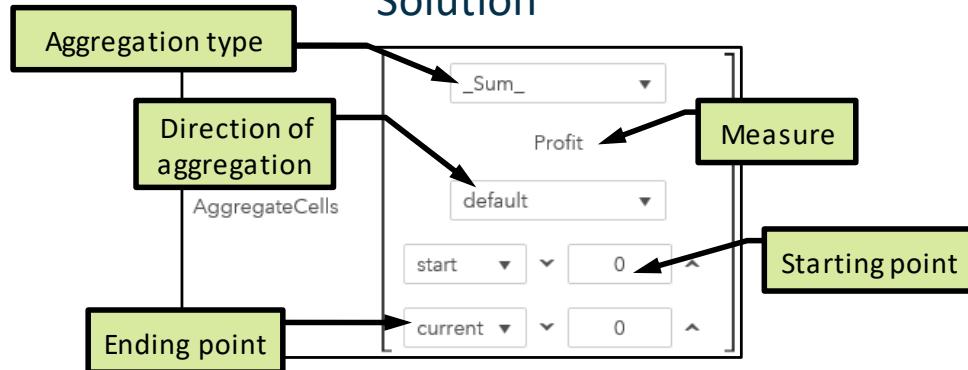
Scopes

Gender ▲	Female	Male	Total
Job Title ▲	Average Salary	Average Salary	Average Salary
Purchasing Agent I	.	\$31,760.00	\$31,760.00
Purchasing Agent III	.	\$35,070.00	\$35,070.00
Sales Rep. I	\$26,319.38	\$26,497.18	\$26,417.79
Sales Rep. II	\$27,346.86	\$27,395.74	\$27,373.58
Sales Rep. III	\$29,743.80	\$29,384.31	\$29,533.29
Sales Rep. IV	\$32,189.62	\$31,531.09	\$31,880.51
Temp. Sales Rep.	\$26,370.86	\$26,208.78	\$26,287.57
Trainee	\$24,586.50	\$25,710.33	\$25,260.80
Total	\$27,607.23	\$27,586.63	\$17,854,545.00

Add scope

Sas

## 7.8 Creating an Advanced Aggregated Measure – Solution



What is the total profit for all countries?

**\$8,259,406.82**

United Arab Emirates	\$544.17	\$5,336,061.08
United Kingdom	\$861,804.13	\$6,197,865.21
United States	\$2,061,541.60	\$8,259,406.82



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## 7.9 Working with CumulativePeriod Scope Parameter (\_ToDate\_) (Optional) – Solution

What is the cumulative profit for Dec2012?

**\$1,436,152.38**

Does this match the total profit for 2012 in the Yearly list table?

**Yes**

Monthly		Yearly	
Order Date	Profit	Cumulative Profit	Order Year
Jan2012	\$118,773.87	\$118,773.87	2012
Feb2012	\$106,735.22	\$225,509.10	2013
Mar2012	\$84,893.31	\$310,402.41	2014
Apr2012	\$94,871.26	\$405,273.68	2015
May2012	\$118,248.93	\$523,522.61	2016
Jun2012	\$159,343.43	\$682,866.04	
Jul2012	\$140,479.12	\$823,345.15	
Aug2012	\$151,644.75	\$974,989.91	
Sep2012	\$74,120.37	\$1,049,110.28	
Oct2012	\$80,908.90	\$1,130,019.18	
Nov2012	\$98,421.95	\$1,228,441.13	
Dec2012	\$207,711.25	\$1,436,152.38	



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## 7.9 Working with CumulativePeriod Scope Parameter (\_ToDate\_) (Optional) – Solution

The year is ignored in the subset day.

Scope      \_ToDate\_      31Mar2018      Subset day

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## 7.9 Working with CumulativePeriod Scope Parameter (\_ToDate\_) (Optional) – Solution

What is the cumulative profit for Mar2012?

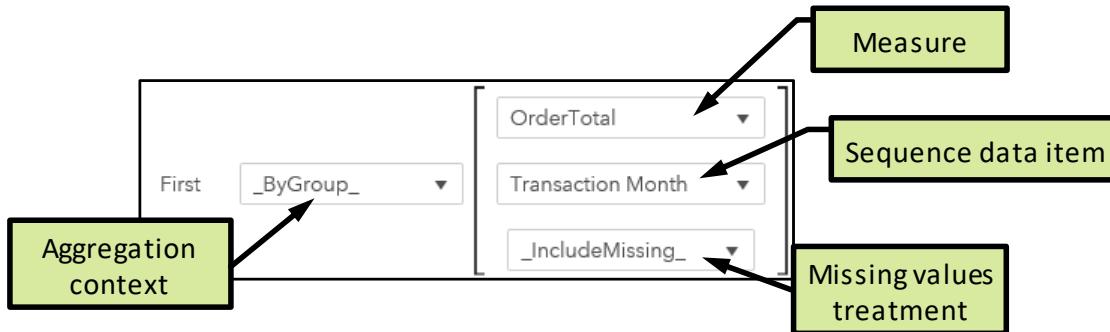
**\$310,402.41**

Does this match the new total profit for 2012 in the Yearly listtable?

**Yes**

Monthly		Yearly	
Order Date	Profit	Cumulative Profit	Order Year
Jan2012	\$118,773.87	\$118,773.87	
Feb2012	\$106,735.22	\$225,509.10	
Mar2012	\$84,893.31	\$310,402.41	2012
Apr2012	\$94,871.26	\$405,273.68	2013
May2012	\$118,248.93	\$523,522.61	2014
Jun2012	\$159,343.43	\$682,866.04	2015
Jul2012	\$140,479.12	\$823,345.15	2016
Aug2012	\$151,644.75	\$974,989.91	
Sep2012	\$74,120.37	\$1,049,110.28	
Oct2012	\$80,908.90	\$1,130,019.18	
Nov2012	\$98,421.95	\$1,228,441.13	
Dec2012	\$207,711.25	\$1,436,152.38	

## 7.10 Working with the First Operator (Optional) – Solution



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## 7.10 Working with the First Operator (Optional) – Solution

What is the order total for Jan2014?

**\$434,319**

Does this match the order total for 2014 in the Yearly listtable?

**Yes**

Monthly		Yearly	
Transaction Month ▲	OrderTotal	Transaction Year ▲	First Month
Jan2014	\$434,319	2014	\$434,319
Feb2014	\$507,458	2015	\$511,635
Mar2014	\$483,018	2016	\$556,871
Apr2014	\$324,288	2017	\$646,285
May2014	\$323,937		
Jun2014	\$296,352		
Jul2014	\$310,416		
Aug2014	\$333,703		
Sep2014	\$343,443		
Oct2014	\$890,684		
Nov2014	\$933,817		
Dec2014	\$635,950		





# Lesson 8 Creating Advanced Filters

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## 8.1 Creating Advanced Filters

### Objectives

- Describe the ways that data can be filtered in SAS Visual Analytics.
- Discuss the types of filters that can be created and modified by the report designer.
- Describe the process of creating advanced filters.
- Examine the difference between detail filters and aggregated filters.
- Describe the process of creating advanced ranks.

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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:

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

For more information about filters that can be created and modified by the report designer, see “Working with Report Filters” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

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

Filters are applied in the following order:

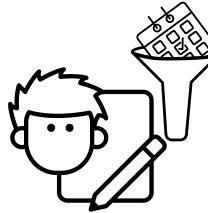
- data source filter (or filters)
- basic or advanced report filter/ post-aggregate report filter
- prompts and actions

## Business Scenario: Products



The head of Sales at Orion Star has a new goal for 2018 to increase orders. Before he can increase future orders, he needs to know what orders looked like in the past.

Specifically, he would like to see the quantity ordered for each order type for the past four years. We need to add an advanced filter to a time series plot to show the specified information.



## 8.01 Activity

Which Date and Time operator could be used to calculate the date value for two years prior to today?

▼ Date and Time

- ⌚ DateFromMDY
- ⌚ DateFromYQ
- ⌚ DatePart
- ⌚ DateTimeFromDate...
- ⌚ DateTimeFromTim...
- # DayOfMonth
- # DayOfWeek
- # DayOfYear
- # Hour

⌚ Minute

# Month

⌚ Now

# Quarter

# Second

⌚ TimeFromHMS

⌚ TimePart

# WeekNumber

# Year

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## Applying an Advanced Filter

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This demonstration illustrates how to apply an advanced filter to a time series plot.

1. From the browser window, sign in to SAS Viya for Learners.
  2. Open **VA2-Demo8.1a**.
    - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
    - b. Right-click **VA2-Demo8.1a** and select **Edit**.
- The report opens in SAS Visual Analytics.
3. Create an advanced filter on the time series plot for the past two years from today.
  4. In the canvas, click the time series plot to select it, if necessary.
  5. In the right pane, click the **Filters** icon.
  6. Select **New filter**  $\Rightarrow$  **Advanced filter**.
    - a. In the **Name** field, enter **Filter: Last 4 Years**.
    - b. On the left side of the window, verify that **Data Items** is selected.
    - c. Expand **Date**.
    - d. Click **Order Date**.
    - e. In the Conditions area, double-click **Order Date > 'x'** to add it to the expression.
    - f. In the left side of the window, click **Operators**.
    - g. Expand **Date and Time**.
    - h. Drag **DateFromMDY** to the **No selection** field in the expression.
    - i. Drag **Month** to the first **number** field in the expression.
    - j. Drag **DatePart** to the **No selection** field in the expression.
    - k. Drag **Now** to the **No selection** field in the expression.
    - l. Right-click **Month(DatePart(Now()))** and select **Copy**.
    - m. Right-click in the second **number** field in the expression and select **Paste**.
    - n. Right-click the **Month** operator and select **Replace Operator with**  $\Rightarrow$  **DayOfMonth**.
    - o. On the left side of the window, expand **Numeric (simple)**.
    - p. Drag **x-y** to the last **number** field in the expression.
    - q. Right-click in the **number** field on the left of the minus sign and select **Paste**.
    - r. Right-click the **Month** operator and select **Replace Operator with**  $\Rightarrow$  **Year**.

- s. In the **number** field on the right of the minus sign, enter **4**.

The expression should resemble the following:

```
( Order Date > DateFromMDY
    Month ( DatePart ( Now () ) )
    DayOfMonth ( DatePart ( Now () ) )
    ( Year ( DatePart ( Now () ) ) - 4 ) )
```

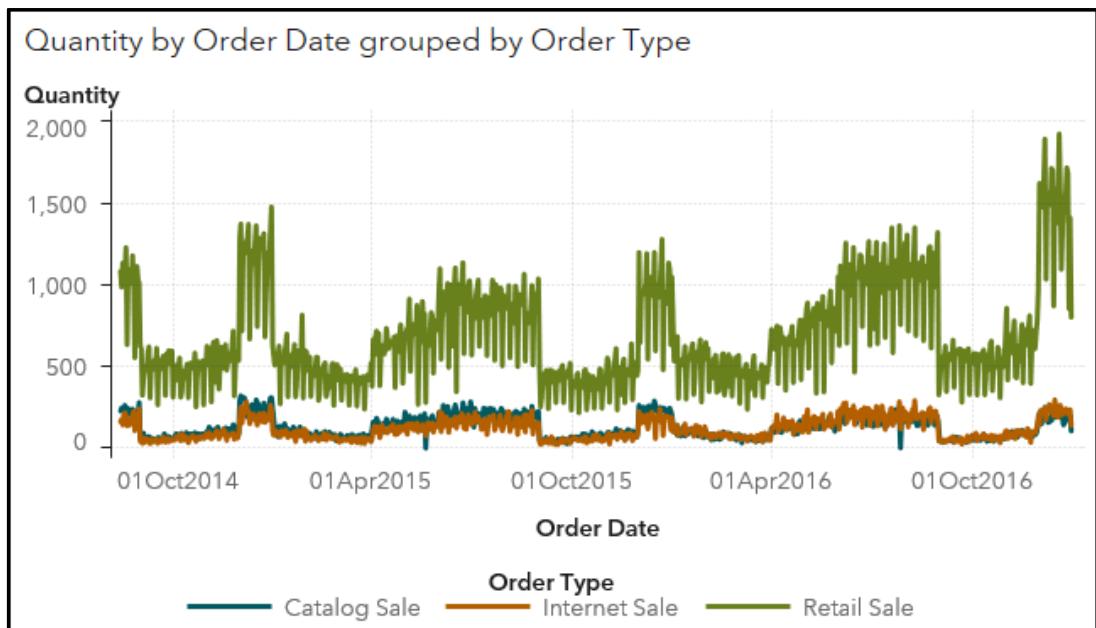
The bottom of the window should resemble the following:

Returned observations: 478,661	Total observations: 951,669
--------------------------------	-----------------------------

**Note:** The number of returned observations might differ based on today's date.

- t. Click **OK** to create the filter.

The time series plot should resemble the following:



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

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

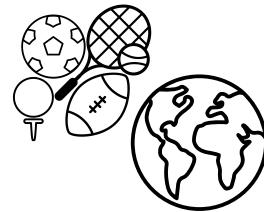
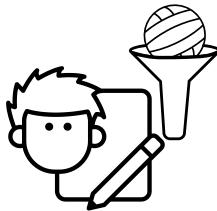
**End of Demonstration**

## Business Scenario: Products



The head of Sales at Orion Star has a new goal for 2018 to increase orders for all countries. Before he can increase future orders, he has to understand the countries that place a large number of orders now.

Specifically, he would like to see a list of the countries that ordered more than 100,000 products. You need to add a post-aggregate filter to a list table to show the specified information.



Sas



## Practice

---

### 1. Creating a Post-Aggregate Filter

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise8.1a**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise8.1a** and select **Edit**.
- c. Add a filter on the list table for **Quantity** and answer the following question:

What is the range for **Quantity**?

**Answer:** \_\_\_\_\_

- d. Change the filter to a post-aggregate filter and answer the following question:

What is the range for aggregate **Quantity**?

**Answer:** \_\_\_\_\_

- e. Filter for countries with a total quantity greater than 100,000 and answer the following question:

How many countries have a total quantity greater than 100,000?

**Answer:** \_\_\_\_\_

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

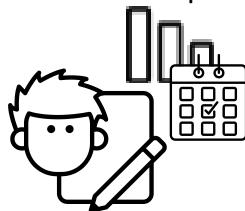
**End of Practices**

## Business Scenario: Products



The head of Sales at Orion Star has a new goal for 2018 to increase orders. Earlier, we created a report that helped him understand orders from the past (specifically, the past four years).

However, now he would like a report that shows the quantity ordered for each order type for rolling quarters so that he can easily modify the time frame that he wants to analyze. We need to add an advanced rank to a time series plot to show the specified information.



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## 8.02 Activity

▼ Numeric (advanced)

- # Abs
- # Ceil
- # Exp
- # Floor
- # Ln
- # Log
- # Mod
- # Power
- # Root
- # Round
- # TreatAs
- # Trunc

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

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## Applying an Advanced Rank

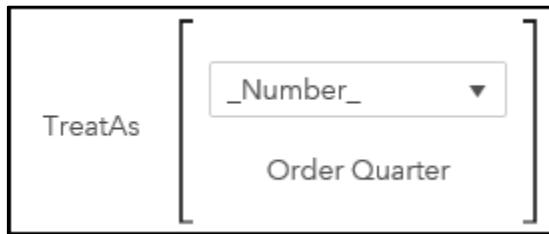
---

This demonstration illustrates how to add an advanced rank to a time series plot to view rolling quarters.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2-Demo8.1b**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2-Demo8.1b** and select **Edit**.

The report opens in SAS Visual Analytics.
3. Create a numeric data item from Order Quarter.
  - a. In the left pane, click the **Data** icon.
  - b. Select **New data item**  $\Rightarrow$  **Calculated item**.
  - c. In the **Name** field, enter **Order Quarter (Numeric)**.
  - d. For the **Result Type** field, verify that **Automatic (Numeric)** is selected.
  - e. On the left side of the window, click **Operators**.
  - f. Expand **Numeric (advanced)**.
  - g. Double-click **TreatAs** to add it to the expression.
  - h. Verify that **\_Number\_** is specified for the TreatAs operator.
  - i. Right-click the **number** field for the TreatAs operator and select **Replace with**  $\Rightarrow$  **Order Quarter**.

The expression should resemble the following:



- j. In the lower right corner, click **Preview**.

Order Quarter (Numeric)	Order Quarter
18,993.00	1st quarter 2012

This expression calculates **Order Quarter** as the number of days since January 1, 1960.

- k. Click **Close** to close the Preview Result window.

- l. Click **OK** to create the new calculated item.

The Data pane should resemble the following:

The screenshot shows the Data pane with the 'Measure' section expanded. Under 'Measure', there are three items: 'Frequency', 'Order Quarter (Numeric)', and 'Quantity'. The 'Order Quarter (Numeric)' item is highlighted with a gray background, indicating it is selected.

4. Add the new data item to the list table.
- In the canvas, click the list table to select it.
  - In the right pane, click the **Roles** icon.
  - For the Columns role, select **Add**  $\Rightarrow$  **Order Quarter (Numeric)**.
  - Click **OK**.

- e. Click the **Order Quarter (Numeric)** column to sort in ascending order.

The list table should resemble the following:

Order Quarter	Order Quarter (Numeric) ▲
1st quarter 2012	663,672,399.00
3rd quarter 2012	742,034,150.00
4th quarter 2012	766,595,396.00
2nd quarter 2012	807,062,360.00
1st quarter 2013	818,266,212.00
1st quarter 2015	842,673,283.00

Notice that the quarters are not in the correct order. By default, all numeric columns have an aggregation of Sum. Because some quarters have more days than others, they are given a higher value. We need to change the aggregation to something that is nonadditive (minimum, medium, or maximum).

- f. In the left pane, click the **Data** icon.  
 g. Next to **Order Quarter (Numeric)**, click  (Edit properties).  
 h. For the **Aggregation** field, select **Minimum**.

The list table should resemble the following:

Order Quarter	Order Quarter (Numeric) ▲
1st quarter 2012	18,993.00
2nd quarter 2012	19,084.00
3rd quarter 2012	19,175.00
4th quarter 2012	19,267.00
1st quarter 2013	19,359.00
2nd quarter 2013	19,449.00

Now **Order Quarter (Numeric)** represents the numeric value of the first day of the quarter in which an order was placed. Therefore, the quarters are sorted appropriately. The numeric value of the first day of the quarter in which an order was placed is the number of days between January 1, 1960, and that date. Notice that as we get farther from 1960, the numeric dates increase.

5. Add a rank to the time series plot to see the last four quarters.
- In the canvas, click the time series plot to select it.
  - In the right pane, click the **Ranks** icon.
  - Select **New rank ⇒ Order Quarter**.
  - Verify that **Top Count** is selected.

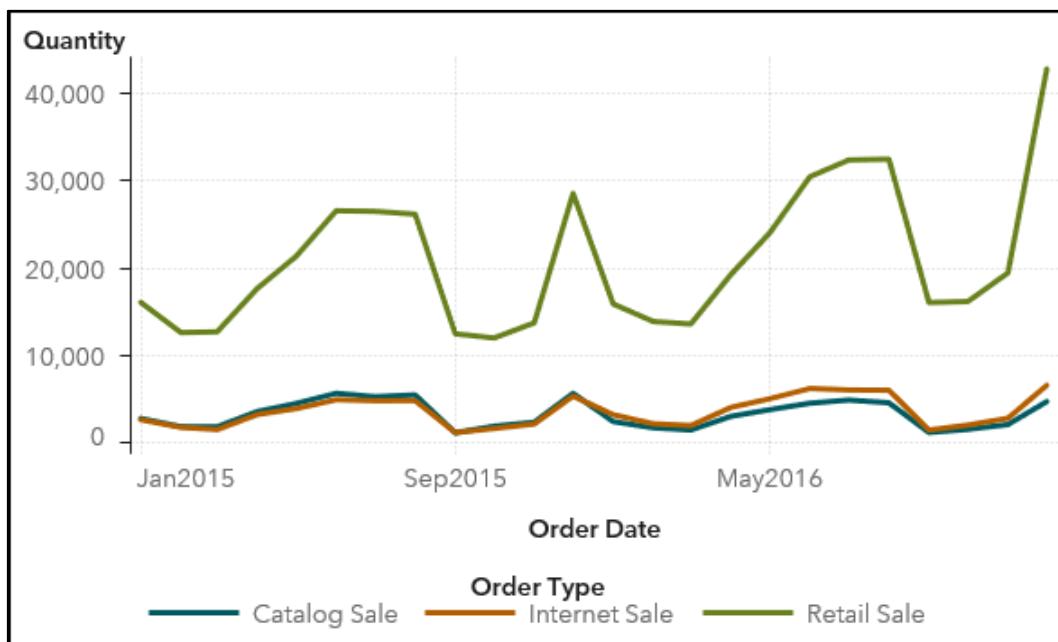
**Note:** This selects the most recent quarters.

- e. In the **Count** field, enter **8**.
- f. For the **By** field, select **Order Quarter (Numeric)**.

The Ranks pane should resemble the following:

The screenshot shows the 'Order Quarter' configuration in the Ranks pane. It includes a dropdown for 'Top count', a 'Count' input field set to '8', a 'By' dropdown set to 'Order Quarter (Numeric)', and an unchecked 'Ties' checkbox.

The time series plot should resemble the following:



The time series plot shows the last eight quarters (that is, the past two years) of data. This will update as new rows are added to the data source.

6. Save the report in My Folder.

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

**End of Demonstration**

## 8.2 Creating Advanced Interactive Filters

### Objectives

- Discuss the types of filters that can be created by a report designer and modified by a report viewer.
- Describe the process for adding automatic actions.
- Discuss the linked selection automatic action.
- Discuss the one-way filter automatic action.
- Discuss the two-way filter automatic action.
- Describe the process for using parameters in external URL links.
- Describe how to apply filters between two different data sources.

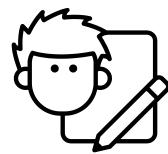
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### Filtering Data

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

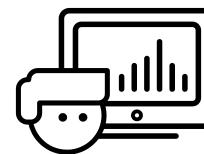


Report Designer

#### Detail report filters

- Data source
- Basic
- Advanced

#### Post-aggregate report filters



Report Viewer

#### Prompts

- Report
- Page

#### Actions

- Filter
- Links

Automatic actions are also available.

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

<b>Report prompt</b>	Automatically subsets the data for all objects in the report as long as the report object uses the same data source as the prompt.
<b>Page prompt</b>	Automatically subsets the data for all objects on the page as long as the report object uses the same data source as the prompt.
<b>Filter action</b>	Subsets the data in the target object based on selections in a source object.
<b>Link action</b>	Subsets the report, a 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.
<b>Automatic actions</b>	Automatically add linked selections and filters to objects on a page. The following types of automatic actions are available:
<b>One-way filters</b>	Applies filters in the order in which they are selected.
<b>Two-way filters</b>	Applies filters to all objects on the page, even previously selected objects.
<b>Linked selections</b>	Simultaneously highlights the same data in all objects on a page based on the selections.

For all prompts and actions, if the report objects use different data sources, automatic mappings are applied. You can modify the data source mappings by right-clicking the control and selecting **Edit data source mappings**. For more information about mapping data sources, see “Map Data Sources for Actions and Links” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

For more information about prompts, see “Working with Controls” in the *SAS® Visual Analytics 8.3: Working with Report Content* documentation.

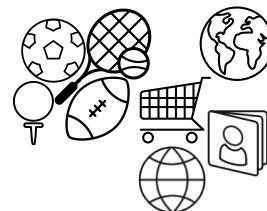
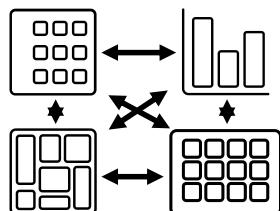
For more information about actions and links, see “Working with Report Actions and Links” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

## Business Scenario: Products



The head of Sales at Orion Star would like to see a report that shows the link between quantity ordered by location, category, and order type.

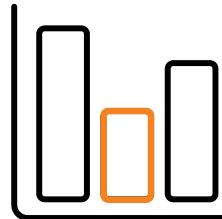
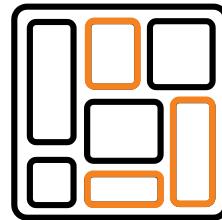
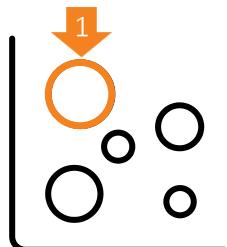
This report needs to be dynamic so that the user can select areas that they are interested in and see how they relate to other areas. We need to add the linked selection automatic action to a report.



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## Automatic Action: Linked Selection



Automatic linked selection actions enable users to show the same data simultaneously.

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Automatic linked selection actions simultaneously show the same data in multiple objects. The linked selection has the same appearance in each object, which makes the data relationship easily apparent to report viewers. In the above illustration, a report viewer selects a bubble in the bubble plot, which highlights the same data in the other objects. Linked selection actions can be applied in any order. For example, if a report viewer selects the bar in the bar chart, the same data would be highlighted in other objects.



## Applying Automatic Actions: Linked Selection

This demonstration illustrates how to apply automatic actions (linked selection) to a report.

1. From the browser window, sign in to SAS Viya for Learners.
  2. Open **VA2-Demo8.2a**.
    - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
    - b. Right-click **VA2-Demo8.2a** and select **Edit**.
- The report opens in SAS Visual Analytics.
3. Apply automatic actions (linked selection) to the report.
    - a. In the canvas, click the crosstab to select it.
    - b. In the right pane, click the **Actions** icon.
    - c. Select **Automatic actions on all objects**.
    - d. Select **Linked selection**.

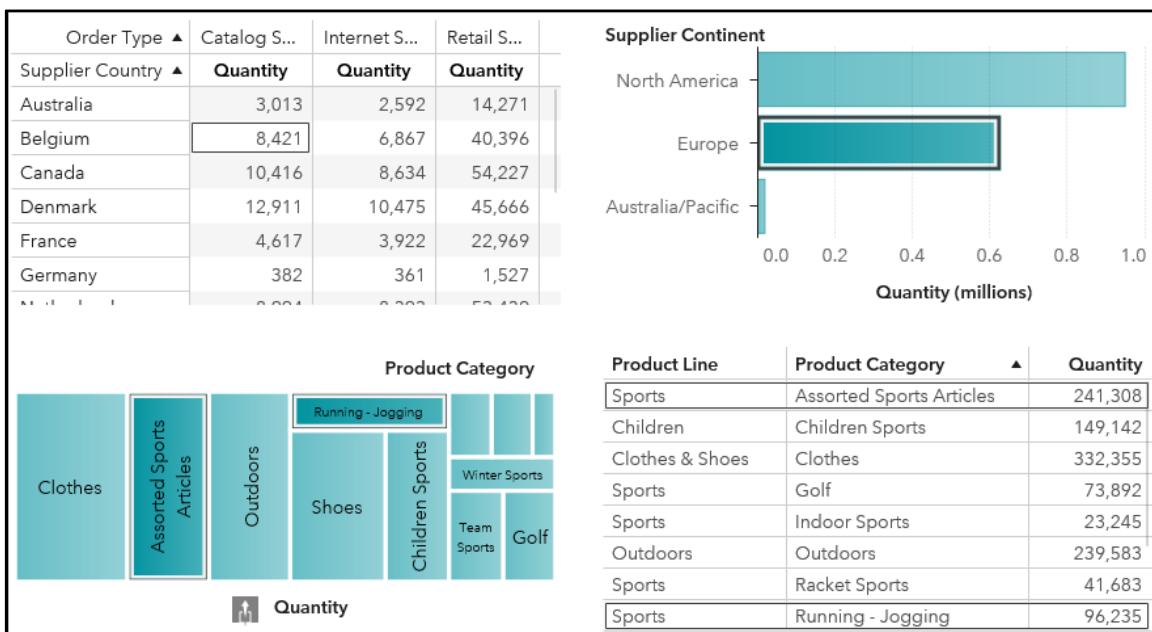
Automatic actions on all objects

Linked selection ▾

Display filter breadcrumb

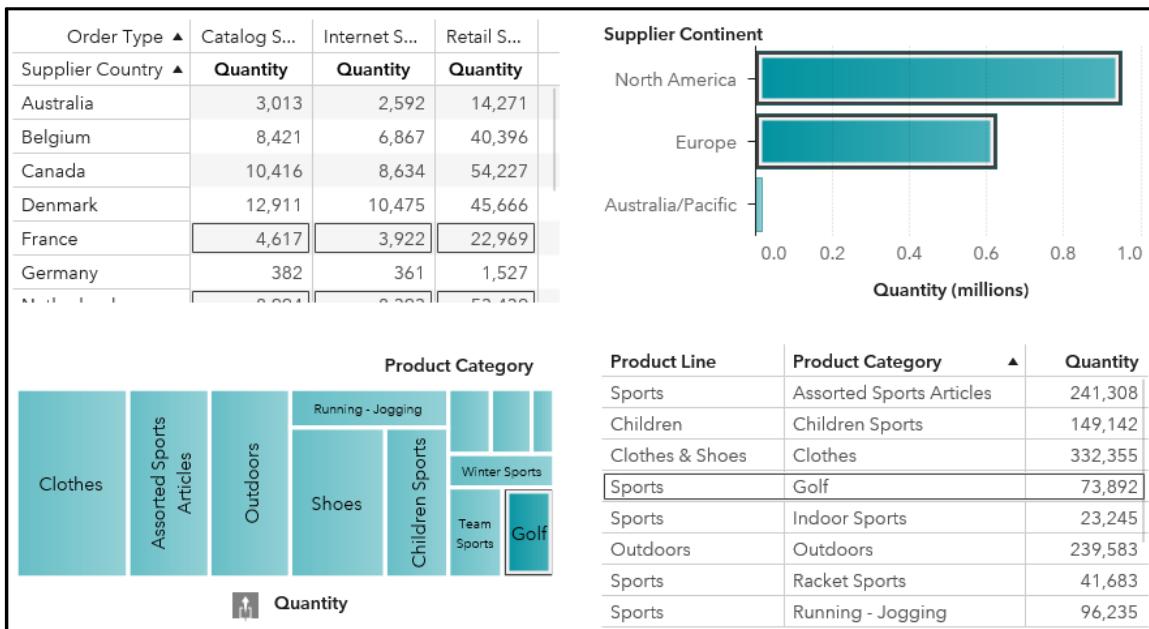
- e. In the crosstab, click the cell for **Belgium** and **Catalog Sale**.

The associated data in the other objects is selected.



- f. In the treemap, click the **Golf** tile to select it.

The associated data in other objects is selected.



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

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

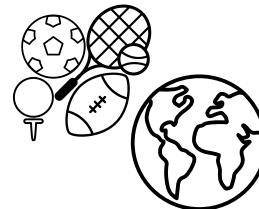
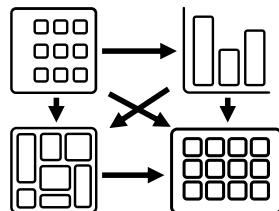
**End of Demonstration**

## Business Scenario: Products



The head of Sales at Orion Star has requested a report that functions like a website.

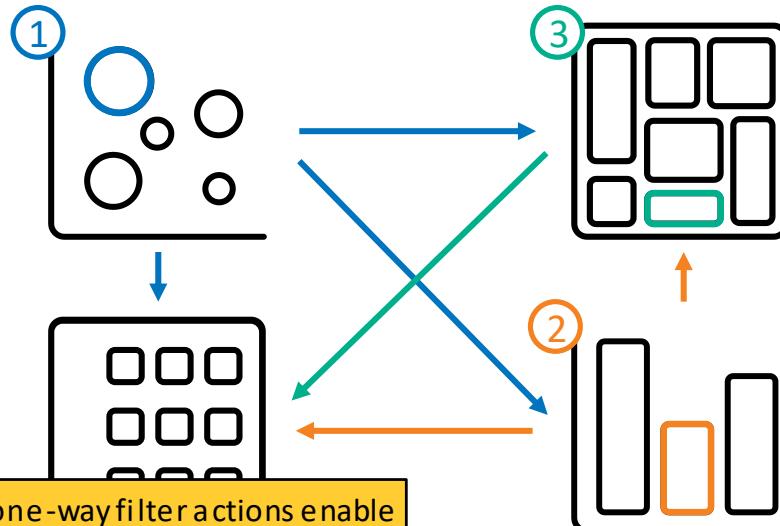
Specifically, he would like a report that filters a list of product groups based on selections of product lines and product categories. You need to add the one-way filter automatic action to a report.



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## Automatic Action: One-Way Filters



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Automatic one-way filter actions apply filters in the order in which they are selected. In the above illustration, a report viewer performs the following actions, in order:

1. selects a bubble in the bubble plot (which filters the treemap, the crosstab, and the bar chart)
2. selects a bar in the bar chart (which filters the treemap and the crosstab)
3. selects a tile in the treemap (which filters the crosstab)

Typically, the one-way filter automatic action is used for objects that are hierarchical or cascading.



## Practice

---

### 2. Applying Automatic Actions: One-Way Filters

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise8.2a**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise8.2a** and select **Edit**.
- c. Apply a one-way filter automatic action to the report.
- d. Answer the following questions:

To which product line does the Running - Jogging product category belong?

**Answer:** \_\_\_\_\_

Which product groups are in the Running - Jogging product category?

**Answer:** \_\_\_\_\_

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

### Challenge (Optional)

### 3. Applying Automatic Actions: Two-Way Filters

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise8.2a (Challenge)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise8.2a (Challenge)** and select **Edit**.
- c. Answer the following question:  
How many orders were placed for products supplied by Australia/Pacific?
- d. Apply a two-way filter automatic action to the report.
- e. View details about the Sports and Outdoors product lines and answer the following question:  
How many orders were placed for products supplied by Australia/Pacific for the Sports and Outdoors product lines?
- f. View details about the Golf product category and answer the following questions:  
To which product line does the Golf product category belong?  
**Answer:** \_\_\_\_\_
- g. View details about Golf orders in **North America** and answer the following question:  
When you select a row in the list table, are the other objects filtered?

**Answer:** \_\_\_\_\_

- h. Modify options for the list table so that it does **not** show detail data and answer the following question:

When you select a row in the list table now, are the other objects filtered?

**Answer:** \_\_\_\_\_

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

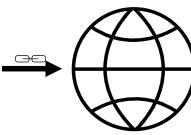
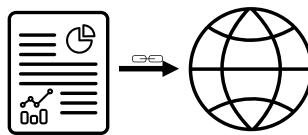
**End of Practices**

## Business Scenario: Products



The head of Sales at Orion Star has requested a report that enables viewers to find products on a web page.

Specifically, he would like a report where viewers can select a specific product group and view products within that group on the web page. We need to add a URL link that uses a parameter value to search a web page.

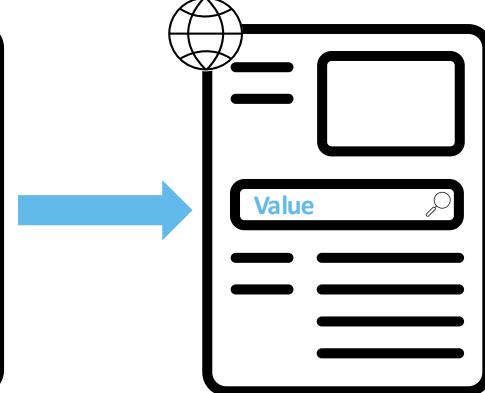
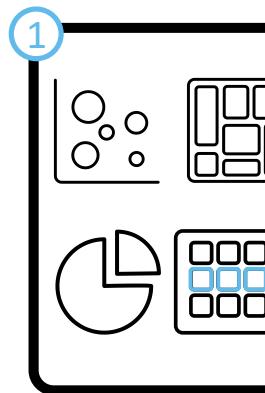


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## Business Scenario: Products



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## Using a Parameter in an External Link

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This demonstration illustrates how to use parameters in an external URL link.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2-Demo8.2b**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2-Demo8.2b** and select **Edit**.

The report opens in SAS Visual Analytics.

3. View the structure of the link for Amazon.
  - a. Open a new tab in the browser.
  - b. In the address bar of the browser, enter [www.amazon.com](http://www.amazon.com) and press Enter.
  - c. In the Search bar, enter **Badminton** and press Enter.



- d. Make a note of the web address: [https://www.amazon.com/s/ref=nb\\_sb\\_noss\\_2?url=search-alias%3Daps&field-keywords=Badminton](https://www.amazon.com/s/ref=nb_sb_noss_2?url=search-alias%3Daps&field-keywords=Badminton)

The web address consists of three parts:

- The main portion of the link: [https://www.amazon.com/s/ref=nb\\_sb\\_noss\\_2?](https://www.amazon.com/s/ref=nb_sb_noss_2?)
- The portion referencing the parameters needed for the search page:  
`url=search-alias%3Daps`
- The portion referencing the specific search string: `&field-keywords=Badminton`

**Note:** We will combine the main portion of the link and the portion referencing the parameters needed for the search page and use `field-keywords=parameter` when creating an external link for the report.

4. Add an external link to the list table in the report.
  - a. In the browser, click the **Visual Analytics** tab to return to the report.
  - b. In the canvas, click the list table to select it.
  - c. In the right pane, click the **Actions** icon.
  - d. Expand **URL Links**.
    - 1) Click **New URL Link**.
    - 2) In the **Name** field, enter **Link to Amazon**.
    - 3) In the **URL** field, enter the following:  
`https://www.amazon.com/s/ref=nb_sb_noss_2?url=search-alias%3Daps`
    - 4) Next to **Parameters**, click **+** (Add) to add a new parameter for the link.
    - 5) For the **Source** field, verify that **Product Group** is specified.
    - 6) In the **Target** field, enter **field-keywords**.

Source:  
Number of Orders by Product Group

Name: Link to Amazon

URL: `/www.amazon.com/s/ref=nb_sb_noss_2?url=search-alias%3Daps`

**Parameters** +

Source: Target:  
 Format `Product Group` ▾ `field-keywords` Delete

- 7) Click **OK** to add the URL link action.

The Actions pane should resemble the following:

- Automatic actions on all objects
- ▼ Object Links
- ▶ Page Links
- ▶ Report Links
- ▼ URL Links
- Link to Amazon : Delete
- + New URL Link

## 5. Test the link.

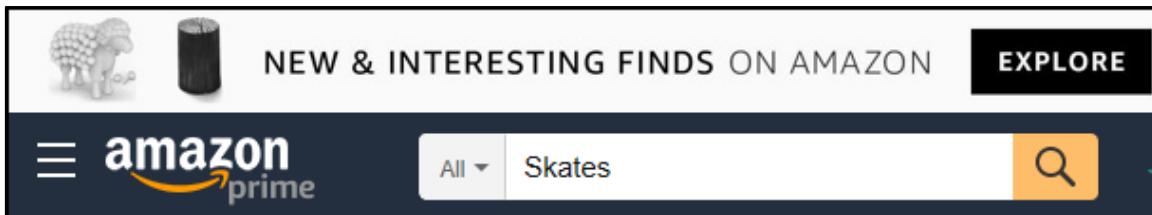
- In the page prompt area, click the **Sports** button to filter the page.
- In the treemap, click the **Assorted Sports Articles** tile to filter the list table.

The report should resemble the following:



- In the list table, double-click the **Skates** row to link to Amazon.

Amazon appears, and search results appear for Skates items:



- In the browser, click the Visual Analytics tab to return to the report.

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

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

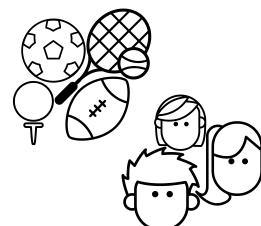
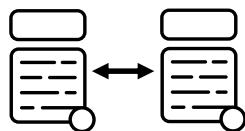
**End of Demonstration**

## Business Scenario: Products



The head of Sales at Orion Star has requested a report that shows sales details.

Specifically, he would like to see details about employees who made sales for certain product categories. However, the details about product categories and the details about employees are contained in two different data sources. You need to map the two data sources to retrieve this information.



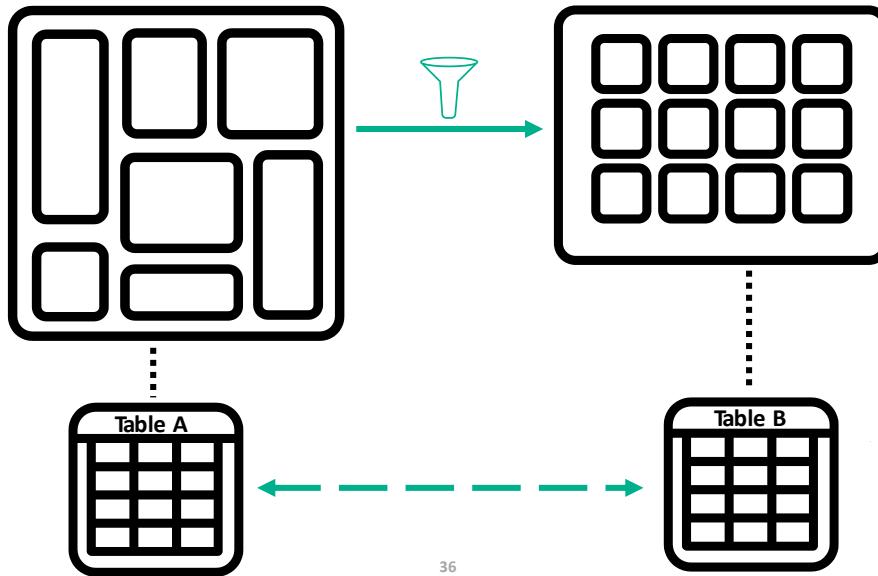
Sas

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**Note:** Beginning in Visual Analytics 8.3, users can perform a data source join within SAS Visual Analytics without having to use the map data source functionality. For more information about data source joins, see “Working with Data Source Joins in Reports” in the *SAS® Visual Analytics 8.3: Working with Report Data* documentation.

## Business Scenario: Products



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## Practice

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### 4. Applying Filters between Two Different Data Sources

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise8.2b**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise8.2b** and select **Edit**.
- c. Answer the following questions:

Which data source is used for the treemap?

**Answer:** \_\_\_\_\_

Which data source is used for the list table?

**Answer:** \_\_\_\_\_

Which data items can be used to map the two data sources?

**Answer:** \_\_\_\_\_

- d. Add a filter action from the treemap to the list table.

Hint: Be sure to map the two data sources appropriately. Remember, the data items used to map the data sources need to be used in both report objects.

- e. View details about employees who sold products in the Indoor Sports product category and answer the following questions:

Which employee makes the highest salary (of those who sold Indoor Sports products)?

**Answer:** \_\_\_\_\_

What is the job title of the above employee?

**Answer:** \_\_\_\_\_

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

**End of Practices**

# 8.3 Solutions

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## Solutions to Practices

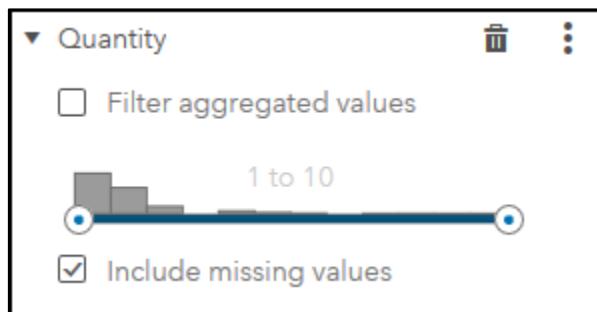
### 1. Creating a Post-Aggregate Filter

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise8.1a**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise8.1a** and select **Edit**.

The report opens in SAS Visual Analytics.
- c. Add a filter on the list table for **Quantity** and answer the question.
  - 1) In the canvas, click the list table to select it.
  - 2) In the right pane, click the **Filters** icon.
  - 3) Select **New filter**  $\Rightarrow$  **Quantity**.
  - 4) Answer the question.

What is the range for quantity?

**Answer:** Quantity ranges from 1 to 10.



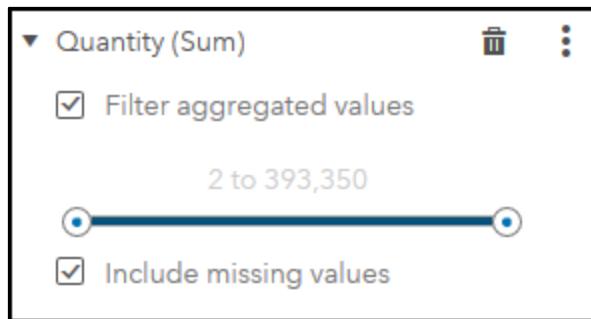
**Note:** The **PRODUCTS\_CLEAN** table contains one row for each product ordered by a customer. The **Quantity** column displays how much of each product the customer ordered per order. The values of **Quantity** range from 1 to 10, meaning that no customer ordered more than 10 of a single product in one order.

- d. Change the filter to a post-aggregate filter and answer the question.

- 1) In the Filters pane, select **Filter aggregated values**.
- 2) Answer the question.

What is the range for aggregate **Quantity**?

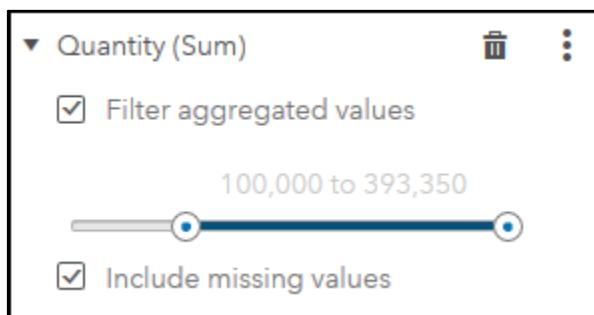
**Answer:** Aggregate quantity ranges from 2 to 393,350.



**Note:** The aggregated values are based on the other columns included in the list table. In this case, the aggregated values match the total quantities ordered for each country.

- e. Filter for countries with a total quantity greater than 100,000 and answer the question.

- 1) On the left of the slider, click to enter a value.
- 2) Enter **100,000** in the field and press Enter.



- 3) Answer the question.

How many countries have a total quantity greater than 100,000?

**Answer:** Seven countries have a total quantity greater than 100,000.

Country	▲	Quantity
France		188K
Germany		212K
Italy		166K
Netherlands		105K
Spain		160K
United Kingdom		178K
United States		393K

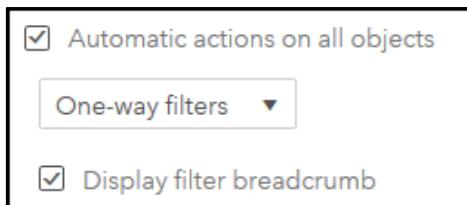
**Note:** The list table uses the abbreviated numerical value of quantity.

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

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

## 2. Applying Automatic Actions: One-Way Filters

- From the browser window, sign in to SAS Viya for Learners.
  - Open **VA2-Exercise8.2a**.
  - Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - Right-click **VA2-Exercise8.2a** and select **Edit**.
- The report opens in SAS Visual Analytics.
- Apply a one-way filter automatic action to the report.
  - In the upper left corner of the canvas, click the bar chart to select it.
  - In the right pane, click the **Actions** icon.
  - Select **Automatic actions on all objects**.
  - Verify that **One-way filters** is selected.



- Answer the following questions:

To which product line does the Running - Jogging product category belong?

**Answer: Sports**



- In the bar chart on the right, click the bar for Running - Jogging.

Which product groups are in the Running - Jogging product category?

**Answer: Jogging and Running Clothes**



- In the bar chart on the right, click the bar for Running - Jogging.

- Save the report in My Folder.

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

### 3. Applying Automatic Actions: Two-Way Filters

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2-Exercise8.2a (Challenge)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise8.2a (Challenge)** and select **Edit**.

The report opens in SAS Visual Analytics.

- Answer the following question:

How many orders were placed for products supplied by Australia/Pacific?

**Answer: 11,349 orders were placed for products supplied by Australia/Pacific.**

Select one (or more) continents:	
<input type="checkbox"/> Australia/Pacific	11,349
<input type="checkbox"/> Europe	327,298
<input type="checkbox"/> North America	478,391

- Apply a two-way filter automatic action to the report.

- 1) In the upper left corner of the canvas, click the first list control to select it.
- 2) In the right pane, click the **Actions** icon.

3) Select **Automatic actions on all objects**.

4) Select **Two-way filters**.

<input checked="" type="checkbox"/> Automatic actions on all objects
Two-way filters ▾
<input checked="" type="checkbox"/> Display filter breadcrumb

e. View details about the Sports and Outdoors product lines and answer the question.

1) In the product lines list control, select **Outdoors** and **Sports**.

Select one (or more) product lines:
<input checked="" type="checkbox"/> Outdoors 107,616
<input checked="" type="checkbox"/> Sports 305,426

2) Answer the question:

How many orders were placed for products supplied by Australia/Pacific for the Sports and Outdoors product lines?

**Answer:** 5,124 orders were placed for products supplied by Australia/Pacific for the Sports and Outdoors product lines. When you select product lines, all other objects in the report are filtered.

Select one (or more) continents:
<input type="checkbox"/> Australia/Pacific 5,124
<input type="checkbox"/> Europe 266,030
<input type="checkbox"/> North America 188,644

f. View details about the Golf product category and answer the questions.

1) In the product category list control, select **Golf**.

Select one (or more) product categories:
<input checked="" type="checkbox"/> Golf 32,270

2) Answer the following questions:

To which product line does the Golf product category belong?

**Answer:** The Golf product category belongs to the Sports product line. When you select product categories, all other objects in the report are filtered, including the product line list control.

Select one (or more) product lines:	
<input checked="" type="checkbox"/> Sports	32,270

How many Golf orders were supplied by Australia/Pacific?

**Answer:** None. When you select product categories, all other objects in the report are filtered. Because Australia/Pacific does not appear in the continents list control, we know they supply no products for the Golf product category.

Select one (or more) continents:	
<input type="checkbox"/> Europe	24,826
<input type="checkbox"/> North America	11,107

g. View details about Golf orders in North America and answer the question.

- 1) In the continent list control, select **North America**.

Select one (or more) continents:	
<input type="checkbox"/> Europe	24,826
<input checked="" type="checkbox"/> North America	11,107

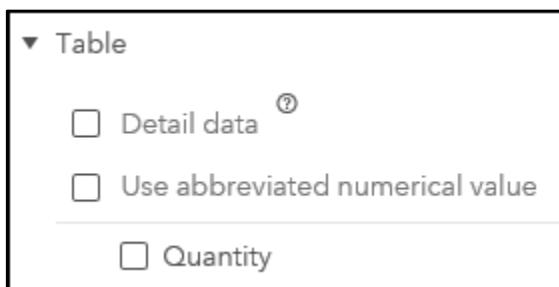
- 2) Answer the following question:

When you select a row in the list table, are the other objects filtered?

**Answer:** No. Because the list table is a detailed list table, it cannot be the source of filter actions, but it can be the target.

- h.** Modify options for the list table so that it does **not** show detail data and answer the question.

  - 1) In the canvas, click the list table to select it, if necessary.
  - 2) In the right pane, click the **Options** icon.
  - 3) In the Table group, clear **Detail data**.



The list table should resemble the following:

Supplier Continent ▲	Product Line	Product Category	Product Group	Quantity
North America	Sports	Golf	Golf Clothes	15,087
North America	Sports	Golf	Golf	6,015

- 4) Answer the following question:

When you select a row in the list table now, are the other objects filtered?

**Answer:** Yes. Now that the list table does not show detail data, it can be both the source and the target of a filter action.

Select one (or more) continents:	Supplier Continent ▲	Product Line	Product Category	Product Group	Quantity
<input checked="" type="checkbox"/> North America 8,106	North America	Sports	Golf	Golf Clothes	15,087
	North America	Sports	Golf	Golf	6,015

Select one (or more) product lines:	
<input checked="" type="checkbox"/> Sports 8,106	

Select one (or more) product categories:	
<input checked="" type="checkbox"/> Golf 8,106	

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

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

#### 4. Applying Filters between Two Different Data Sources

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

b. Open **VA2-Exercise8.2b**.

- 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- 2) Right-click **VA2-Exercise8.2b** and select **Edit**.

The report opens in SAS Visual Analytics.

c. Answer the following questions:

Which data source is used for the treemap?

**Answer: PRODUCTS\_CLEAN**



- In the canvas, click the treemap to select it.
- In the left pane, click the Data icon.

Which data source is used for the list table?

**Answer:** EMPLOYEES\_CLEAN

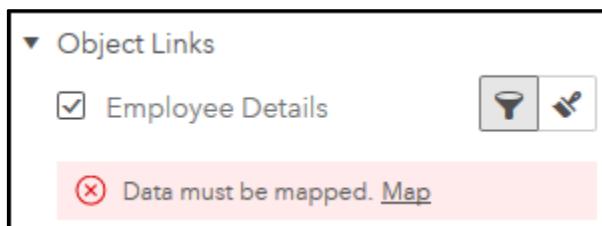


- In the canvas, click the list table to select it.
- In the left pane, click the Data icon.

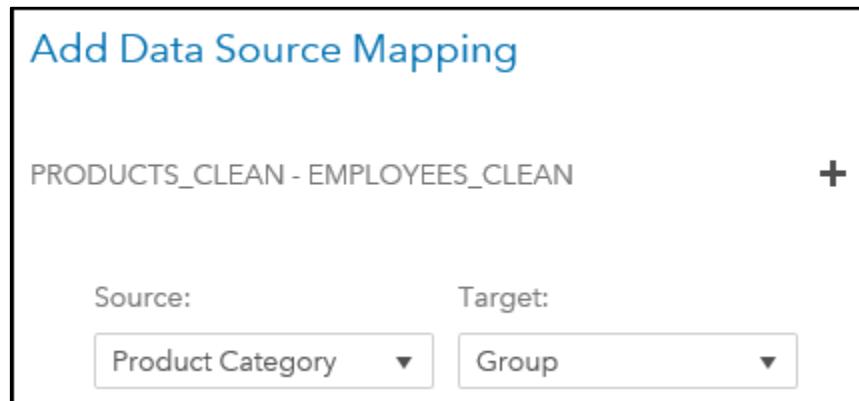
Which data items can be used to map the two data sources?

**Answer:** Product Category from PRODUCTS\_CLEAN and Group from EMPLOYEES\_CLEAN have similar values and can be used to map the two data sources.

- Add a filter action from the treemap to the list table.
  - In the canvas, click the treemap to select it.
  - In the right pane, click the **Actions** icon.
  - If necessary, expand **Object Links**.
  - Select **Employees Details** to filter the list table.

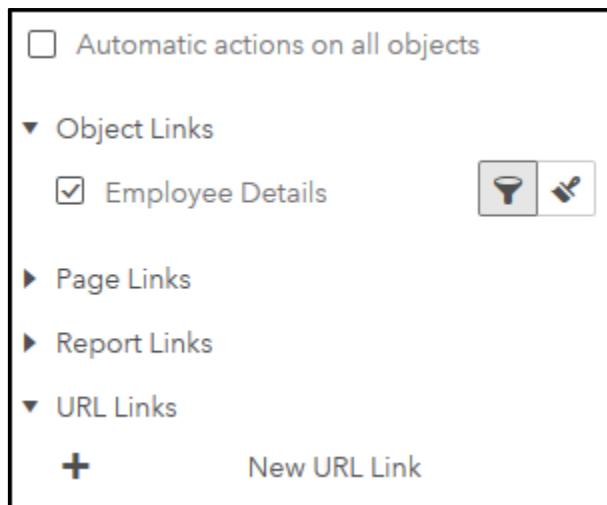


- Click **Map**.
  - In the **Source** field, verify that **Product Category** is selected.
  - For the **Target** field, select **Group**.



- Click **OK** to map the data sources.

The Actions pane should resemble the following:



- e. View details about employees who sold products in the Indoor Sports product category and answer the questions.

- 1) In the treemap, click the **Indoor Sports** tile.

The list table should resemble the following:

EmployeeName	Group	Job Title	Annual Salary
Alexei Platts	Indoor Sports	Sales Rep. IV	\$32,490
Anne Marie Heijne	Indoor Sports	Sales Rep. III	\$30,280
Atul Leyden	Indoor Sports	Sales Rep. I	\$26,605
Clement Davis	Indoor Sports	Sales Rep. III	\$30,185
Daniel Pulliam	Indoor Sports	Sales Rep. III	\$29,805
Francoise Schmaltz	Indoor Sports	Sales Rep. I	\$26,945
Giovanni Nitti	Indoor Sports	Sales Rep. II	\$26,590
Ismael Alonso Sanz	Indoor Sports	Sales Rep. II	\$28,160
Melanie Delarue	Indoor Sports	Sales Rep. III	\$30,620
Nicolette Kuner	Indoor Sports	Sales Rep. I	\$27,830
Rita Tidemann Jernfort	Indoor Sports	Sales Rep. I	\$29,710
Stuart Cohen	Indoor Sports	Sales Rep. I	\$26,700
Sylvie Latimier	Indoor Sports	Sales Rep. II	\$26,020
Tywanna Mcdade	Indoor Sports	Sales Rep. III	\$29,955
Wambuna Menten	Indoor Sports	Sales Rep. II	\$28,185
Wolfgang Jülich	Indoor Sports	Sales Rep. II	\$27,310

- 2) Answer the following questions:

Which employee makes the highest salary (of those who sold Indoor Sports products)?

**Answer:** Alexei Platts makes the highest salary of those employees who sold Indoor Sports products.

EmployeeName	Group	Job Title	Annual Salary ▾
Alexei Platts	Indoor Sports	Sales Rep. IV	\$32,490

- In the list table, click the Annual Salary column twice to sort in descending order.

What is the job title of the above employee?

**Answer:** Alexei Platts is a Sales Rep. IV.

EmployeeName	Group	Job Title	Annual Salary ▾
Alexei Platts	Indoor Sports	Sales Rep. IV	\$32,490

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

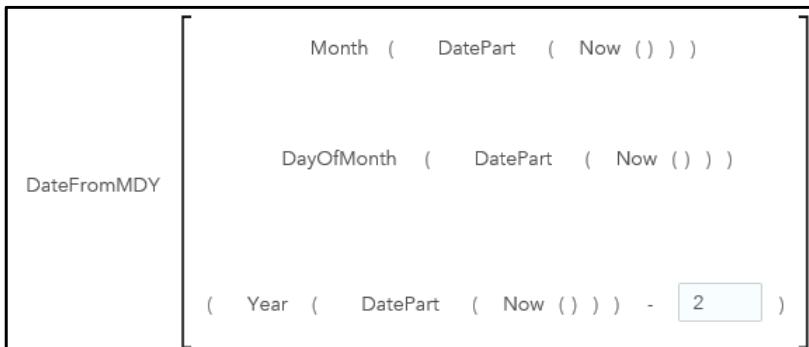
- To save the report, click  (Menu) in the upper right corner and select **Save As**.
- Navigate to **My Folder**.
- Click **Save**.

**End of Solutions**

## Solutions to Activities and Questions

### 8.01 Activity – Correct Answer

Which Date and Time operator could be used to calculate the date value for two years prior to today? **DateFromMDY**



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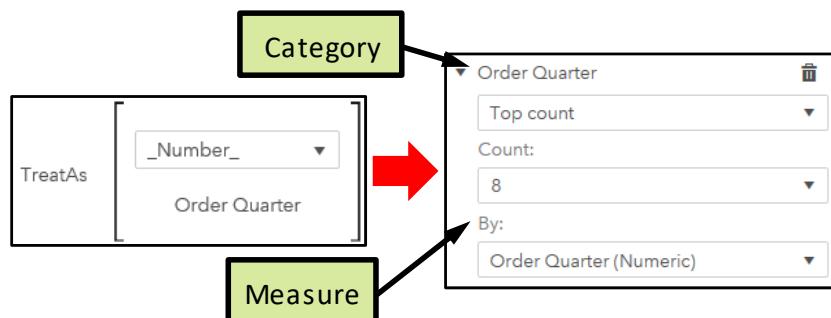
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### 8.02 Activity – Correct Answer

▼ Numeric (advanced)

- # Abs
- # Ceil
- # Exp
- # Floor
- # Ln
- # Log
- # Mod
- # Power
- # Root
- # Round
- # TreatAs**
- # Trunc

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



Because ranks use measures for the BY variable, we need to convert date values to numbers to show the last eight quarters.

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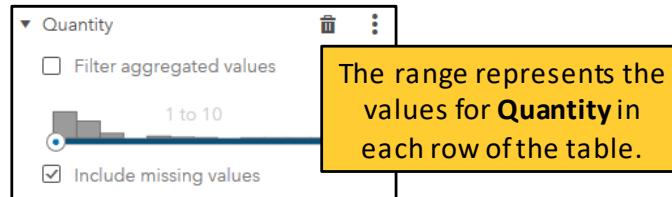
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## Practice Review

### 8.1 Creating a Post-Aggregate Filter – Solution

What is the range for **Quantity**?

**1 to 10**



What is the range for aggregated **Quantity**?

**2 to 393,350**

The aggregated values are based on the other columns included in the list table.



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### 8.1 Creating a Post-Aggregate Filter – Solution

How many countries have total quantity greater than 100,000?

**Seven**

Country	▲	Quantity
France		188K
Germany		212K
Italy		166K
Netherlands		105K
Spain		160K
United Kingdom		178K
United States		393K

The list table uses the abbreviated numerical value of quantity.

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## 8.2 Applying Automatic Actions: One-Way Filters – Solution

To which product line does the Running - Jogging product category belong?

**Sports**



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## 8.2 Applying Automatic Actions: One-Way Filters – Solution

Which product groups are in the Running - Jogging product category?

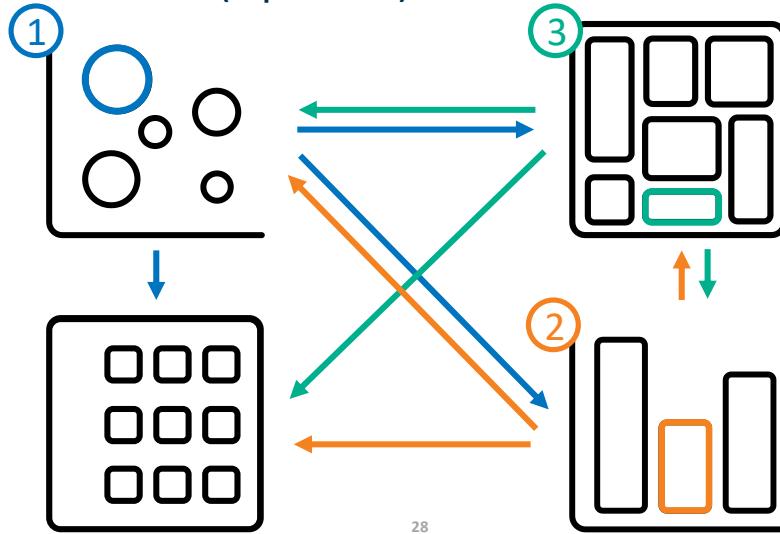
**Jogging and Running Clothes**



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## 8.3 Applying Automatic Actions: Two-Way Filters (Optional) – Solution



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Two-way filter automatic actions apply filters to all objects on a page, even previously selected objects. In the above illustration, a report viewer performs the following actions, in order:

- Selects a bubble in the bubble plot (which filters the treemap, the crosstab, and the bar chart)
- Selects a bar in the bar chart (which filters the bubble plot, the treemap, and the crosstab)
- Selects a tile in the treemap (which filters the bubble plot, the crosstab, and the bar chart)

**Note:** Only objects that can be the source of a filter can participate in the two-way filter automatic action.

## 8.3 Applying Automatic Actions: Two-Way Filters (Optional) – Solution

How many orders were placed for products supplied by Australia/Pacific?  
**11,349 orders**

Select one (or more) continents:

- |                                            |         |
|--------------------------------------------|---------|
| <input type="checkbox"/> Australia/Pacific | 11,349  |
| <input type="checkbox"/> Europe            | 327,298 |
| <input type="checkbox"/> North America     | 478,391 |

Select one (or more) continents:

<input type="checkbox"/> Australia/Pacific	5,124
<input type="checkbox"/> Europe	266,030
<input type="checkbox"/> North America	188,644

Select one (or more) product lines:

<input checked="" type="checkbox"/> Outdoors	107,616
<input checked="" type="checkbox"/> Sports	305,426

How many orders were placed for products supplied by Australia/Pacific for the Sports and Outdoors product lines?

**5,124 orders. When you select product lines, all other objects in the report are filtered.**

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## 8.3 Applying Automatic Actions: Two-Way Filters (Optional) – Solution

To which product line does the Golf product category belong? **Sports product line**

How many Golf orders were supplied by Australia/Pacific? **None**

Select one (or more) product lines:

<input checked="" type="checkbox"/> Sports	32,270
--------------------------------------------	--------

Select one (or more) continents:

<input type="checkbox"/> Europe	24,826
<input type="checkbox"/> North America	11,107

When you select a row in the list table, are the other objects filtered?

**No. Because the list table is a detailed list table, it cannot be the source of filter actions, but it can be the target.**

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## 8.3 Applying Automatic Actions: Two-Way Filters (Optional) – Solution

When you select a row in the list table now, are the other objects filtered?

**Yes. Now that it does not show detail data, it can be both the source and the target of a filter action.**

Select one (or more) continents:

North America 8,106

Supplier Continent ▲	Product Line	Product Category	Product Group	Quantity
North America	Sports	Golf	Golf Clothes	15,087
North America	Sports	Golf	Golf	6,015

Select one (or more) product lines:

Sports 8,106

Supplier Continent ▲	Product Line	Product Category	Product Group	Quantity
North America	Sports	Golf	Golf Clothes	15,087
North America	Sports	Golf	Golf	6,015

Select one (or more) product categories:

Golf 8,106

Supplier Continent ▲	Product Line	Product Category	Product Group	Quantity
North America	Sports	Golf	Golf Clothes	15,087
North America	Sports	Golf	Golf	6,015

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## 8.4 Applying Filters between Two Different Data Sources – Solution

Which data source is used for the treemap?

**PRODUCTS\_CLEAN**

Which data source is used for the list table?

**EMPLOYEES\_CLEAN**

Which data items can be used to map the two data sources?

**Product Category from PRODUCTS\_CLEAN and Group from EMPLOYEES\_CLEAN.**

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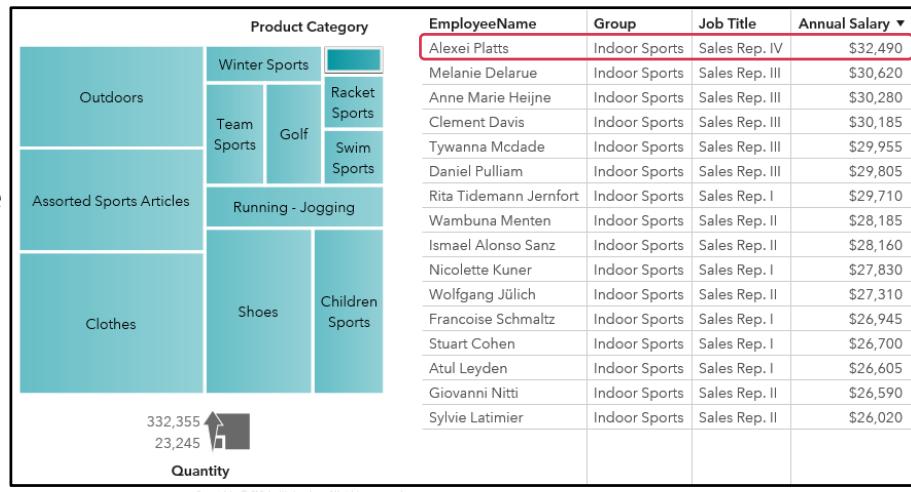
## 8.4 Applying Filters between Two Different Data Sources – Solution

Which employee makes the highest salary (of those who sold Indoor Sports products)?

**Alexei Platts**

What is the job title of the above employee?

**Sales Rep. IV**



# Lesson 9 Using Parameters to Create Advanced Reports

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# 9.1 Using Numeric Parameters

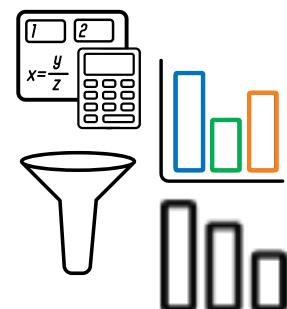
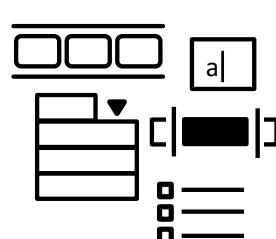
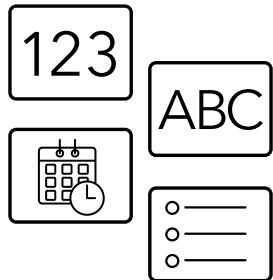
## Objectives

- Discuss the steps needed for using parameters in a report.
- Describe the process of creating numeric parameters.
- Discuss which control objects can be used with numeric parameters.
- Discuss using numeric parameters in a rank.

3



## Steps for Using Parameters



4



<b>Create</b>	In the Create step, you create the parameter using the Data pane. You need to know what type of parameter (numeric, character, date, multiple values) is needed for your scenario.
<b>Populate</b>	In the Populate step, you add a control object to the canvas so that the report viewer has some method to modify the value of the parameter. The type of control object you can use depends on the type of parameter that was created in the previous step and your scenario.
<b>Apply</b>	In the Apply step, you use the parameter in a calculation, a display rule, a filter, or a rank to make your report more dynamic.

The type of parameter must match the type of data that is required for the control object. The following table lists the supported control objects and parameter types:

Control Objects	Parameters		
	Character	Numeric	Date/Date Time
Drop-Down List	Yes	No*	Yes
List (multiple values)	Yes	No*	Yes
Button Bar	Yes	No*	Yes
Text Input	Yes	Yes	Yes
Slider (single-point only)	No	Yes	Yes

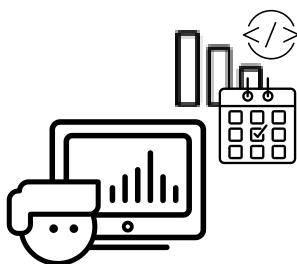
\*Numeric parameters can be used only with drop-down list, list, and button bar controls if the underlying category data item is numeric.

## Business Scenario: Products



The head of Sales at Orion Star has requested an analysis of orders.

Specifically, he would like a report that shows the quantity ordered for each order type for the number of rolling quarters selected by a report viewer. We need to use parameters so that the report viewer can select the number of rolling quarters.





## Using a Numeric Parameter in a Rank

This demonstration illustrates how to create a numeric parameter, populate the parameter with a control object, and apply the parameter to a rank.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2-Demo9.1**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2-Demo9.1** and select **Edit**.

The report opens in SAS Visual Analytics.
3. View the rank on the time series plot.
  - a. In the canvas, click the time series plot to select it, if necessary.
  - b. In the right pane, click the **Ranks** icon.

**Ranks**

Quantity by Order Type and Date

+ New rank

▼ Order Quarter Delete

Top count ▼

Count:

8 ▼

By:

Order Quarter (Numeric) ▼

Include:

Ties

The rank shows the most recent eight quarters of data in the table. We would like for the report viewer to choose how many quarters to view.

4. In the canvas, view the list table.

Order Quarter	Order Quarter (Numeric) ▲
1st quarter 2012	18,993.00
2nd quarter 2012	19,084.00
3rd quarter 2012	19,175.00
4th quarter 2012	19,267.00
1st quarter 2013	19,359.00

The dates in the table range from the first quarter in 2012 ...

1st quarter 2016	20,454.00
2nd quarter 2016	20,545.00
3rd quarter 2016	20,636.00
4th quarter 2016	20,728.00

... to the fourth quarter of 2016. That is five years of data, or 20 quarters.

5. Create a numeric parameter.

- In the left pane, click the **Data** icon.
- Select **New data item** ⇒ **Parameter**.

- 1) In the **Name** field, enter **RankParameter**.
- 2) For **Type**, verify that **Numeric** is selected.

**Note:** Because we want the report viewer to change the number of quarters in the rank, we need a numeric parameter.

- 3) In the **Minimum value** field, enter **2**.

**Note:** This is the lowest number of quarters that a viewer can select.

- 4) In the **Maximum value** field, enter **20**.

**Note:** This is the total number of quarters available in the table.

- 5) Next to the **Format** field, click  (Edit).

- a) For **Format**, verify that **Comma** is selected.
- b) For the **Width** field, verify that **12** is specified.
- c) In the **Decimals** field, enter **0**.
- d) Click **OK**.

- 6) In the **Current value** field, enter **4** and press Enter.

The New Parameter window should resemble the following:

Name: RankParameter

Type: Numeric

Multiple values

Minimum value: 2

Maximum value: 20

Format: COMMA12. (Comma)

Current value: 4

- 7) Click **OK** to create the numeric parameter.

The Data pane should resemble the following:

▼ Parameter

x RankParameter

6. Modify the control object to populate the parameter.
  - a. In the canvas, click the text input control to select it.
  - b. In the right pane, click the **Roles** icon.
  - c. For the Parameter role, select **Add** ⇒ **RankParameter**.

The text input control should resemble the following:

Specify the number of quarters to view (2-20):

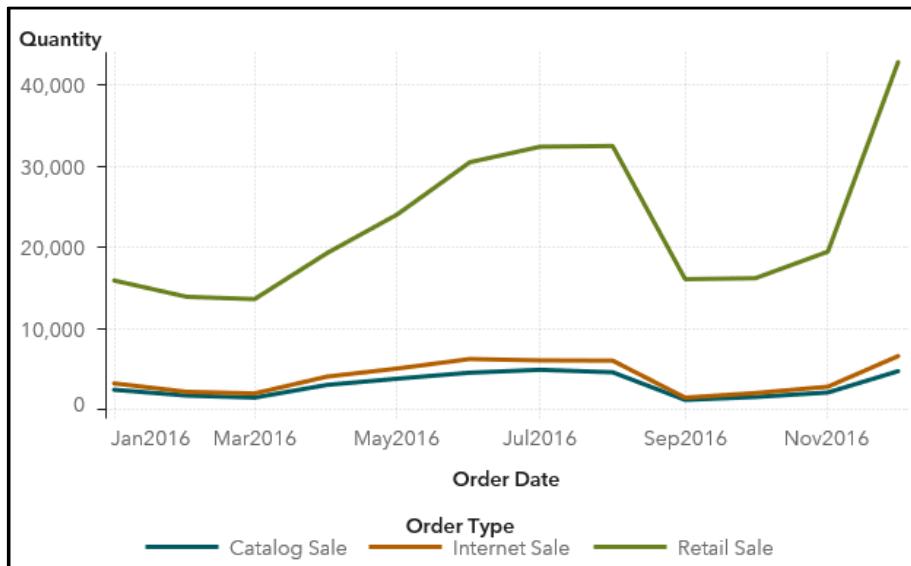
4

**Note:** The parameter still needs to be applied to the rank on the time series plot.

7. Apply the parameter to the rank on the time series plot.

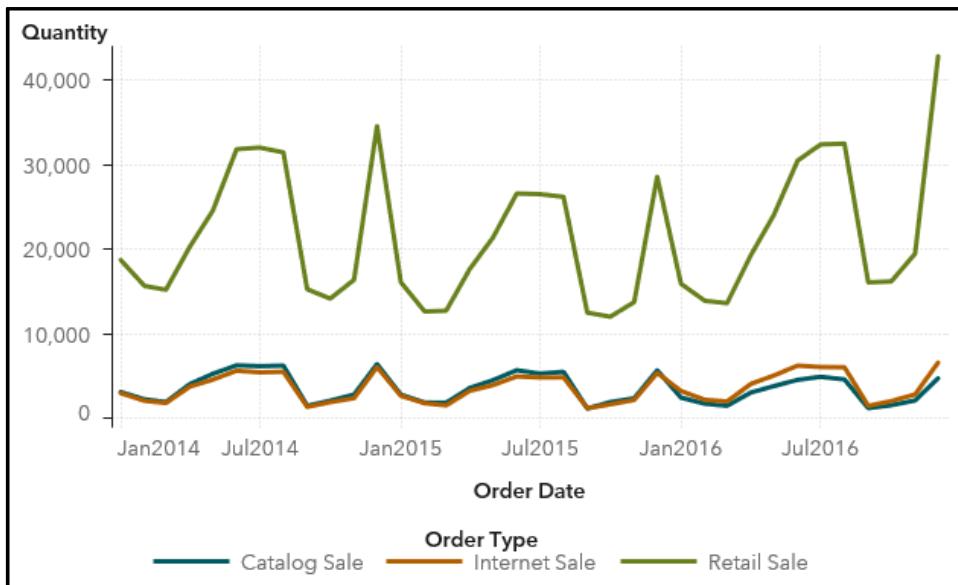
- In the canvas, click the time series plot to select it.
- In the right pane, click the **Ranks** icon.
- For the **Count** field, select **RankParameter**.

The time series plot should resemble the following:



- In the text input control, enter 12 and press Enter.

The time series plot should resemble the following:



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

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

**End of Demonstration**

## 9.2 Using Character Parameters

### Objectives

- Describe the process of creating character parameters.
- Discuss the process of creating a new parameter from an existing data item.
- Discuss using character parameters in a calculation.
- Discuss using character parameters in an advanced rank.
- Describe the process of using parameters to select your metric.

8



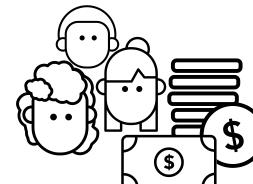
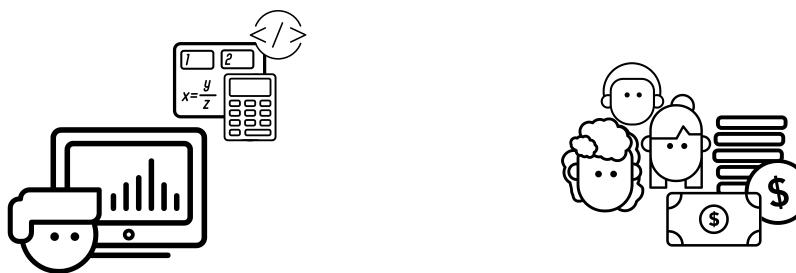
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### Business Scenario: Customers



The head of Orion Star wants to compare profits for different locations.

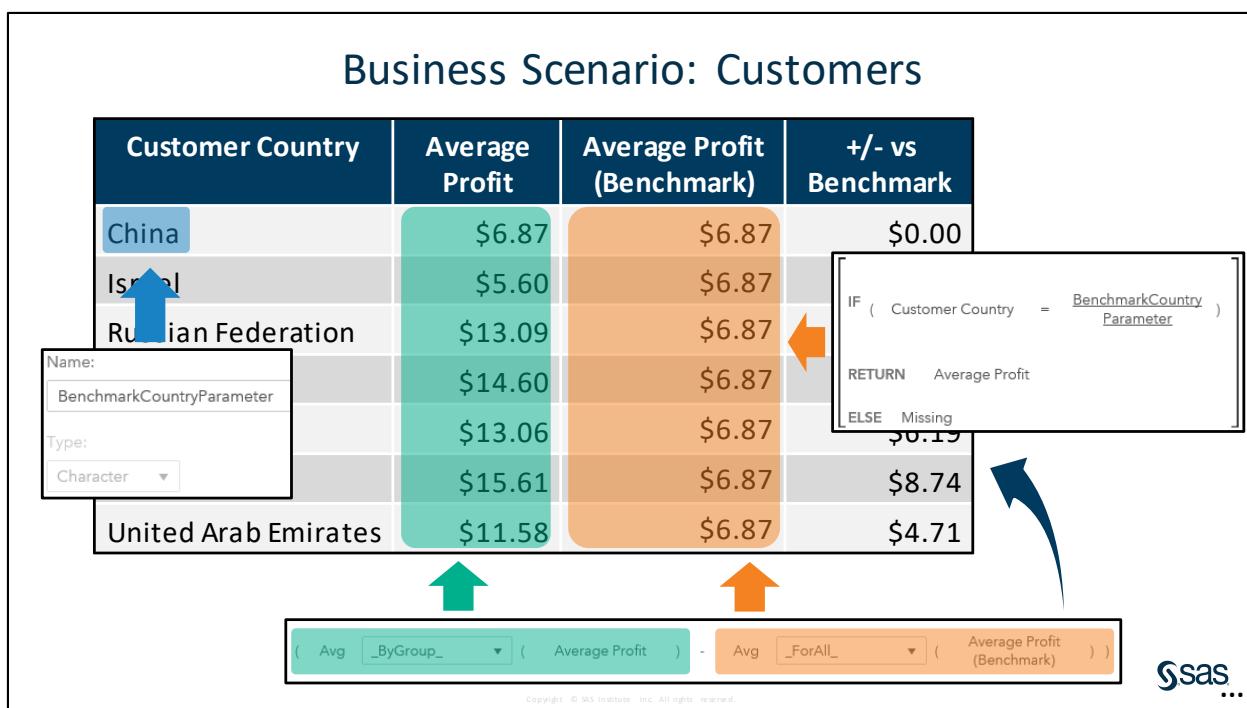
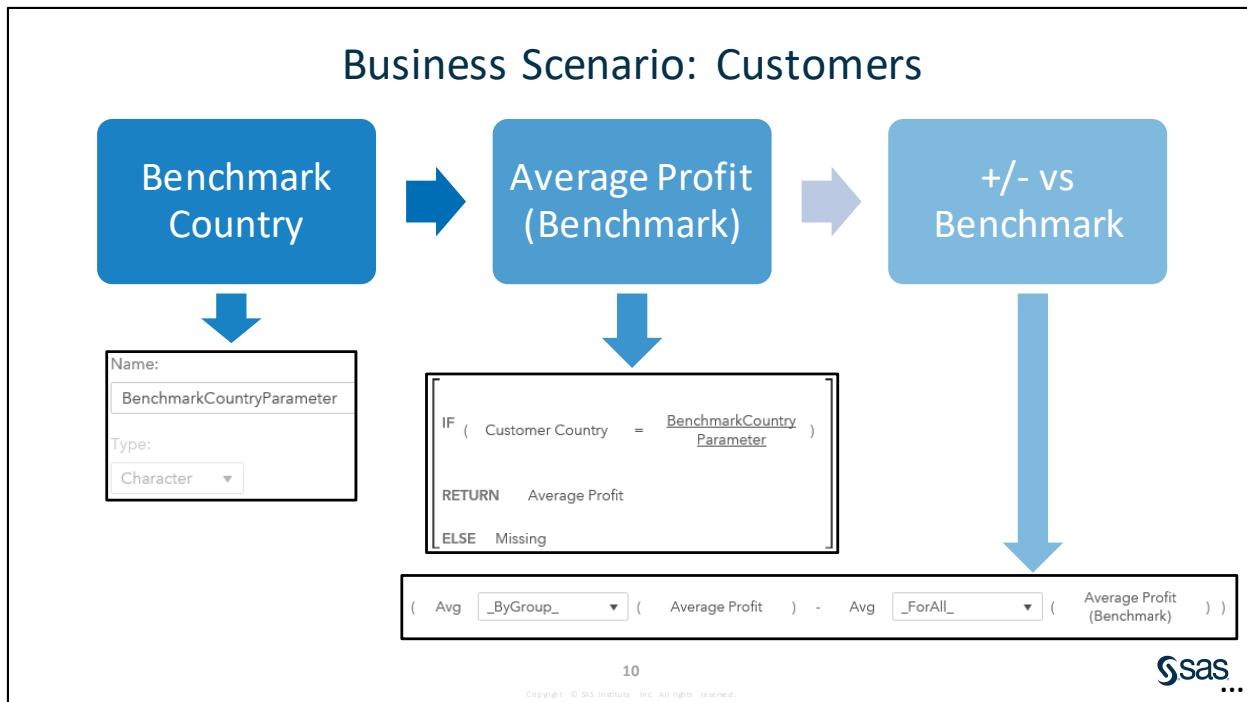
Specifically, she would like to select a benchmark country and see how average profit in other countries compares to the benchmark.



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## Using a Character Parameter in a Calculation

This demonstration illustrates how to create a character parameter, populate the parameter with a control object, and apply the parameter to a calculation.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2-Demo9.2**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2-Demo9.2** and select **Edit**.

The report opens in SAS Visual Analytics.
3. Create a character parameter for Customer Country.
  - a. In the left pane, click the **Data** icon.
  - b. Right-click **Customer Country** and select **New parameter**.
  - c. In the Name field, enter **BenchmarkCountryParameter**.
  - d. For **Type**, verify that **Character** is specified.

The New Parameter window should resemble the following:

Name:  
BenchmarkCountryParameter

Type:  
Character ▾

Multiple values

Current value:

**Note:** Current values do not need to be specified for character parameters.

- e. Click **OK**.
- The Data pane should resemble the following:

▼ Parameter

BenchmarkCountryParameter ▾

4. Modify the control object to populate the parameter.
  - a. In the canvas, click the drop-down list control to select it.
  - b. In the right pane, click the **Roles** icon.
  - c. For the Category role, select **Add ⇒ Customer Country**.

- d. For the Parameter role, select **Add**  $\Rightarrow$  **BenchmarkCountryParameter**.

The drop-down list control should resemble the following:



5. Modify the calculated item for the average profit of the benchmark country.
- In the left pane, click the **Data** icon.
  - In the Measure group, right-click **Average Profit (Benchmark)** and select **Edit**.

The expression should resemble the following:

```
[ IF ( Customer Country = "China" )
      RETURN Average Profit
      ELSE Missing ]
```

China has been hardcoded into the expression. We need to replace this with the new parameter.

**Note:** Because we are looking at average profits, the ELSE condition needs to be a missing value and not zero. Missing values are ignored in the average, but zeros are not.

- Right-click **China** and select **Replace with**  $\Rightarrow$  **BenchmarkCountryParameter**.

The expression should resemble the following:

```
[ IF ( Customer Country = BenchmarkCountryParameter )
      RETURN Average Profit
      ELSE Missing ]
```

- In the bottom right corner of the window, click **Preview**.
  - In the Parameter Configuration on the right side of the window, enter **Germany**.

The preview should resemble the following:

Average Profit (Benchmark)	Customer Country	Average Profit
.	Australia	\$1.20
.	Australia	(\$0.40)
.	Australia	\$4.00
.	Australia	\$5.60
.	Canada	\$1.10
.	Switzerland	\$3.90
30.60	Germany	\$30.60
0.10	Germany	\$0.10

**Note:** **Average Profit (Benchmark)** will contain the value of the average profit for the benchmark (or selected) country.

- b) Click **Close** to close the Preview Result window.
- 3) Click **OK** to update the calculated item.
- 6. View the aggregated measure that calculates the difference of average profit for the benchmark country from the average profit for each country.
  - a. In the Aggregated Measure group, right-click **+/- vs Benchmark** and select **Edit**.

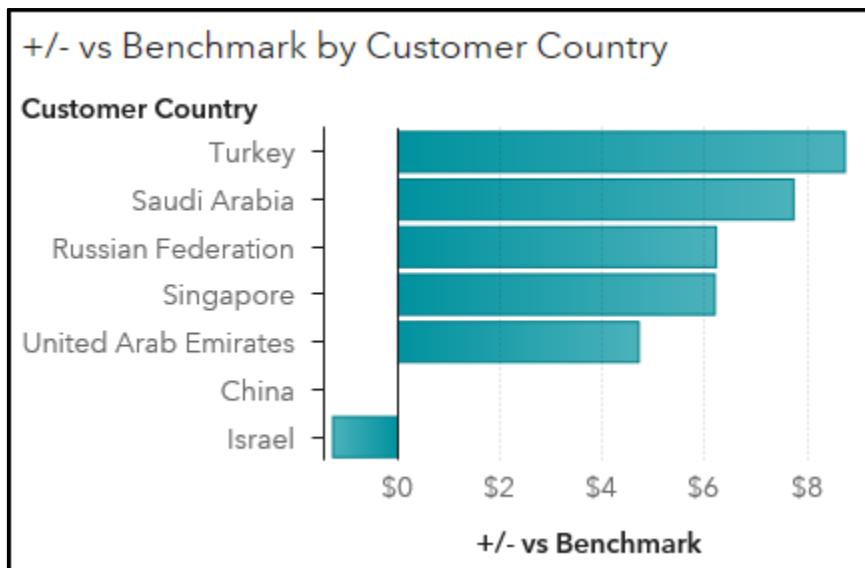
The expression should resemble the following:

```
( Avg _ByGroup_ ▾ ( Average Profit ) - Avg _ForAll_ ▾ ( Average Profit (Benchmark) ) )
```

**Note:** **+/- vs Benchmark** calculates the difference in the average profit (for each country) from the benchmark country. The aggregation context for the **Average Profit (Benchmark)** value must be **\_ForAll\_** because this value needs to be calculated and compared to every country in the report object.

- b. Click **Cancel** to close the aggregated measure.
- 7. Modify the roles for the bar chart.
  - a. In the canvas, click the bar chart to select it.
  - b. In the right pane, click the **Roles** icon, if necessary.
  - c. For the Measure role, select **Frequency**  $\Rightarrow$  **+/- vs Benchmark**.

The bar chart should resemble the following:



8. Modify the roles for the list table.
  - a. In the canvas, click the list table to select it.
  - b. In the right pane, click the **Roles** icon, if necessary.
  - c. For the Columns role, click **Add**.
  - d. Select the following measures:

**Average Profit (Benchmark)**

**+/- vs Benchmark**

- e. Click **OK**.

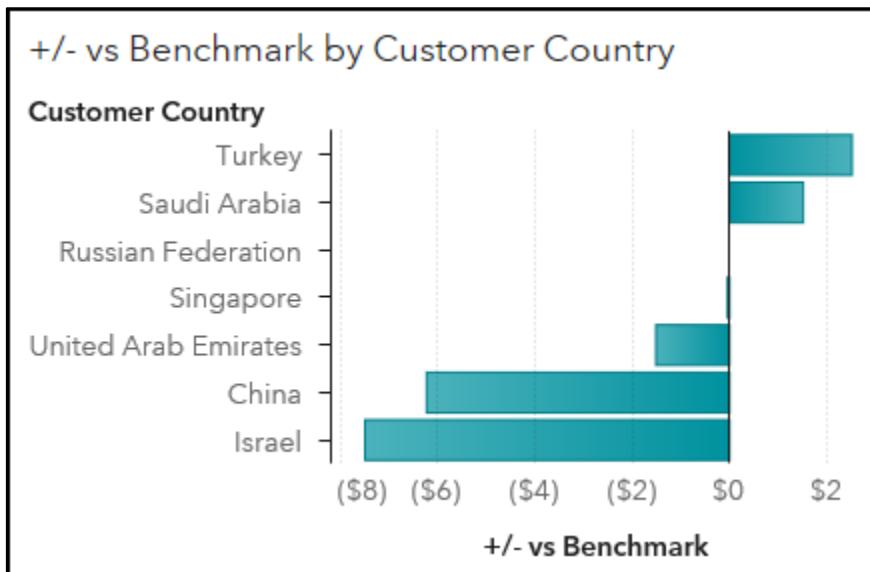
The list table should resemble the following:

Customer Country	Average Profit	Average Profit (Benchmark)	+/- vs Benchmark
China	\$6.87	\$6.87	\$0.00
Israel	\$5.60	.	(\$1.27)
Russian Federation	\$13.09	.	\$6.22
Saudi Arabia	\$14.60	.	\$7.74
Singapore	\$13.06	.	\$6.20
Turkey	\$15.61	.	\$8.74
United Arab Emirates	\$11.58	.	\$4.71

With China selected as the benchmark country, the **+/- vs Benchmark** values are updated to compare average profit for each country to the average profit for China. In this instance, only one country (Israel) has a lower average profit than China.

9. In the drop-down list control, select **Russian Federation**.

The bar chart should resemble the following:



The list table should resemble the following:

Customer Country	Average Profit	Average Profit (Benchmark)	+/- vs Benchmark
China	\$6.87	.	(\$6.22)
Israel	\$5.60	.	(\$7.49)
Russian Federation	\$13.09	\$13.09	\$0.00
Saudi Arabia	\$14.60	.	\$1.51
Singapore	\$13.06	.	(\$0.03)
Turkey	\$15.61	.	\$2.52
United Arab Emirates	\$11.58	.	(\$1.51)

With Russian Federation selected as the benchmark country, the **+/- vs Benchmark** values are updated to compare average profit for each country to the average profit for Russian Federation. In this instance, four countries (China, Israel, Singapore, and United Arab Emirates) have a lower average profit than Russian Federation.

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

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

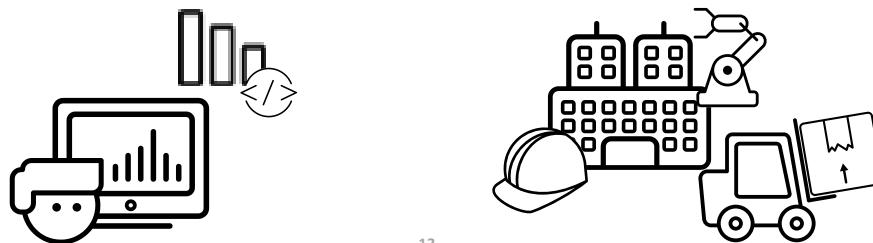
**End of Demonstration**

## Business Scenario: Facilities



The head of Logistics at Orion Star has requested a report that shows unit details.

Specifically, she wants to see the top 10 units by measures that the report viewer can select: unit actual, unit capacity, and unit discards. You need to create a parameter so that the report viewer can select a measure and get a list of the top 10 units by that measure.



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## Business Scenario: Facilities

**Measures List**

**Rank Parameter**

**Rank By Measure**



Name:  
RankParameter

```
IF ( RankParameter = "Unit Actual" )
  RETURN Unit Actual
  IF ( RankParameter = "Unit Discards" )
    RETURN Unit Discards
  ELSE
    RETURN Unit Capacity
```

Remaining Values:

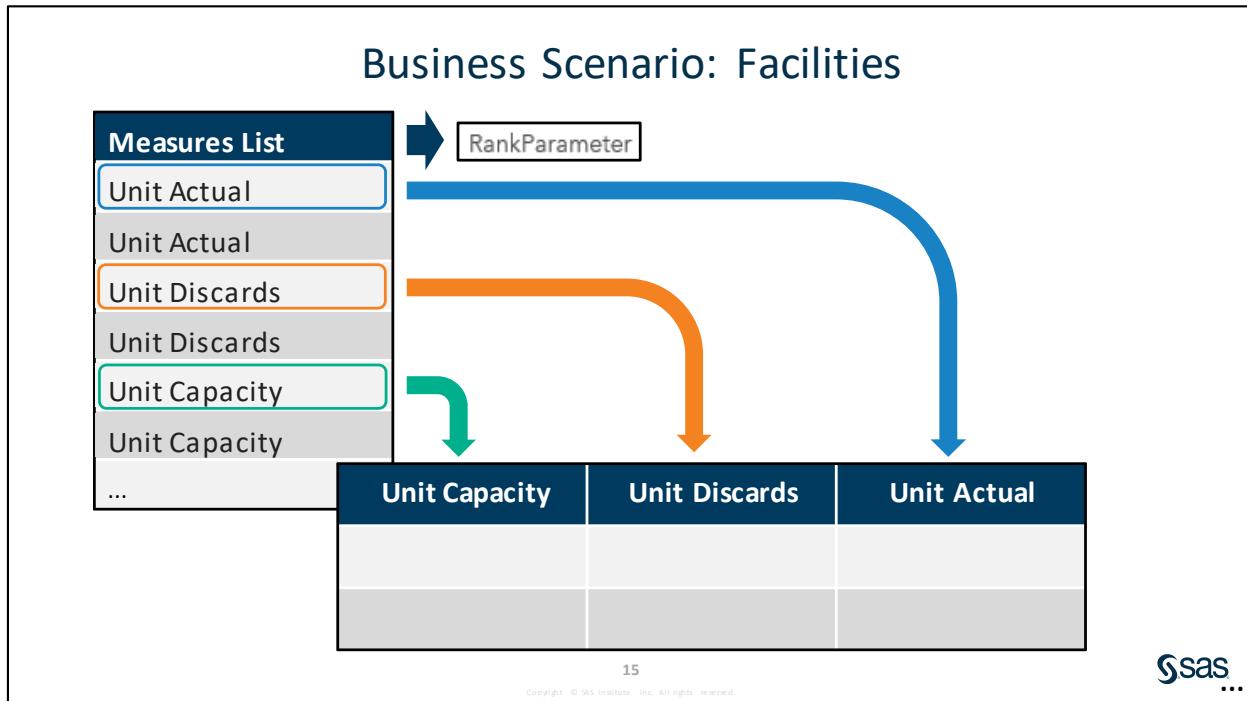
Show as is  Show as missing  Group as: Unit Capacity

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Our goal is to create a simulated data item (**Measures List**) that contains the values *Unit Actual*, *Unit Discards*, and *Unit Capacity*. An easy way to do this is to create a custom category that produces those values. The Measures List custom category can be based on any category data item that contains at least three distinct values. However, because this simulated data item is based on a category data item in the CAS table, you need to be very careful when adding actions between objects, as the action will use the underlying data item.

**Note:** As an alternative, you can load a small table that contains one data item that has the values *Unit Actual*, *Unit Discards*, and *Unit Capacity*. The challenge exercise explores this option.





## Practice

---

### 1. Using a Parameter in an Advanced Rank

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise9.2**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise9.2** and select **Edit**.
- c. View the rank on the bar chart and answer the following question:  
What measure is used to rank the bar chart?  
**Answer:** \_\_\_\_\_
- d. Create a custom category (**Measures List**) that contains the following values:  
*Unit Actual*  
*Unit Discards*  
*Unit Capacity*  
Hint: This custom category can be based on any category data item.
- e. Create a parameter (**RankParameter**) from the custom category.
- f. Create a calculated item (**Rank By Measure**) that returns the appropriate measure based on the selected value of the parameter.
- g. Modify the control object in the canvas to populate the parameter.  
Hint: The control object is required, so a report viewer must choose a measure.
- h. Modify the rank to use the selected measure.
- i. Answer the following questions:  
What type of parameter did you create? Why?  
**Answer:** \_\_\_\_\_  
What are the top 10 units by discards? By capacity?  
**Answer:** \_\_\_\_\_  
What happens if you add a filter action between the control object and the bar chart? Why?  
**Answer:** \_\_\_\_\_
- j. Save the report in My **Folder**.

### Challenge (Optional)

### 2. Using a Parameter to Select Your Metric

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise9.2 (Challenge)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise9.2 (Challenge)** and select **Edit**.

- c. Answer the following questions:

What are the names of the data sources used in the report?

**Answer:** \_\_\_\_\_

Which data source contains a data item called **Category**?

**Answer:** \_\_\_\_\_

How many distinct values does **Category** have?

**Answer:** \_\_\_\_\_

What are the distinct values of **Category**? Do these match data items in the other data source?

**Answer:** \_\_\_\_\_

- d. Create a parameter (**CategoryParameter**) from the **Category** data item.  
e. Create a calculated item (**Selected Category**) that returns the appropriate category based on the selected value of the parameter.

Hint: The new calculated item should be associated with the data source that is used to create the bar chart.

- f. Add a control object to the canvas to populate the parameter.

Hint: Make the control object required so that a report viewer must choose a category.

- g. Modify the bar chart to use the selected category.

- h. Answer the following questions:

What type of parameter did you create? Why?

**Answer:** \_\_\_\_\_

Which continent has the highest profit? Which customer type? Which order type?

**Answer:** \_\_\_\_\_

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

**End of Practices**

## 9.3 Using Date Parameters

### Objectives

- Describe the process of creating date parameters.
- Discuss using date parameters in an advanced filter.
- Discuss when to use the IsSet operator for parameters.
- Discuss using date parameters in a calculated item.

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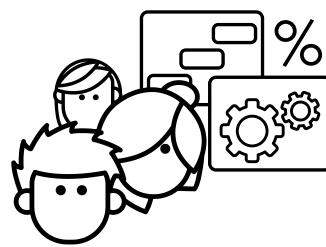


### Business Scenario: Training Path



The training center managers have requested a calendar that shows which courses are being delivered over a 90-day span.

Specifically, they would like to specify a date and see all courses scheduled for the next 90 days. We need to create a parameter so that the report viewer can select a date and see a calendar of all courses in the next 90 days.



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## 9.01 Activity

Which comparison operator enables you to select a range of dates?

- ▼ Comparison
  - BetweenExclusive
  - BetweenInclusive
  - In
  - IsSet
  - Missing
  - NotBetweenExclusive
  - NotBetweenInclusive
  - NotIn
  - NotMissing



## Using a Date Parameter in an Advanced Filter

This demonstration illustrates how to create a date parameter, populate the parameter with a control object, and apply the parameter to an advanced filter.

1. From the browser window, sign in to SAS Viya for Learners.
2. Open **VA2-Demo9.3**.
  - a. Navigate to **SAS Content/Courses/YVA283/Advanced/Demos**.
  - b. Right-click **VA2-Demo9.3** and select **Edit**.

The report opens in SAS Visual Analytics.
3. View the date parameter.
  - a. In the left pane, click the **Data** icon.
  - b. In the Parameter group, right-click **DateParameter** and select **Edit**.

Name:  
DateParameter

Type:  
Date ▾

Multiple values

Minimum value:  
17Oct2006 [Calendar Icon]

Maximum value:  
31Aug2018 [Calendar Icon]

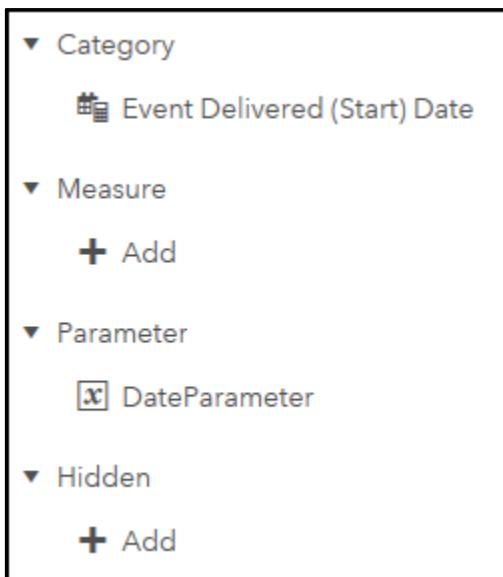
Format:  
DATE9 (Date with Month Name) [Search Icon]

Current value:  
04May2011 [Calendar Icon]

**Note:** The minimum and maximum values for the parameter match the span of dates available in the table.

- c. Click **Cancel** to close the parameter.
4. View the control object that populates the parameter.
  - a. In the canvas, click the text input control to select it.
  - b. In the right pane, click the **Roles** icon.

The Roles pane should resemble the following:

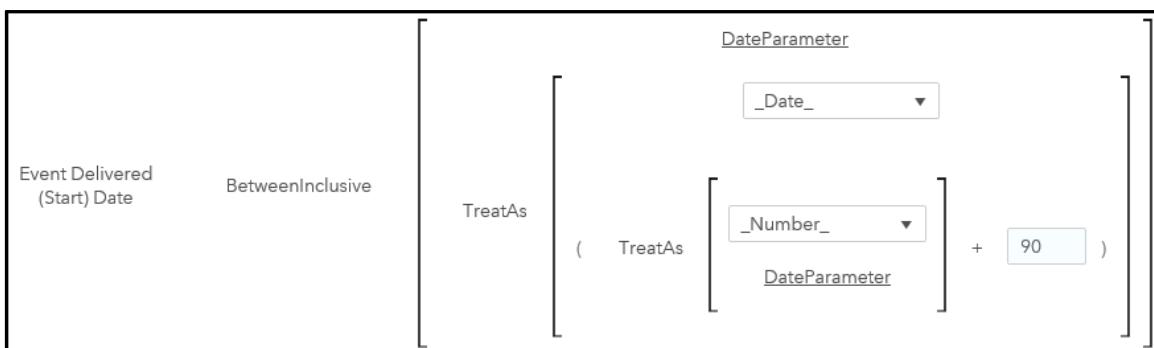


Entering a date in the text input control updates the current value of **DateParameter**.

5. View the advanced filter on the schedule chart.

  - a. In the canvas, click the schedule chart to select it.
  - b. In the right pane, click the **Filters** icon.
  - c. Next to the **Selected Date Plus 90 Days** filter, click **⋮ (Options)** and select **Advanced edit**.

The expression should resemble the following:



This filter looks for all **Event Delivered (Start) Date** values between the selected date (**Date Parameter**) and the selected date plus 90 days.

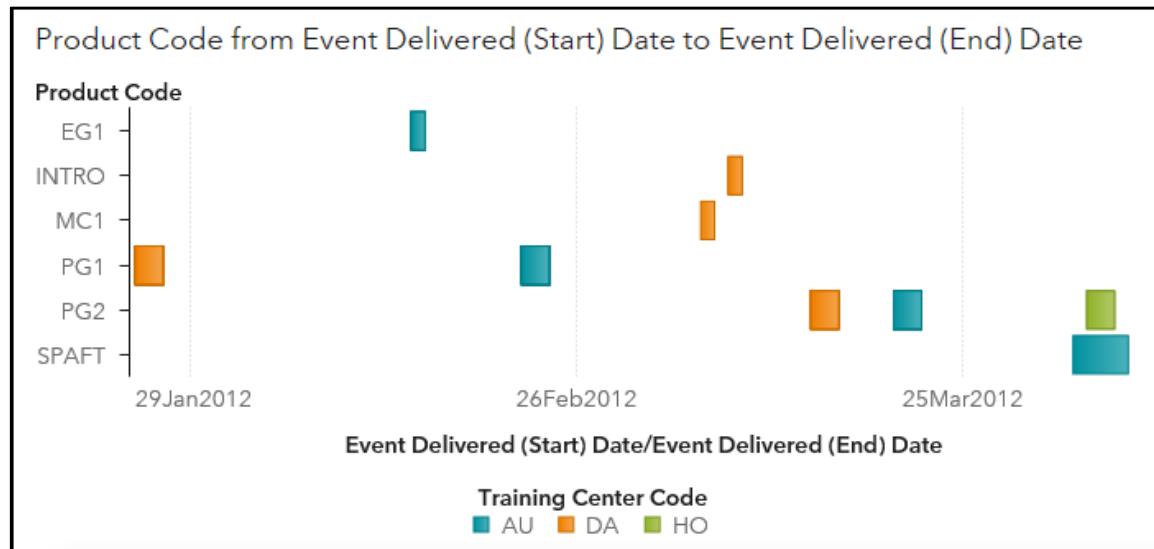
**Note:** **DateParameter** must be treated as a number to add 90 days. The result must then be treated as a date to use in the **BetweenInclusive** operator with **Event Delivered (Start) Date**.

- d. Click **Cancel** to close the Edit Filter Expression window.
6. Test the parameter.

  - a. In the text input control, enter **11Jan2012** and press Enter.

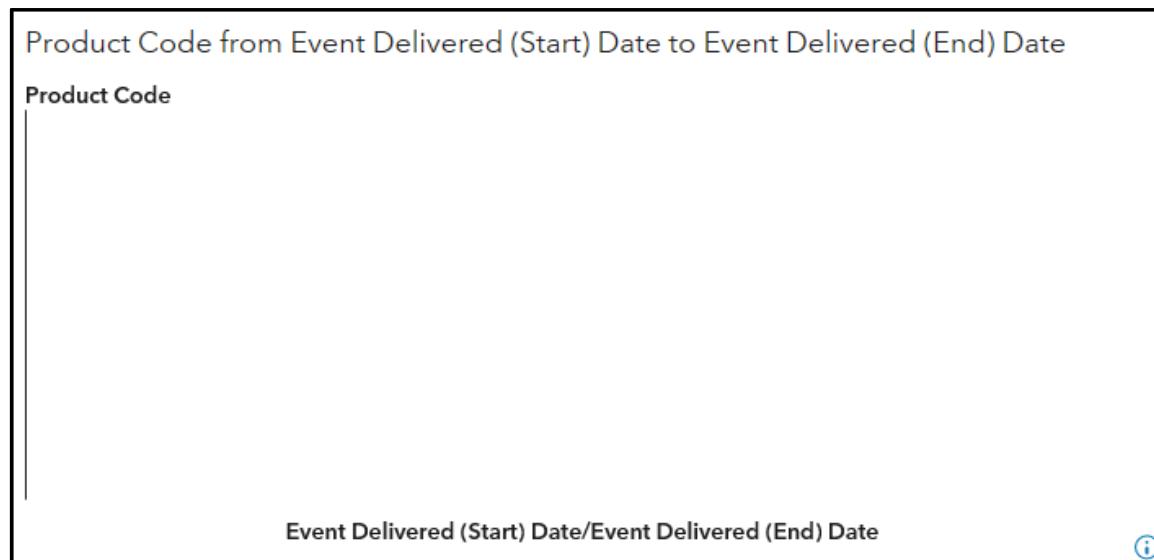
**Note:** Dates must be entered in the format ddMMMyyyy because that is the format specified for **Event Delivered (Start) Date**. As an alternative, a single-point slider control can be used to specify the value of the parameter.

The schedule chart should resemble the following:



- Clear the text input control and press Enter.

The schedule chart should resemble the following:

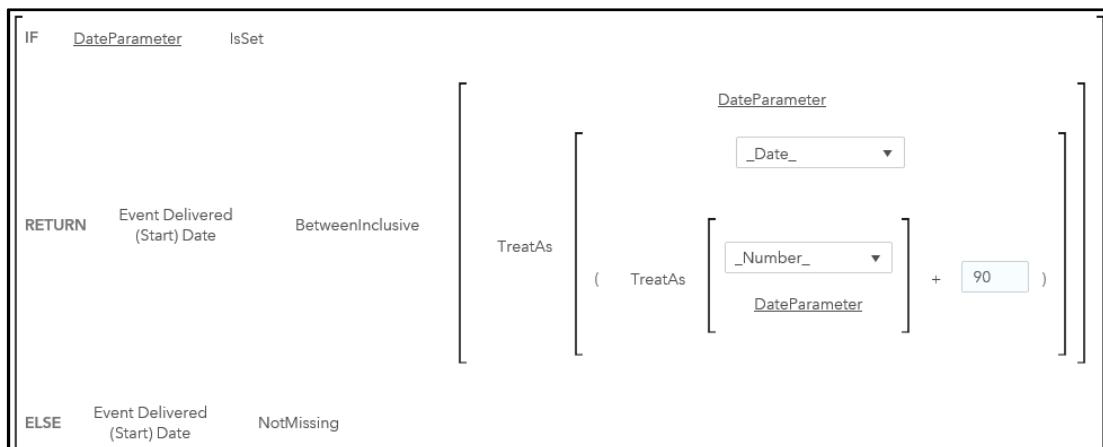


Because the text input control has a missing value, the parameter also has a missing value, so the filter expression does not return any data.

- In the canvas, click the schedule chart to select it.
- In the right pane, click the **Filters** icon.
- Next to the **Selected Date Plus 90 Days** filter, click **⋮ (Options)** and select **Advanced edit**.
  - Right-click the expression and select **Copy**.

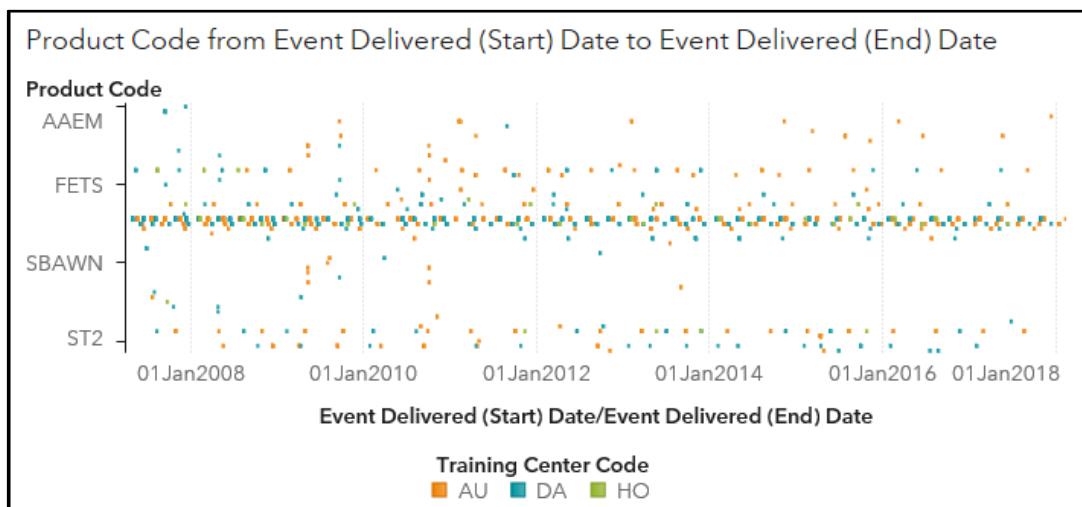
- 2) Right-click the expression and select **Clear**.
- 3) On the left side of the window, click **Operators**.
- 4) Expand **Boolean**.
- 5) Double-click **IF...ELSE** to add it to the expression.
- 6) On the left side of the window, expand **Comparison**.
- 7) Drag **IsSet** to the **condition** field for the IF operator in the expression.
- 8) Right-click the field (for the IsSet operator) and select **Replace with DateParameter**.
- 9) Right-click **condition** for the RETURN operator and select **Paste**.
- 10) On the left side of the window, expand **Comparison** if necessary.
- 11) Drag **NotMissing** to the **condition** field for the ELSE operator.
- 12) Right-click the **number** field for the NotMissing operator and select **Replace with Event Delivered (Start) Date**.

The expression should resemble the following:



- 13) Click **OK** to update the advanced filter.

The schedule chart should resemble the following:



When no value is specified for the parameter, all the data is displayed.

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

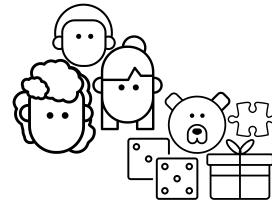
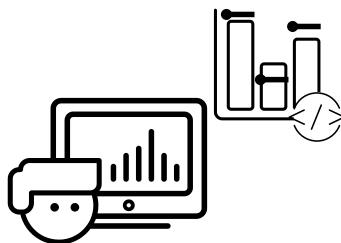
- a. To save the report, click  (**Menu**) in the upper right corner and select **Save As**.
- b. Navigate to **My Folder**.
- c. Click **Save**.

**End of Demonstration**

## Business Scenario: Toy Customers

The head of Sales at Insight Toy Company has requested a report that compares customer satisfaction between months.

Specifically, she wants to select a month and see customer satisfaction for that month compared to the prior month. You need to use parameters to create the requested report.



Sas

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## Business Scenario: Toy Customers

Date Parameter

Selected Month

Prior Month

Name: DateParameter

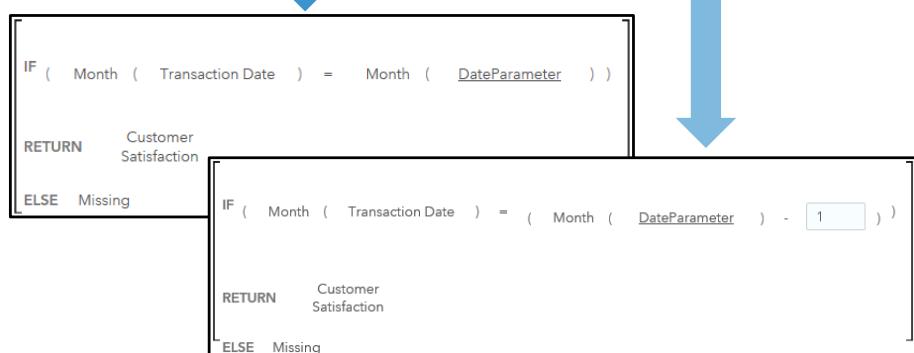
Type: Date

Multiple values

Minimum value: February

Maximum value: December

Format: MONTH7(Month)





## Practice

---

### 3. Using a Parameter in a Calculated Item

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise9.3**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise9.3** and select **Edit**.
- c. Create a parameter (**DateParameter**) from **Transaction Date**.
- d. Add a control object to the canvas to populate the parameter.  
Hint: Make the control object required so that a report viewer must choose a measure.
- e. Hint: Because there is only one year of data, add a filter so that the report viewer cannot select January.
- f. Create a calculated item (**Selected Month**) that returns customer satisfaction for the month specified by the parameter.
- g. Create a calculated item (**Prior Month**) that returns customer satisfaction for the month before the month specified by the parameter.
- h. Modify the targeted bar chart to compare the selected month to the prior month.

What type of parameter did you create? Why?

**Answer:**

For February, does the customer satisfaction for any product line exceed the prior month?

**Answer:**

For April, does the customer satisfaction for any product line exceed the prior month?

**Answer:**

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

### Challenge (Optional)

#### 4. Modifying a Calculated Item

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise9.3 (Challenge)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise9.3 (Challenge)** and select **Edit**.

- c. Answer the following questions:

What format is used for the date data item?

**Answer:** \_\_\_\_\_

In the drop-down list control, select **Jan2013**. What target values are displayed in the bar chart? Why?

**Answer:** \_\_\_\_\_

- d. Modify the calculated item (**Prior Month**) to return the correct values when January is selected.
- e. Save the report in **My Folder**.

**End of Practices**

## 9.4 Solutions

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### Solutions to Practices

#### 1. Using a Parameter in an Advanced Rank

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2-Exercise9.2**.

1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.

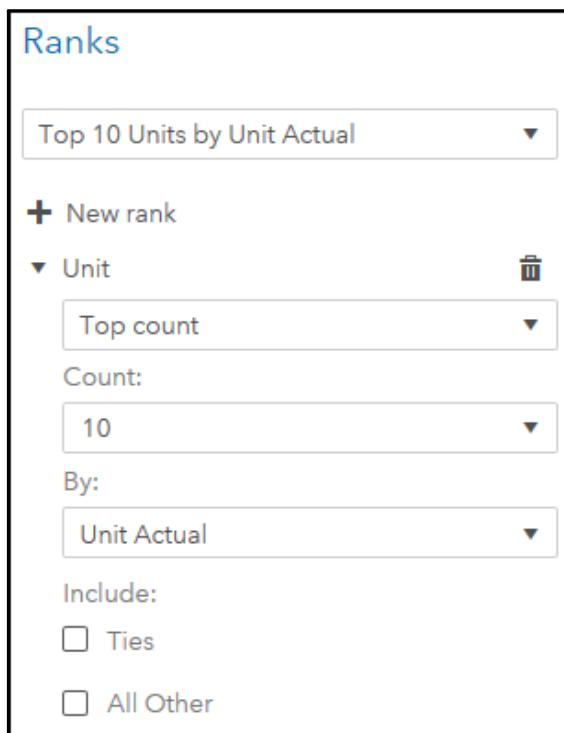
2) Right-click **VA2-Exercise9.2** and select **Edit**.

The report opens in SAS Visual Analytics.

- View the rank on the bar chart and answer the question.
- In the canvas, click the bar chart to select it.
- In the right pane, click the **Ranks** icon.

What measure is used to rank the bar chart?

**Answer:** **Unit Actual.** The bar chart shows the top 10 units by Unit Actual (production).



- Create a custom category (**Measures List**) that contains the following values:
  - In the left pane, click the **Data** icon.
  - Select **New data item** ⇒ **Custom category**.
    - In the **Name** field, enter **Measures List**.
    - For the **Based on** field, verify that **Facility** is selected.

**Note:** The custom category can be based on any category data item that has at least three distinct values.

- c) In the Value Groups area, click **Value Group 1** to edit it.
- d) Enter **Unit Actual** and press Enter.
- e) Drag any facility values from the left part of the window under **Unit Actual**.
- f) Click **+** (Add) to add another value group.
- g) Click **Value Group 1** to edit it.
- h) Enter **Unit Discards** and press Enter.
- i) Drag any facility values from the left part of the window under **Unit Discards**.

The Value Groups area should resemble the following:

Value Groups	
▼	Unit Actual
	ARBUENOS0118
	BRBELOHO0119
▼	Unit Discards
	BRRIODEJ0120
	BRSAOPAU0121

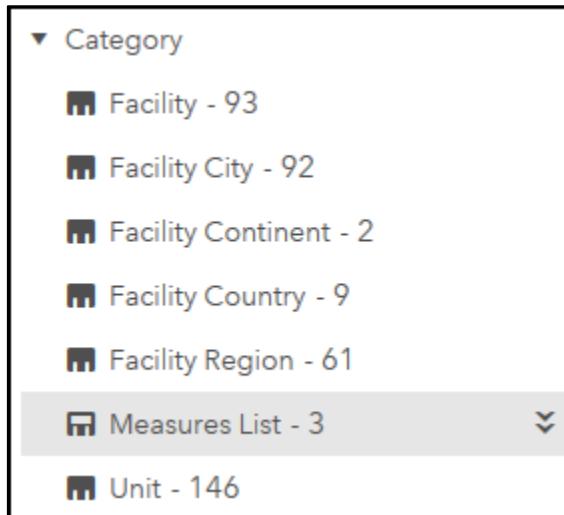
**Note:** It does not matter which values you drag under each value group as long as each group has some values.

- j) At the bottom of the window, for **Remaining Values**, verify that **Group as** is selected.
- k) In the **Group as** field, enter **Unit Capacity**.

Remaining Values:		
<input type="radio"/> Show as is	<input type="radio"/> Show as missing	<input checked="" type="radio"/> Group as: Unit Capacity

- I) Click **OK** to create the custom category.

The Data pane should resemble the following:



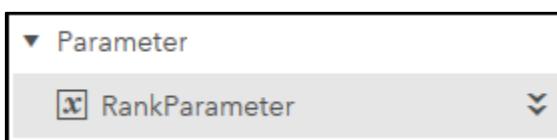
- e. Create a parameter (**RankParameter**) from the custom category.
  - 1) In the left pane, click the **Data** icon, if necessary.
  - 2) Right-click **Measures List** and select **New parameter**.
  - 3) In the **Name** field, enter **RankParameter**.
  - 4) For **Type**, verify that **Character** is specified.

The New Parameter window should resemble the following:

Name:	<input type="text" value="RankParameter"/>
Type:	<input type="button" value="Character ▾"/>
<input type="checkbox"/> Multiple values	
Current value:	<input type="text"/>

- 5) Click **OK** to create the new parameter.

The Data pane should resemble the following:



- f. Create a calculated item (**Rank By Measure**) that returns the appropriate measure based on the selected value of the parameter.
- 1) In the left pane, click the **Data** icon, if necessary.
  - 2) Select **New data item**  $\Rightarrow$  **Calculated item**.
    - a) In the **Name** field, enter **Rank By Measure**.
    - b) For the **Result Type** field, verify that **Automatic (Numeric)** is specified.
    - c) On the left side of the window, click **Operators**.
    - d) Expand **Boolean**.
    - e) Double-click **IF...ELSE** to add it to the expression.
    - f) Expand **Comparison**.
    - g) Drag **x=y** to the **condition** field in the expression.
    - h) Right-click the **number** field (on the left of the equal sign) and select **Replace with**  $\Rightarrow$  **RankParameter**.
      - i) Enter the string **Unit Actual** in the **string** field (on the right of the equal sign).
      - j) Right-click the **number** field (for the RETURN operator) and select **Replace with**  $\Rightarrow$  **Unit Actual**.
      - k) On the left side of the window, expand **Boolean**, if necessary.
      - l) Drag **IF...ELSE** to the ELSE operator.
      - m) On the left side of the window, expand **Comparison**, if necessary.
      - n) Drag **x=y** to the **condition** field in the expression.
      - o) Right-click the **number** field (on the left of the equal sign) and select **Replace with**  $\Rightarrow$  **RankParameter**.
        - p) Enter the string **Unit Discards** in the **string** field (on the right of the equal sign).
        - q) Right-click the **number** field (for the RETURN operator) and select **Replace with**  $\Rightarrow$  **Unit Discards**.

- r) Right-click the **number** field (for the ELSE operator) and select **Replace with**  $\Rightarrow$  **Unit Capacity**.

The expression should resemble the following:

```

IF ( RankParameter = "Unit Actual" )

RETURN Unit Actual

ELSE
  IF ( RankParameter = "Unit Discards" )

    RETURN Unit Discards

  ELSE
    Unit Capacity
  
```

- s) In the bottom right corner of the window, click **Preview**.

- (1) In the Parameter Configuration area, enter **Unit Discards**.

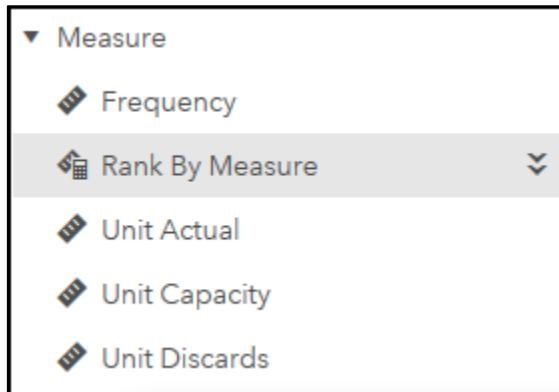
The Preview should resemble the following:

Rank By Measure	Unit Actual	Unit Discards	Unit Capacity
0.00	5	0	8
0.00	6	0	8
0.00	10	0	14
0.00	7	0	12
0.00	5	0	9
0.00	5	0	9
0.00	6	0	14

- (2) Click **Close** to close the Preview Result window.

- t) Click **OK** to create the new calculated item.

The Data pane should resemble the following:



- g. Modify the control object in the canvas to populate the parameter.

- 1) In the canvas, click the button bar control to select it.
- 2) In the right pane, click the **Roles** icon.
- 3) For the Category role, select **Add**  $\Rightarrow$  **Measures List**.
- 4) For the Parameter role, select **Add**  $\Rightarrow$  **RankParameter**.

The button bar should resemble the following:

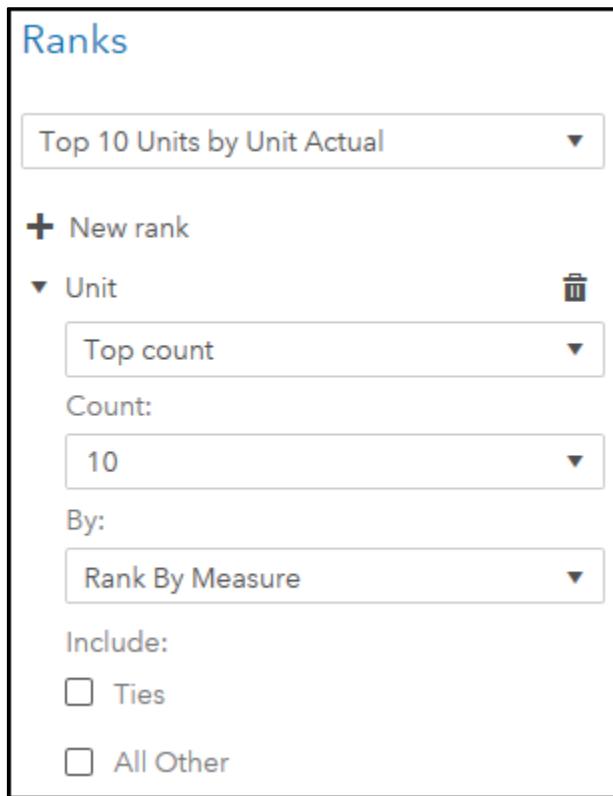


- h. Modify the rank to use the selected measure.

- 1) In the canvas, click the bar chart to select it.
- 2) In the right pane, click the **Ranks** icon.

- 3) For the **By** field, select **Rank By Measure**.

The Ranks pane should resemble the following:



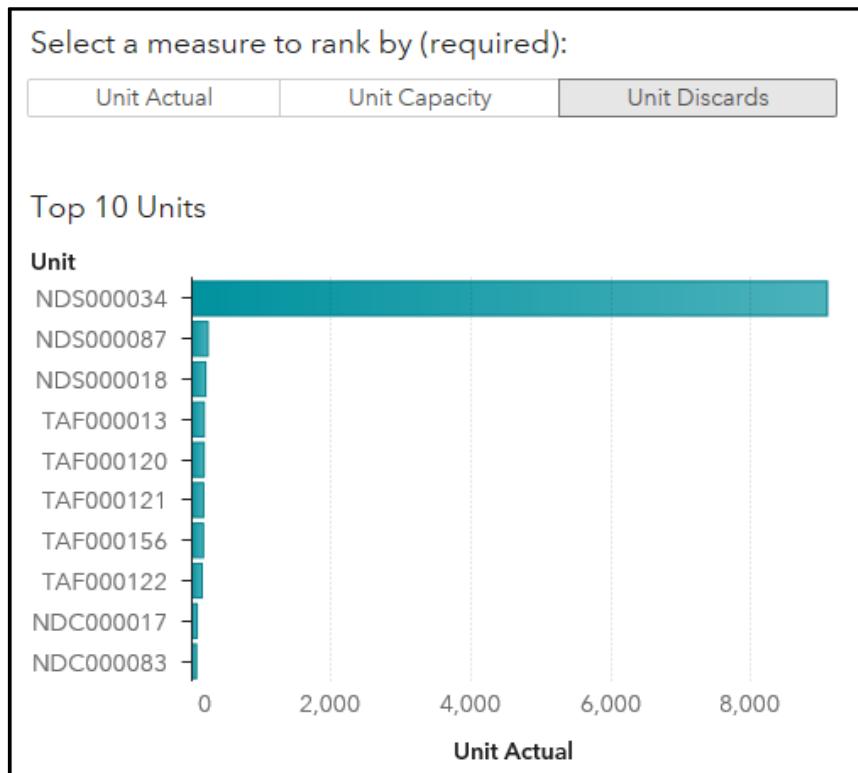
- i. Answer the following questions.

What type of parameter did you create? Why?

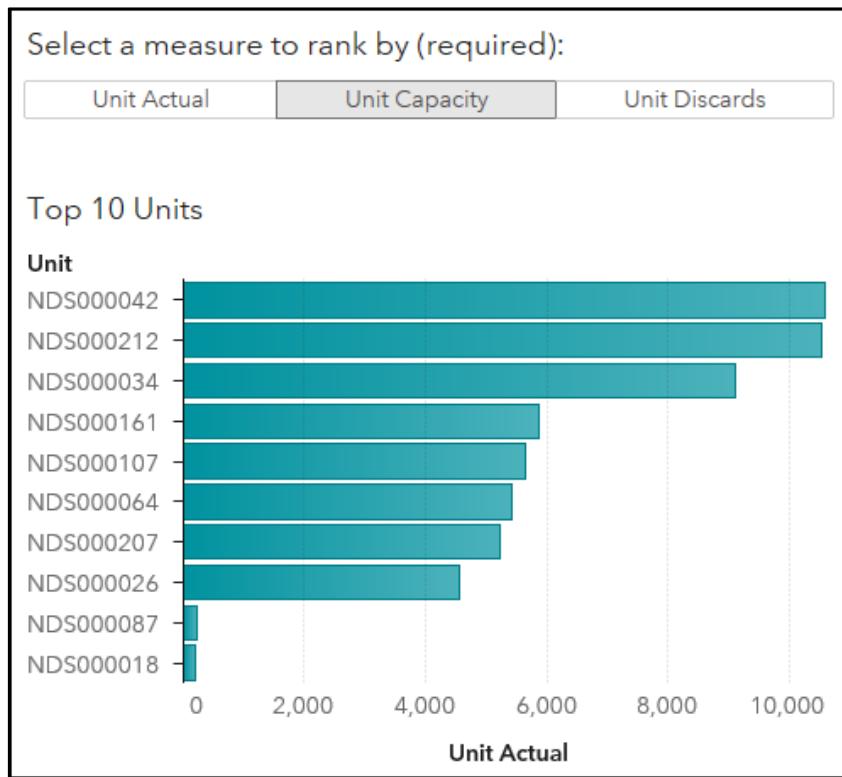
**Answer:** Because you want a report viewer to select a measure value (Unit Actual, Unit Discards, or Unit Capacity) and update the rank on the bar chart, you need to create a character parameter.

What are the top 10 units by discards? By capacity?

**Answer:** The top 10 units by discards are as follows:

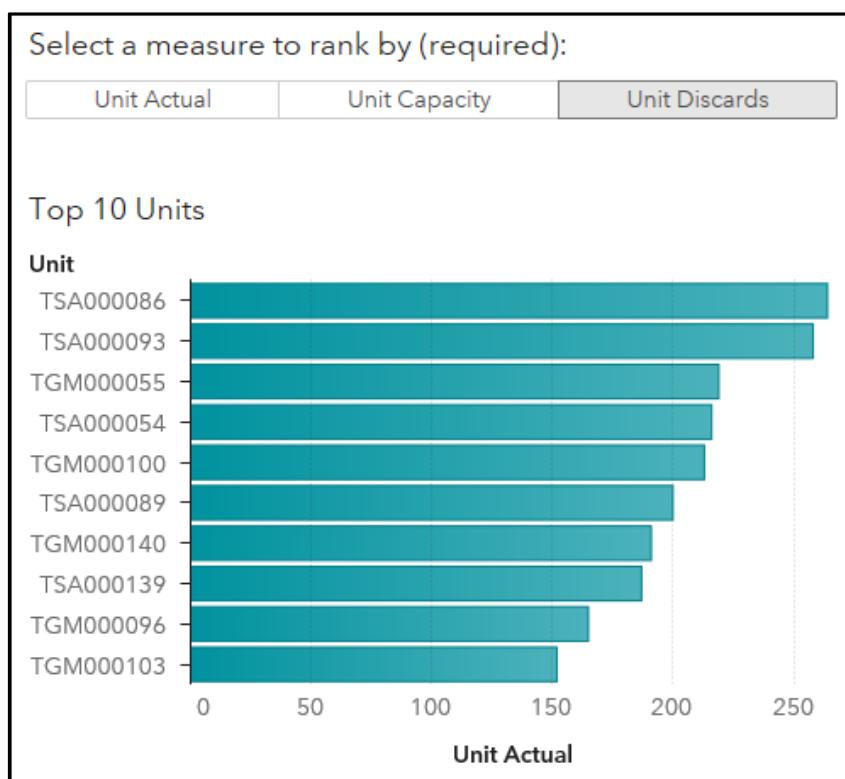


The top 10 units by capacity are as follows:

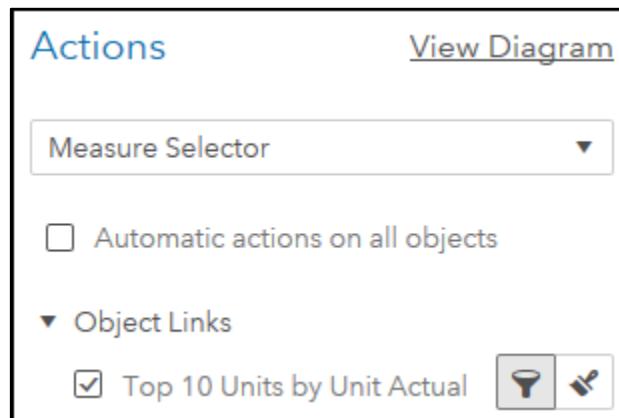


What happens if you add a filter action between the control object and the bar chart? Why?

**Answer:** The bar chart is filtered to show the units used to create the custom category and then ranked by the selected measure.



- In the canvas, click the button bar to select it.
- In the right pane, click the Actions icon.
- Expand Object Links, if necessary.
- Select Top 10 Units by Unit Actual.



- In the button bar, click Unit Discards.

**When we created the custom category, the following units were grouped into Unit Discards:**

```

▼ Unit Discards
  BRRIODEJ0120
  BRSAOPAU0121

```

**By adding the filter action, we are essentially filtering the bar chart for those units and then ranking them by unit discards.**

**Warning: When using parameters, be very careful about adding actions!**

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

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

**2. Using a Parameter to Select Your Metric**

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

b. Open **VA2-Exercise9.2 (Challenge)**.

- 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
- 2) Right-click **VA2-Exercise9.2 (Challenge)** and select **Edit**.

The report opens in SAS Visual Analytics.

c. Answer the following questions:

What are the names of the data sources used in the report?

**Answer: CATEGORIES and CUSTOMERS\_CLEAN**

CUSTOMERS_CLEAN	▼
CATEGORIES	
CUSTOMERS_CLEAN	
+ Add data source...	

- In the left pane, click the Data icon.
- Next to the data source, click .

Which data source contains a data item called **Category**?

**Answer:** The CATEGORIES data source contains a data item called Category.

The screenshot shows a data source interface for 'CATEGORIES'. At the top is a dropdown menu labeled 'CATEGORIES' with a downward arrow and a refresh icon. Below it is a search bar with a magnifying glass icon and the word 'Filter'. Underneath the search bar are two buttons: '+ New data item' and a minus sign followed by 'Category'. A list item 'Category - 3' is shown under the 'Category' node, preceded by a small blue square icon.

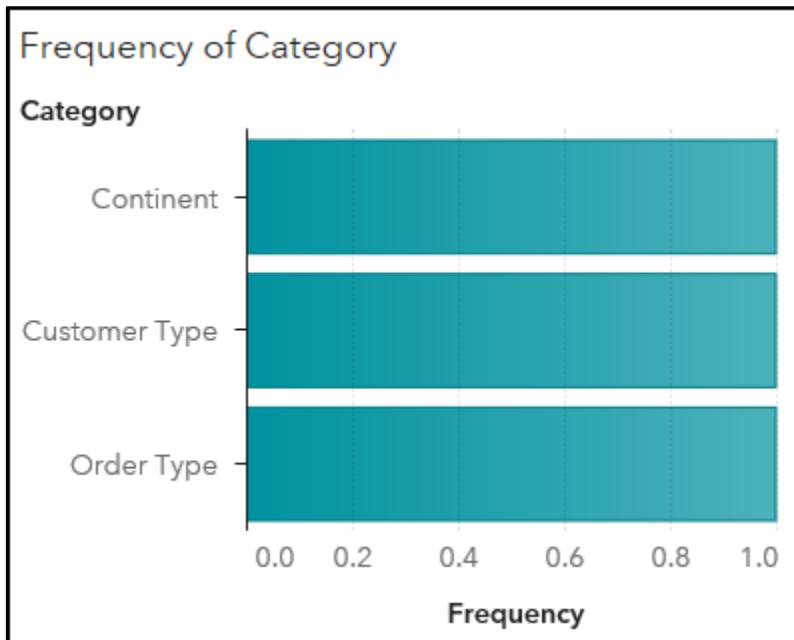
How many distinct values does **Category** have?

**Answer:** Category has three distinct values.

The screenshot shows a data item interface for 'Category'. It features a downward arrow icon followed by the word 'Category'. Below it is a list item 'Category - 3' preceded by a small blue square icon.

What are the distinct values of **Category**? Do these match data items in the other data source?

**Answer:** Category has the distinct values *Continent*, *Customer Type*, and *Order Type*.



**Yes, they match the categories **Continent Name**, **Customer Type Name**, and **Order Type** in the **CUSTOMERS\_CLEAN** data source.**

The screenshot shows the Data pane with the following interface elements:

- Top bar: CUSTOMERS\_CLEAN, a dropdown arrow, and a refresh icon.
- Filter bar: A search icon and the word "Filter".
- New data item button: A plus sign icon followed by "New data item".
- Category section: A minus sign icon followed by "Category". Underneath are three items:
  - Continent Name - 5
  - Customer Type Name - 7
  - Order Type - 3

- Create a parameter (**CategoryParameter**) from the **Category** data item.
  - In the left pane, click the **Data** icon.
  - Select the **CATEGORIES** data source, if necessary.
  - Right-click **Category** and select **New parameter**.
    - In the **Name** field, enter **CategoryParameter**.
    - For **Type**, verify that **Character** is specified.

The New Parameter window should resemble the following:

The New Parameter window contains the following fields:

- Name: CategoryParameter
- Type: Character
- Multiple values (unchecked)
- Current value: (empty input field)

- Click **OK**.

The Data pane should resemble the following:

The Data pane shows the following structure:

- Parameter section: A minus sign icon followed by "Parameter".
- CategoryParameter: A dropdown menu with "CategoryParameter" selected.

- e. Create a calculated item (**Selected Category**) that returns the appropriate category based on the selected value of the parameter.
- 1) In the left pane, click the **Data** icon, if necessary.
  - 2) Select **CUSTOMERS\_CLEAN** as the data source.
  - 3) Select **New data item**  $\Rightarrow$  **Calculated item**.
    - a) In the **Name** field, enter **Selected Category**.
    - b) For the **Return Type** field, select **Character**.
    - c) On the left side of the window, click **Operators**.
    - d) Expand **Boolean**.
    - e) Double-click **IF...ELSE** to add it to the expression.
    - f) Expand **Comparison**.
    - g) Drag **x=y** to the **condition** field in the expression.
    - h) Right-click the **number** field (on the left of the equal sign) and select **Replace with**  $\Rightarrow$  **CategoryParameter**.
      - i) Enter the string **Continent** in the **string** field (on the right of the equal sign).
      - j) Right-click the **string** field (on the RETURN operator) and select **Replace with**  $\Rightarrow$  **Continent Name**.
    - k) On the left side of the window, expand **Boolean**, if necessary.
    - l) Drag **IF...ELSE** to the **string** field (on the ELSE operator).
    - m) Expand **Comparison**, if necessary.
    - n) Drag **x=y** to the **condition** field in the expression (in the second IF condition).
    - o) Right-click the **number** field (on the left of the equal sign) and select **Replace with**  $\Rightarrow$  **CategoryParameter**.
      - p) Enter the string **Customer Type** in the **string** field (on the right of the equal sign).
      - q) Right-click the **string** field (on the second RETURN operator) and select **Replace with**  $\Rightarrow$  **Customer Type Name**.
    - r) Right-click the **string** field (on the second ELSE operator) and select **Replace with**  $\Rightarrow$  **Order Type**.

The expression should resemble the following:

```

IF ( CategoryParameter = "Continent" )

RETURN Continent Name

ELSE
  IF ( CategoryParameter = "Customer Type" )

    RETURN Customer Type
    Name

  ELSE
    Order Type
  
```

- s) In the lower right corner of the window, click **Preview**.  
 (1) In the Parameter Configuration area, enter **Customer Type**.

The preview should resemble the following:

Selected Categ...	Continent Name	Customer Type...	Order Type
Internet/Catalog Customers	Oceania	Internet/Catalog Customers	Internet Sale
Orion Club Gold members high activity	Oceania	Orion Club Gold members high activity	Internet Sale
Orion Club Gold members high activity	Oceania	Orion Club Gold members high activity	Internet Sale
Orion Club Gold members high activity	Oceania	Orion Club Gold members high activity	Internet Sale
Orion Club Gold members medium activity	North America	Orion Club Gold members medium activity	Internet Sale

- (2) Click **Close** to close the Preview Result window.

- t) Click **OK** to create the new calculated item.

The Data pane should resemble the following:

The screenshot shows the Data pane with a tree view. The root node is 'Category'. Under 'Category', there are four items: 'Continent Name - 5', 'Customer Type Name - 7', 'Order Type - 3', and 'Selected Category - 5'. The 'Selected Category - 5' item is highlighted with a gray background and has a dropdown arrow icon to its right.

- f. Add a control object to the canvas to populate the parameter.

- 1) In the left pane, click the **Objects** icon.
- 2) From the Controls group, drag the **Button Bar** object to the canvas above the bar chart.
- 3) In the left pane, click the **Data** icon.
- 4) For the data source, select **CATEGORIES**.
- 5) In the right pane, click the **Roles** icon.
- 6) For the Category role, select **Add**  $\Rightarrow$  **Category**.
- 7) For the Parameter role, select **Add**  $\Rightarrow$  **CategoryParameter**.
- 8) In the right pane, click the **Options** icon.
- 9) Expand the **Object** group, if necessary.
- 10) In the **Name** field, enter **Category Selector**.
- 11) For the **Title** field, select **Custom title**.
- 12) In the **Title** field, enter **Choose a category to view in the bar chart below:**.
- 13) In the Button Bar group, select **Required**.

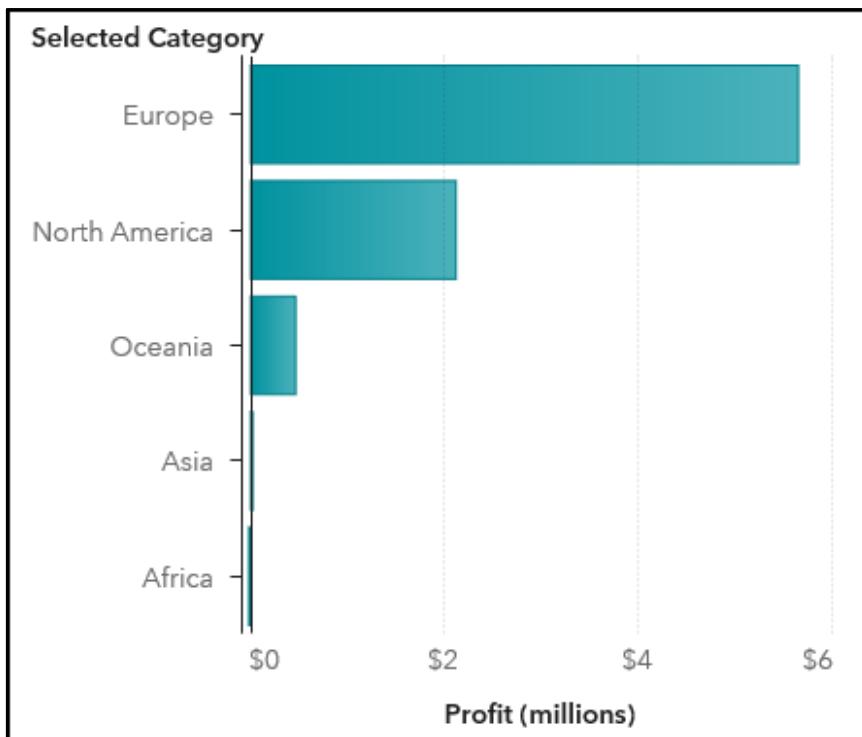
The button bar should resemble the following:

The screenshot shows a button bar with three tabs labeled 'Continent', 'Customer Type', and 'Order Type'. The 'Continent' tab is currently selected, indicated by a blue border around the tab itself and a blue background for the text.

- g. Modify the bar chart to use the selected category.

- 1) In the canvas, click the bar chart that shows profit by continent name to select it.
- 2) In the right pane, click the **Roles** icon.
- 3) For the Category role, select **Continent Name**  $\Rightarrow$  **Selected Category**.

The bar chart should resemble the following:



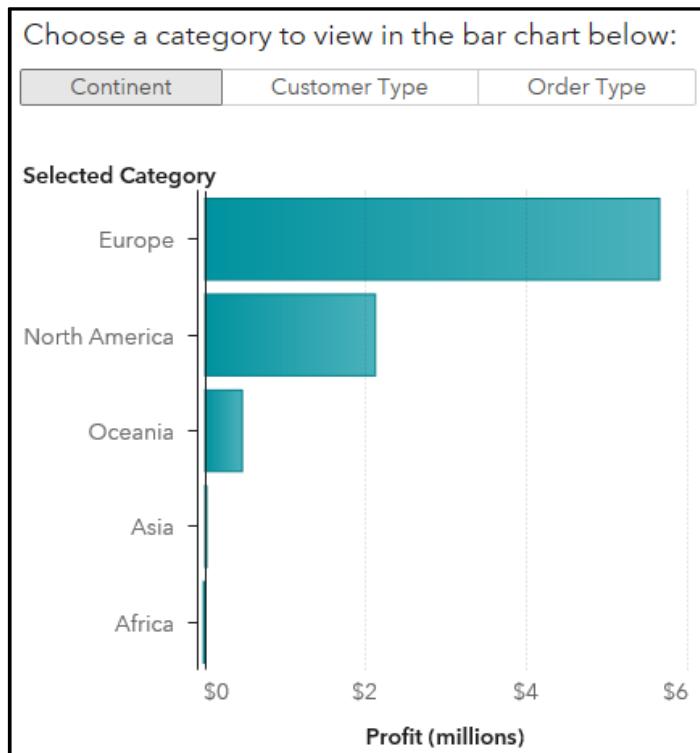
- h. Answer the following questions:

What type of parameter did you create? Why?

**Answer:** Because the parameter is based off Category (a character data item), you need to create a character parameter.

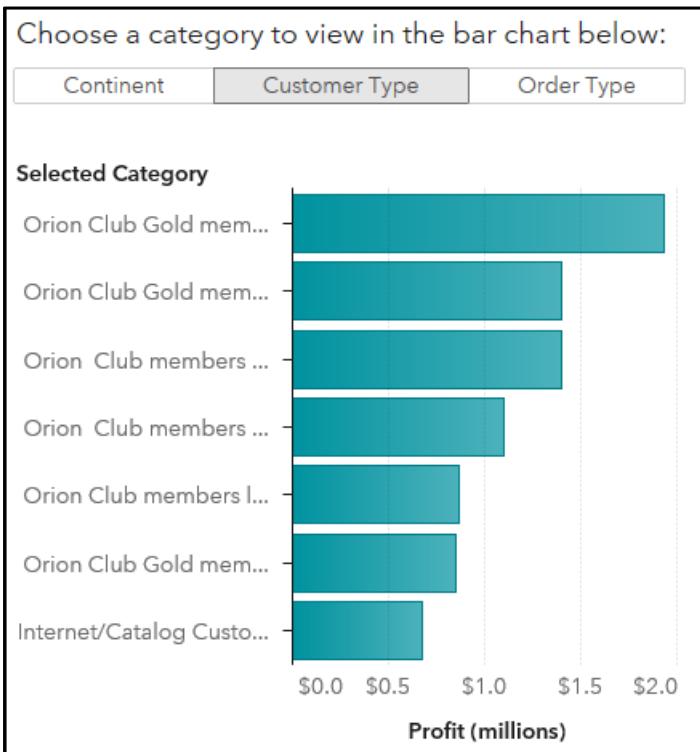
Which continent has the highest profit? Which customer type? Which order type?

**Answer: Europe has the highest profit.**



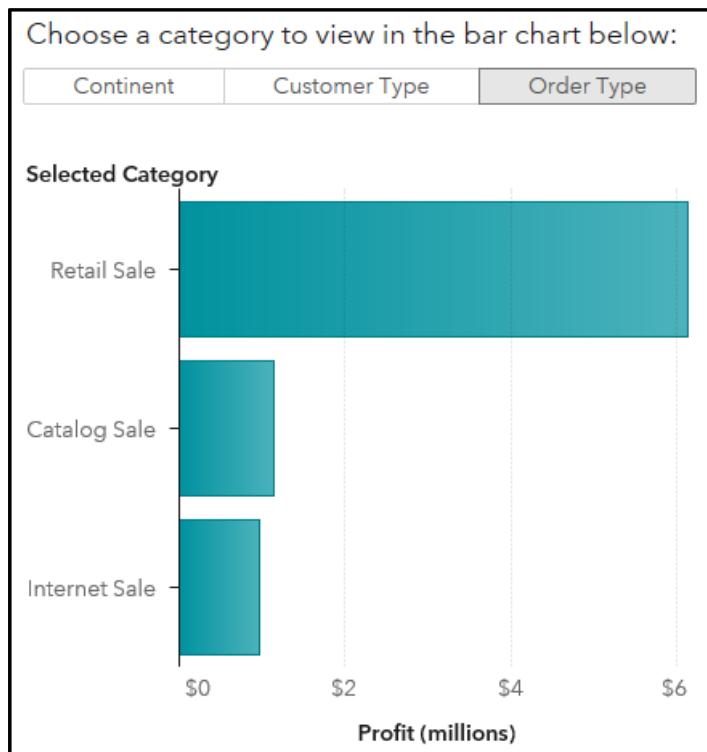
**Orion Club Gold members high activity has the highest profit.**

- On the button bar, click the Customer Type button.



**Retail Sale has the highest profit.**

- On the button bar, click the Order Type button.



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

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

### 3. Using a Parameter in a Calculated Item

- From the browser window, sign in to SAS Viya for Learners.
- Open **VA2-Exercise9.3**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise9.3** and select **Edit**.

The report opens in SAS Visual Analytics.
- Create a parameter (**DateParameter**) from **Transaction Date**.
  - 1) In the left pane, click the **Data** icon.
  - 2) Right-click **Transaction Date** and select **New parameter**.
    - a) In the **Name** field, enter **DateParameter**.
    - b) For **Type**, verify that **Date** is specified.
    - c) Click in the **Minimum value** field.
      - (1) For the **Month** field, select **February**.

**Note:** The year does not matter in this instance because we have only one year of data.

- (2) Click **OK**.
- d) For the **Maximum value** field, verify that **December** is specified.
- e) For the **Format** field, verify that **MONTH7 (Month)** is specified.
- f) Click in the **Current value** field.
  - (1) For the **Month** field, select **February**.
  - (2) Click **OK**.

The New Parameter window should resemble the following:

Name:  
DateParameter

Type:  
Date

Multiple values

Minimum value:  
February

Maximum value:  
December

Format:  
MONTH7 (Month)

Current value:  
February

- g) Click **OK** to create the date parameter.

The Data pane should resemble the following:

▼ Parameter  
DateParameter

- d. Add a control object to the canvas to populate the parameter.
- 1) In the left pane, click the **Objects** icon.
  - 2) From the Controls group, drag the **Drop-Down List** object to the canvas above the targeted bar chart.
  - 3) In the right pane, click the **Roles** icon.
  - 4) For the Category role, select **Add**  $\Rightarrow$  **Transaction Date**.
  - 5) For the Parameter role, select **Add**  $\Rightarrow$  **DateParameter**.
  - 6) In the right pane, click the **Options** icon.
  - 7) Expand the **Object** group, if necessary.
  - 8) In the **Name** field, enter **Date Selector**.
  - 9) For the **Title** field, select **Custom title**.
  - 10) In the **Title** field, enter **Select a month to view customer satisfaction details:**.
  - 11) In the Drop-Down List group, select **Required**.
  - 12) In the right pane, click the **Filters** icon.
  - 13) Select **New filter**  $\Rightarrow$  **Transaction Date**.
  - 14) Clear **January**.

**Note:** Because we have only one year of data, we cannot enable the viewer to select January, as there is no prior month to compare.

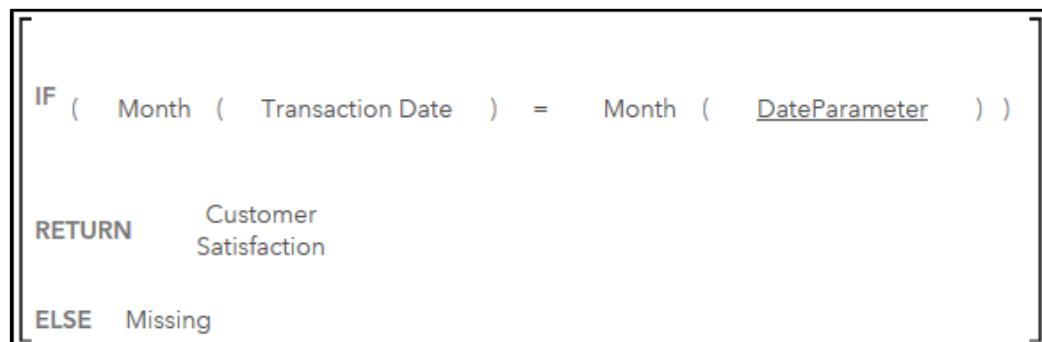
The drop-down list control should resemble the following:



- e. Create a calculated item (**Selected Month**) that returns customer satisfaction for the month specified by the parameter.
- 1) In the left pane, click the **Data** icon.
  - 2) Select **New data item**  $\Rightarrow$  **Calculated item**.
    - a) In the **Name** field, enter **Selected Month**.
    - b) For the **Result Type** field, verify that **Automatic (Numeric)** is specified.
    - c) In the upper right corner of the window, for the **Format** field, click (Edit).
      - (1) For the **Format**, select **Percent**.
      - (2) For the **Width** field, verify that **12** is specified.
      - (3) For the **Decimals** field, verify that **2** is specified.
      - (4) Click **OK**.
    - d) On the left side of the window, click **Operators**.
    - e) Expand **Boolean**.

- f) Double-click **IF...ELSE** to add it to the expression.
- g) Expand **Comparison**.
- h) Drag **x=y** to the **condition** field in the expression.
- i) Expand **Date and Time**.
- j) Drag **Month** to the **number** field (on the left of the equal sign).
- k) Right-click **No selection** (on the left of the equal sign) and select **Replace with**  $\Rightarrow$  **Transaction Date**.
- l) Drag **Month** to the **number** field (on the right of the equal sign).
- m) Right-click **No selection** (on the right of the equal sign) and select **Replace with**  $\Rightarrow$  **DateParameter**.
- n) Right-click the **number** field (for the **RETURN** operator) and select **Replace with**  $\Rightarrow$  **Customer Satisfaction**.
- o) Right-click the **number** field (for the **ELSE** operator) and select **Replace with**  $\Rightarrow$  **Missing Value**.

The expression should resemble the following:



```

IF ( Month ( Transaction Date ) = Month ( DateParameter ) )
  RETURN Customer Satisfaction
ELSE Missing
  
```

- p) Click **OK** to create the new calculated item.
- 3) In the Data pane, next to **Selected Month**, click  $\downarrow$  (**Edit properties**).
- 4) For the **Aggregation** field, select **Average**.
- f) Create a calculated item (**Prior Month**) that returns customer satisfaction for the month before the month specified by the parameter.
  - 1) In the left pane, click the **Data** icon, if necessary.
  - 2) Right-click **Selected Month** and select **Duplicate**.
  - 3) Right-click **Selected Month (1)** and select **Edit**.
    - a) In the **Name** field, enter **Prior Month**.
    - b) For the **Result Type** field, verify that **Numeric** is specified.
    - c) On the left side of the window, click **Operators**.
    - d) Expand **Numeric (simple)**.
    - e) Drag **x-y** to the right of the equal sign.

- f) Enter **1** in the **number** field on the right of the minus sign.

The expression should resemble the following:

```
IF ( Month ( Transaction Date ) = ( Month ( DateParameter ) - 1 ) )
    RETURN Customer Satisfaction
ELSE Missing
```

- g) Click **OK** to update the data item.

The Data pane should resemble the following:

▼ Measure

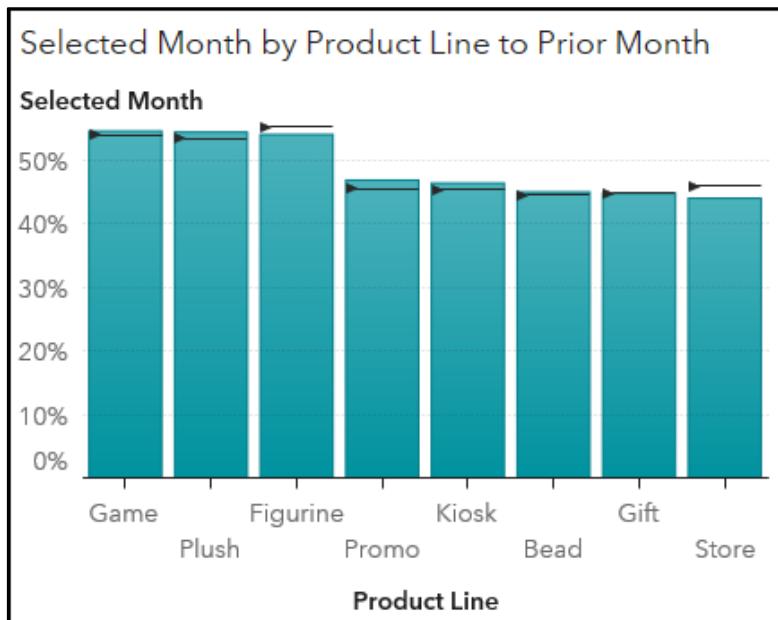
- Customer Satisfaction
- Frequency
- Prior Month
- Selected Month

- g. Modify the targeted bar chart to compare the selected month to the prior month.

- 1) In the canvas, click the targeted bar chart to select it.
- 2) In the right pane, click the **Roles** icon.
- 3) For the Measure role, select **Add** ⇒ **Selected Month**.

- 4) For the Target role, select **Add**  $\Rightarrow$  **Prior Month**.

The targeted bar chart should resemble the following:



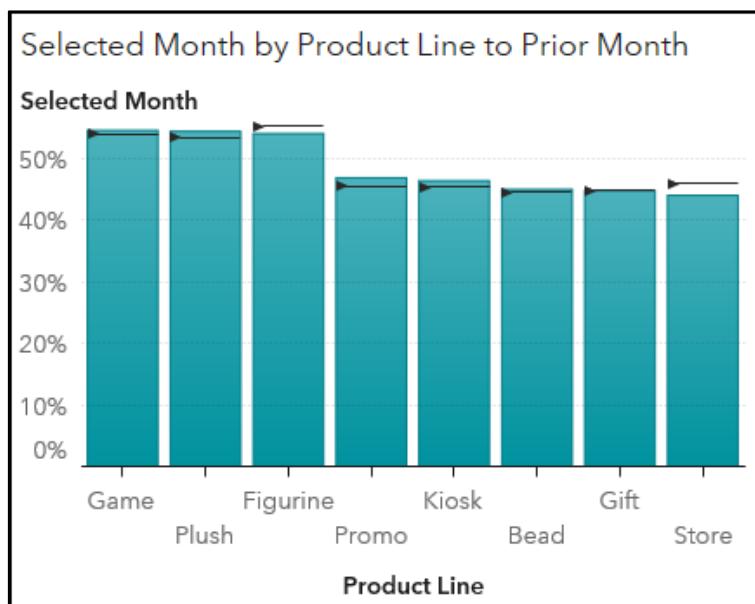
- h. Answer the following questions.

What type of parameter did you create? Why?

**Answer:** Because the parameter is based off Transaction Date (a date data item), we need to create a date parameter.

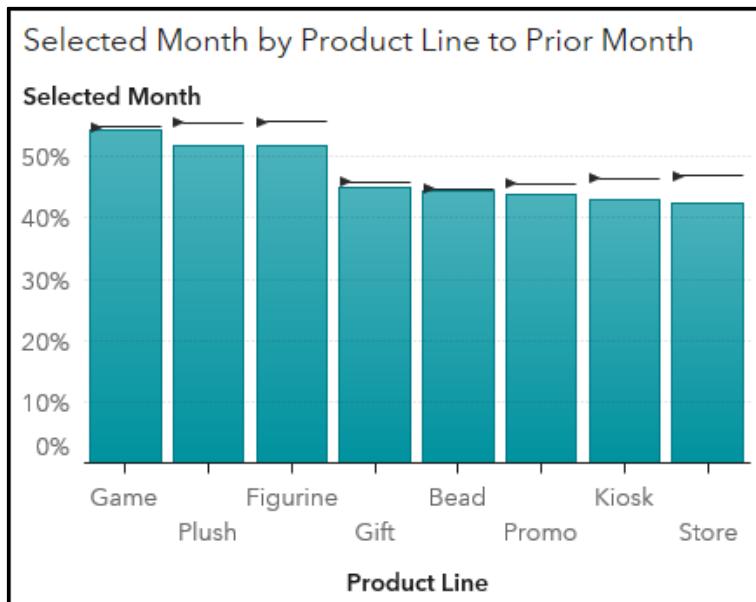
For February, does the customer satisfaction for any product line exceed the prior month?

**Answer:** Yes, customer satisfaction for February exceeds customer satisfaction in January for the following product lines: Game, Plush, Promo, Kiosk, and Bead.



For April, does the customer satisfaction for any product line exceed the prior month?

**Answer:** No, customer satisfaction in April does not exceed customer satisfaction for March for any product line.



- In the drop-down list control, select **April**.

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

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

4. Modifying a Calculated Item

- a. From the browser window, sign in to SAS Viya for Learners.
- b. Open **VA2-Exercise9.3 (Challenge)**.
  - 1) Navigate to **SAS Content/Courses/YVA283/Advanced/Exercises**.
  - 2) Right-click **VA2-Exercise9.3 (Challenge)** and select **Edit**.

The report opens in SAS Visual Analytics.

c. Answer the following questions:

What format is used for the date data item?

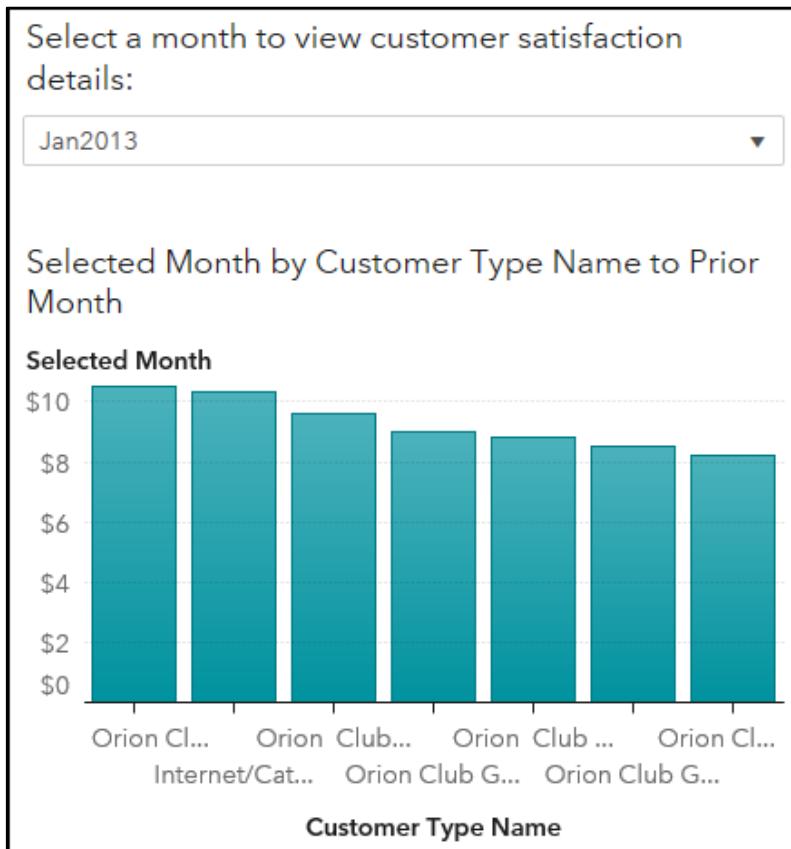
**Answer: Order Date uses the format MONYY7 (MMYYYY).**



- In the left pane, click the Data icon.
- Next to Order Date, click (Edit properties).

In the drop-down list control, select Jan2013. What target values are displayed in the bar chart? Why?

**Answer: No target values are displayed. In the calculation for Prior Month, 1 is subtracted from the selected month. Because January (1) is the selected month, Prior Month is looking for month 0. Because there is no month 0, the calculation returns no values.**



- d. Modify the calculated item (**Prior Month**) to return the correct values when January is selected.
- 1) In the left pane, click the **Data** icon.
  - 2) Right-click **Prior Month** and select **Edit**.
  - 3) Right-click the expression and select **Copy**.
  - 4) Right-click the expression and select **Clear**.
  - 5) On the left side of the window, click **Operators**.
  - 6) Expand **Boolean**.
  - 7) Double-click **IF...ELSE** to add it to the expression.
  - 8) Expand **Comparison**.
  - 9) Drag **x=y** to the **condition** field in the expression.
  - 10) Expand **Date and Time**.
  - 11) Drag **Month** to the **number** field (on the left of the equal sign).
  - 12) Right-click **No selection** and select **Replace with**  $\Rightarrow$  **DateParameter**.
  - 13) Enter **1** in the **number** field (on the right of the equal sign).
  - 14) On the left side of the window, expand **Boolean**, if necessary.
  - 15) Drag **IF...ELSE** to the **number** field (on the **RETURN** operator).
  - 16) Drag **AND** to the **condition** field in the expression.
  - 17) Expand **Comparison**, if necessary.
  - 18) Drag **x=y** to the first **condition** field (on the **AND** operator).
  - 19) Expand **Date and Time**, if necessary.
  - 20) Drag **Month** to the **number** field (on the left of the equal sign).
  - 21) Right-click **No selection** and select **Replace with**  $\Rightarrow$  **Order Date**.
  - 22) Enter **12** in the **number** field (on the right of the equal sign).
  - 23) On the left side of the window, expand **Comparison**, if necessary.
  - 24) Drag **x=y** to the second **condition** field (on the **AND** operator).
  - 25) Expand **Date and Time**, if necessary.
  - 26) Drag **Year** to the **number** field (on the left of the equal sign).
  - 27) Right-click **No selection** and select **Replace with**  $\Rightarrow$  **Order Date**.
  - 28) On the left side of the window, expand **Numeric (simple)**.
  - 29) Drag **x-y** to the **number** field (on the right of the equal sign).
  - 30) Expand **Date and Time**, if necessary.
  - 31) Drag **Year** to the **number** field (on the left of the minus sign).
  - 32) Right-click **No selection** and select **Replace with**  $\Rightarrow$  **DateParameter**.
  - 33) Enter **1** in the **number** field (on the right of the minus sign).

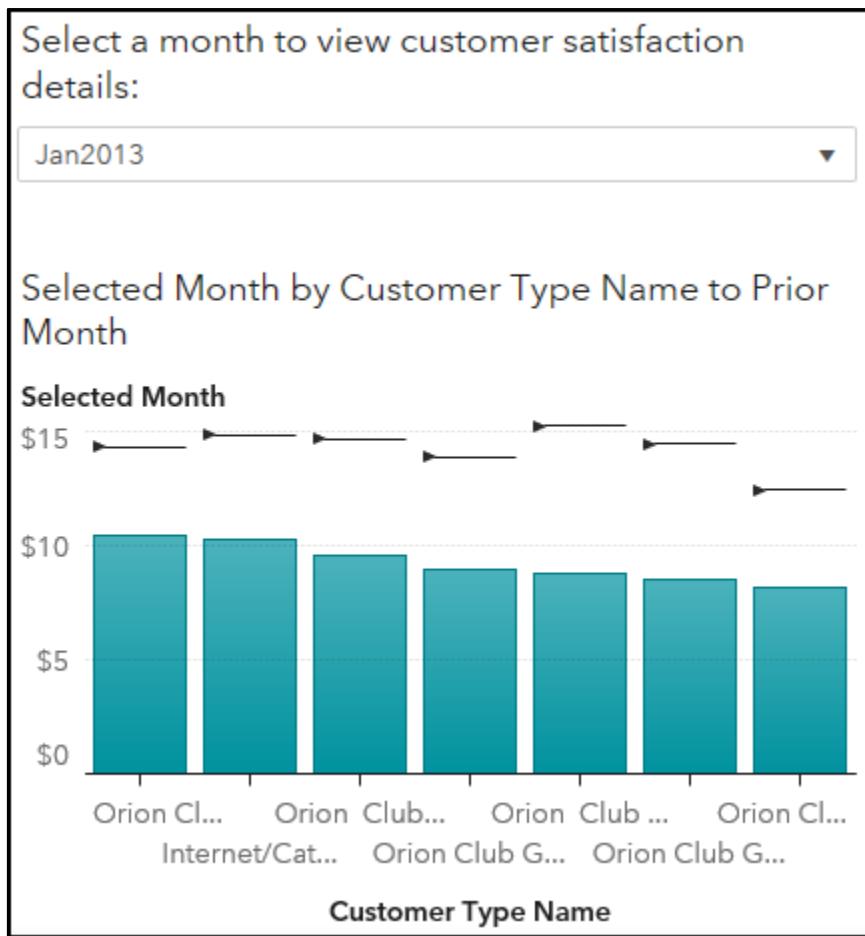
- 34) Right-click the **number** field (on the RETURN operator) and select **Replace with**  $\Rightarrow$  **Profit**.
- 35) Right-click the **number** field (on the ELSE operator) and select **Replace with**  $\Rightarrow$  **Missing Value**.
- 36) Right-click the **number** field (on the last ELSE operator) and select **Paste**.

The expression should resemble the following:



- 37) Click **OK** to modify the data item.

The targeted bar chart should resemble the following:



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

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

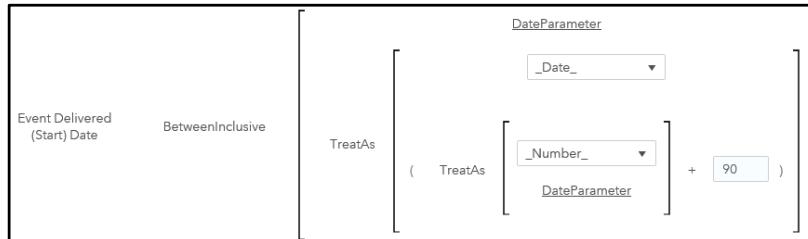
**End of Solutions**

## Solutions to Activities and Questions

### 9.01 Activity – Correct Answer

Which comparison operator enables you to select a range of dates?

- ▼ Comparison
  - BetweenExclusive
  - BetweenInclusive **✓**
  - In
  - IsSet
  - Missing
  - NotBetweenExclusive
  - NotBetweenInclusive
  - NotIn
  - NotMissing



## Practice Review

### 9.1 Using a Parameter in an Advanced Rank – Solution

What measure is used to rank the bar chart?

**Unit Actual**

What type of parameter did you create?

**Character**

Why?

**You want the report viewer to select a measure value (Unit Actual, Unit Discards, or Unit Capacity) to update the rank on the bar chart.**

The dialog box is titled "Ranks" and shows the following configuration:

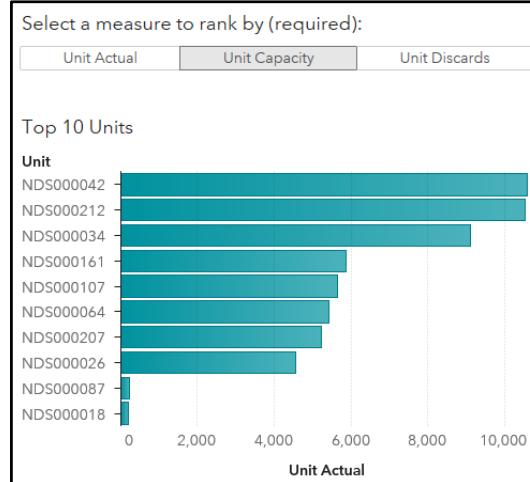
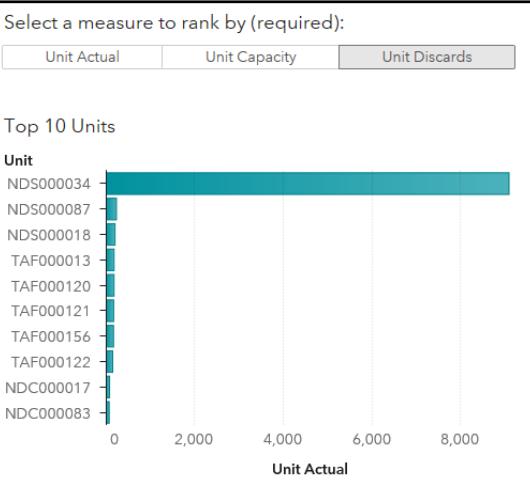
- Rank Type: Top 10 Units by Unit Actual
- Rank Method: New rank
- Measure: Unit
- Count: Top count (set to 10)
- By: Unit Actual
- Include: Ties (unchecked), All Other (unchecked)

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### 9.1 Using a Parameter in an Advanced Rank – Solution

What are the top 10 units by discards? By capacity?



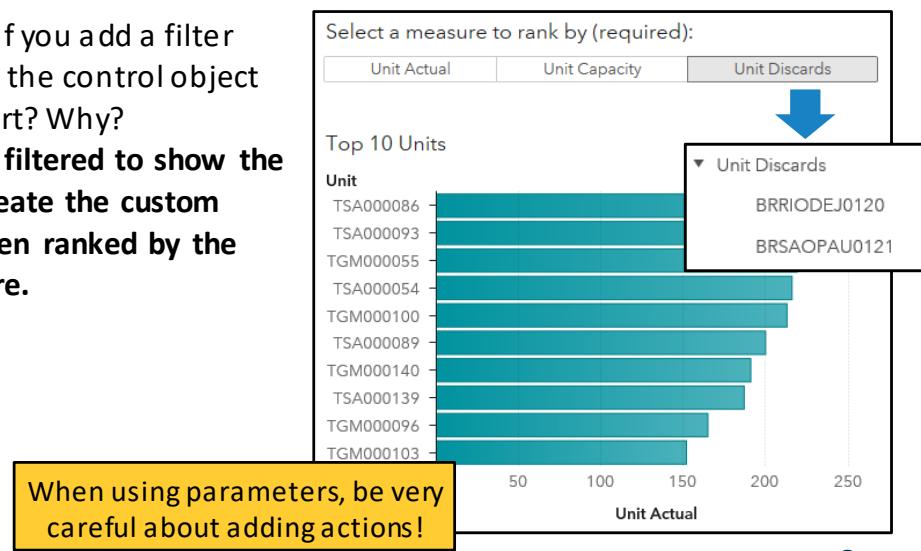
18


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## 9.1 Using a Parameter in an Advanced Rank – Solution

What happens if you add a filter action between the control object and the bar chart? Why?

**The bar chart is filtered to show the units used to create the custom category and then ranked by the selected measure.**



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## 9.2 Using a Parameter to Select Your Metric (Optional) – Solution

What are the names of the data sources used in the report?

**CATEGORIES and CUSTOMERS\_CLEAN**

CUSTOMERS\_CLEAN

CATEGORIES

CUSTOMERS\_CLEAN

+ Add data source...

Which data source contains a data item called **Category**?

**CATEGORIES**

CATEGORIES

Filter

+ New data item

▼ Category

Category - 3



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## 9.2 Using a Parameter to Select Your Metric (Optional) – Solution

What are the distinct values of **Category?**  
**Continent, Customer Type, and Order Type**

Do these match data items in the other data source?

**Yes**

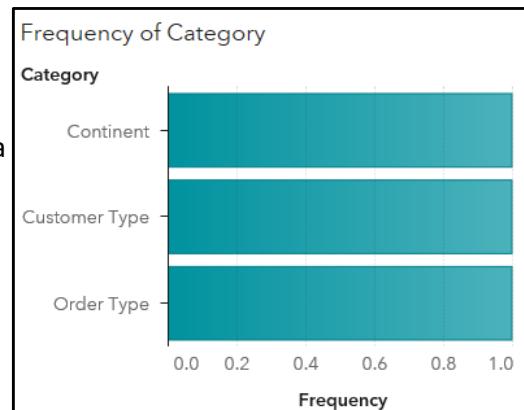
CUSTOMERS\_CLEAN

Filter

+ New data item

▼ Category

- Continent Name - 5
- Customer Type Name - 7
- Order Type - 3



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## 9.2 Using a Parameter to Select Your Metric (Optional) – Solution

What type of parameter did you create?

**Character**

Why?

**You need the report viewer to select a category (a character data item) to update the bar chart.**

22



## 9.2 Using a Parameter to Select Your Metric (Optional) – Solution

Which continent has the highest profit? Which customertype? Which order type?



23



## 9.3 Using a Parameter in a Calculated Item – Solution

What type of parameter did you create?

**Date**

Why?

**Because the parameter is based off Transaction Date (a date data item), we need to create a date parameter.**

33



### 9.3 Using a Parameter in a Calculated Item – Solution

For February, does the customer satisfaction for any product line exceed the prior month?

**Yes for Game, Plush, Promo, Kiosk, and Bead**



For April, does the customer satisfaction for any product line exceed the prior month?

**No**

34



### 9.4 Modifying a Calculated Item (Optional) – Solution

What format is used for the date data item?

**MONYY7.**

In the drop-down list control, select **Jan2013**.

What target values are displayed in the bar chart?

**None**

Why?

**In the calculation for Prior Month, 1 is subtracted from the selected month. Because January (1) is the selected month, Prior Month is looking for month 0. Because there is no month 0, the calculation returns no values.**

Order Date - 60

Name:	<input type="text" value="Order Date"/>
Format:	<input type="text" value="MMYYYY (MONYY7)"/> <input type="button" value="..."/>

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