



**Fundamentals of
Data Visualisation**

Training Exercises

(Tableau)



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Exercise 1: Connect to Data Sources

You are able to connect to the following Data sources:

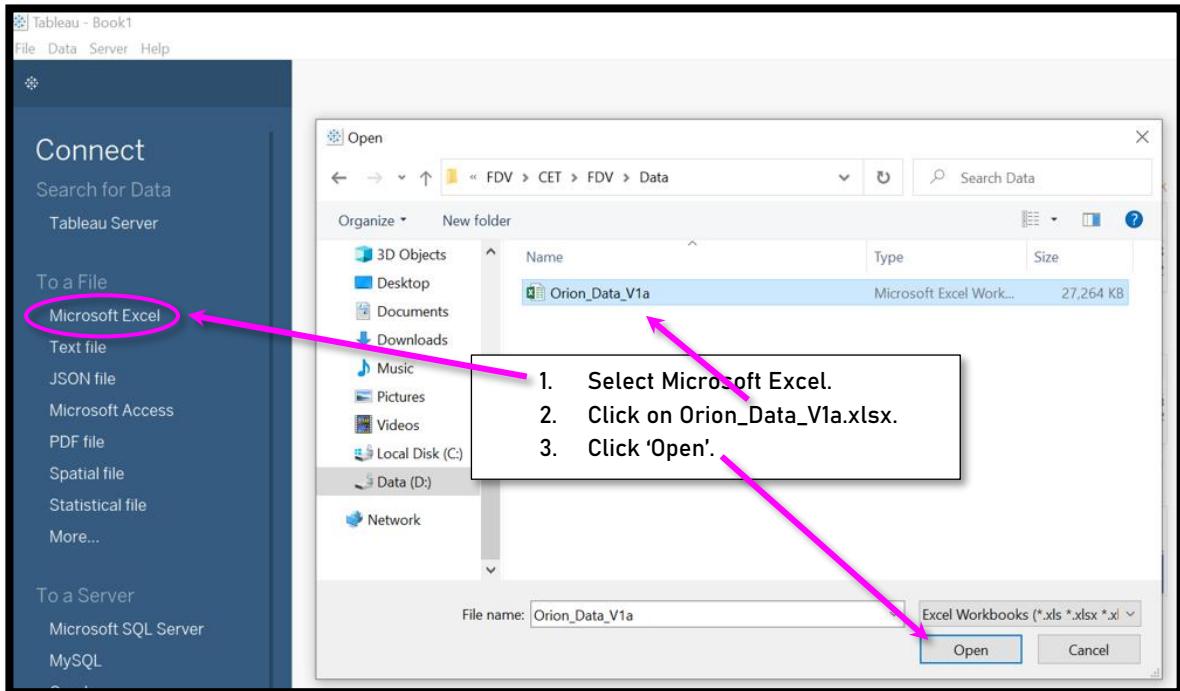
| Need not require additional installation of ODBC | May Require Additional installation of ODBC |
|--|---|
| Excel | MySQL |
| Tableau Extract | Oracle |
| Microsoft Access | Microsoft SQL Server |
| Text File | IBM DB2 |
| Import from Tableau | Etc |

For this course, we will be using the Orion_Data_V1a.xlsx as the data source.

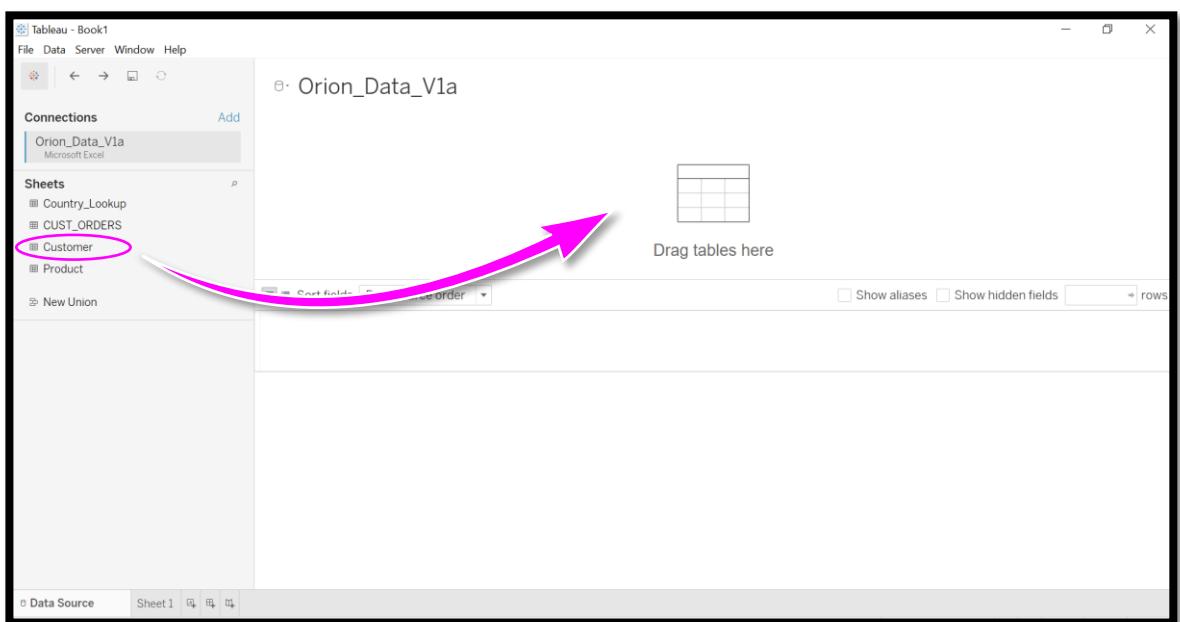
| CUST_ORDERS | Country_Lookup | Customer | Product |
|--|---|--|--|
| <i>CustomerID</i> <i>EmployeeID</i> <i>Order_Date</i> <i>Delivery_Date</i> <i>Order_ID</i> <i>OrderType</i> Product_ID <i>Quantity</i> <i>Total_Retail_Price</i> <i>CostPrice per Unit</i> | <i>country_key</i> <i>country_name</i> | <i>Customer_ID</i> <i>Customer_Country</i> <i>Customer_Gender</i> <i>Customer_FirstName</i> <i>Customer_LastName</i> <i>Customer_BirthDate</i> <i>Customer_Type</i> <i>Customer_Group</i> | Product_ID <i>Product_Line</i> <i>Product_Group</i> <i>Product_Name</i> <i>Supplier_Country</i> <i>Supplier_Name</i> <i>Supplier_ID</i> |

1. Activate the Tableau Software with the product key provided by your course trainer.

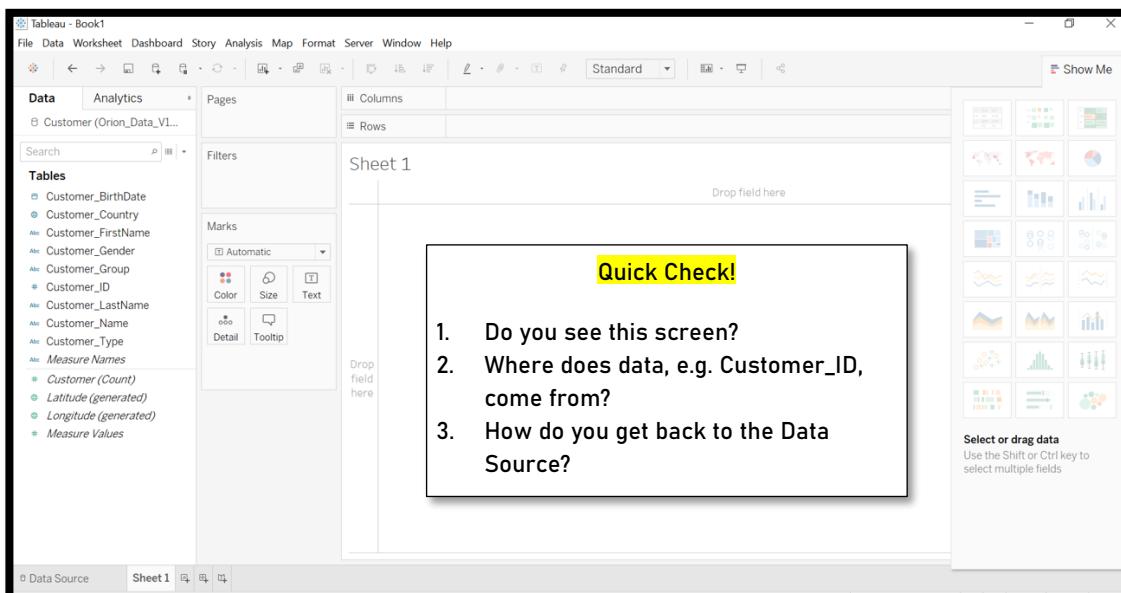
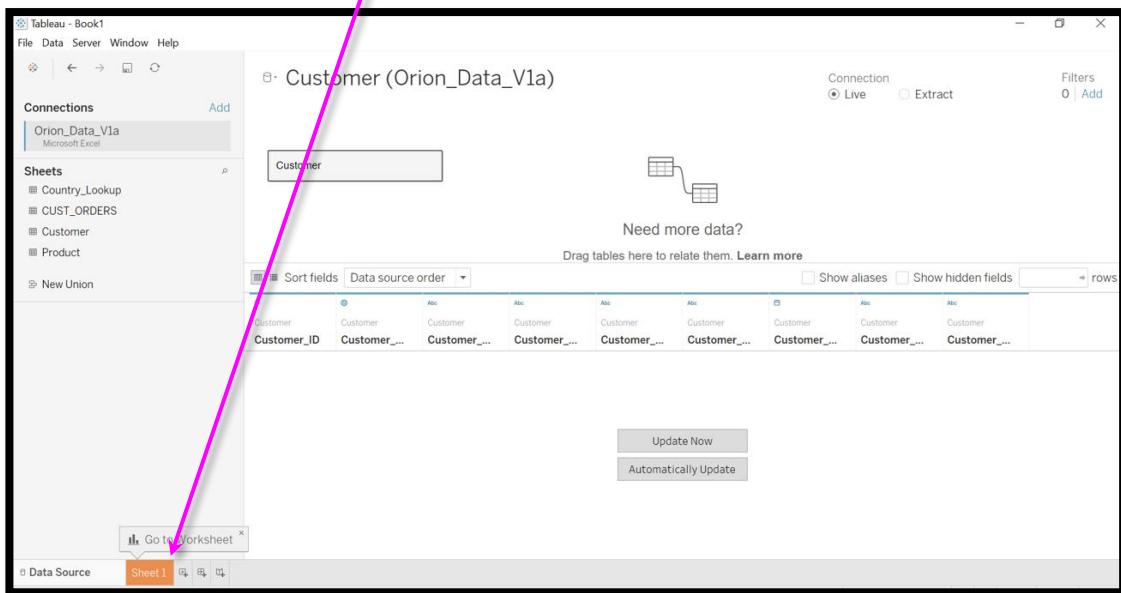
2. Select the connection to 'Microsoft Excel' and open the file as below:



3. Select the Customer sheet and drag it into the space as shown:

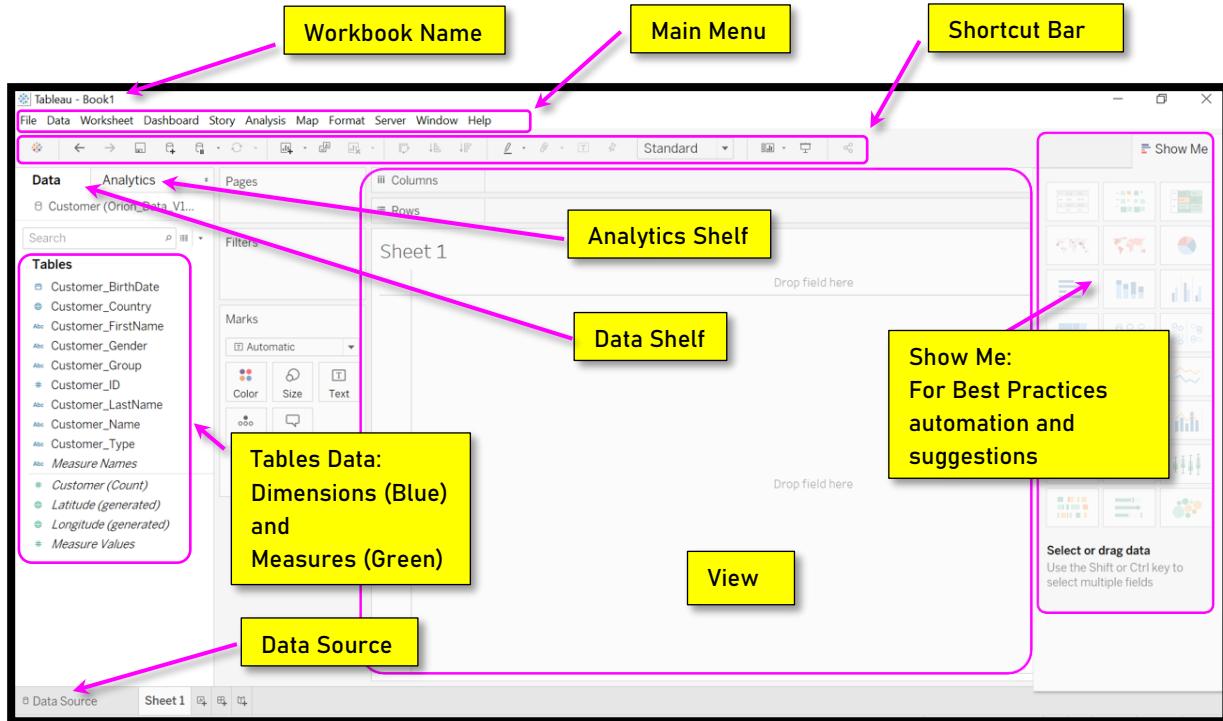


4. You will see the 'Go to Worksheet' prompt. Click on the highlighted 'Sheet1'.



Exercise 2: Explore the Workspace

Navigating the Tableau Interface



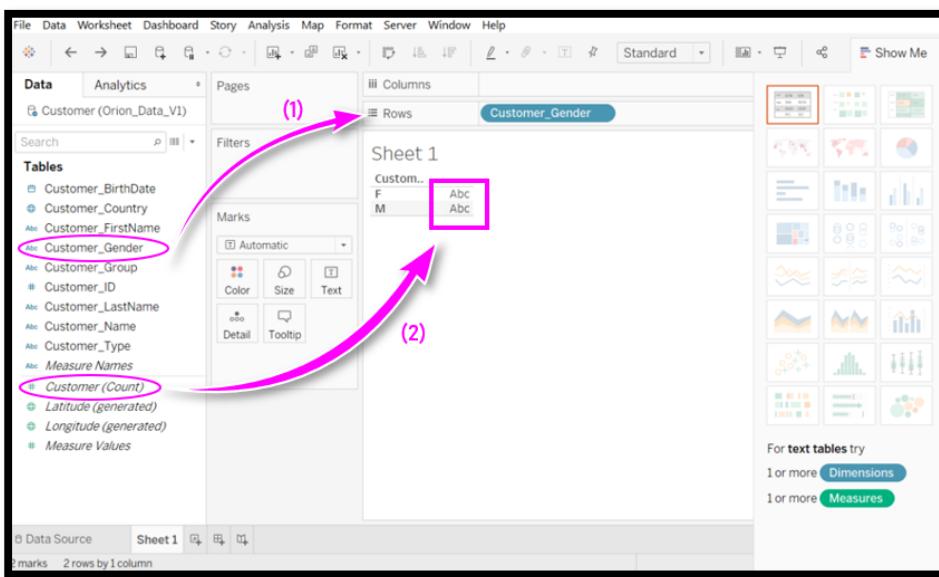
- **Dimensions** (in Blue) contain qualitative values (such as names, dates, or geographical data). You can use dimensions to categorise, segment, and reveal the details in your data. Dimensions affect the level of detail in the view. Examples include Country name, gender, customer name, etc.
- **Measures** (*Italics* in Green) contain numeric or quantitative values that you can measure and count. Measures can be aggregated. When you drag a measure into the view, Tableau applies an aggregation to that measure (by default). An example is the Customer (Count) which aggregates the total number of customers.

Exercise 3: Tabulate the Data

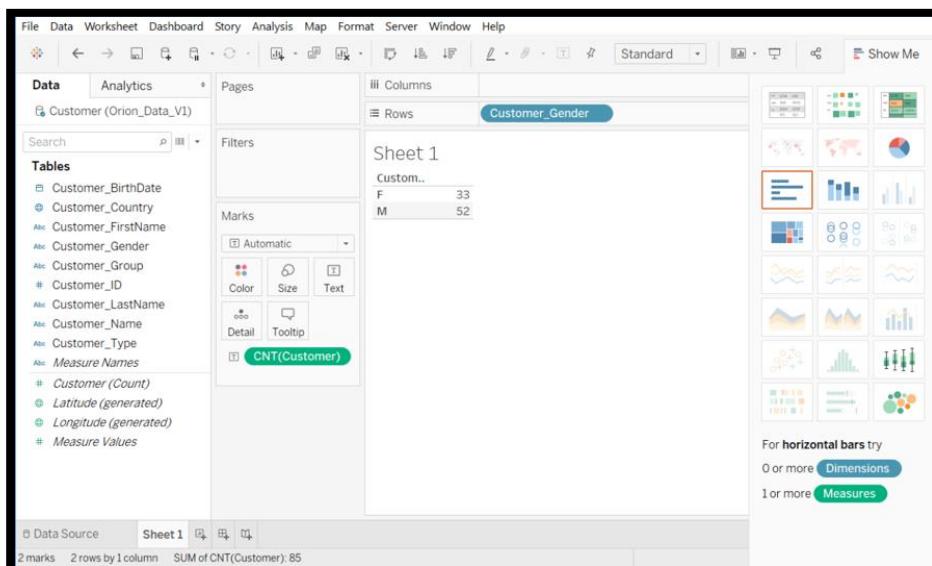
Any visualization (aka viz) created in Tableau is known as a view. Before creating a viz, start with a business question, i.e. what do you want to know from the data? The viz created should help to answer the question visually.

Exercise 3a: Creating the Table View

1. Select the 'Customer_Gender' from the Dimension Shelf and drag into Rows.
2. Select the *Customer (Count)* and drag into Sheet 1 - Abc column.

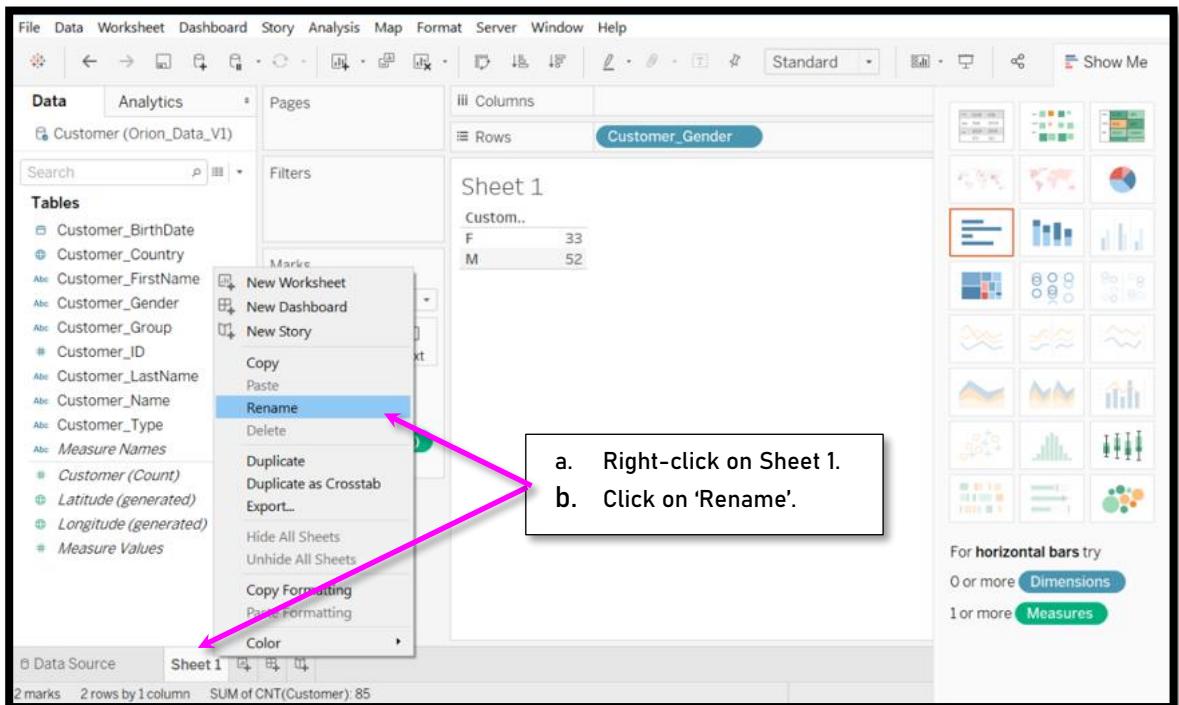


3. You should see the screen as follows:

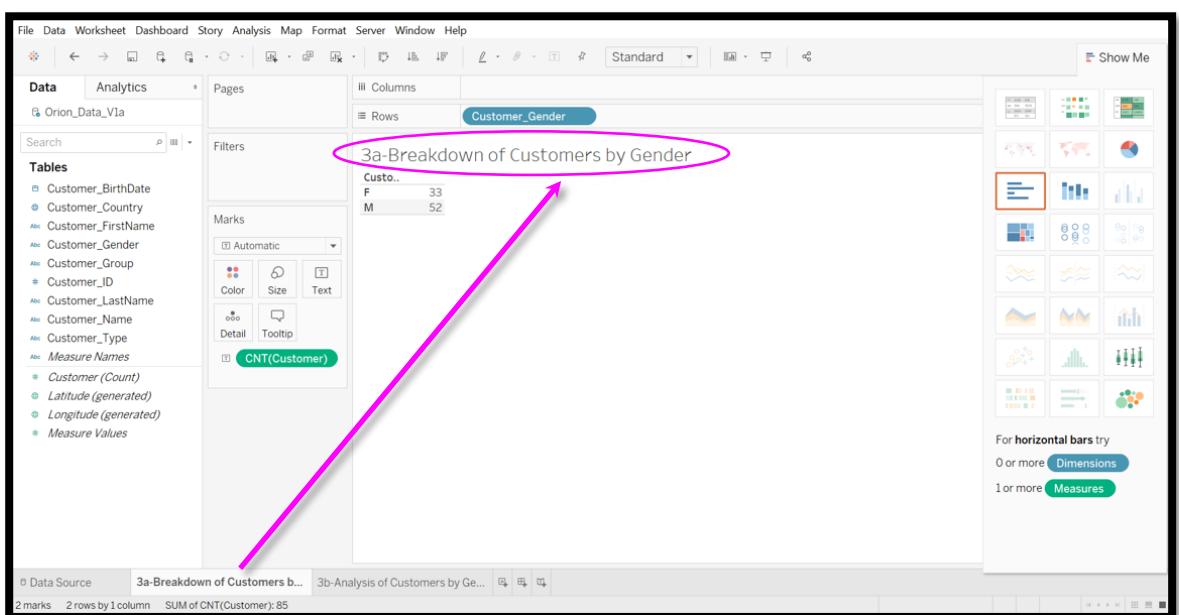


Change the Name of the Worksheet

1. Right-click on 'Sheet 1' tab. (Note: You can also double-click on the 'Sheet 1' tab).
2. Click on 'Rename' and change the name to 'Ex. 3a - Breakdown of Customers by Gender'.

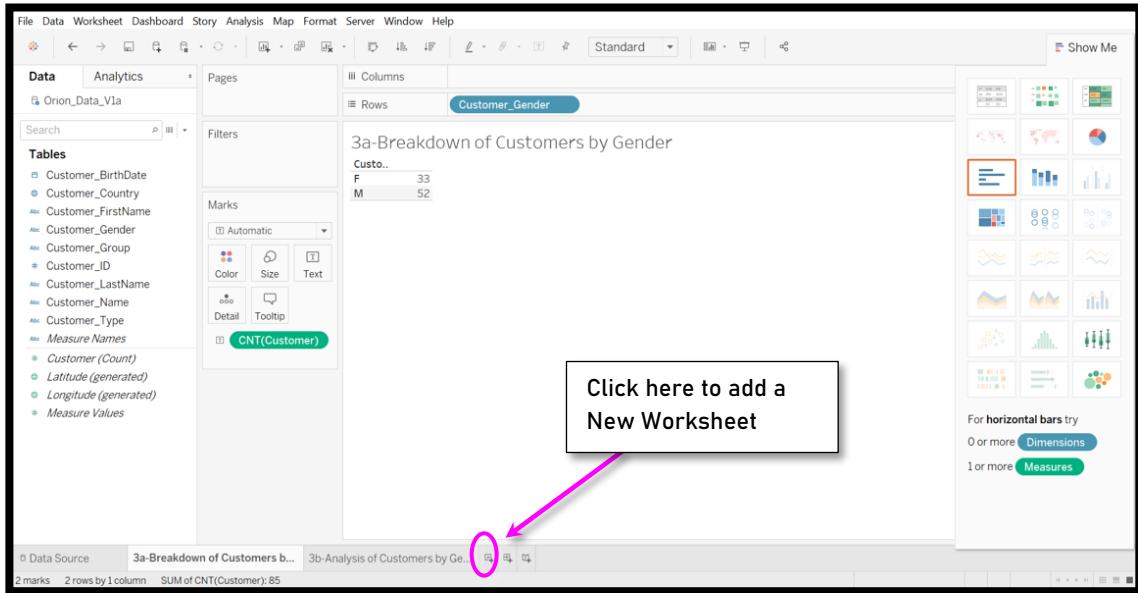


Note that the worksheet title has also changed accordingly.

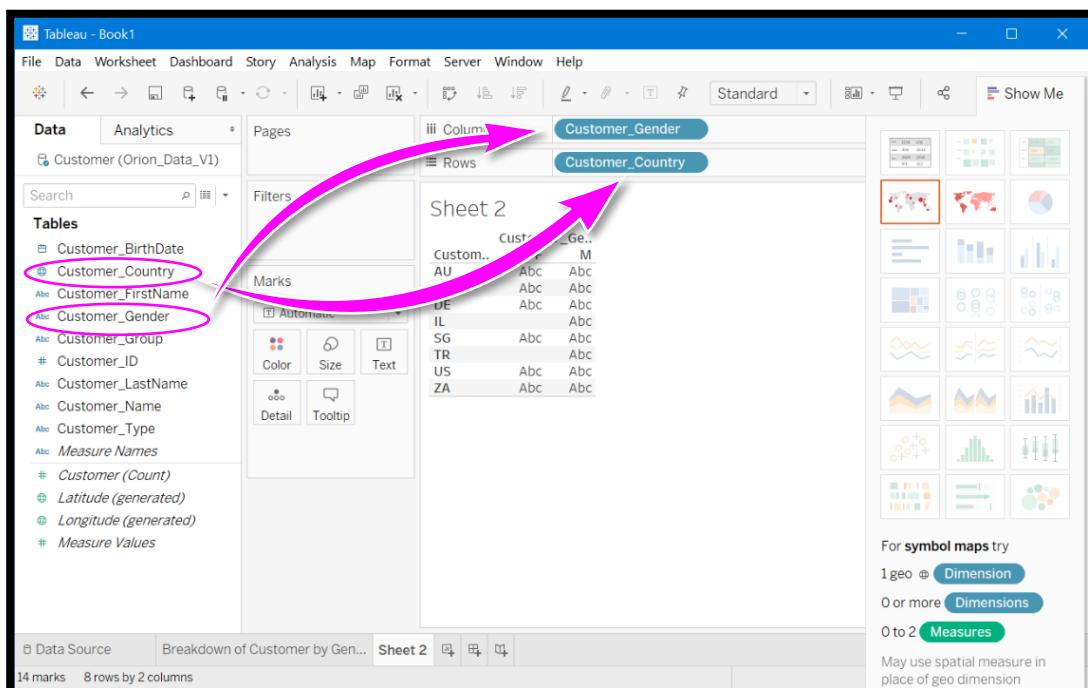


Exercise 3b: Table Representation

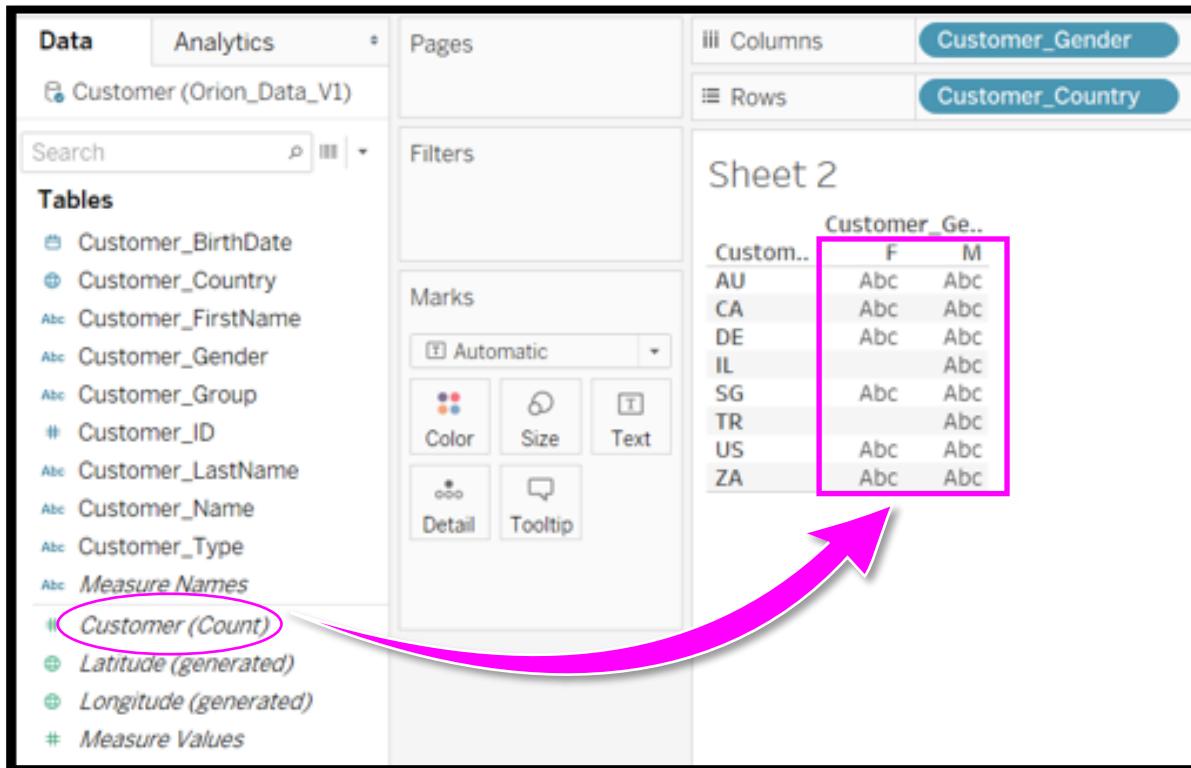
- Add another worksheet by clicking on the  icon at the bottom tab.



- Drag the 'Customer_Gender' from the Dimension Shelf into the Columns.
- Drag the 'Customer_Country' into the Rows.



4. Select the '*Customer (Count)*' and drag it to the Abc columns under the F and M.

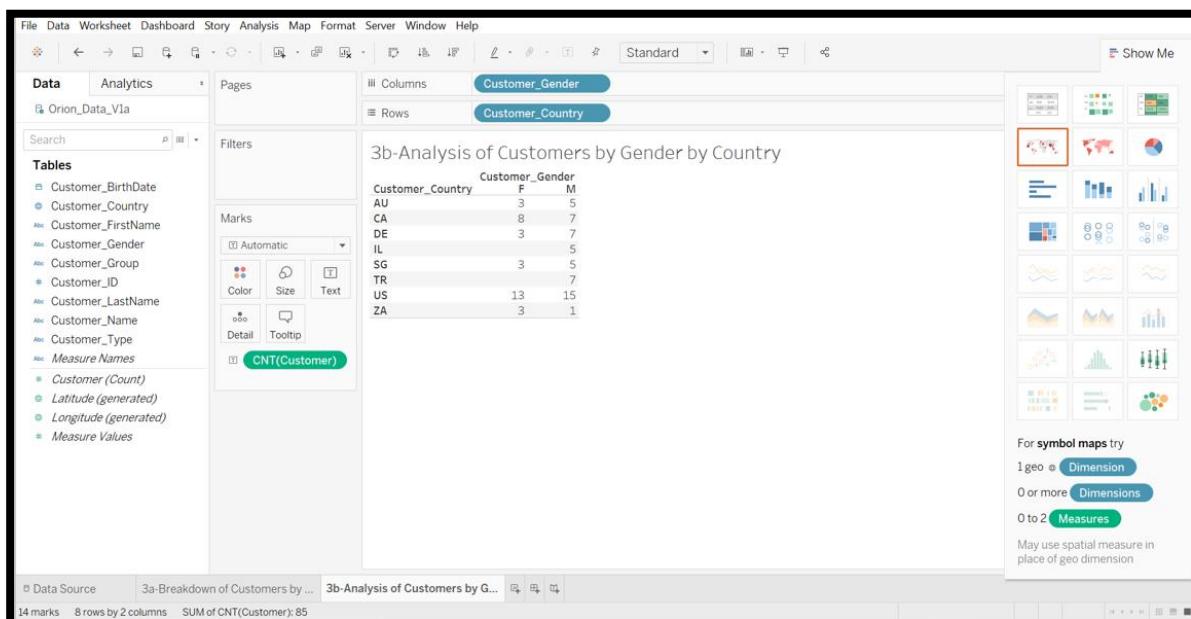


The screenshot shows the Tableau Data Source interface. On the left, under 'Tables', the 'Customer (Count)' measure is circled in pink. A large pink arrow points from this selection to the 'Sheet 2' view on the right. In 'Sheet 2', the data is displayed in a table:

| Customer_Ge.. | F | M |
|---------------|-----|-----|
| AU | Abc | Abc |
| CA | Abc | Abc |
| DE | Abc | Abc |
| IL | | Abc |
| SG | Abc | Abc |
| TR | | Abc |
| US | Abc | Abc |
| ZA | Abc | Abc |

5. Name the worksheet as 'Ex. 3b - Analysis of Customers by Gender by Country'.

6. You should see the following:



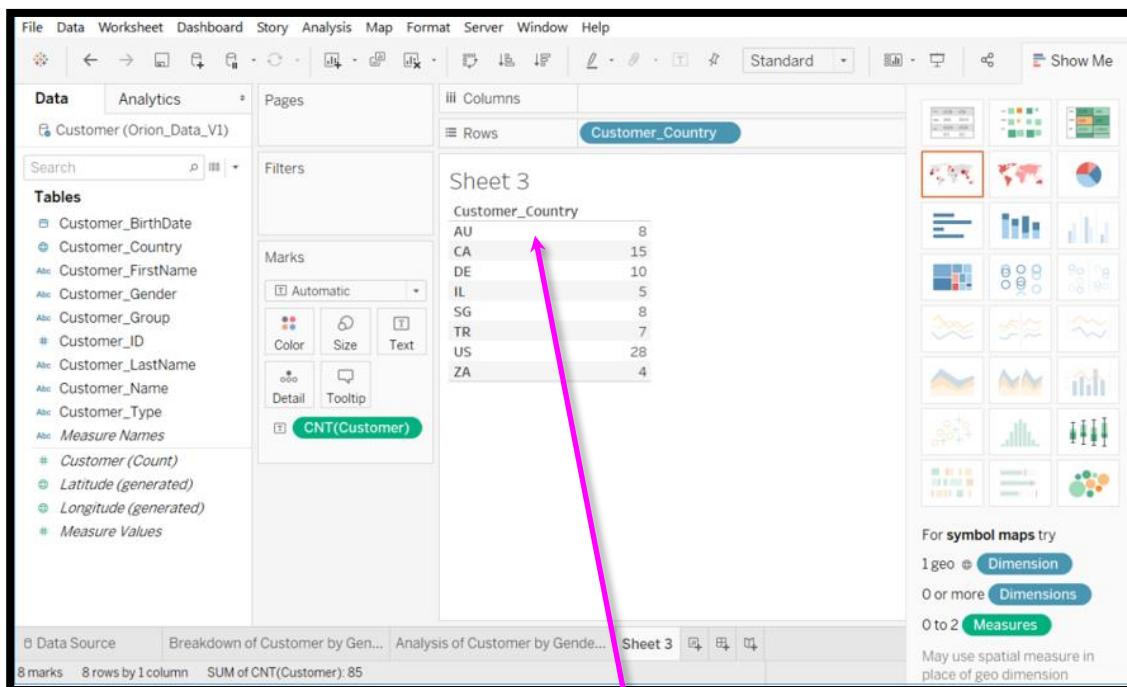
The screenshot shows the final Tableau visualization titled '3b-Analysis of Customers by Gender by Country'. The visualization displays the following data:

| Customer_Gender | F | M |
|-----------------|----|----|
| AU | 3 | 5 |
| CA | 8 | 7 |
| DE | 3 | 7 |
| IL | | 5 |
| SG | 3 | 5 |
| TR | | 7 |
| US | 13 | 15 |
| ZA | 3 | 1 |

The visualization is located in the '3b' worksheet. The status bar at the bottom indicates: 14 marks, 8 rows by 2 columns, SUM of CNT(Customer): 85.

Exercise 4: Create Table and World Map

1. Add a new worksheet and generate a table that will show the number of customers by country as shown below.



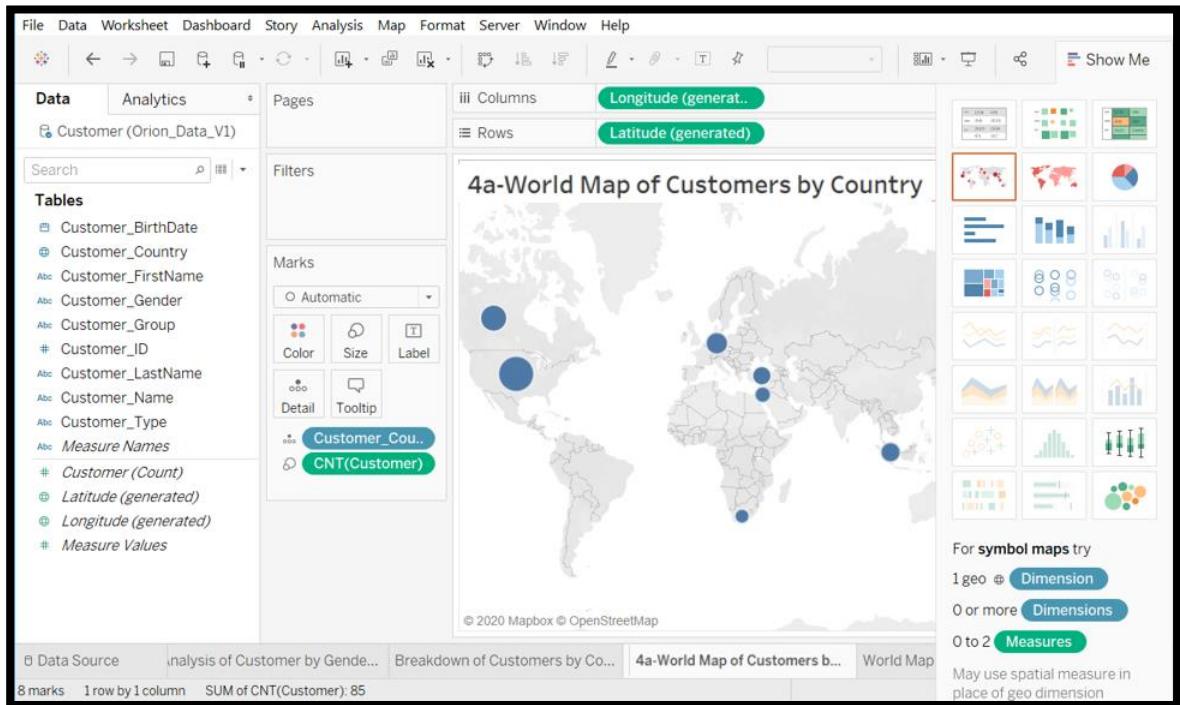
2. Drag the column so that the field label "Customer_Country" is shown in full.
3. Name the worksheet as 'Ex. 4 - Breakdown of Customers by Country'.

Hint:

- a) Drag the Customer_Country dimension to the Rows.
- b) Drag the Customer (Count) measure into the Abc column.

Challenge Exercise 4a: World Map

- Duplicate the worksheet from Exercise 4 and use the World Map to represent the table instead as shown below.



- Name the worksheet as 'Ex. 4a - World Map of Customers by Country'.
- What are the advantages and disadvantages of using a World Map to represent the data?

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Challenge Exercise 4b: Additional World Map Enhancements

1. Increase or decrease the size of all the bubbles evenly for better visualisation of the data.



2. What happens if you increase the size of the bubbles too much?

(Hint: Use Size in the Marks card.)

3. Duplicate and use the other World Map feature in Show Me. Is the visualisation better or worse?



Is the visualisation better or worse?

Exercise 5: Generate a Tabular Report

1. Add a new worksheet and create a tabular report showing the breakdown of Customer Type against Countries.
2. Name the worksheet as 'Ex. 5 - Breakdown of Customer Type by Country'.

| 5-Breakdown of Customer Type by Country | | | | | | | | |
|---|-----------|----------------------|---|--|---|--|---------------------------------------|--|
| Custo.. | Customers | Customer_Type | | | | | | |
| | | Internet/ Catalog | Orion Club Gold members high activity | Orion Club Gold members low activity | Orion Club Gold members medium activity | Orion Club members high activity | Orion Club members low activity | Orion Club members medium activity |
| AU | 1 | | | | 1 | 2 | 2 | 2 |
| CA | 1 | 1 | 2 | | | 2 | 3 | 6 |
| DE | 1 | 3 | 1 | 1 | | 1 | 2 | 1 |
| IL | 1 | 1 | | | | 2 | | 1 |
| SG | 2 | 1 | 1 | | | 2 | | 2 |
| TR | | 1 | | | | 2 | 4 | |
| US | 4 | 3 | 1 | 4 | | 2 | 6 | 8 |
| ZA | | 1 | 1 | | | | | 2 |

Hints:

- a) Drag the 'Customer_Country' dimension to Rows.
- b) Drag the 'Customer_Type' dimension to Columns.
- c) Drag the '*Customer (Count)*' measure into the Abc columns under 'Customer_Type'.

Challenge Exercise 5a: Highlight Table

1. Duplicate the worksheet from the above exercise and use the Highlight Table  in Show Me to represent the report generated.
2. What are the advantages and disadvantages of using a Highlight Table to represent the data? In what situations will this come in useful or not useful?

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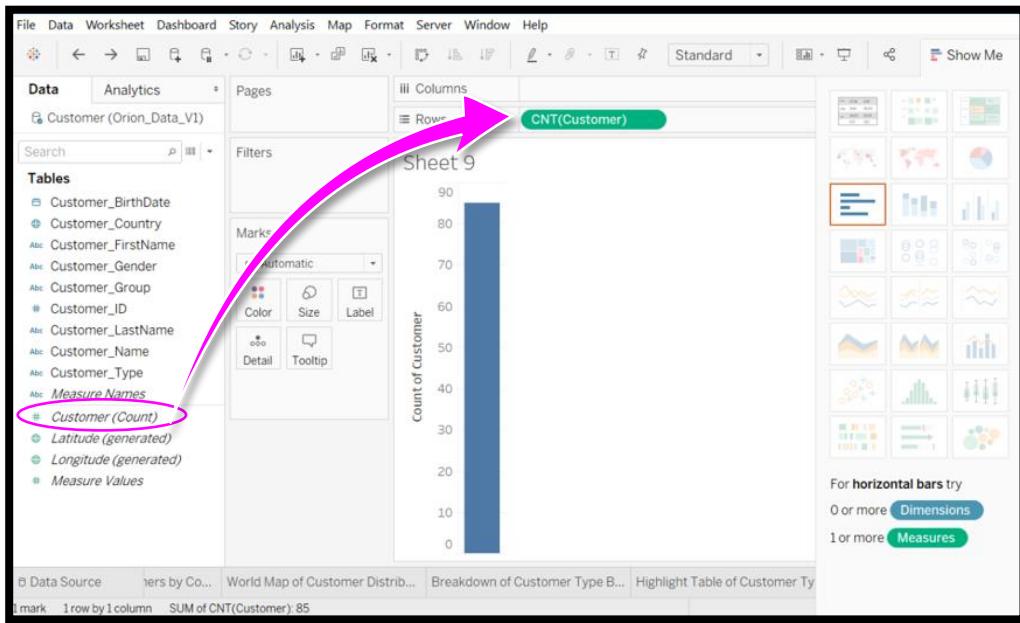
3. Name the worksheet as "Ex. 5a - Highlight Table of Customer Type by Country".

| Customer Type | Customer Country | | | | | | | |
|---------------------------------------|------------------|----|----|----|----|----|----|----|
| | AU | CA | DE | IL | SG | TR | US | ZA |
| Internet/Catalog Customers | 1 | 1 | 1 | 1 | 2 | | 4 | |
| Orion Club Gold members high activity | | 1 | 3 | 1 | 1 | 1 | 3 | 1 |
| Orion Club Gold members low activity | | 2 | 1 | | 1 | | 1 | 1 |
| Orion Club Gold members medium acti.. | 1 | | 1 | | | | 4 | |
| Orion Club members high activity | 2 | 2 | 1 | 2 | 2 | 2 | 2 | |
| Orion Club members low activity | 2 | 3 | 2 | | | 4 | 6 | |
| Orion Club members medium activity | 2 | 6 | 1 | 1 | 2 | | 8 | 2 |

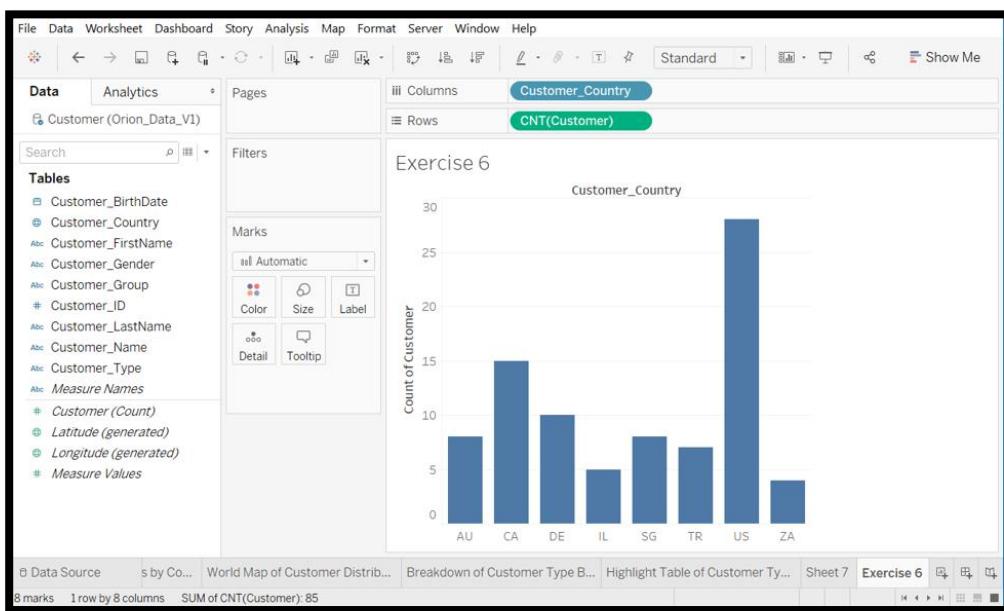
Note: Remember to click on the 'SAVE' button to save your work regularly.

Exercise 6: Generate a Visual Report using a Bar Chart

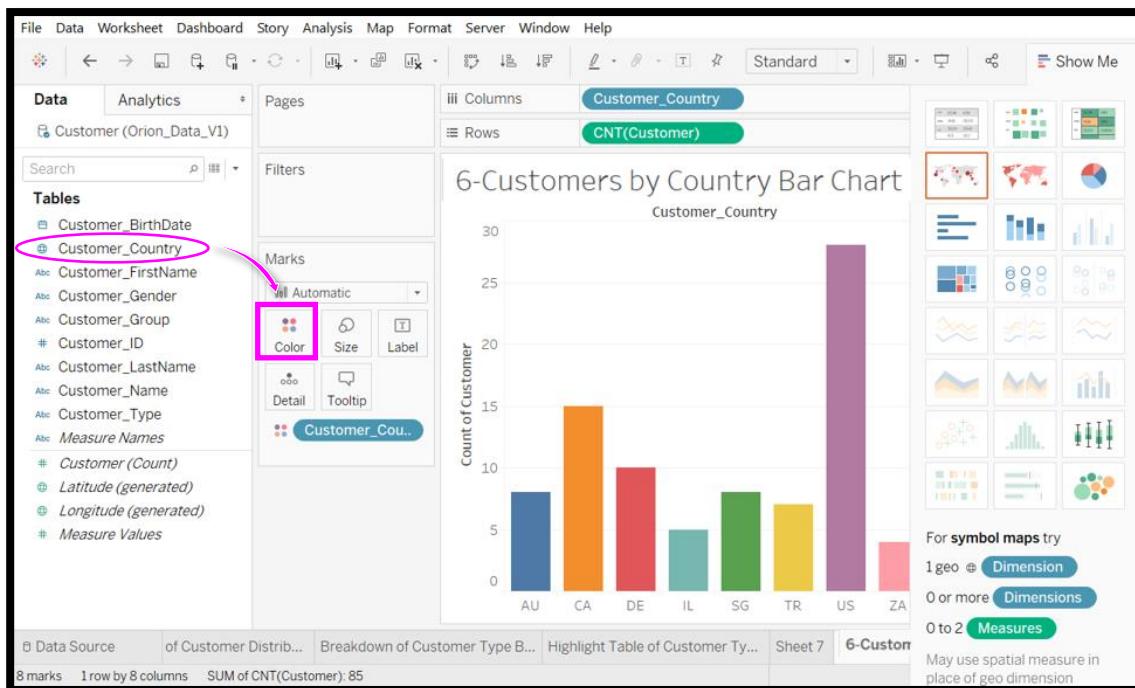
1. Add a new worksheet.
2. Select the *Customer (Count)* from the Measure Shelf and drag it to Rows.



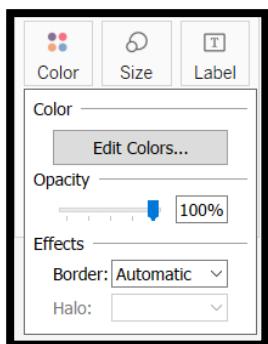
3. Select the Customer_Country and drag it to Columns. You should get the following:



- Change the colour of the individual bar by selecting the 'Customer_Country' from 'Dimension' Shelf and dropping it into 'Color' in the Marks card. You will get individual colours for the different countries as shown below:



- Explore how to change the colour of the bars by double-clicking on the Color box.

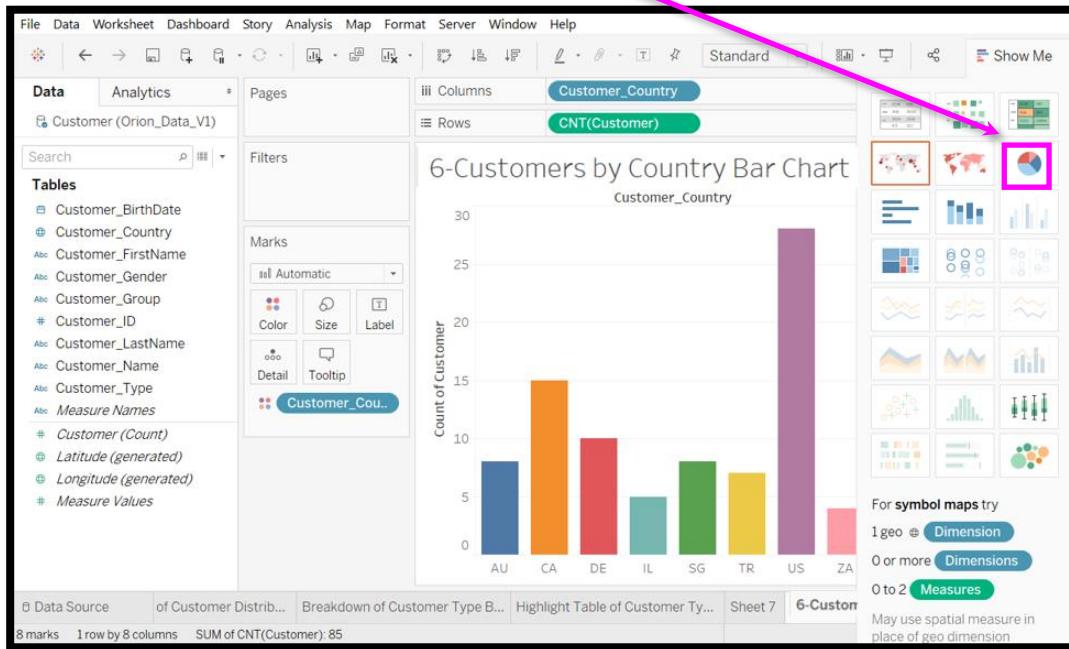


- Name the worksheet as 'Ex. 6 - Customers by Country Bar Chart'. Is this a good visualisation? Why or why not?

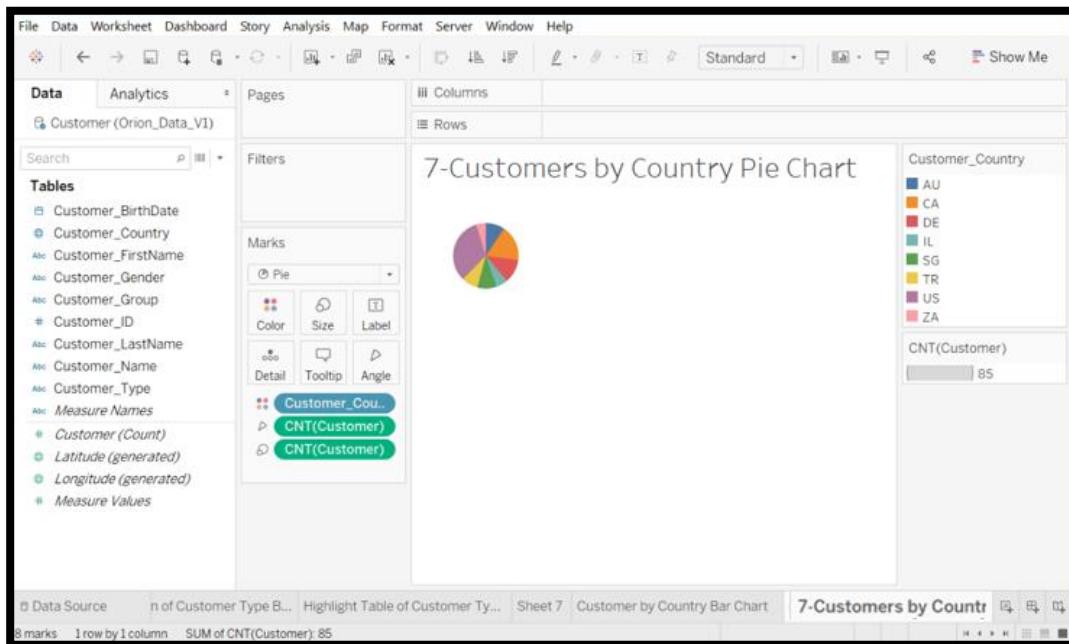
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Exercise 7: Generate a Visual Report using a Pie Chart

1. Make a duplicate of the worksheet in Exercise 6.
2. Click on the Pie Chart icon in the 'Show Me' menu as shown:



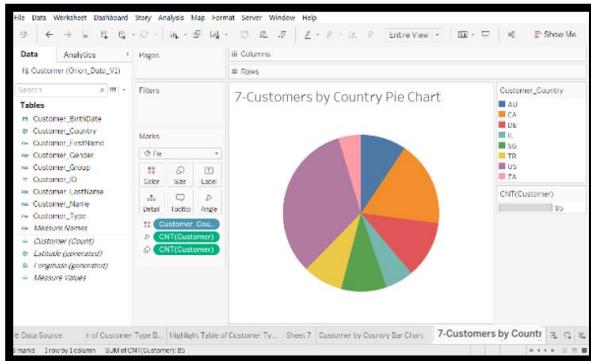
3. Name the worksheet as 'Ex. 7 - Customers by Country Pie Chart'.





Challenge Exercise 7a: Change the Pie Chart Sizes and Labels

1. Increase or decrease the size of the Pie Chart to fit into the page for better visualisation of the data.

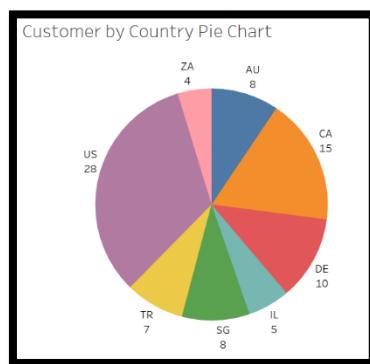
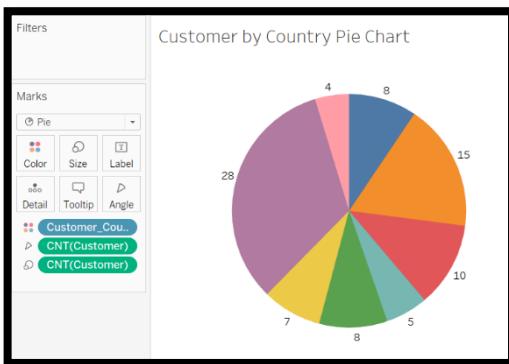


What happens when you make the Pie Chart too large?

How do you fit the whole Pie Chart into the sheet?

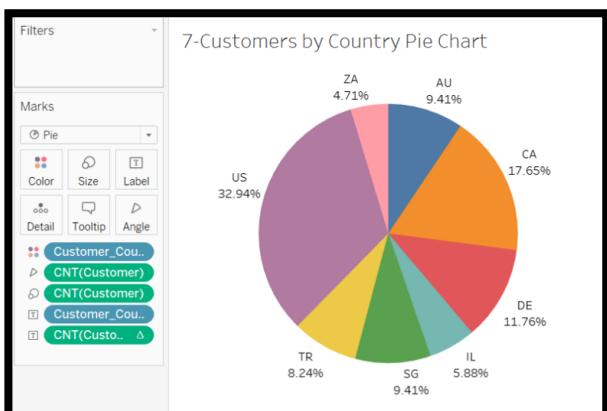
Hint: Change 'Standard View' to 'Entire View' in the Menu Bar.

2. Add the actual values to the various segments of the Pie Chart.



3. Add the names of the countries to the various segments of Pie Chart.

4. Instead of the actual values, change it to a Percentage of the Table.

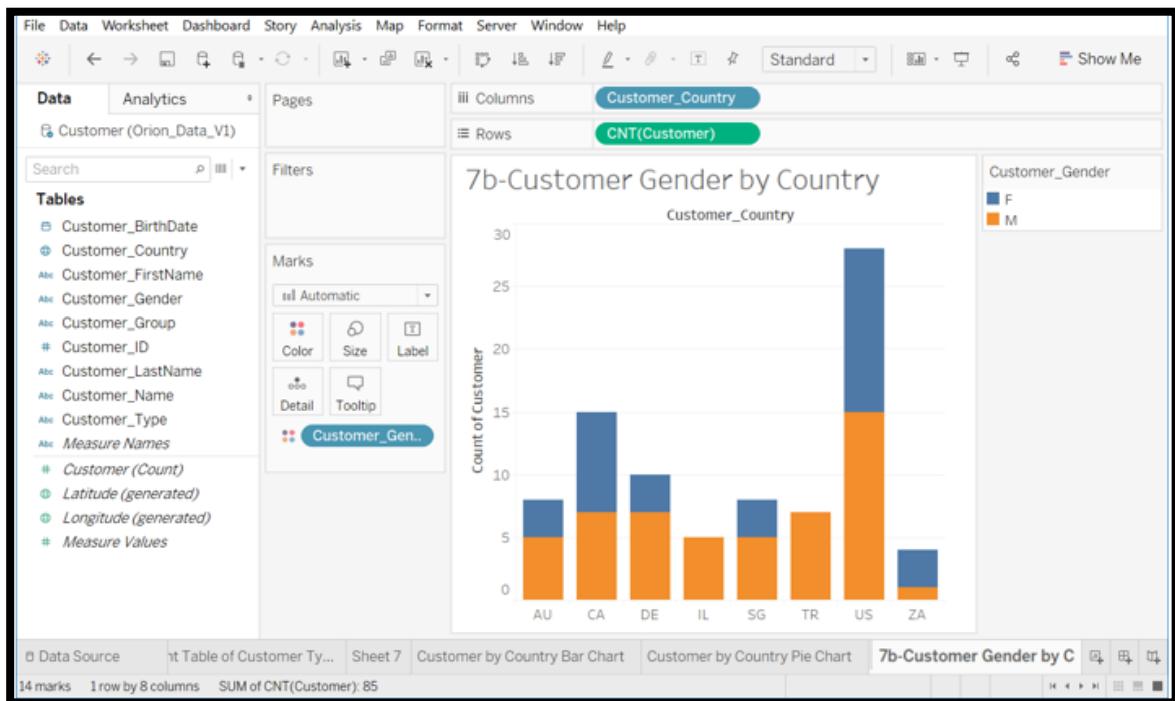


Hint:

Check out 'Analysis' available at the top of the screen.

Challenge Exercise 7b: Create Stacked Bar Chart

1. Start with a new worksheet.
2. Create a Stacked Bar Chart as follows on Customer Gender by Country:

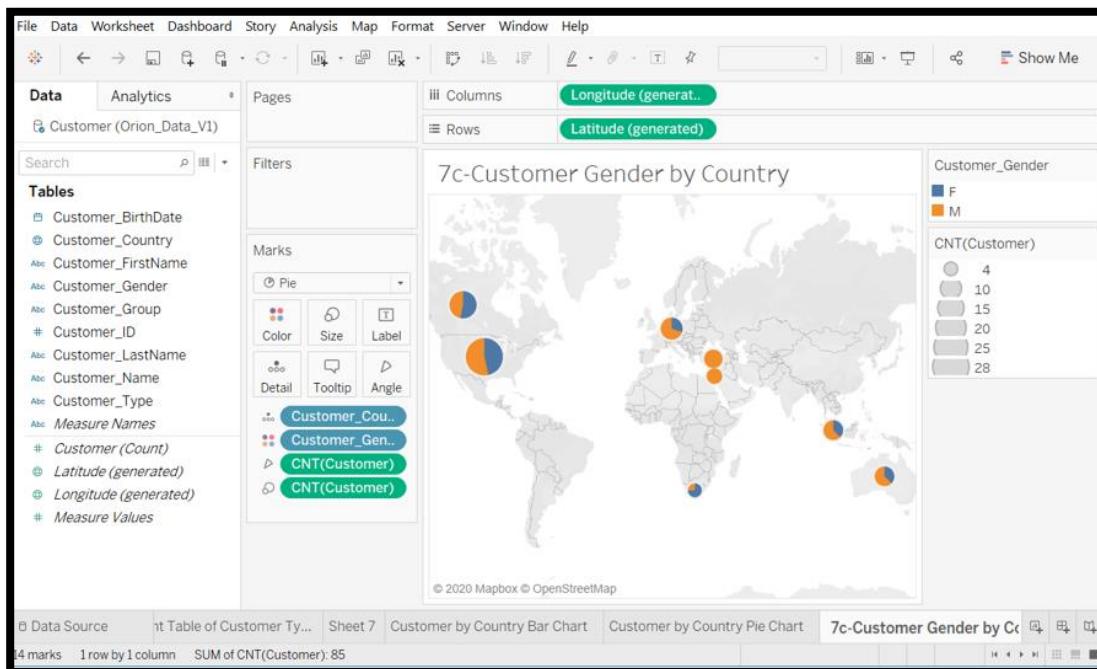


3. What are the advantages and disadvantages of a Stacked Bar Chart?
What immediate inferences can you derive from the chart above?

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Challenge Exercise 7c: Add Pie Chart inside a World Map

1. Plot the distribution of Customer_Gender on a World Map as follows:

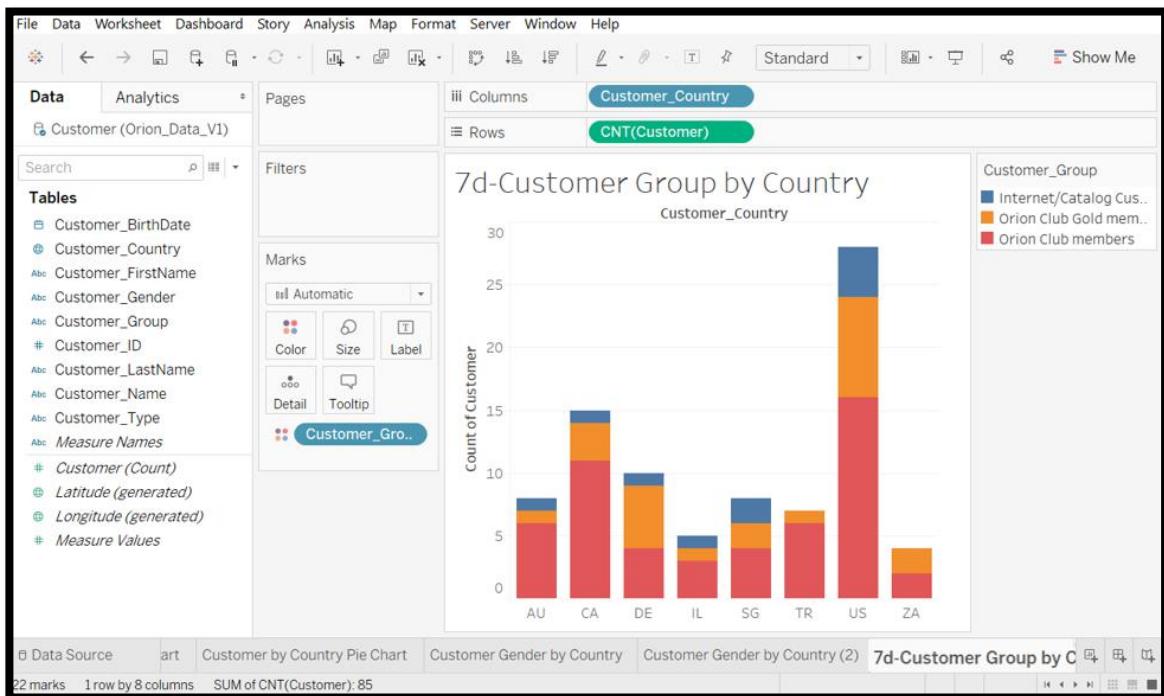


2. Can you think of situations where you would want to use a Pie Chart on a World Map?

(Hint: Example: Covid-19 Total infections vs. Death/Recovery.)

Challenge Exercise 7d: Analyse using Stacked Bar Chart

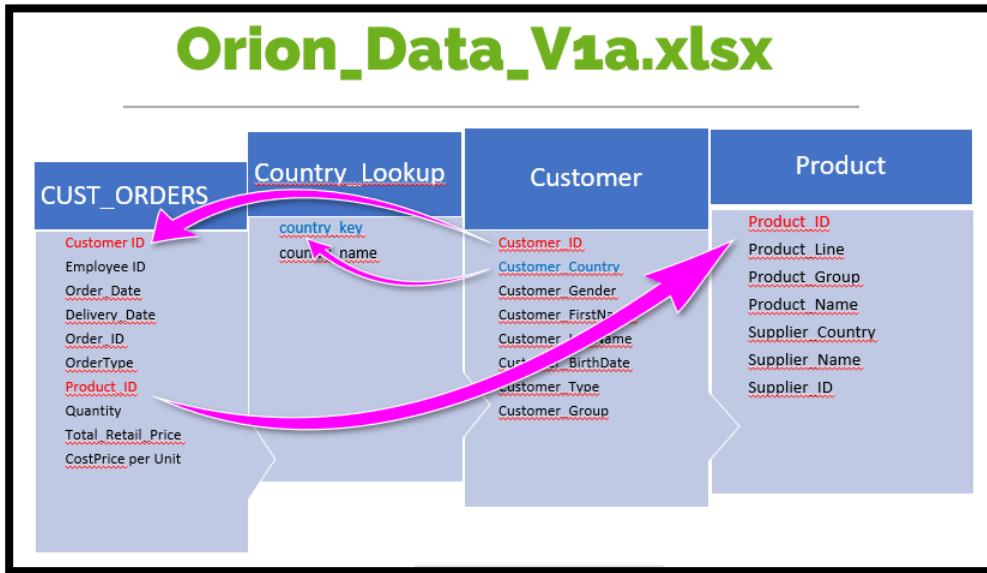
- Instead of 'Customer_Gender', create a Stacked Bar on the Count of Customer Group by Country as below:



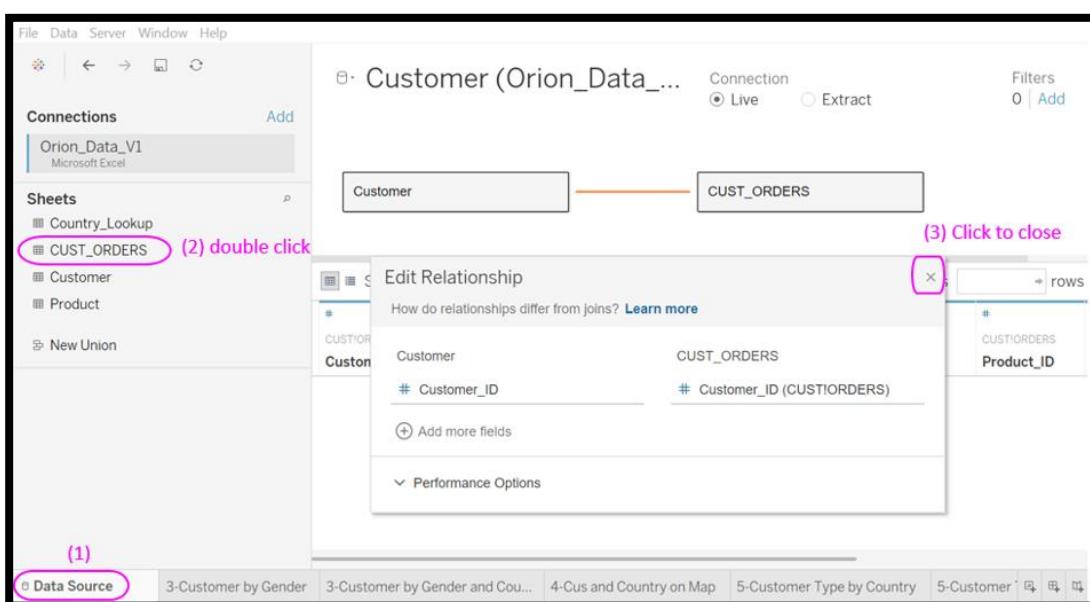
- What immediate inferences can you derive from the chart?

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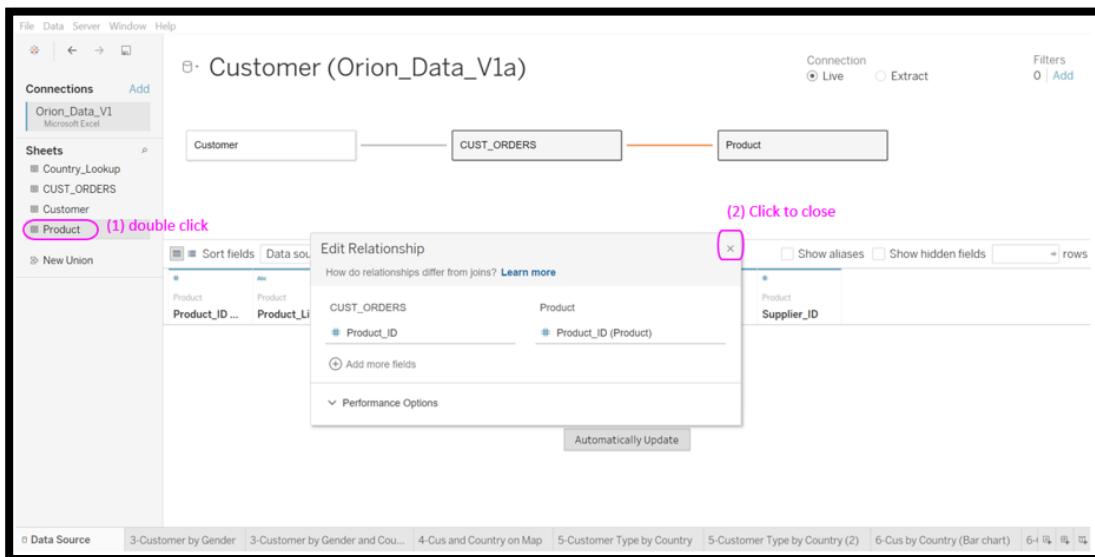
Exercise 8: Add New Data Sources via Relationships



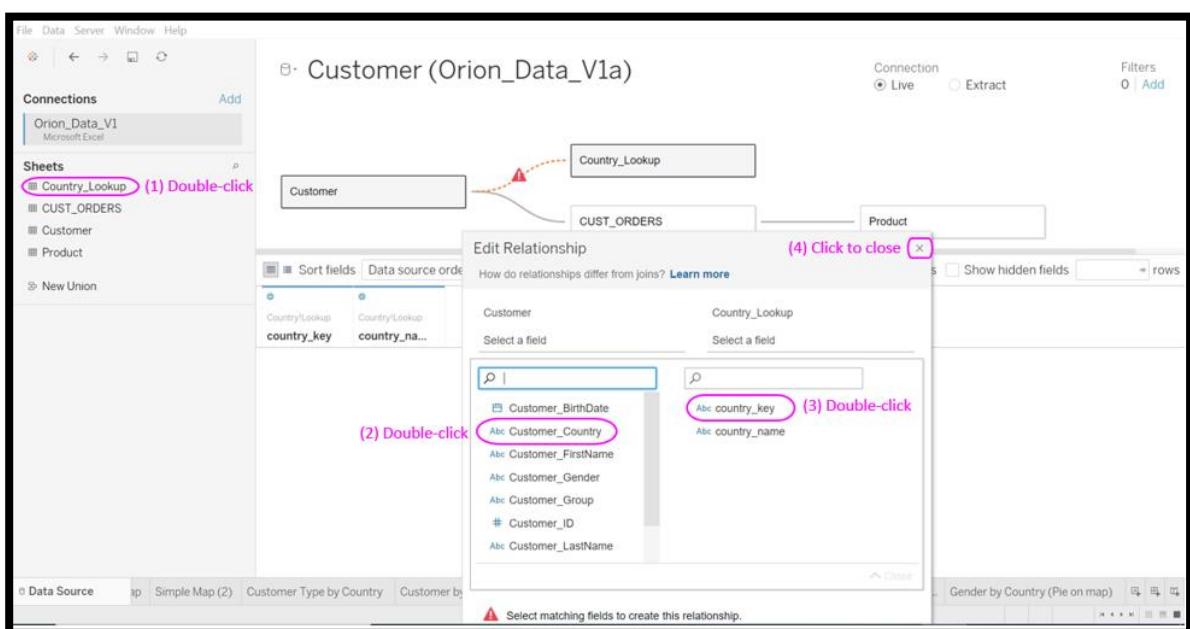
1. At the bottom left, click on “Data Source”.
2. Double-click on the **CUST_ORDERS** sheet. Tableau will suggest a relationship between Customer and **CUST_ORDERS** based on matching field names and existing key constraints. You can overwrite or add more fields to establish the relationship, if required.
3. Accept the suggested relationship field ‘Customer_ID’ by closing the ‘Edit Relationship’ window.



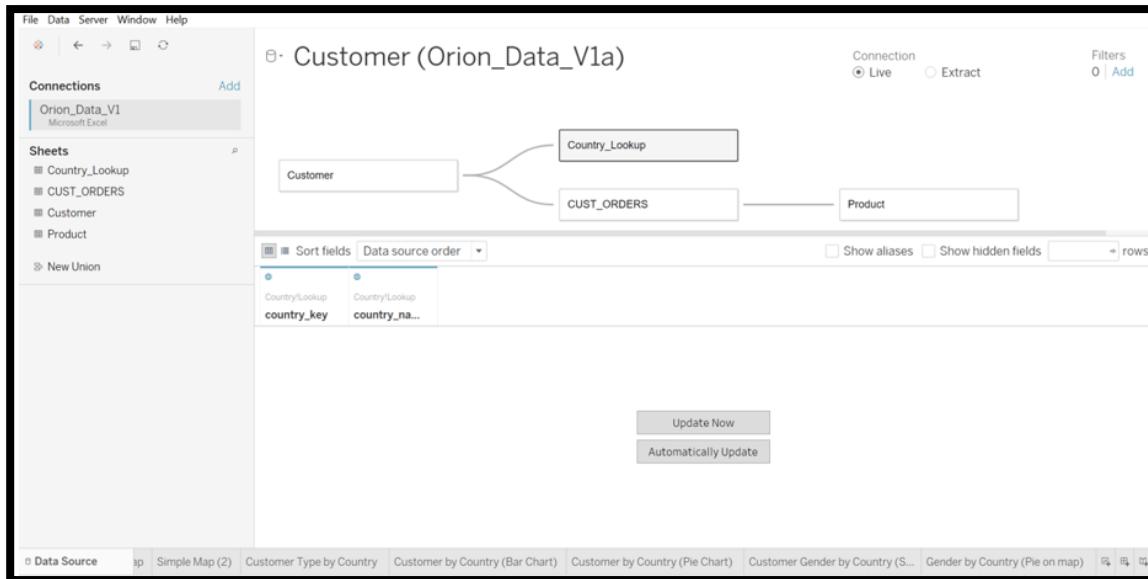
4. Double-click on the Product sheet and accept the suggested relationship field 'Product_ID' by closing the 'Edit Relationship' window.



5. Perform the following steps to include the Country_Lookup sheet.
- Step 1: Double-click on the Country_Lookup sheet.
 - Step 2: In the 'Edit Relationship' dialogue box, double-click to select 'Customer_Country' under Customer.
 - Step 3: Under Country_Lookup, double-click to select 'Country_Key' to form the relationship between the 2 tables.
 - Step 4: Click to close the 'Edit Relationship' dialogue box.



6. The current set of relationships between the 4 tables are defined as shown below:

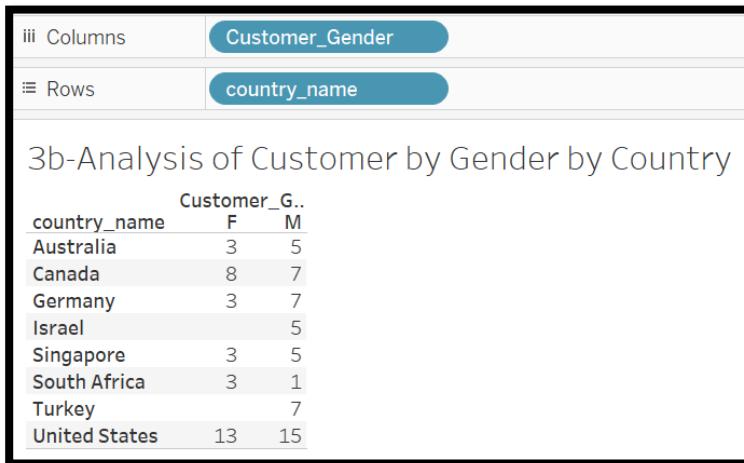


7. Add a new sheet. Now, you will see 4 tables added to the Data pane. Save your file.

The screenshot shows the Tableau Data pane. The 'Data' tab is selected, displaying a list of four tables: 'Country_Lookup', 'CUST_ORDERS', 'Customer', and 'Product'. The 'CUST_ORDERS' table is highlighted with a pink rectangle. The Data pane includes sections for 'Pages', 'Columns', 'Rows', and 'Marks' (Automatic, Color, Size, Text, Detail, Tooltip). The main workspace is labeled 'Sheet 10'. The bottom navigation bar includes tabs for Data Source, Map (2), Customer Type by Country, Customer by Country (Bar Chart), Customer by Country (Pie Chart), Customer Gender by Country (S...), Gender by Country (Pie on map), and Sheet 10.



8. Repeat Exercise 3b. In this case, use 'Country Name' from the 'Country_Lookup' instead of from 'Customer'. Observe the difference between the two charts.



The screenshot shows the Tableau interface with the following configuration:

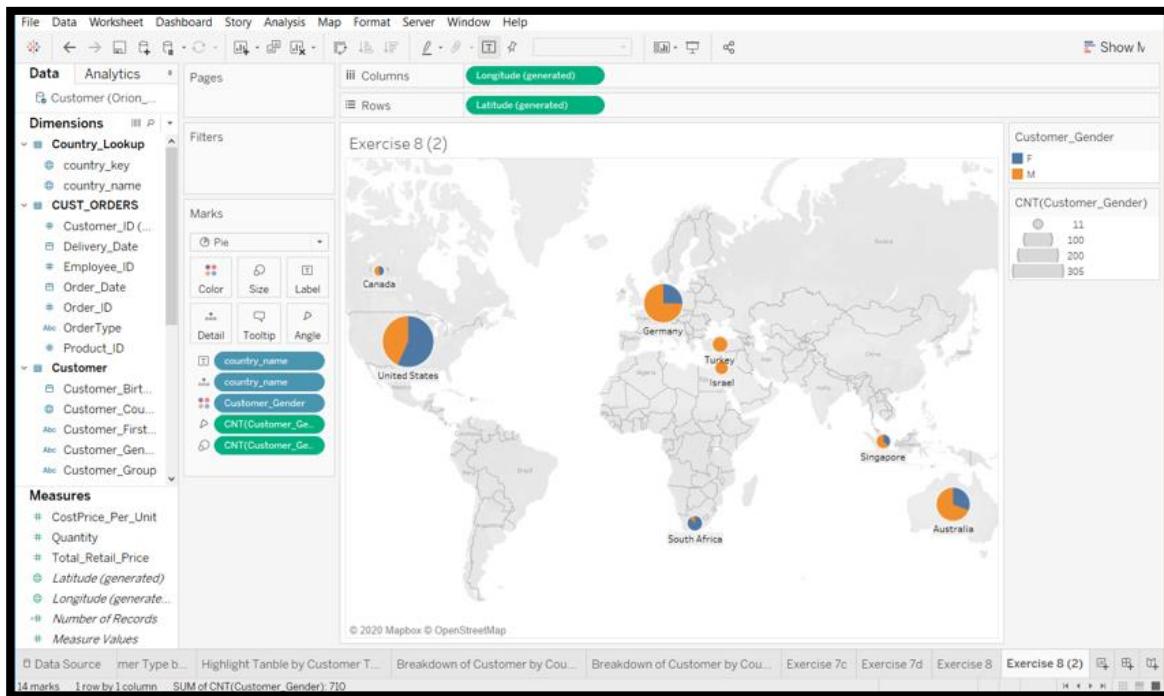
- Columns:** Customer_Gender
- Rows:** country_name

Below the interface, the table data is displayed:

| country_name | F | M |
|---------------|----|----|
| Australia | 3 | 5 |
| Canada | 8 | 7 |
| Germany | 3 | 7 |
| Israel | | 5 |
| Singapore | 3 | 5 |
| South Africa | 3 | 1 |
| Turkey | | 7 |
| United States | 13 | 15 |

Challenge Exercise 8a: Update World Map with Country Labels

1. Make a duplicate of the worksheet created in Exercise 7c.
2. Plot the distribution of Customer Gender on a World Map as follows, with the country name in full:



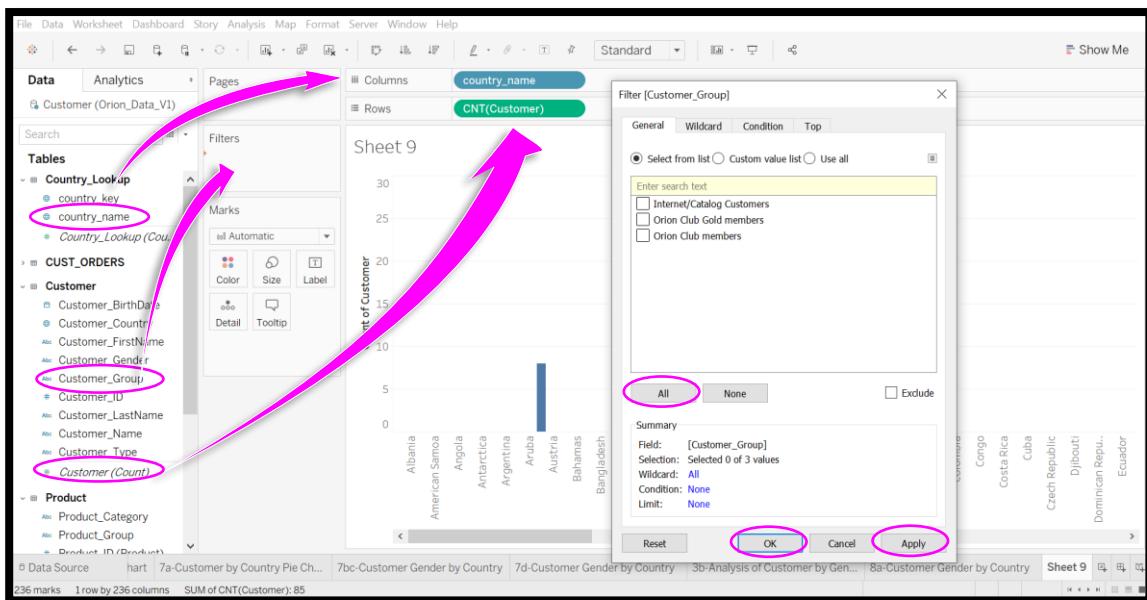
Hints:

1. Click on the World Map icon in the Show Me panel to create the World Map.
2. Use the Size function to change the sizes of the Pie Charts.
3. Drag the Country Name (from the Country_Lookup) to the Label function in the Marks card.

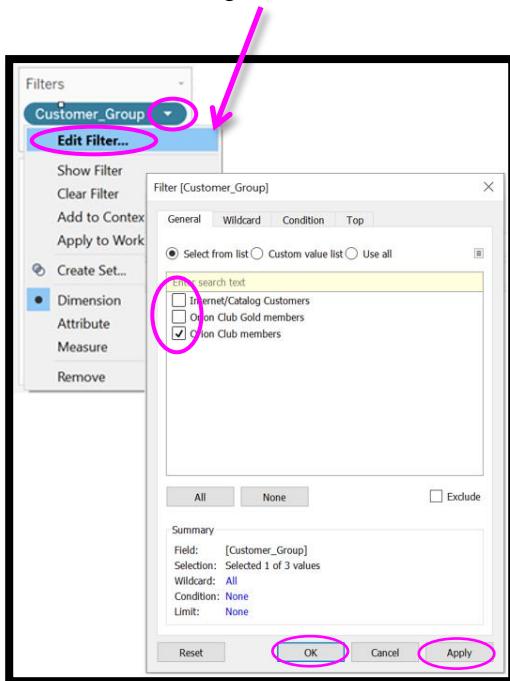
Exercise 9: Use of Filters

The purpose of filtering is to create a view comprising of a subset of the data that is relevant to the user.

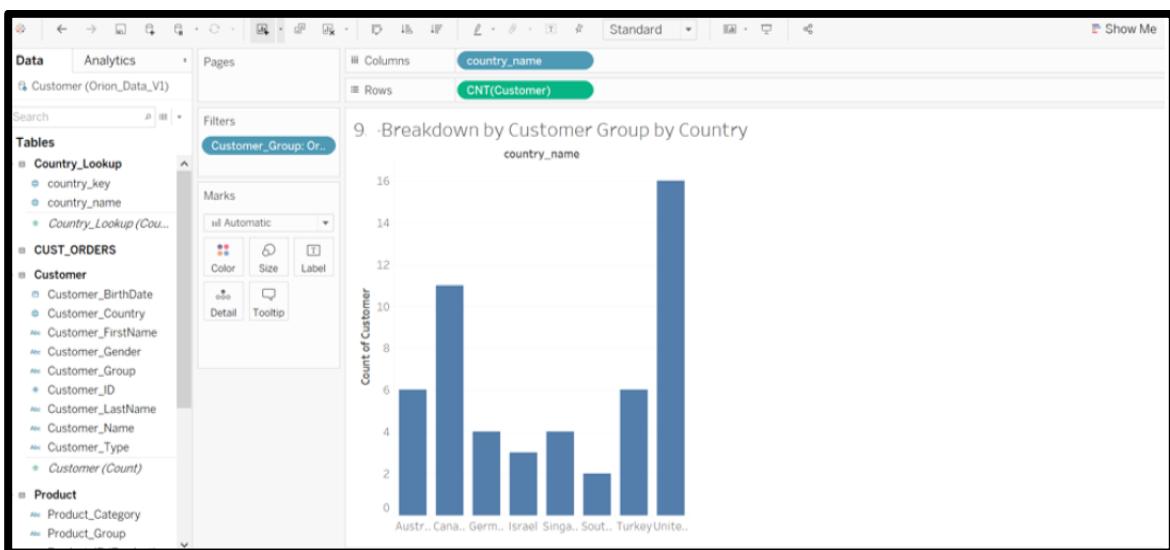
1. Add a new worksheet.
2. Drag the 'Country Name' from the Country_Lookup table into the Columns.
3. Drag the 'Customer (Count)' from the Customer table into the Rows.
4. Drag the 'Customer_Group' from the Customer table into the Filters Shelf.
5. Click the 'All' button to select all the values in the 'Filter [Customer_Group]' dialogue box, click "Apply" and then 'OK'.



6. You can edit the Filter to select a subset of Customer_Group of your choice (e.g. 'Orion Club members' or any combination of choices) for your viz by clicking on the down arrow and then selecting Edit Filter.



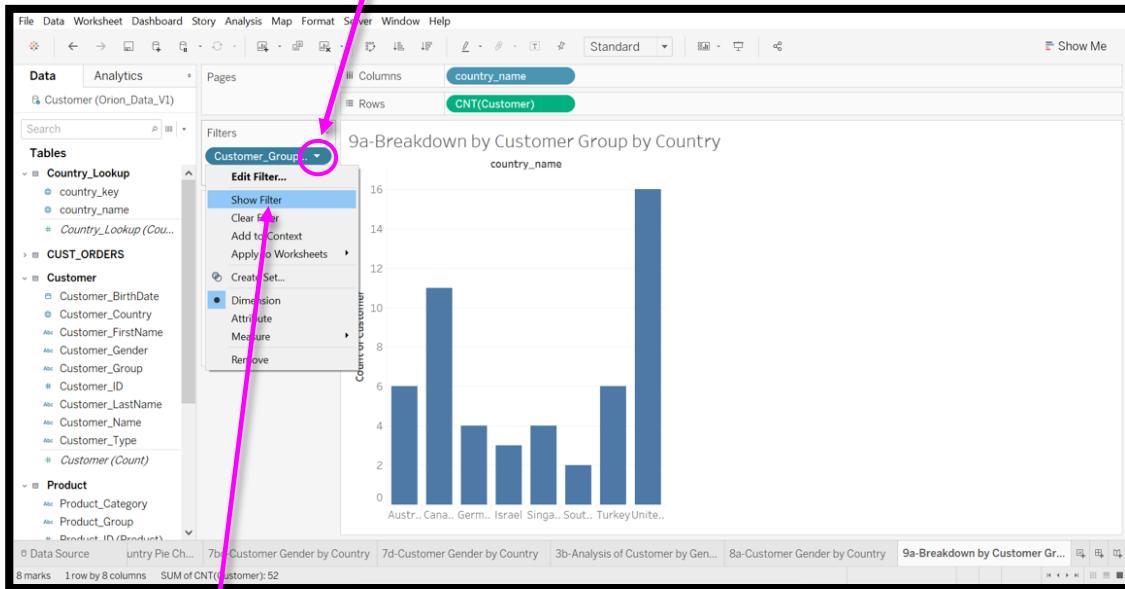
7. If you have filtered for 'Orion Club members' only, your viz will look as follows:



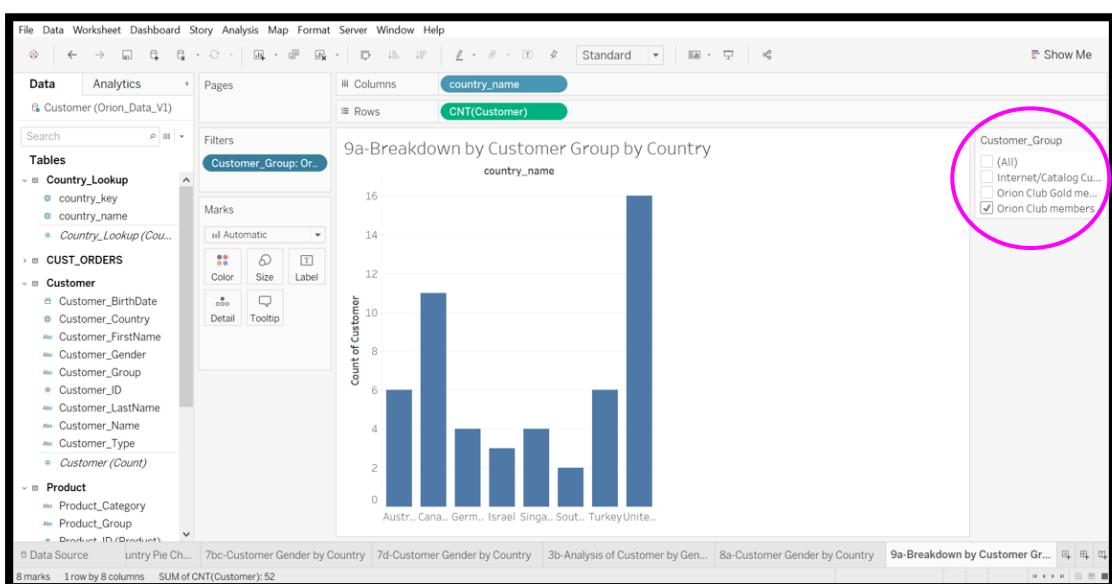
8. Name the worksheet as 'Ex. 9 - Breakdown by Order Type by Country'.

Exercise 9a: Show Filter for Interactivity

1. Duplicate the worksheet created from Exercise 9.
2. Right-click on 'Customer_Group' or click on the down arrow as below:

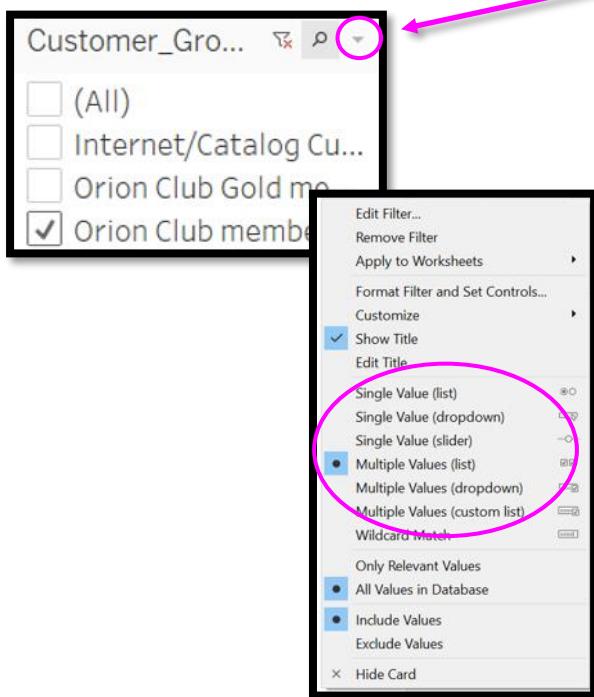


3. Click on 'Show Filter' to select this option.
4. The interactive selection panel is now shown on the right-hand side of the worksheet as shown:
[Hint: Turn off the 'Show Me' panel.]





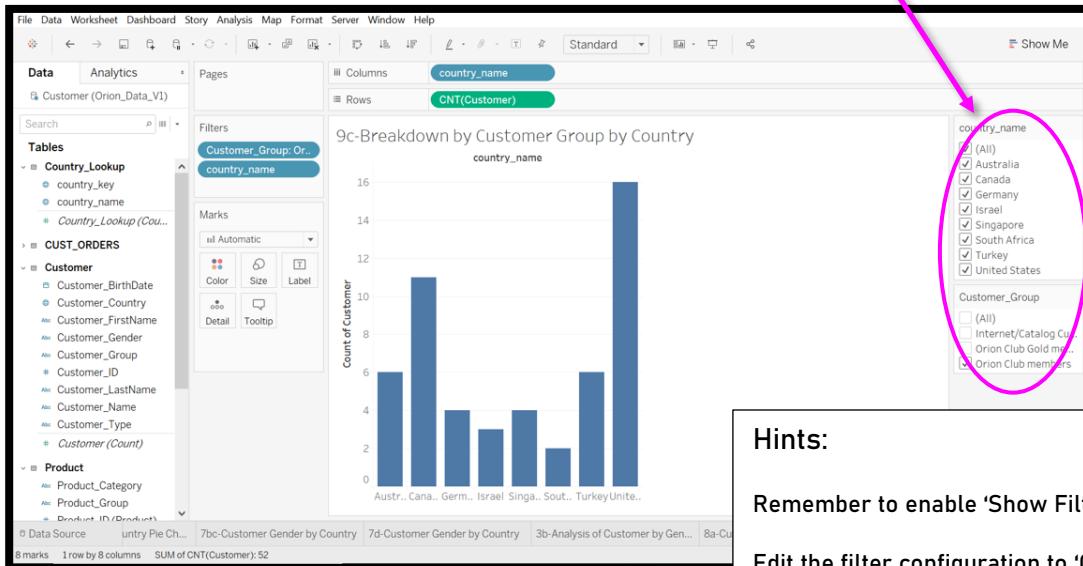
5. To change the filter selection option, click on the down arrow for the option menu.





Challenge Exercise 9b: Use Multiple Filters

- Continuing from Exercise 9a, display the Filters for BOTH the 'Country Name' and the 'Customer Group' on the right-hand side as follows:



Hints:

Remember to enable 'Show Filter'.

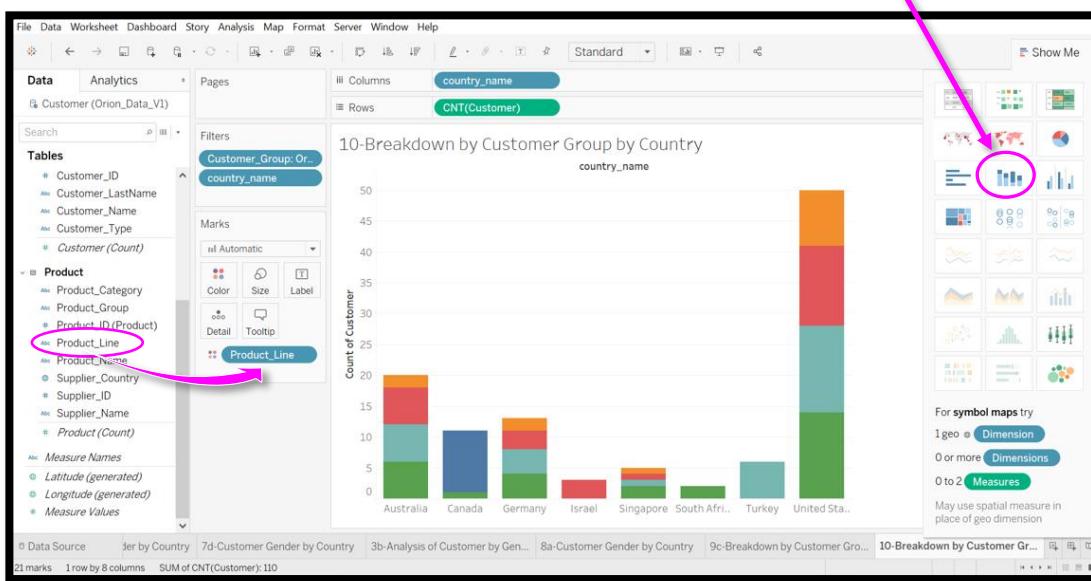
Edit the filter configuration to 'Only Relevant Values' option.



Exercise 10: Use the Keep Only Function

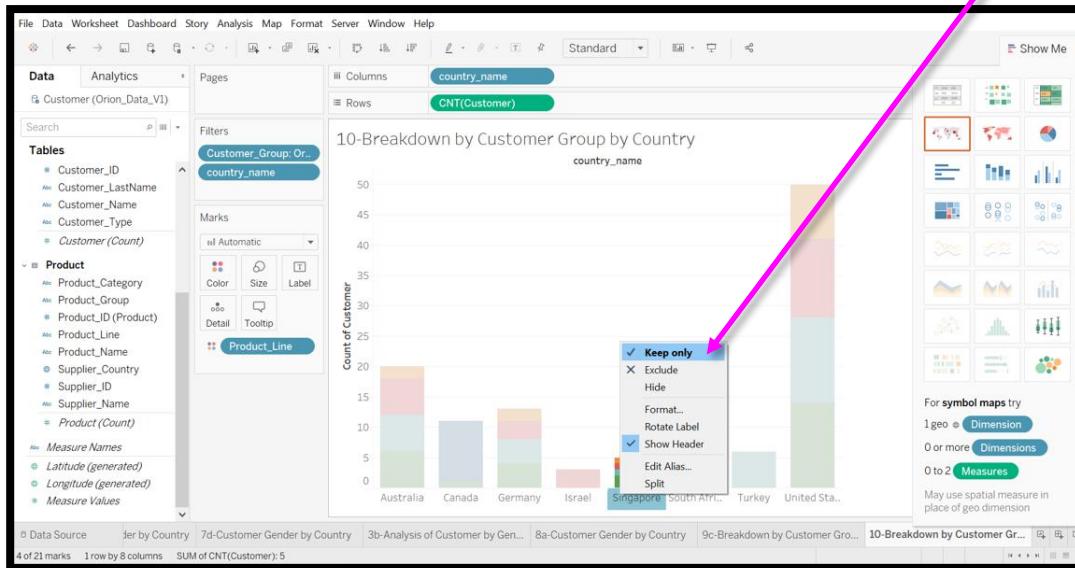
The purpose of the Keep Only function is to do ad-hoc filtering of only ONE variable so as to zoom in and focus on only this variable.

1. Create a duplicate from Exercise 9b with filter for 'Customer Group' set to 'Orion Club members'.
2. Drag the 'Product Line' to the Marks card and then click on the Stacked Bar icon. You should see the screen as below:

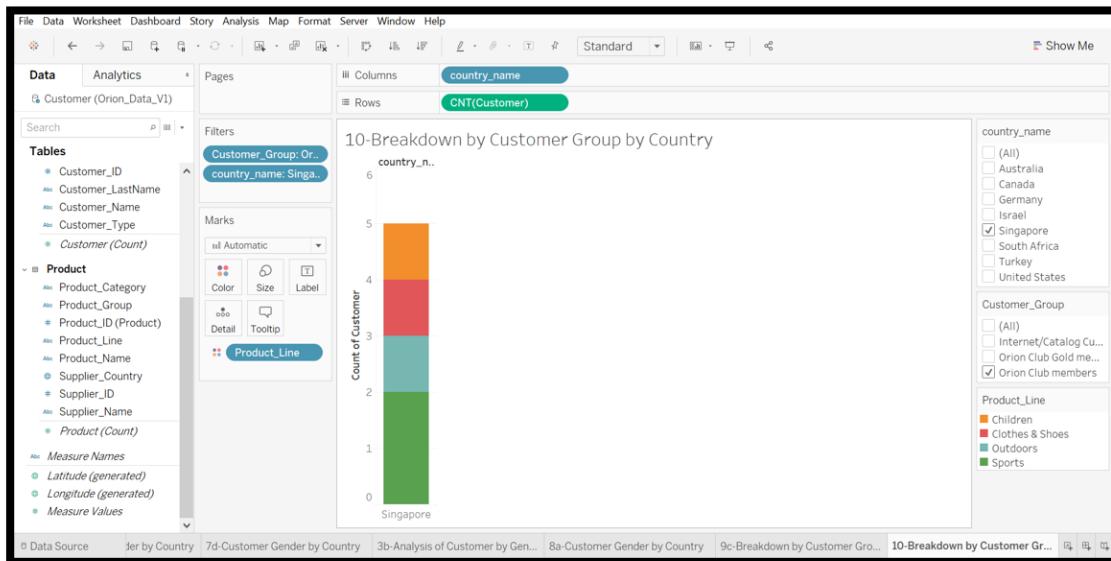


3. As there is now too much information shown, you can focus on a particular country (e.g. Singapore) using the 'Keep Only' function.

4. Right-click on any country on the X-axis (e.g. Singapore) and select the 'Keep Only' option.



5. Now you are able to drill down to just one country.





Challenge Question 10a: Revert the Keep Only function

1. How do you now go back to the original Stacked Bar containing all the countries in the chart or select a new set of countries e.g. Singapore and Australia?
2. What are the advantages and disadvantages of the 'Keep Only' function?

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Hint:

Remember the Filter on the right-hand side?

To revert to all the countries, just click on (All) in the Country Name Filter box.

Exercise 11: Assign Alias to Values

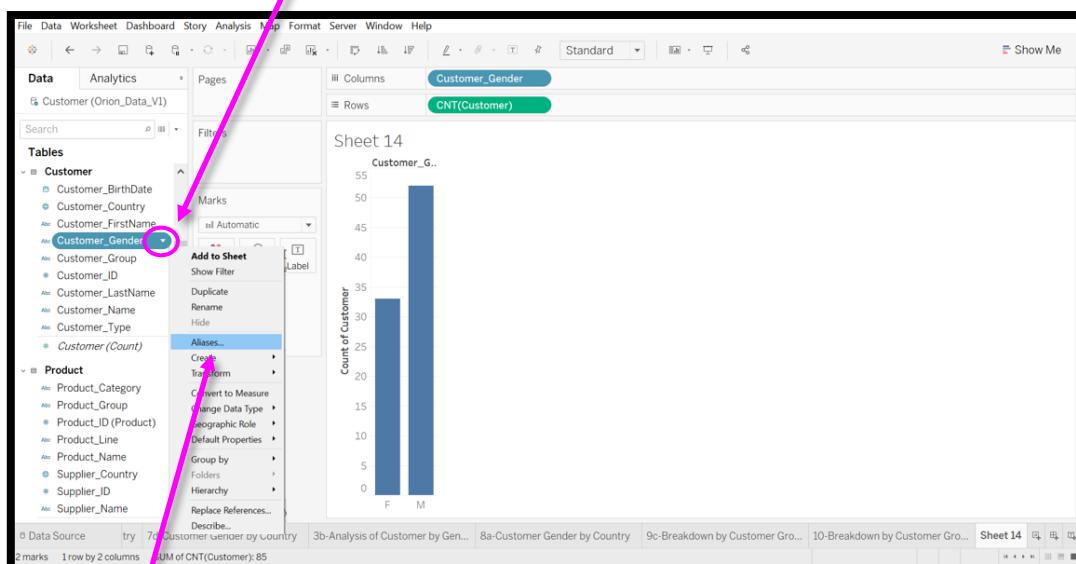
Alias is to change a code value to a more meaningful description.

- For example, if the month value is represented numerically (e.g. 01, 02), you can change the value to Jan, Feb, Mar, etc.

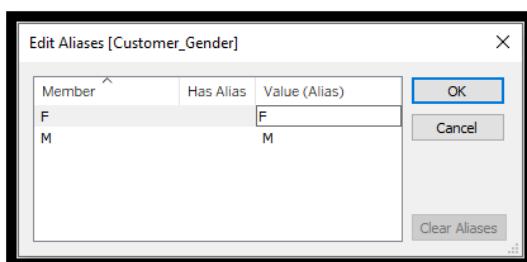
It can also be used for grouping when there are too many possible values.

- For example, customer's age could range from 9 to 80. You may like to categorize them into age groups of 9 to 15, 16 to 20 etc.

- Add a new worksheet.
- Drag the 'Customer Gender' into the Columns.
- Drag the 'Customer (Count)' into the Rows.
- Click on the 'Customer Gender' down arrow.

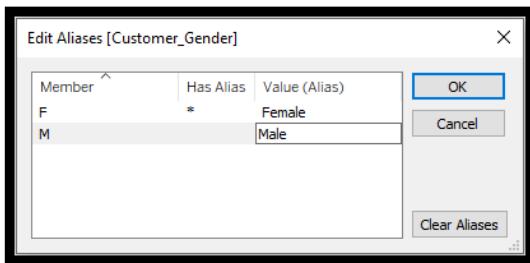


- Select 'Aliases...'

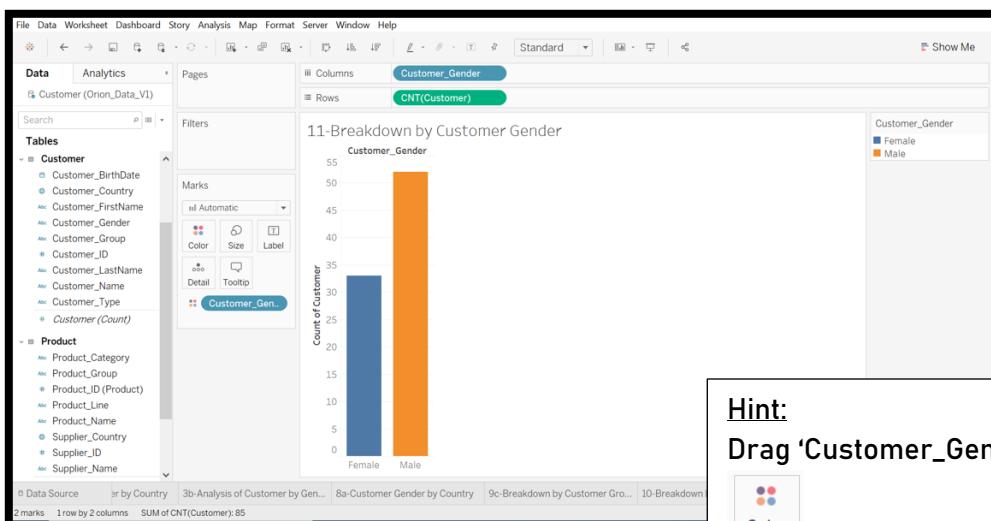




6. Click on the Value (Alias) and change the values to accordingly:
E.g. F -> Female, M-> Male.



7. Your viz may look as follows, with 'Customer Gender' differentiated by colours:



Hint:
Drag 'Customer_Gender' to
Color in the Marks card.



Exercise 12: Create a One-Way Frequency Table with Filter

A One-way Frequency table is a table that contains the frequency (i.e. Count) of one particular variable.

- For example, gender and the total number of males and females.

1. Add a new Worksheet.
2. Drag the 'OrderType' into Rows.
3. Drag the 'CUST_ORDERS(Count)' into the Abc column.

The screenshot shows the Tableau interface with the following details:

- Data View:** The left sidebar lists the "Customer (Orion_Data_V1)" data source with tables: "Country_Lookup", "CUST_ORDERS", and "Customer". The "CUST_ORDERS" table is expanded, showing fields like "Customer_ID", "Delivery_Date", "Employee_ID", "Order_Date", "OrderID", "OrderType", "Product_ID", "CostPrice_Per_Unit", "Quantity", "Total_Retail_Price", and "CUST_ORDERS(Count)". The "OrderType" field is circled in red.
- Marks View:** The center panel shows the "Marks" shelf with "Automatic" selected. It includes options for Color, Size, and Text, along with Detail and Tooltip.
- Rows View:** The top right shows the "Rows" shelf with "OrderType" selected.
- Columns View:** The bottom right shows the "Columns" shelf with "Abc" selected, which corresponds to the "CUST_ORDERS(Count)" field.
- Sheet View:** The main area is titled "Sheet 15" and displays three rows of data corresponding to the OrderType categories: Catalogue Sale, Internet Sale, and Retail Sale. Each row has a value of "Abc" in the "Abc" column.

4. Drag the Order Type into the Filters Shelf, then show the filter on the right of the screen. This will provide flexibility to the user to select the OrderType of choice.

The screenshot shows the Tableau interface with the 'Data' tab selected. In the Data pane, the 'CUST_ORDERS' table is expanded, and the 'OrderType' field is highlighted with a red oval and a pink arrow pointing to it. The 'Filters' shelf at the top has 'OrderType' selected. The main canvas displays a sheet titled 'Sheet 15' with a single data point: 'OrderType Catalogue Sale 54,031'. To the right, a sidebar shows a list of OrderTypes with checkboxes: '(All)', 'Catalogue Sale', 'Internet Sale', and 'Retail Sale', all of which are checked. A callout box labeled 'Hint:' provides instructions: 'Right-click on 'OrderType' in the Filters Shelf, then select 'Show Filter' from the drop-down list.'

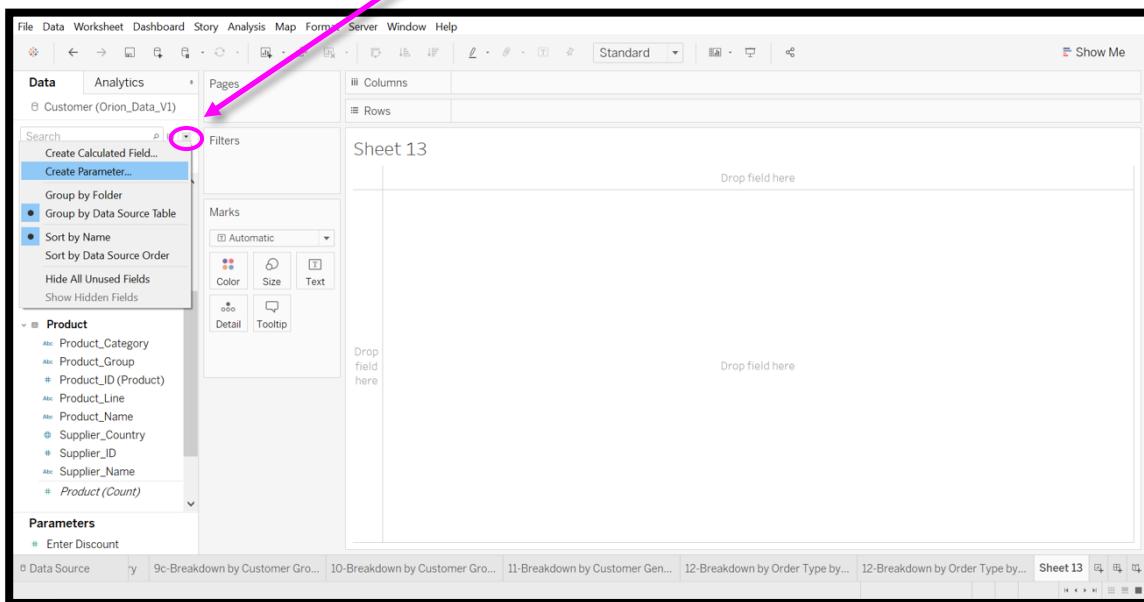
5. By dragging other fields from the Data pane (e.g. Product_Category) into Columns, the data will be tabulated accordingly.

The screenshot shows the Tableau interface with the 'Data' tab selected. In the Data pane, the 'Customer' and 'Product' tables are expanded. The 'Product_Category' field is highlighted with a red oval and a pink arrow pointing to it. The 'Columns' shelf at the top has 'Product_Category' selected. The main canvas displays a sheet titled '12-Breakdown by Order Type by Product Category' with a table of data. The table has columns for OrderType, Product_Category, and various numerical values. The 'Rows' shelf has 'OrderType' selected. To the right, a sidebar shows a list of OrderTypes with checkboxes: '(All)', 'Catalogue Sale', 'Internet Sale', and 'Retail Sale', all of which are checked. The bottom status bar shows '36 marks 3 rows by 12 columns SUM of CNT(CUST_ORDERS): 407,869'.

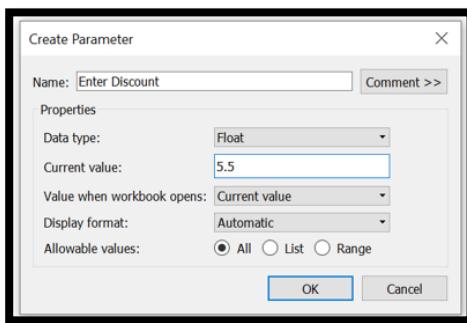
Exercise 13: Create a Parameter

A parameter is a dialog box that allows the user to key in a specific condition or a set of value(s) which can then be used, say for further computations in the viz.

1. Add a new worksheet.
2. From the Data pane, click on the arrow and select 'Create Parameter'.



3. In the dialog box, type in 'Enter Discount' and input/select the rest of the fields as shown in the following diagram, then click 'OK':

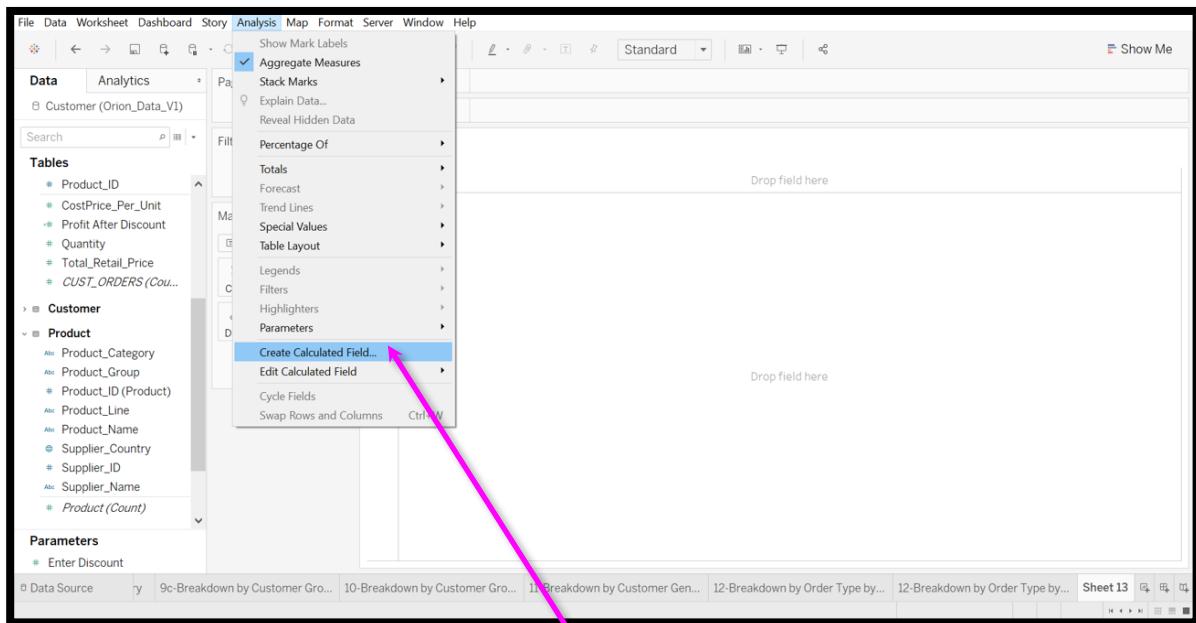


Note:

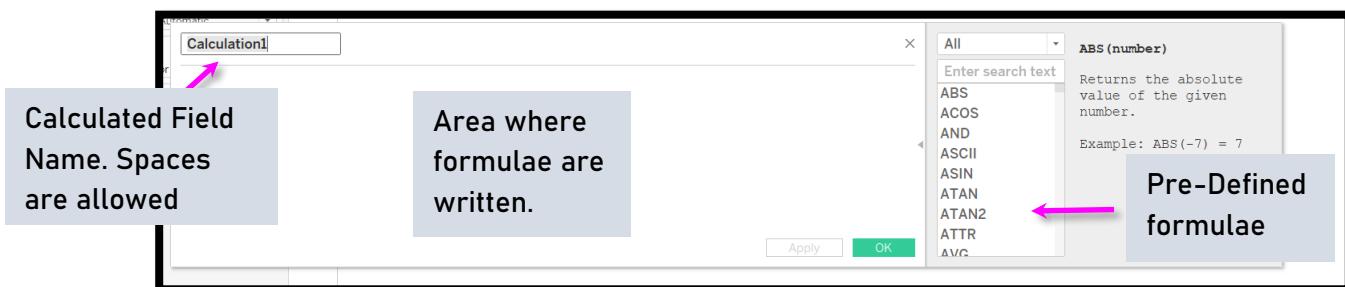
NAME – represents the name of the dialog box.

DATA TYPE – represents the type of data you are expecting (e.g. Integer, String, Float, Date and Date Time).

4. From the Main Menu, click on the 'Analysis' function.



5. In the drop-down menu, select the 'Create Calculated Field' option. The following screen will be displayed:



6. Create a Calculated Field named 'Profit After Discount'.

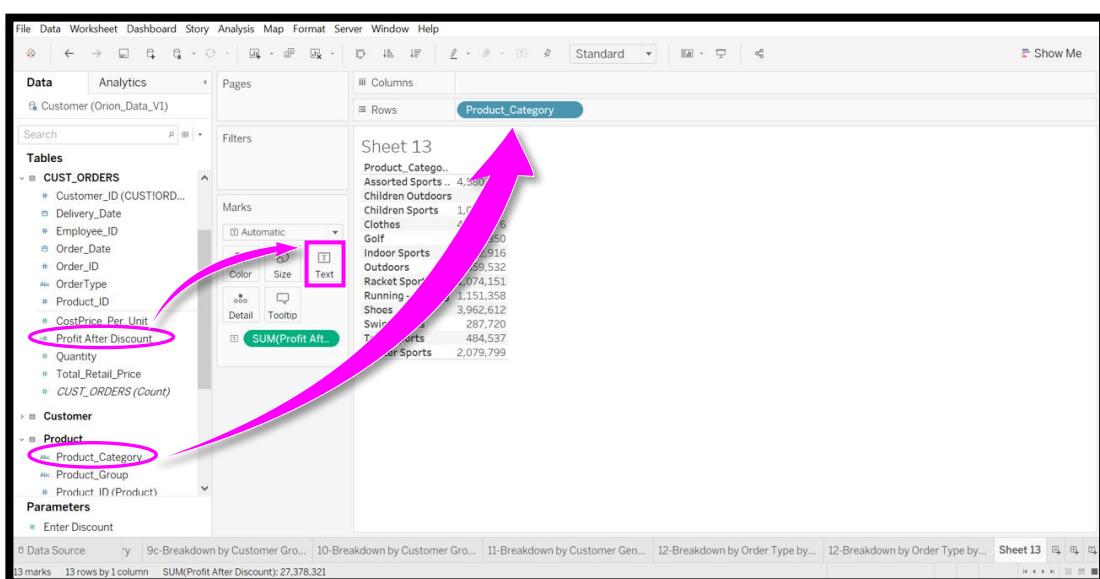
7. In the formula workspace, type in the formula as follows:

[As you type the formula, Tableau will assist you with the relevant fields displayed for you to select.]

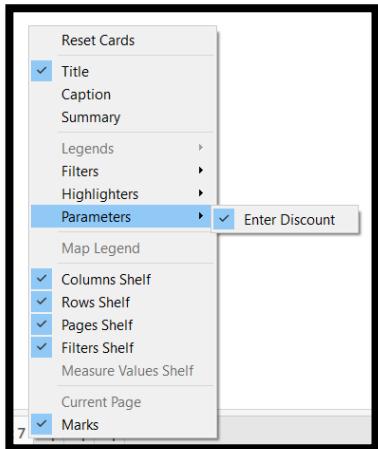
[Total_Retail_Price] * (1 - ([Enter Discount] / 100)) - [Quantity] * [CostPrice_Per_Unit]



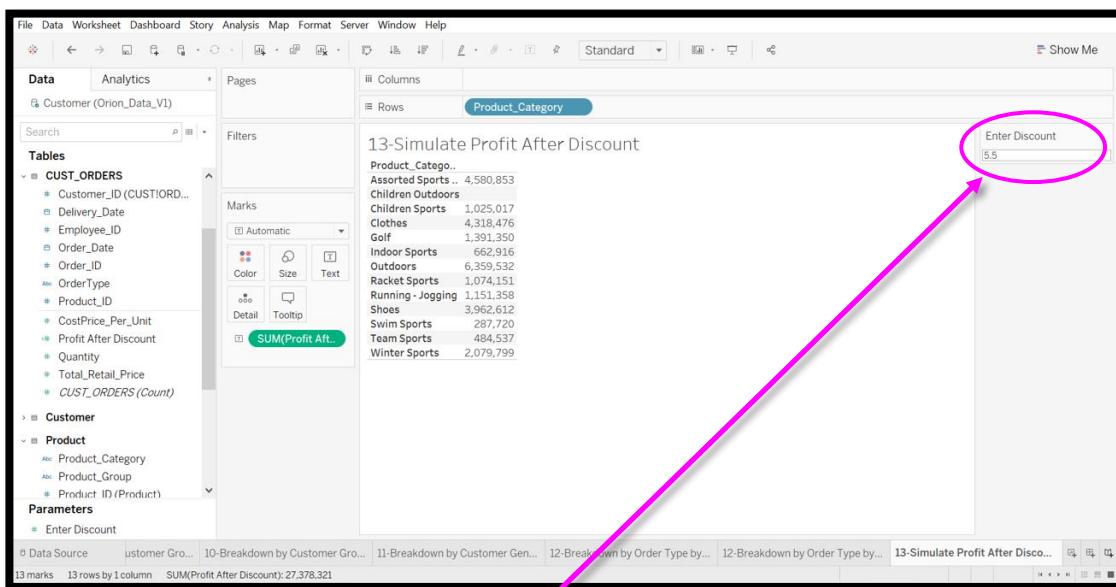
8. Make sure you see this prompt, then click 'OK'. Else, check to ensure that the formulae you have entered is correct.
9. Drag the 'Product_Category' to the Rows, followed by 'Profit After Discount' to Text in the Marks card.



10. Next, right-click anywhere on the canvas. From the 'Parameters' option in the drop-down list, select the Parameter you have created earlier ('Enter Discount') by clicking on it.



11. You should get the following screen:



12. When you change the value for 'Discount', the values in the column change accordingly.

Challenge Exercise 13a: Play with What-if Scenarios

Scenario: What is the maximum discount (in integer) you can give for Swim Sports to avoid being unprofitable?

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(Hint: Edit 'Enter Discount' to be of data type integer, with allowable values from 1 to 100, step size of 1.)

(Stretch the challenge a little more: Create a slider for the user to select the discount value.)



Exercise 14: Create a New Field – Part 1

A new field can be created for analysis by deriving its value from existing data in the data set.

- For example, height and weight are found in the data set, but not BMI. So, you can derive a new field called BMI.

- At the main menu, click on the 'Analysis' tab, select 'Create Calculated Field'.
- Create a new field named 'Profit'.
- Enter the formula as shown below:

The formula is: [Total Retail Price] - ([CostPrice Per Unit] * [Quantity]).



- Ensure you see this prompt, then click 'OK'.

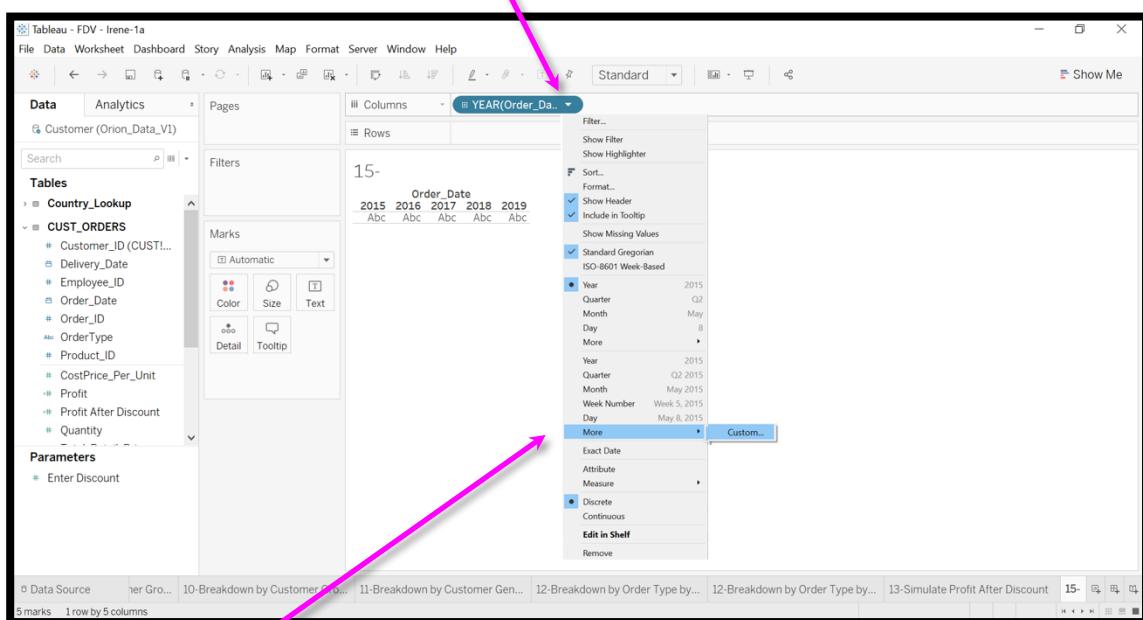
The Profit Formula will be used in Exercise 15.

Exercise 15: Generate a Line Chart

Tableau allows for the customisation of a Date field:

- Day
- Month
- Quarter
- Year
- Other Custom:
 - Month/Year
 - Etc.

1. Add a new worksheet.
2. Drag the 'Order Date' into Columns.
3. Click on 'YEAR(Order Date)' in Columns.

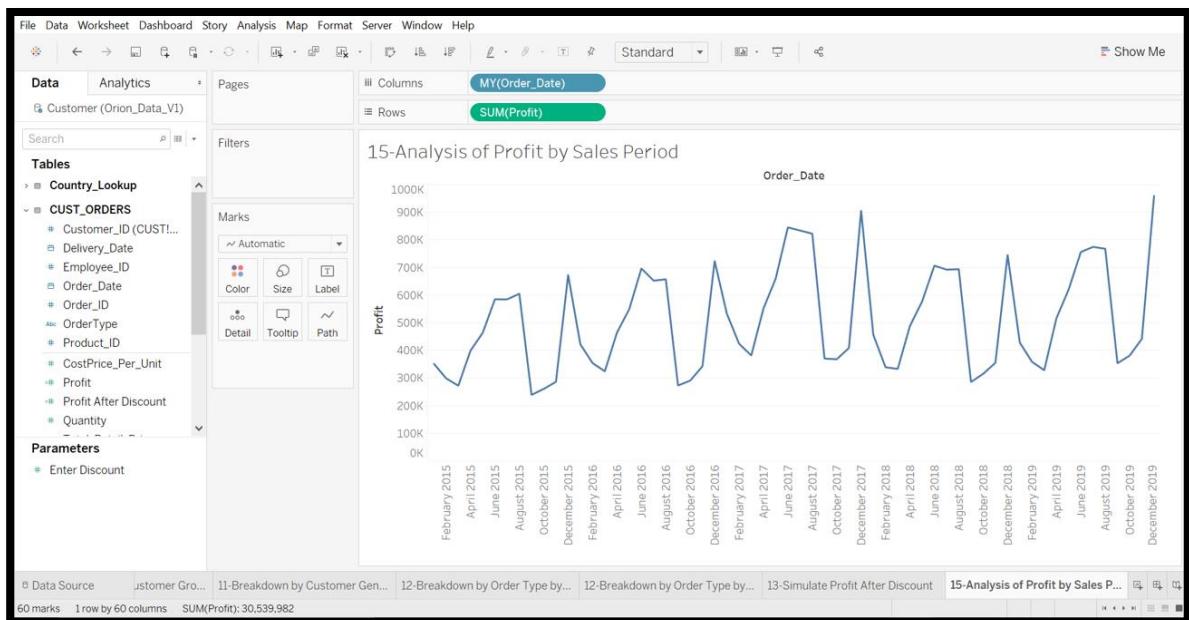


4. Click on the 'More' option followed by the 'Custom' option.

- In the Custom Dialog box, select 'Month/Year' from the selection menu.



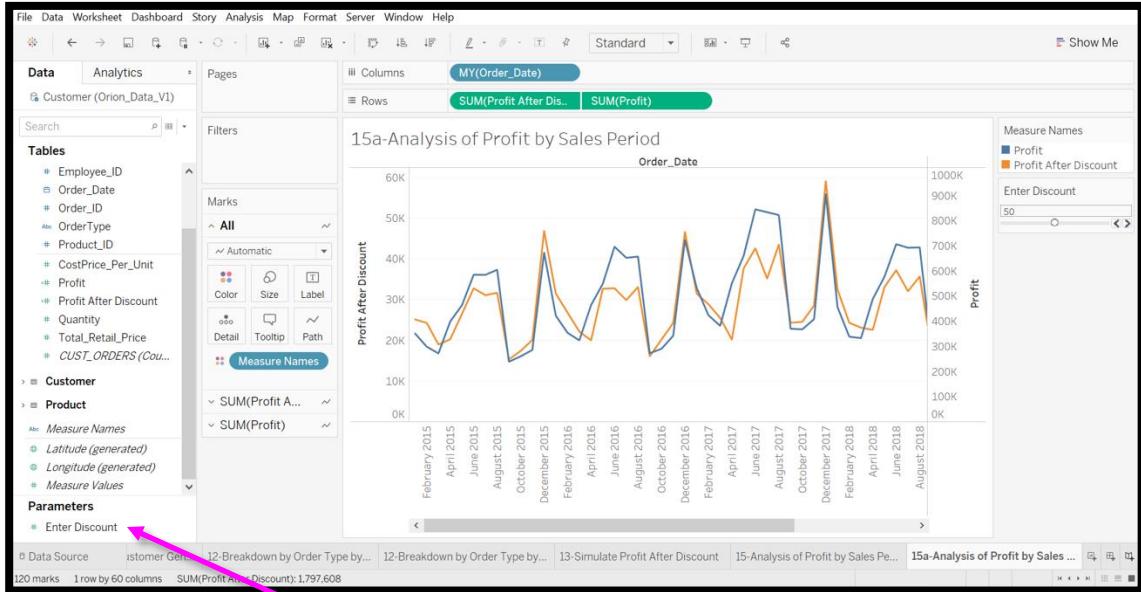
- Click on the 'OK' button.
- Drag the 'Profit' into the ROWS – Tableau will automatic add the 'Sum' aggregate function.



- Name the worksheet as 'Ex. 15-Analysis of Profit by Sales Period'.

Challenge Exercise 15a: Combine Line Charts

- Combine both the 'Profit' and the 'Profit After Discount' line charts together in one viz.



Hints:

- Duplicate the worksheet from Exercise 15.
- Drag Profits After Discount into the Rows.
- Click on the Dual Lines Icon  in Show Me.
- At the bottom of the Data pane, under 'Parameters', right-click on 'Enter Discount' and select 'Show Parameter' from the drop-down list.
- Click on the Y-Axis and select 'Synchronize Axis' to ensure that the scales of the Profit and the Profit After Discount are the same.

- Play What-if scenarios by using the slider to input different values in the 'Enter Discount' parameter and observe the changes in the chart.

Note that in Exercise 13a, we have redefined "Enter Discount" to accept only whole number.

Exercise 16: Create a New Field – Part 2

Tableau provides built-in functions for use in the Calculated Fields:

- Number Functions
- String Functions
- Date Functions
- Logical Functions
- Aggregate Functions
- And more

The following 2 exercises use Tableau Functions DateDiff and If..Then Else...Else....End.

1. Click on the Analysis, followed by 'Create Calculated Fields'.
2. Create a calculated field called 'Customer Age'.
3. It is important to determine the criteria that calculate the age of customer when an order was placed (i.e. as of Order Date). In this exercise, the age is:
Order Date – Birth Date
4. In the formula workspace, add in the following formula:
DATEDIFF('year', [Customer BirthDate], [Order Date])
5. Important point to know about this pre-defined formula used (From the help screen):

DATEDIFF(date_part, start_date, end_date, [start_of_week])

Returns the difference between two dates where start_date is subtracted from end_date. The difference is expressed in units of date_part. If start_of_week is omitted, the week start day is determined by the start day configured for the data source.

Example: DATEDIFF('month', #2004-07-15#, #2004-04-03#, 'sunday') = -3

Date_Part is the unit in which the return value will be in. In the case of our exercise, it will return the year value. The Start_Of_Week parameter in the formula is optional.

6. Try to create a bar chart to display the average age by country as below:



Hint:

**Remember to select
Average in the Measure!**



Challenge Exercise 16a: Create Age Group Using Logical Function

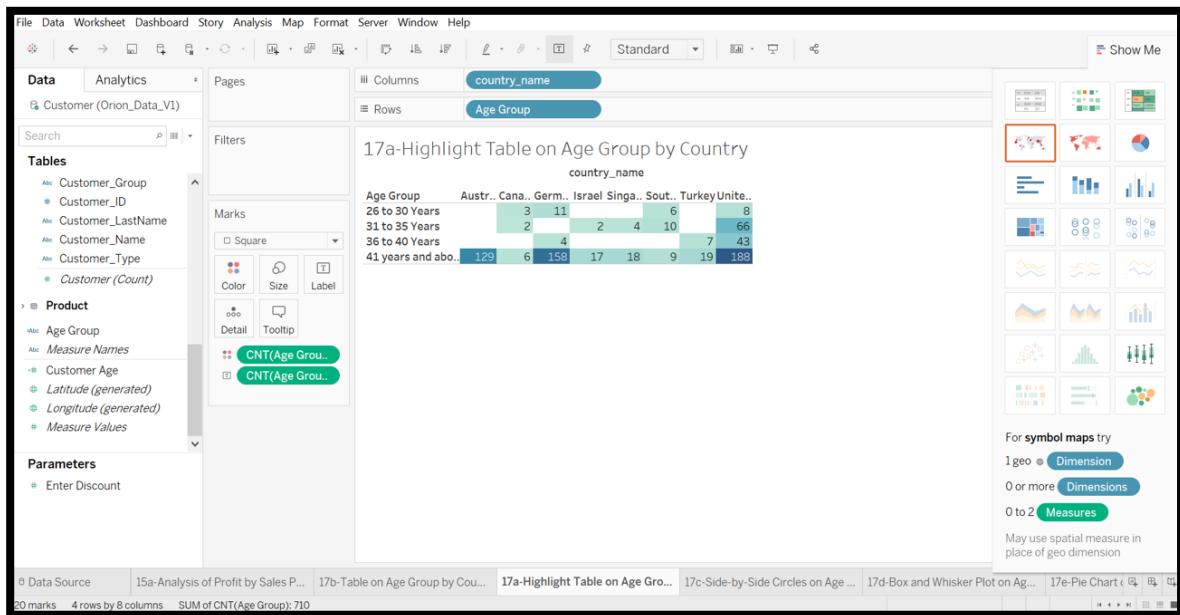
1. To create the Age Group fields, click on 'Analysis' in Main menu followed by the 'Create Calculated Field'.
2. In the 'Create Calculated Field' name space, type in 'Age Group' as the name of this new field.
3. In the workspace, type in the following formula:

```
If [Customer Age] >= 5 AND [Customer Age] <= 10 then
    '5 to 10 Years'
    elseif [Customer Age] >= 11 and [Customer Age] <=15 then
        '11 to 15 Years'
    elseif [Customer Age] >= 16 and [Customer Age] <=20 then
        '16 to 20 Years'
    elseif [Customer Age] >= 21 and [Customer Age] <=25 then
        '21 to 25 Years'
    elseif [Customer Age] >= 26 and [Customer Age] <=30 then
        '26 to 30 Years'
    elseif [Customer Age] >= 31 and [Customer Age] <=35 then
        '31 to 35 Years'
    elseif [Customer Age] >= 36 and [Customer Age] <=40 then
        '36 to 40 Years'
    else
        '41 years and above'
end
```



Exercise 17: Edit Formula

1. Create a Highlight Table on Age Group by Country as below:



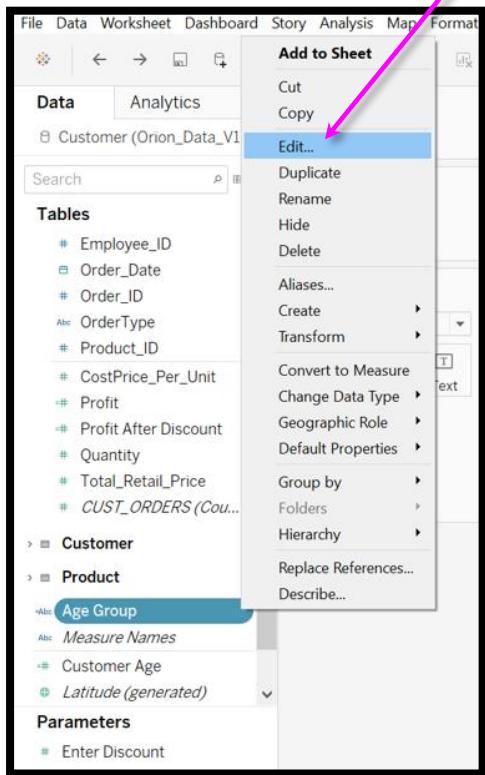
Hints:

1. Drag 'Country_Name' in Columns and 'Age Group' in Rows.
2. Drag 'Age Group' into Text under the Marks card, then right-click on 'Age Group' to select 'Measure', then select 'Count'.
3. Select 'Highlight Table' from Show Me.



Challenge Exercise 17a: Edit Formula

1. The formula in the calculated field (e.g. Age Group) can be edited by right-clicking on it from the Data pane, and select 'Edit' in the drop-down list to amend as follows:

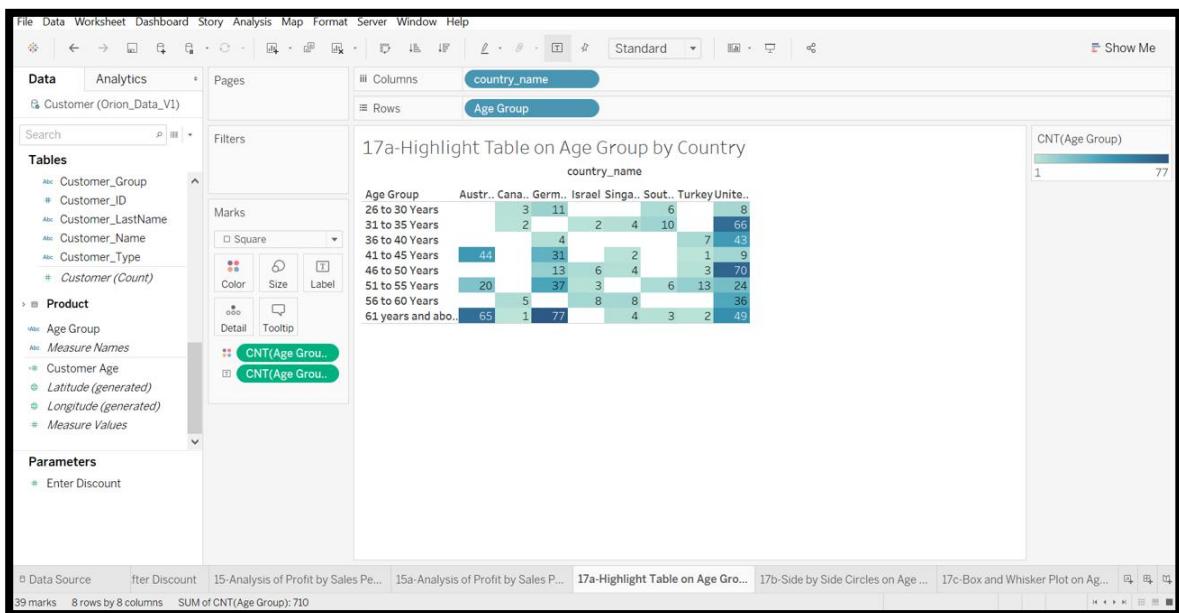


The screenshot shows the Tableau Data pane with the 'Customer (Orion_Data_V1)' data source selected. In the 'Tables' section, 'Age Group' is highlighted. A context menu is open over 'Age Group', with the 'Edit...' option highlighted in blue and a pink arrow pointing to it.

Edit the formula as follows:

```
elseif [Customer Age] >= 41 and [Customer Age] <=45 then
    '41 to 45 Years'
elseif [Customer Age] >= 46 and [Customer Age] <=50 then
    '46 to 50 Years'
elseif [Customer Age] >= 51 and [Customer Age] <=55 then
    '51 to 55 Years'
elseif [Customer Age] >= 56 and [Customer Age] <=60 then
    '56 to 60 Years'
else
    '61 years and above'
End
```

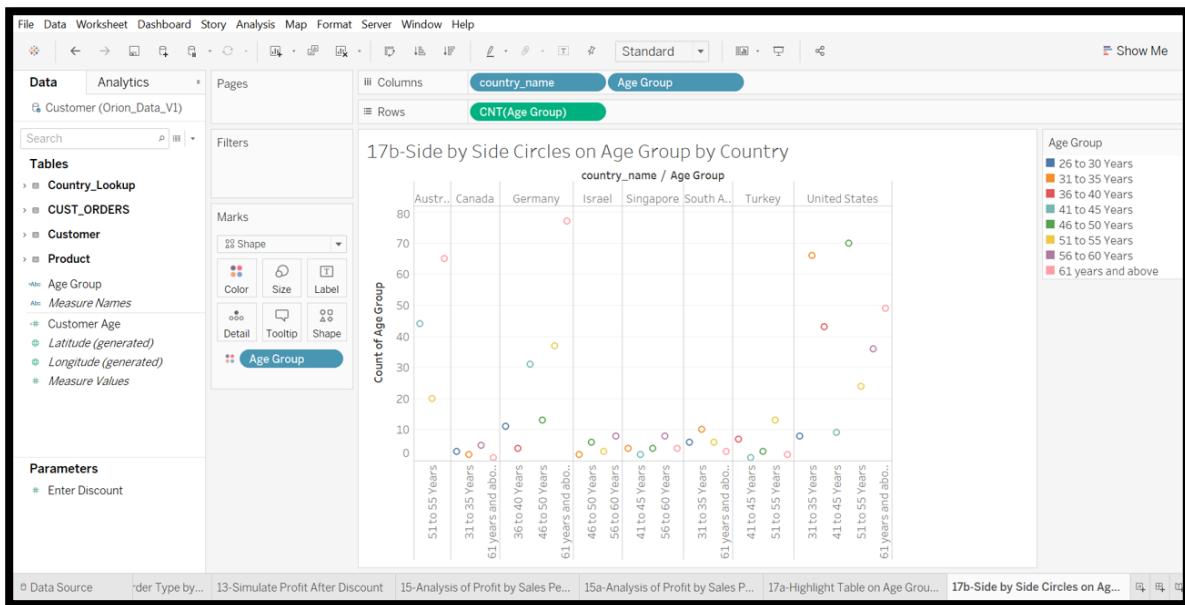
2. The Highlight Table will be updated automatically as below:





Challenge Exercise 17b: Create Side-by-Side Circles

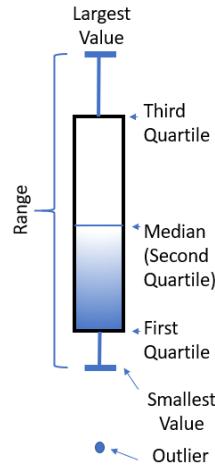
1. Create a Side-by-Side Circles Chart on the Distribution of Age Group by Country as below:



Hints:

1. To create the above, duplicate the worksheet from the previous exercise on Highlight Table.
2. Select 'Side-by-Side Circles' from Show Me.
3. Under Columns, place 'Country_Name', followed by 'Age Group'.
4. Drag 'Age Group' to Colour in the Marks card.

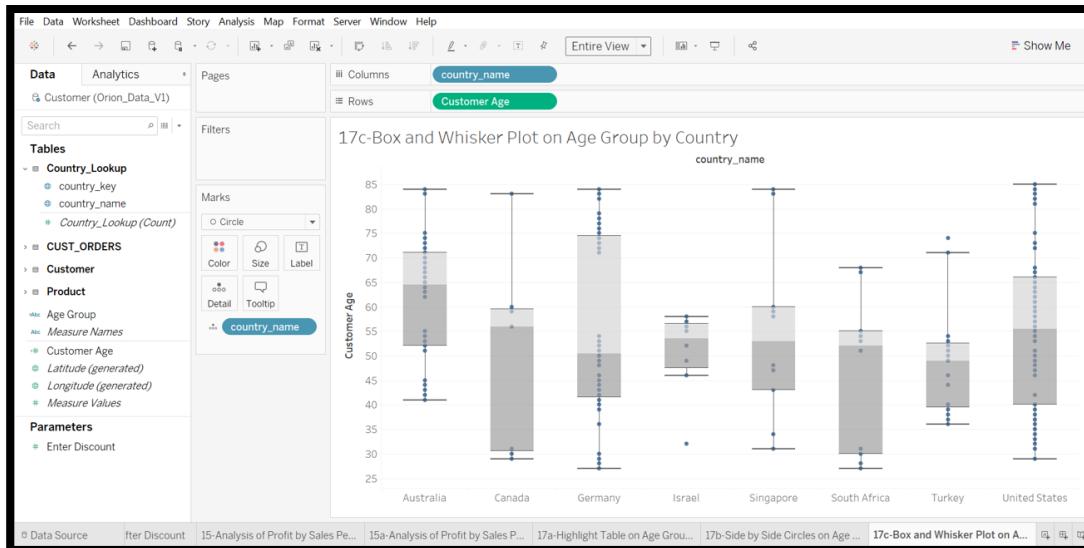
Challenge Exercise 17c: Create Box and Whisker Plot



- There are 5 components in a box plot:
The lower end of the line (also called the whisker) represents the minimum value and the upper end of the line represents the maximum value .
- When a box plot is built, it generally separates the outliers from the data. These outliers (if any) are represented by dots.

Additional Reading: <https://www.excel-easy.com/examples/box-whisker-plot.html>

1. Create a Box and Whisker Plot on the Spread of Customer Age by Country as follows:



Hints:

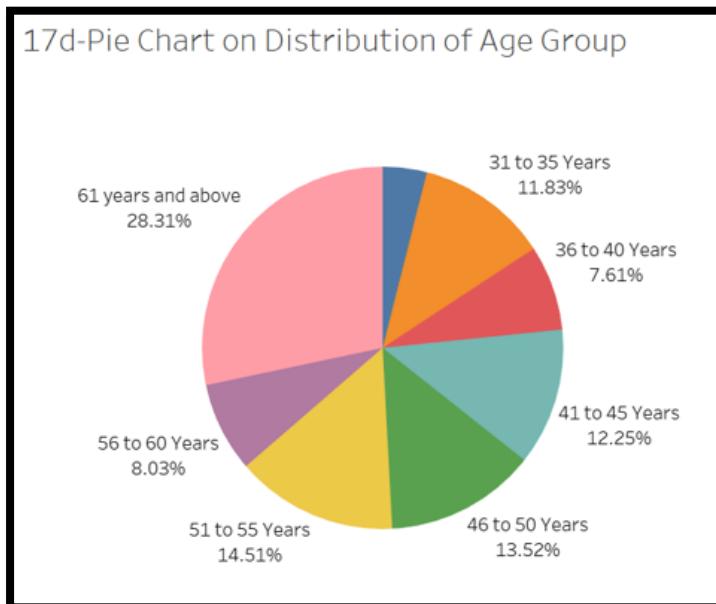
1. Add a new worksheet.
2. Drag 'Country_Name' to Columns.
3. Drag 'Customer Age' to Rows.
4. Select 'Box-and-Whisker Plots' from Show Me.
5. Drag 'Country_Name' to Columns.
6. Under Rows, right-click on 'Customer Age' to select 'Dimension' from the drop-down list.
7. From the menu bar, change 'Standard View' to 'Entire View'

2. What immediate inferences can you derive from the charts generated from Challenge Exercises 17b & 17c? When would you use these charts?

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Challenge Exercise 17d: Create Pie Chart

1. Create a Pie Chart o the Distribution of Age Group



Hints:

To create a pie chart

1. Drag Age Group to Columns.
2. Drag Age Group to Text under the Marks card.
3. Right-click on Age Group in the Marks card, then from the drop-down list, select Measure, followed by select Count.
4. Select Pie Chart from Show Me.
5. To enlarge the pie chart, press <Shift><Ctrl>. To shrink the pie chart, press <Ctrl>.

To label the pie chart

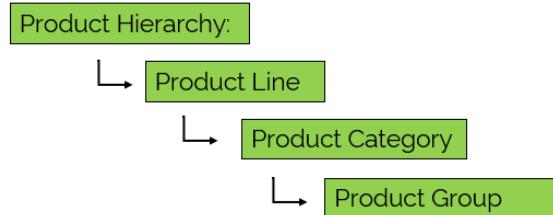
1. Drag Age Group to Label in the Marks card.
2. Drag 'CNT(Age Group)' from the Marks Card to Label to display the count on the pie chart.
3. Click Analysis, select 'Percentage Of', then select 'Table'.

Exercise 18: Create a Hierarchy

Creating a Data Hierarchy allows for analysis of data from different perspectives.

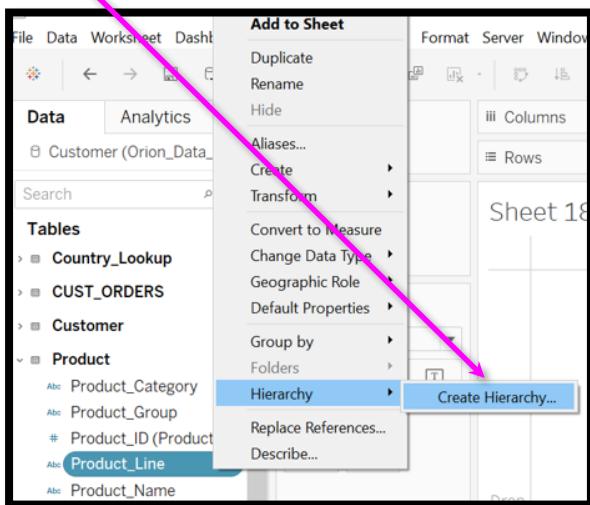
For example:

- A product can belong to particular product line (e.g. Children, Clothes, shoes)
- Each product line has different product categories (e.g. Children Outdoor, Children sport)
- Each category has different product groups (e.g. Outdoor Things,, Bathing Suits)

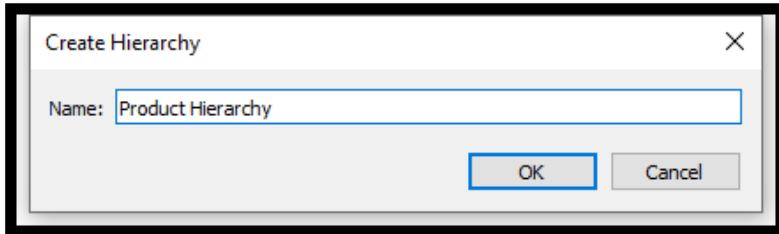


Having a hierarchy allows the management to drill down to the next level of detail or roll up to a higher level of detail in the viz.

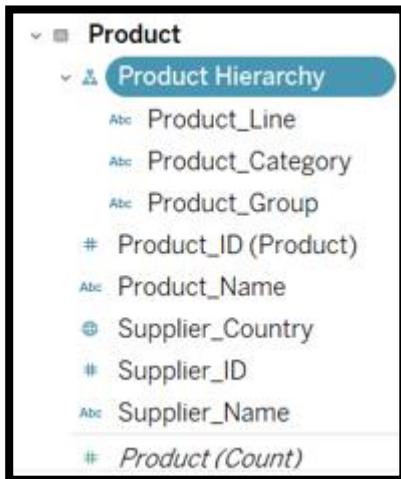
1. Right-click on 'Product Line' from the Data pane, select 'Hierarchy', followed by 'Create Hierarchy' option from the menu.



2. Type in the name of the Hierarchy (e.g. Product Hierarchy) and click 'OK'.

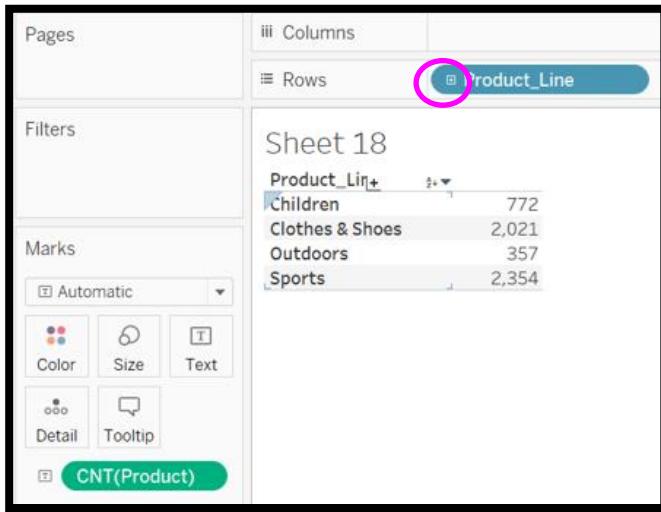


3. Drag 'Product Category' and 'Product Group' into 'Product Hierarchy' in the sequence as shown:



4. In this example, 'Product Line' is the highest in the hierarchy, followed by 'Product Category', and finally 'Product Group'.
5. You can change the hierarchy level by dragging the field to the required level.
6. Add a new Worksheet and drag the 'Product Hierarchy' into the Rows.
7. Drag 'Product(Count)' to the Abc column.

8. Hover over 'Product Line' in Rows and click on the '+' symbol to drill down to lower levels.
Hover over 'Product Category' and do the same.

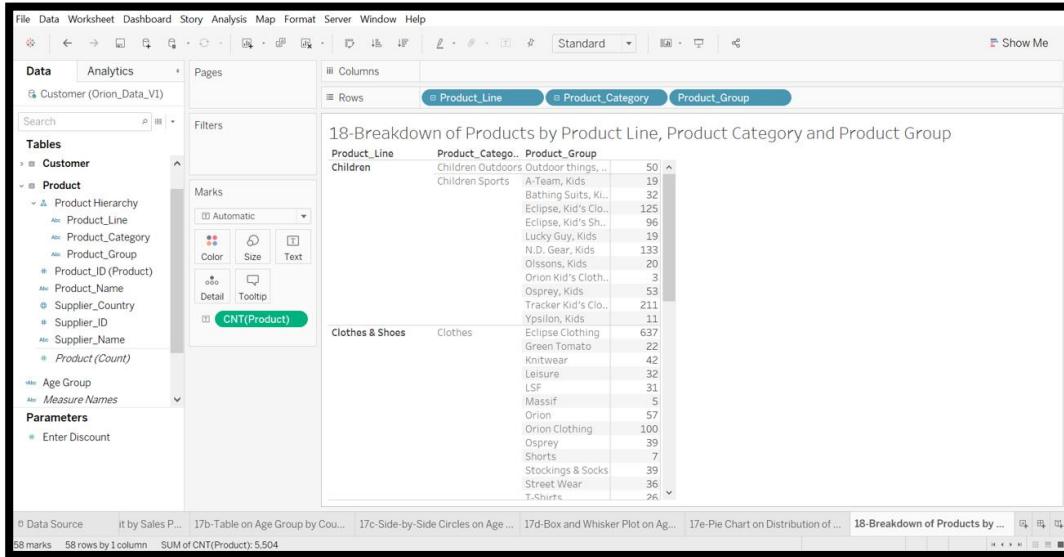


The screenshot shows a Tableau interface with the following details:

- Pages:** Shows 'Sheet 18'.
- Filters:** No filters are applied.
- Marks:** Marks are set to 'Automatic'. Under 'Color', 'Size', and 'Text', there are three items each: 'Color', 'Size', and 'Text'.
- Rows:** The 'Product_Line' field is selected and highlighted with a pink circle.
- Sheet 18 Data:**

| Product_Lin | |
|-----------------|-------|
| Children | 772 |
| Clothes & Shoes | 2,021 |
| Outdoors | 357 |
| Sports | 2,354 |
- Bottom Panel:** A green button labeled 'CNT(Product)' is visible.

9. Your screen will be as follows with the drill downs:



The screenshot shows a more detailed Tableau interface with the following details:

- File:** File, Data, Worksheet, Dashboard, Story, Analysis, Map, Format, Server, Window, Help.
- Data:** Customer (Orion_Data_V1)
- Tables:**
 - Customer
 - Product
 - Product Hierarchy
 - Product_Line
 - Product_Category
 - Product_Group
 - Product_ID (Product)
 - Product_Name
 - Supplier_Country
 - Supplier_ID
 - Supplier_Name
 - Product_Count
 - Age Group
 - Measure Names
- Parameters:** Enter Discount
- Pages:** Pages
- Filters:** No filters are applied.
- Marks:** Marks are set to 'Automatic'. Under 'Color', 'Size', and 'Text', there are three items each: 'Color', 'Size', and 'Text'.
- Rows:** The 'Product_Line' field is selected and highlighted with a pink circle.
- Sheet 18 Data:**

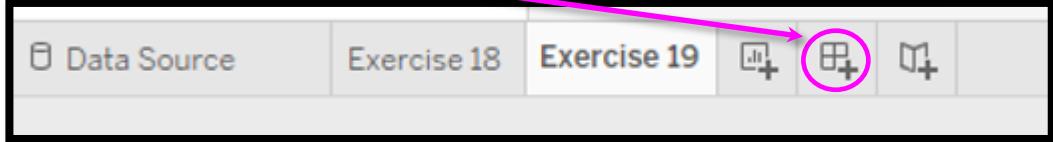
| Product_Line | Product_Catego.. | Product_Group | |
|-----------------|------------------|-----------------------|-----|
| Children | Children | Outdoor things... | 50 |
| Children | Children | A-Team, Kids | 19 |
| Children | Children | Bathing Suits, Ki... | 32 |
| Children | Children | Eclipse, Kid's Clo... | 125 |
| Children | Children | Eclipse, Kid's Sh... | 96 |
| Children | Children | Lucky Guy, Kids | 19 |
| Children | Children | N.D. Gear, Kids | 133 |
| Children | Children | Ollsons, Kids | 20 |
| Children | Children | Orion Kid's Cloth... | 3 |
| Children | Children | Osprey, Kids | 53 |
| Children | Children | Tracker Kid's Clo... | 211 |
| Children | Children | Ypsilon, Kids | 11 |
| Clothes & Shoes | Clothes | Eclipse Clothing | 637 |
| Clothes & Shoes | Clothes | Green Tomato | 22 |
| Clothes & Shoes | Clothes | Knitwear | 42 |
| Clothes & Shoes | Clothes | Leisure | 32 |
| Clothes & Shoes | Clothes | LSF | 31 |
| Clothes & Shoes | Clothes | Massif | 5 |
| Clothes & Shoes | Clothes | Orion | 57 |
| Clothes & Shoes | Clothes | Orion Clothing | 100 |
| Clothes & Shoes | Clothes | Osprey | 39 |
| Clothes & Shoes | Clothes | Shorts | 7 |
| Clothes & Shoes | Clothes | Stockings & Socks | 39 |
| Clothes & Shoes | Clothes | Street Wear | 36 |
| Clothes & Shoes | Clothes | T-shirts | 26 |
- Bottom Panel:** A green button labeled 'CNT(Product)' is visible.

Exercise 19: Create a Dashboard

A dashboard is a collection of key data visualisations put together in a single space for quick analysis to answer key business questions, or monitor KPIs and metrics at a glance.

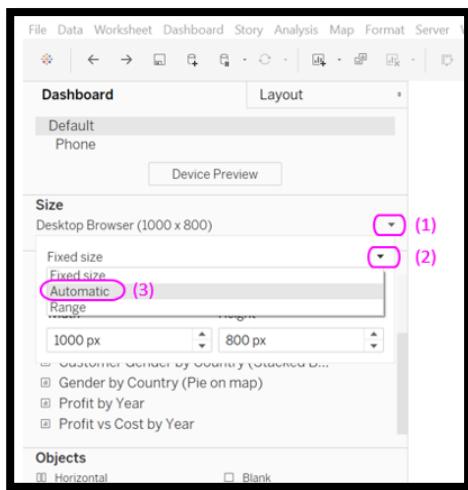
The visualisations we have created using Tableau worksheets in our exercises thus far can be selected as views in a dashboard, together with text areas, web pages and images. If required, multiple dashboards can be created to serve an intent.

1. Along the tabs at the bottom, there is an icon  that creates the Dashboard
2. Click on the icon.

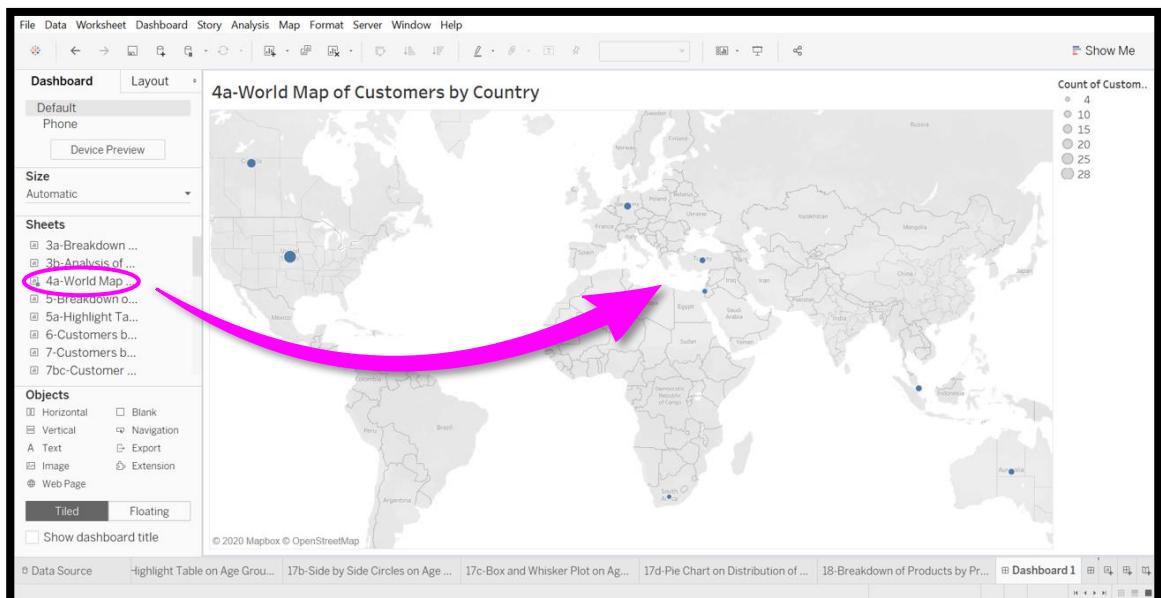


3. The following is the Dashboard workspace:

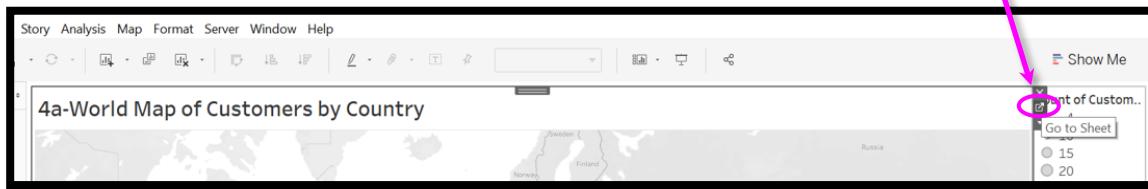
4. Before you start creating a Dashboard, it is a good practice to set the Size to Automatic.



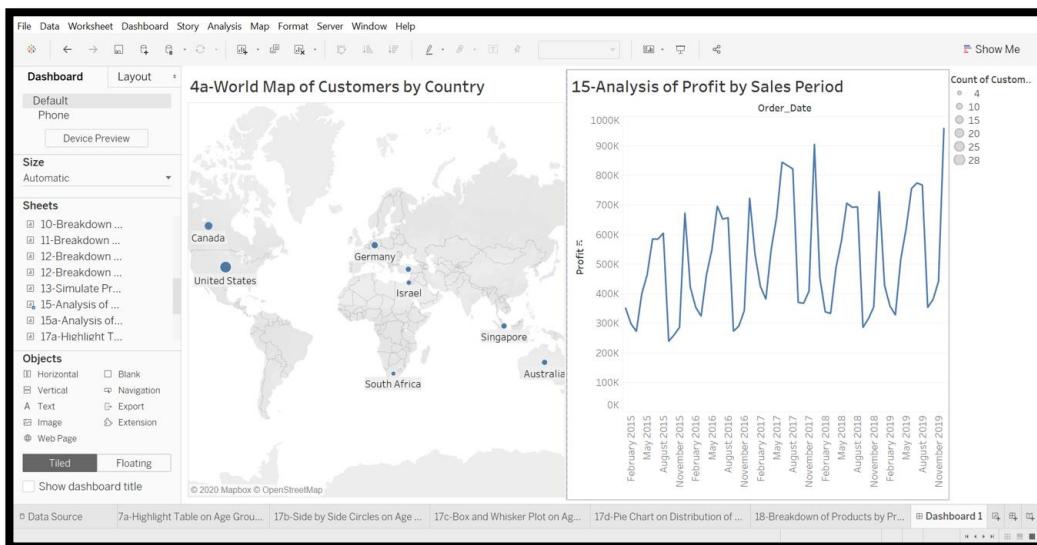
5. From the Sheets list on the left, drag a worksheet (e.g. from Exercise 4a) into the Dashboard workspace.



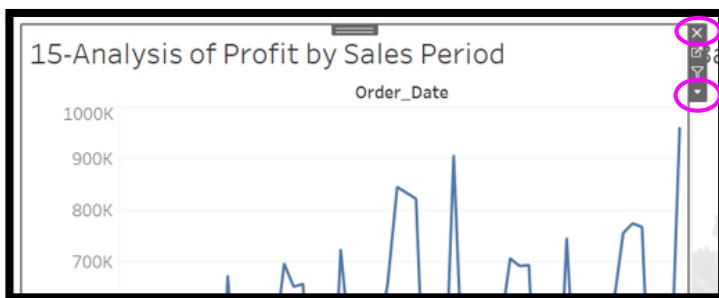
- Click on the sheet and options menu will appear at the corner. Click on  to go to the original worksheet to add in the full country name.
(Hint: On the original worksheet of Exercise 4a, drag 'Country_Name' to Labels. The updated worksheet with the full country name is also displayed at the dashboard.)



- At the dashboard, drag another worksheet (e.g. from Exercise 15) into the Dashboard area. Mouse over the Dashboard area, some gridlines will appear. You can click and use your mouse to adjust the height or width of the area.

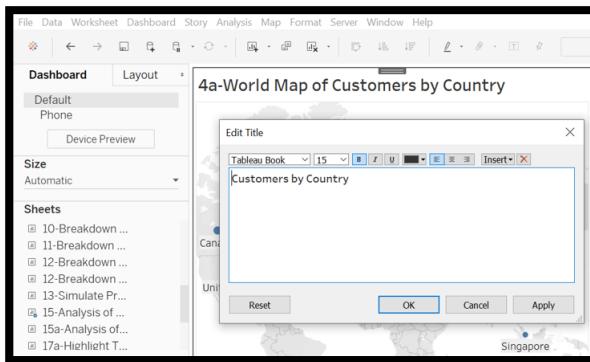


- Click on the sheet and the options menu will appear at the corner. If needed, click on 'X' to remove the worksheet from the Dashboard. Click on the triangular down arrow for more options. Explore the different options available.

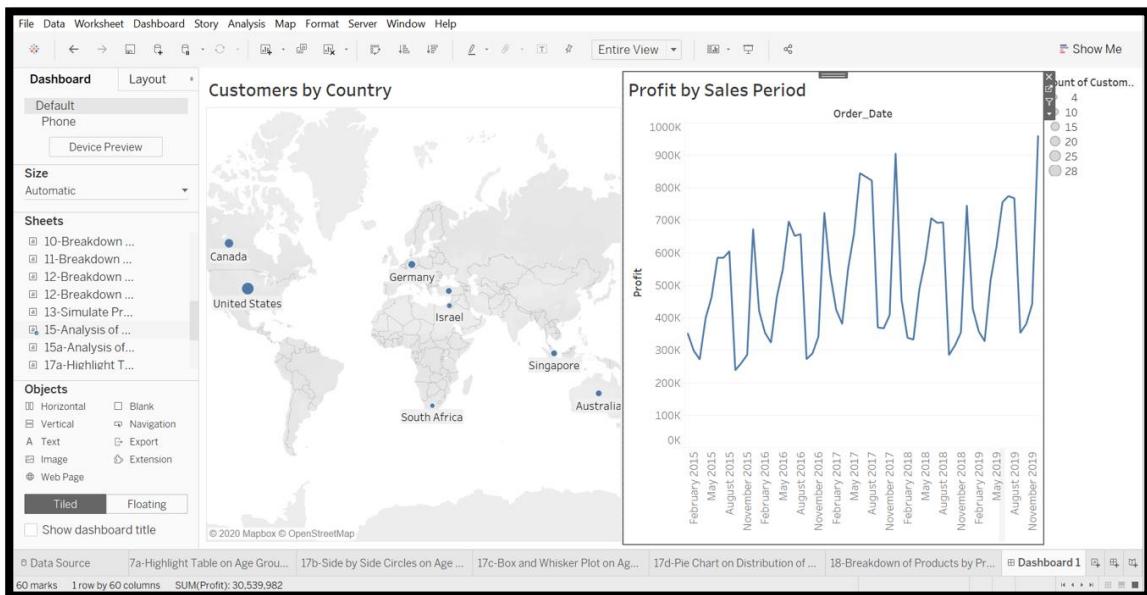




9. Double-click to edit the Title of each view on the Dashboard. Click 'Apply', followed by 'OK' when done.

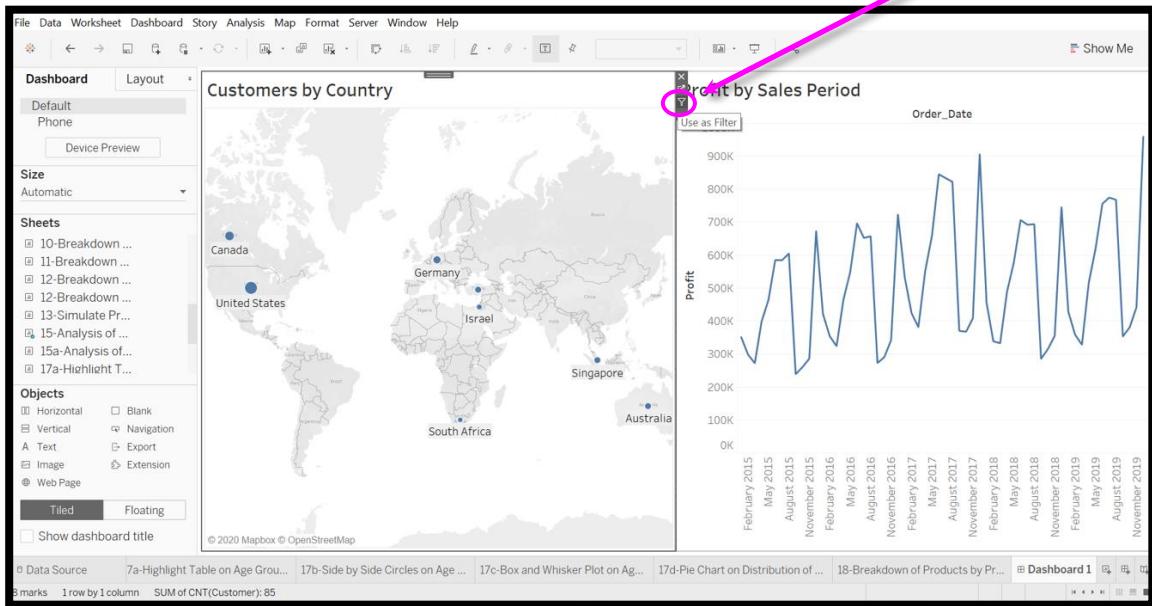


10. Rename all the graphs/charts the Dashboard. Now it may look as below. How do you remove the legend on 'Count of Customer'?
(Hint: Similar to how you remove worksheet from the dashboard.)



11. How do you allow a user to select any part of the line graph from the view on the left, so that the data in the other view on the right is also correspondingly filtered, and vice versa?

(Hint: Click on the view 'Customers by Country' to make it active, then select  'Use as Filter'. Do the same for 'Profit by Sales Period'.)



Exercise 20: Create a Story

In Tableau, a story is a sheet comprising of worksheets and/or dashboards sequenced as story points to guide the audience in a step-by-step process to draw the insights you have made and to help them to understand how you have come to your conclusion.

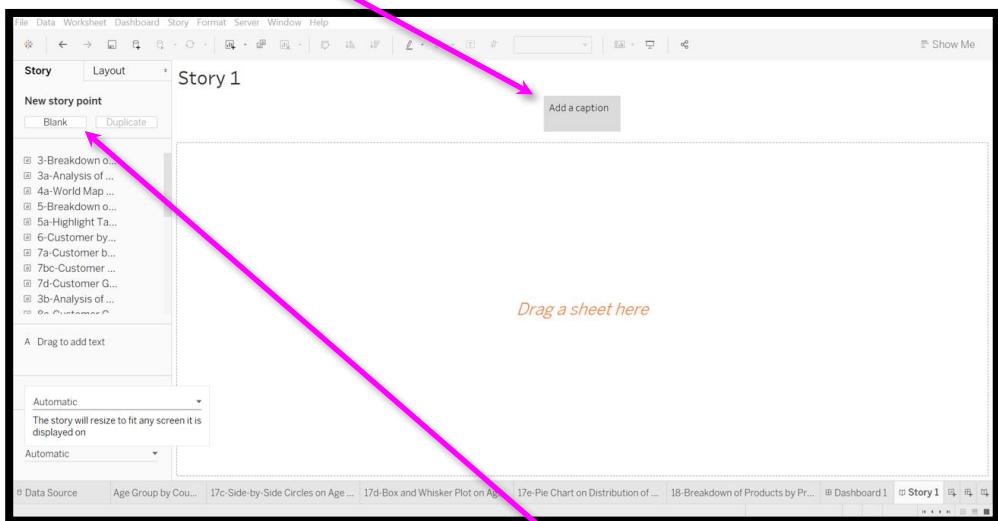
Text annotations and/or filters can be applied to support the narrative.

Tips to create story points:

- Set the context in the first story point in a story.
- Build on the insights from the previous story points to help the user to gain increased context and understanding.
- Allow the user to interact with the story points (e.g. incorporate filters and sliders).
- Ask a question about the data to lead the user to click the next story point for answers.



1. To start a story, click on the Story icon at the bottom status bar.
2. Again, it is a good practice to change the Size to Automatic.
3. Simply drag a pre-created Workbook or Dashboard from the left pane.
4. Click on the [Add a caption] button to add a story point or the title of your page.



5. To add a new page in the Story, click on the [Blank] button under the New story point.

6. Repeat steps 3 to 5 to add new pages and titles to your Story.
7. You can also add text to annotate your tables or charts in the page using the [Drag to add text] button on the left panel.

~ End of Training Exercises ~