Assignment Code: DA-AG-014

Introduction to Tableau and Data Visualization| Assignment

Instructions:

- Carefully read each question. Use **Google Docs**, **Microsoft Word**, or a similar tool to create a document where you type out **each question along with its answer**.
    - For **theoretical questions**, write clear and concise answers.
    - For **practical questions**, complete the tasks in **Tableau Public or Tableau Desktop** and **insert relevant screenshots** of your visualizations, dashboards, or Tableau Prep workflows in your answer document.
- Use the provided dataset:
  🔗 **Dataset Link:** Global_sales_Dataset
- Once you've completed all questions, **save your document as a PDF** and **upload it to the LMS or as per your instructor's instructions**.
- **Do not zip or archive the file** before uploading.
- Each question carries **20 marks**.

Total Marks: 200

Question 1 : What is Tableau? Explain its importance in Business Intelligence and how it helps in data-driven decision-making.

Answer :

What is Tableau?

Tableau is a powerful and user-friendly **data visualization and business intelligence (BI) tool** that allows users to connect to various data sources, clean and transform the data, and create interactive and shareable dashboards, reports, and charts. It helps organizations convert raw data into understandable visuals, making it easier to identify patterns, trends, and actionable insights.

Importance in Business Intelligence:

In the field of Business Intelligence, Tableau plays a crucial role in:

- **Data exploration and discovery:** It allows users to interactively explore data without deep technical knowledge.
- **Fast and real-time reporting:** Dashboards can update in real time, helping stakeholders make quick decisions.
- **Data democratization:** Non-technical users like business analysts or managers can analyze data without coding.
- **Visual storytelling:** Tableau transforms numbers into meaningful visual stories that help in strategic decision-making.

How Tableau Helps in Data-Driven Decision-Making:

1. **Quick Insight Generation:** Tableau enables users to rapidly generate visuals and identify trends or outliers.
2. **Collaboration:** Reports and dashboards can be shared securely across teams, encouraging collaborative decision-making.
3. **Data Transparency:** Visualizations offer an intuitive understanding of data, even for non-experts.
4. **Predictive Capabilities:** When combined with calculated fields and forecasting tools, Tableau helps anticipate future trends.

Question 2 : Explain the role of the following Tableau components:

a) Data Pane

b) Worksheet

c) Dashboard

d) Story

Answer :

a) Data Pane:
The **Data Pane** is located on the left side of the Tableau interface. It displays all the **dimensions and measures** available from the connected data source. Users can drag fields from the Data Pane onto various shelves (like Rows, Columns, Filters, etc.) to build visualizations. It also provides calculated fields, hierarchies, sets, and parameters.

b) Worksheet:
A **Worksheet** is the canvas where users create individual **visualizations or charts** in Tableau. Each worksheet is independent and allows users to experiment with different views of the data. Multiple worksheets can be created and then assembled into dashboards.

c) Dashboard:
A **Dashboard** is a collection of multiple worksheets and objects (like text, images, filters) assembled on a single screen. Dashboards allow users to combine views for **interactive storytelling** and provide a holistic overview of insights. Filters and actions can be applied across all visuals within a dashboard.

d) Story:
A **Story** in Tableau is a sequence of visualizations that work together to convey a **data-driven narrative**. It helps guide the viewer through a series of insights and conclusions. Each part of the story (called a "story point") can highlight a key finding, often used for presentations or decision-making discussions.

Question 3 : What is the difference between **Dimensions** and **Measures** in Tableau? Provide examples of each.

Answer :

In Tableau, **Dimensions** and **Measures** are two primary types of data fields that help structure and analyze your dataset.

1. Dimensions:

- **Definition:** Dimensions are **qualitative (categorical)** fields used to segment, group, or label the data.
- **Purpose:** They **provide context** to the data and are often used to define the **"what"** of your analysis.

- **Examples:**
  - Customer Name
  - Country
  - Product Category
  - Order Date

Use Case: If you want to see **Sales by Region**, "Region" would be your dimension.

2. Measures:

- **Definition:** Measures are **quantitative (numeric)** fields that can be **aggregated** (e.g., summed, averaged).
- **Purpose:** They **provide values** that can be analyzed and are often the **"how much"** or **"how many"** of the data.

- **Examples:**
  - Sales
  - Profit
  - Quantity
  - Discount

Use Case: If you want to calculate **total profit by product**, "Profit" is the measure.

Key Differences Table:

Feature	Dimensions	Measures
Type of Data	Categorical	Quantitative
Aggregation	Not aggregated	Aggregated (Sum, Avg, etc.)
Role in Viz	Slice, group, filter data	Used to analyze data
Examples	Region, Segment, Category	Sales, Profit, Quantity

Question 4 : Define and explain the purpose of Filters, Parameters, and Sets in Tableau.

Answer :

In Tableau, **Filters**, **Parameters**, and **Sets** are powerful tools used to **customize, control, and segment** the data. Each serves a different purpose but contributes to making dashboards interactive and insightful.

1. Filters:

- **Definition:** Filters are used to **restrict the data** displayed in a view.
- **Purpose:** To show only the data that meets specific criteria.
- **Types of Filters:**
    - Dimension filter (e.g., Region = "West")
    - Measure filter (e.g., Sales > 5000)
    - Relative date filters (e.g., Last 30 days)
- **Use Case:** Display sales only for a specific country or category.

2. Parameters:

- **Definition:** Parameters are **dynamic input values** (like a control knob) that users can manually select to change a calculation, filter, or field.
- **Purpose:** To allow interactivity and flexibility in reports or calculations.
- **Use Case Examples:**
    - Allow user to choose between "Profit" or "Sales" to view in a chart.
    - Create what-if scenarios by changing input values like discount %.

🔄 *Unlike filters, parameters don't automatically filter data — they need to be used in calculated fields or filters.*

3. Sets:

- **Definition:** Sets are **custom subsets** of data based on certain conditions or manual selection.
- **Purpose:** To compare or highlight specific groups within data.
- **Types:**
    - **Fixed sets** (manually selected members)
    - **Dynamic sets** (based on conditions)
- **Use Case:** Create a set of **Top 10 customers by sales**, and compare them to the rest.

Feature	Filters	Parameters	Sets
User Input	Direct	User selects value	Manual or condition-based
Usage	Limit what data is shown	Modify calculations or filters	Compare or group data
Interaction	Limited	Highly interactive	Conditional or comparative

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Question 5 : Create a bar chart showing Gross Sales by Country.

- 🔗 **Dataset Link:** Global_sales_Dataset
- Sort the countries in descending order of sales.
- **Highlight or annotate the bar** that represents the **maximum** and **minimum** Gross Sales
- Add data labels and format the chart for presentation.

Answer :

Steps to Create the Bar Chart in Tableau:

Step 1: Open Tableau

- Launch **Tableau Desktop** or **Tableau Public** on your system.

Step 2: Connect to the Dataset

- Click on **"Microsoft Excel"** under "Connect".
- Locate and select the downloaded file: `Financial Sample.xlsx`.

Step 3: Load the Data

- Drag the worksheet (usually named `Financials`) to the canvas.
- Click **"Sheet 1"** to begin creating your visualization.

Step 4: Build the Bar Chart

- Drag `Country` to the **Columns** shelf.
- Drag `Gross Sales` to the **Rows** shelf.
- Tableau will automatically generate a vertical bar chart.

Step 5: Sort the Chart

- Click the **Sort descending** icon (Z → A) on the toolbar to arrange countries from highest to lowest Gross Sales.

Step 6: Add Data Labels

- Click on the **Label** icon in the Marks card.
- Check the box for **"Show Mark Labels"** to display values on each bar.

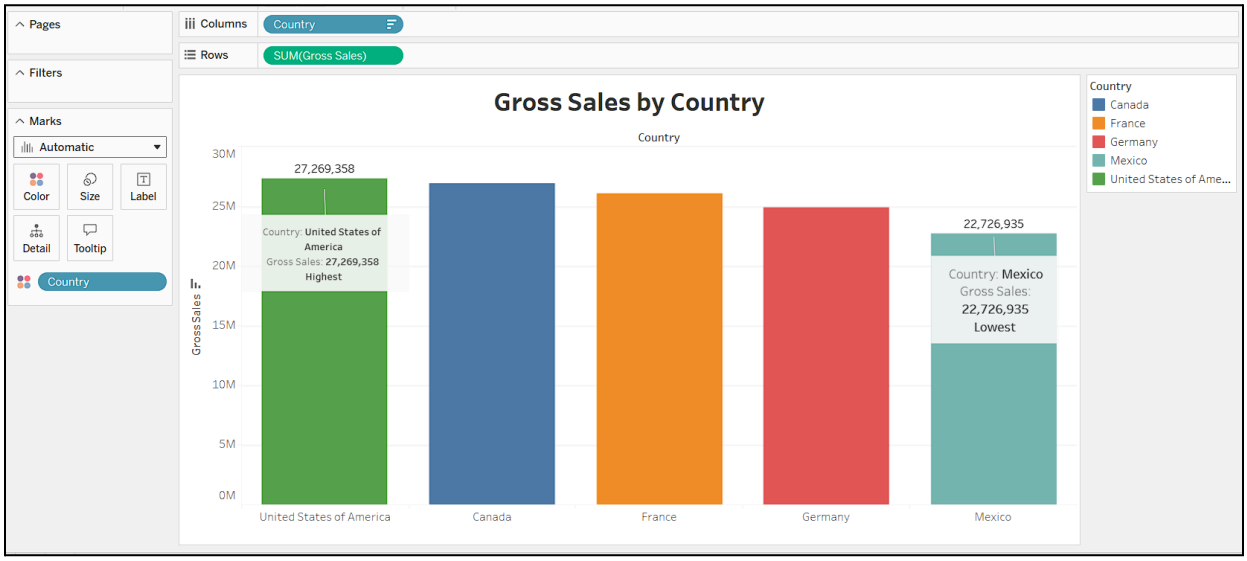
Step 7: Highlight Maximum and Minimum Sales Bars

- Use **Annotations** or color formatting to label:
  - The **bar with the highest Gross Sales**
  - The **bar with the lowest Gross Sales**
- (Optional) Right-click the bars → **Annotate** → **Mark** to write "Highest" and "Lowest".

Step 7: Format the Chart (Optional)

- Change bar color using the **Color** option in the Marks card.
- Rename the title to: `"Gross Sales by Country"`
- Format font size and axis labels for better presentation.

Output:



Question 6 : Using Tableau, create a dual-axis chart that displays:

- 🔗 **Dataset Link:** Global_sales_Dataset
- Monthly Sales as bars
- Monthly Profit as a line
- Filter the data to include only records from the year 2014
- Ensure both axes are synchronized and properly labeled
- Add an appropriate chart title, and format the chart for clear visual presentation
- Paste a screenshot of the final chart in your submission

Answer :

Step 1: Open Tableau and Connect to Dataset

- Open Tableau Public/Desktop.
- Connect to **`Financial Sample.xlsx`**.

Step 2: Load the Data

- Drag the `Financials` sheet into the canvas.
- Click **Sheet 1** to start.

Step 3: Filter Data for Year 2014

- Drag `Date` to the **Filters** shelf.
- Select **"Years"**, then check **only 2014**.
- Click OK.

This ensures that only 2014 data will be used.

Step 4: Build the Sales Bar Chart

- Drag `Date` to **Columns**
  - Right-click `Date` → Select **"Month"**.
- Drag `Sales` to **Rows**.
- Tableau will generate a bar chart by default.

Step 5: Add Profit as a Second Axis

- Drag `Profit` to the **Rows shelf**, next to `Sales`.
- You'll now see **two charts** stacked vertically.

Step 6: Create Dual Axis

- Right-click on the second axis (**Profit**) → Select **Dual Axis**.

Step 7: Customize Each Axis

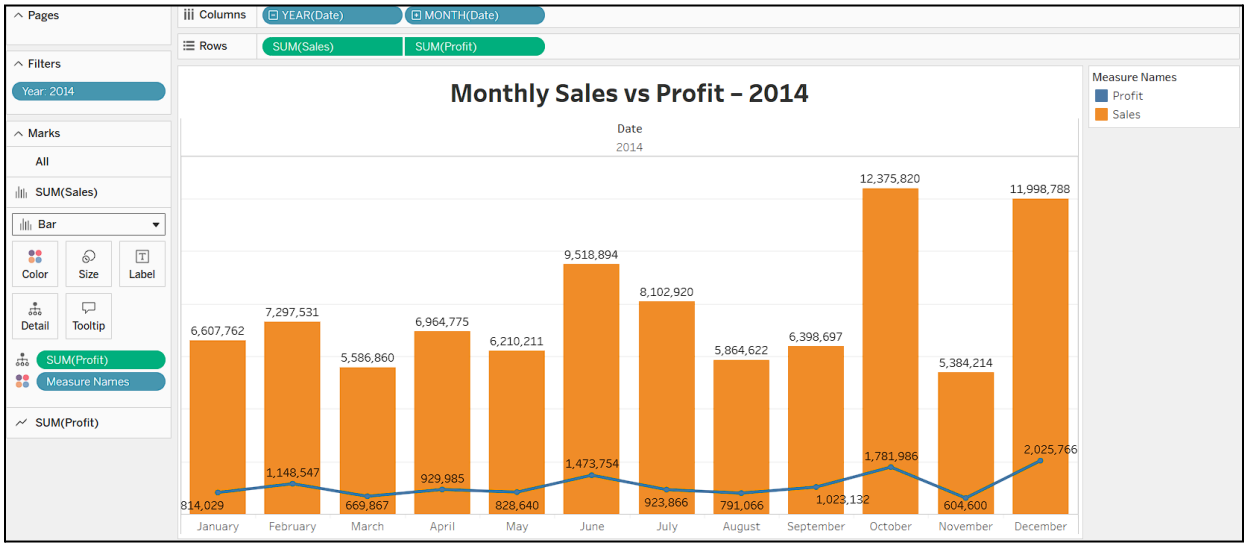
- On the **Marks card**, you'll now see:
  - `SUM(Sales)`
  - `SUM(Profit)`
- Click **SUM(Sales)** → Change **Marks type to Bar**
- Click **SUM(Profit)** → Change **Marks type to Line**

This gives you **Sales as bars** and **Profit as a line** on the same chart.

Step 8: Synchronize and Format

- Right-click on the **Profit axis** → **Synchronize Axis**.
- Right-click again → Uncheck **Show Header** (to remove duplicate axis labels).
- Add a meaningful **title**, such as:
  "Monthly Sales vs Profit – 2014"
- Add **tooltips, labels, and color formatting** as needed.

Output:



Question 7 : Create a filled map showing total Units Sold by Country.

- 🔗 **Dataset Link:** Global_sales_Dataset
- **Add a parameter to allow users to switch between Units Sold and Profit.**
- **Use the Discount Band as a filter in your visualization.**

Answer :

Step 1: Open Tableau and Connect to Dataset

- Launch Tableau Desktop or Public.
- Connect to `Financial Sample.xlsx`.
- Drag the `Financials` sheet to the canvas.
- Go to **Sheet 1**.

Step 2: Create a Base Filled Map

- Drag `Country` to the **view**.
- Click **Show Me** and choose the **Filled Map** chart type.
- Tableau will generate a shaded map using geographic roles.

Step 3: Create a Parameter to Switch Metrics

1. Right-click in the **Data pane** → Click **Create Parameter**
2. Name it: `Select Metric`
3. Set the data type to: **String**
4. In "Allowable values," choose **List**
5. Add two values:
   - `Profit`
   - `Sales`
6. Click OK.

Step 4: Create a Calculated Field Based on the Parameter

1. Right-click in the Data pane → Click **Create Calculated Field**
2. Name it: `Metric Value`

Enter the following formula

```
IF [Select Metric] = "Profit" THEN [Profit]
ELSE [Sales]
END
```

Click OK.

Step 5: Use the Calculated Field in the Map

- Drag the `Metric Value` field to the **Color** shelf on the Marks card.
- This will now dynamically color the map based on the parameter selection.

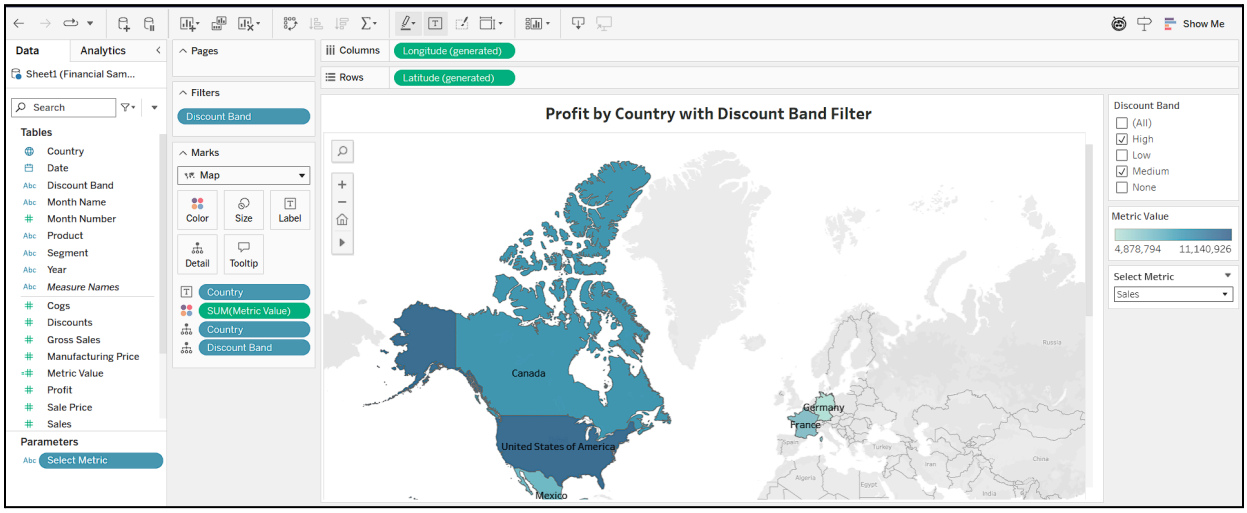
Step 6: Show Parameter Control

- Right-click the parameter `Select Metric` in the Data pane → Select **Show Parameter**
  You'll now see a drop-down to toggle between "Profit" and "Sales".

Step 7: (Optional) Add Filters

- Drag `Segment` or `Discount Band` to the **Filters shelf**.
- Right-click → Select **Show Filter** for interactivity.

Output:



Question 8 : Create a **dashboard** that includes:

- 🔗 **Dataset Link:** Global_sales_Dataset
- KPI tiles for **Total Sales**, **Total Profit**, and **Total Units Sold**
- A line chart for **Profit trend over time**
- Filters for **Product** and **Country**

Ensure your dashboard is **interactive and visually appealing**.

Answer :

Step 1: Open Tableau and Connect to the Dataset

- Launch **Tableau Desktop or Tableau Public**
- Connect to `Financial Sample.xlsx`
- Load the `Financials` sheet

Step 2: Create the KPI Tiles

Create **three separate worksheets** for each KPI:

Worksheet 1 – Total Sales (KPI Tile)

- Double-click `Sales` → This will create a SUM(Sales) metric
- Format the number as currency
- Remove unnecessary axis and titles
- Rename the sheet to **Total Sales**

Worksheet 2 – Total Profit (KPI Tile)

- Double-click `Profit` → This creates SUM(Profit)
- Format as currency
- Remove axes and title
- Rename the sheet to **Total Profit**

Worksheet 3 – Total Units Sold (KPI Tile)

- Double-click `Units Sold`
- Clean up formatting and labels
- Rename to **Total Units Sold**

Step 3: Create Profit Trend Line Chart

- Create a new worksheet named **Profit Trend**
- Drag `Date` to **Columns**
  - Right-click → Select **Month**
- Drag `Profit` to **Rows**
- This gives you a **monthly line chart** of Profit
- Format chart with labels and a title

Step 4: Add Filters for Product and Country

- In any worksheet (e.g., Profit Trend):
  - Drag `Product` and `Country` to the **Filters shelf**
  - Right-click each field → Select **Show Filter**

Now these filters will be available when building the dashboard.

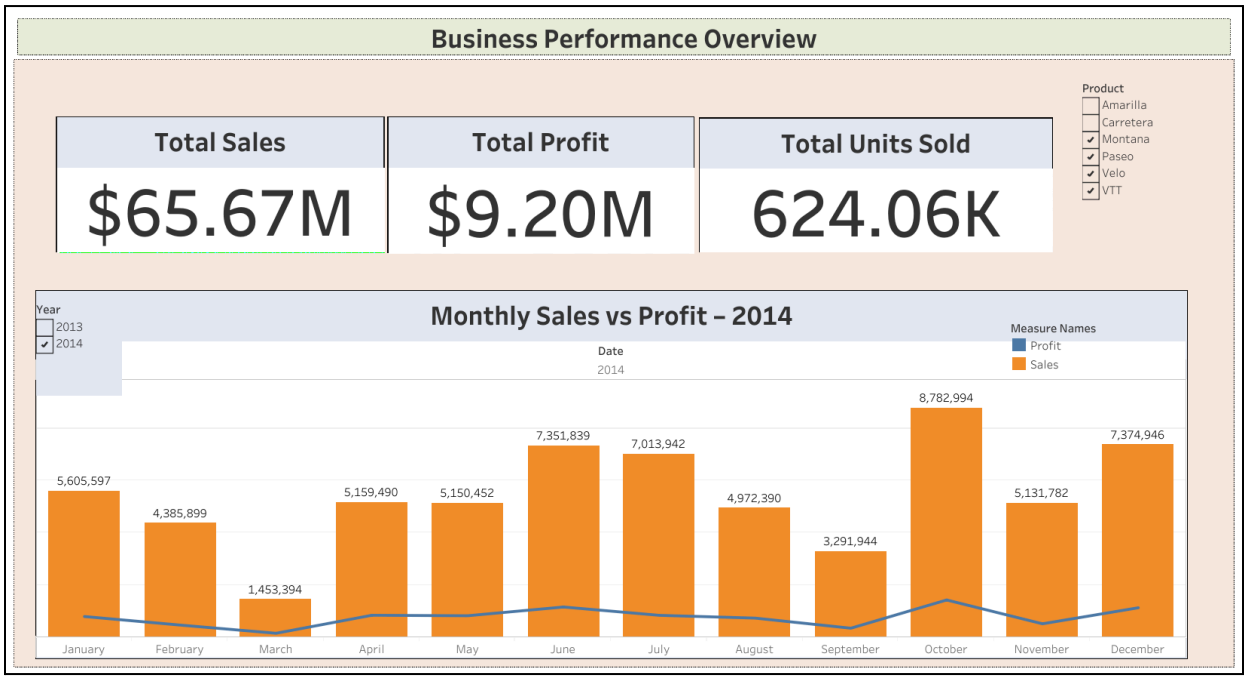
Step 5: Create the Dashboard

- Click **New Dashboard** at the bottom
- Set dashboard size (e.g., 1200 x 800)
- Drag and arrange:
  - **Total Sales**
  - **Total Profit**
  - **Total Units Sold**
  - **Profit Trend**
- Place **filters (Product and Country)** on the right or top

Step 6: Format for Visual Appeal

- Use containers to align KPIs at the top
- Adjust background colors or borders
- Add a **dashboard title**, e.g., *"Business Performance Overview"*
- Ensure filters are set to apply to **All Worksheets** (use drop-down on filter → Apply to All)

Output:



Question 9 : Your goal is to identify products that generate low profit despite high sales volume.

- 🔗 **Dataset Link:** Global_sales_Dataset
- **Use scatter plot or highlight table to identify such products.**
- **Add filters for Country and Segment.**
- **Write two business insights based on your chart.**

Answer :

Step 1: Open Tableau and Connect to the Dataset

- Launch **Tableau Desktop** or **Tableau Public**
- Connect to the `Financial Sample.xlsx` file
- Drag the `Financials` sheet into the canvas
- Click **Sheet 1** to begin your visualization

Step 2: Create a Scatter Plot of Sales vs. Profit

This will help you identify products that have **high sales** but **low or negative profit**.

- Drag `Sales` to the **Columns shelf**
- Drag `Profit` to the **Rows shelf**
- Drag `Product` to the **Detail** shelf in the **Marks card**
- Set **Marks type** to **Circle**
- Drag `Product` also to **Label** to display product names
- Optionally, drag `Country` and `Segment` to **Filters** shelf for additional breakdown

Step 3: Identify Key Patterns

- Look at the **bottom-right quadrant** of the chart:
  - These are products with **high sales but low (or even negative) profit**
- You can add **reference lines**:
  - Right-click on the axes → Add reference line for **average Sales** and **average Profit** to divide the view into four quadrants

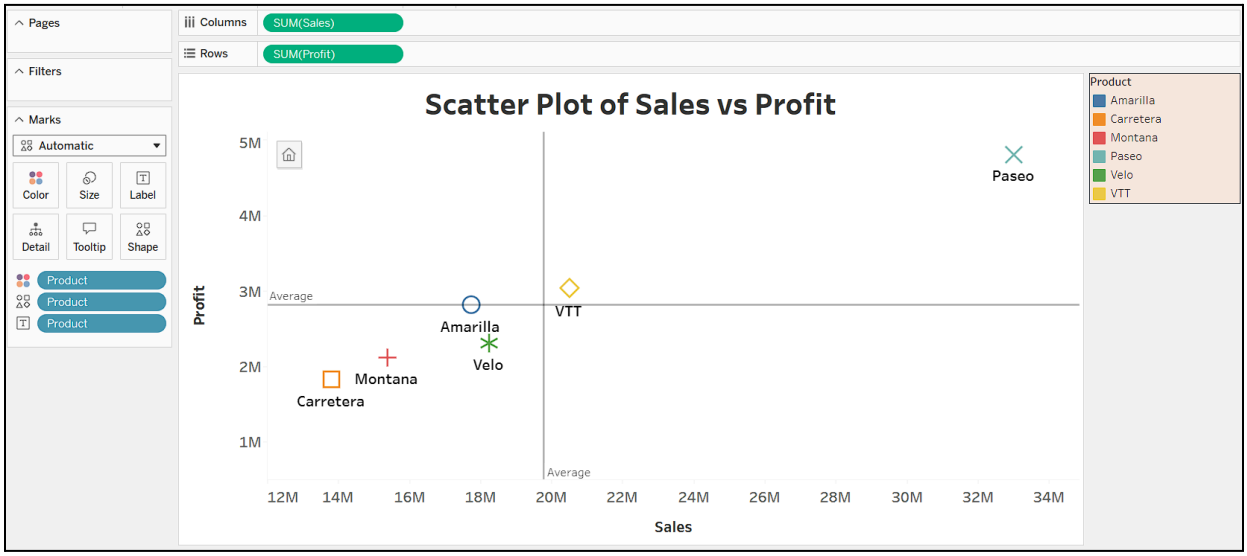
Step 4: Customize the View

- Adjust the size of the dots using the **Size** shelf
- Color-code the products by **Profit level** using the **Color** shelf:
  - Use a diverging color scheme (e.g., red for low profit, green for high profit)
- Use tooltips to display:
  - Product Name
  - Sales
  - Profit

Step 5: Add Filters (Optional but Recommended)

- Drag `Country` and `Segment` to the **Filters shelf** and also **Show Filter** for both
- This allows interactive filtering of the view to analyze profitability by region or customer segment

Output:



Business Insights:

- The product Carretera shows low profit despite having moderately high sales, which places it in the bottom-right quadrant of concern. This indicates potential issues such as high discounting, high cost of goods, or inefficient pricing.
- In contrast, Paseo stands out with both high sales and high profit, making it a strong performer.
- It is recommended that management re-evaluate the pricing and cost structure of Carretera to improve profitability, while also exploring ways to replicate the success model of Paseo across other products.

Question 10 :

[Scenario-Based – Customer Behavior & Retention Strategy]

Dataset to Use: online_retail_II

Dataset Name: *Online Retail II*
Dataset Source: UCI Machine Learning Repository – Online Retail II Dataset

Business Scenario:

You are a **Data Analyst at an e-commerce company** that sells home decor and gifts across multiple countries. The leadership team is concerned about **customer churn** and **revenue loss** due to inconsistent customer behavior.

They've asked you to investigate patterns in **customer orders**, **returns**, and **geographic sales performance** from the *Online Retail II* dataset.

Your Task in Tableau:

1. **Use Tableau to answer these questions:**
    - Which countries have the **highest number of repeat customers**?
    - What is the **return rate** by product and Find top 10 countries?
    - What time of year do customers tend to buy the most (Seasonality)?
    - Are there certain customers with **high order value** but also **high return rates**?
2. **Create visualizations:**
    - A map showing **Revenue by Country**
    - A line chart of **Monthly Sales Trend**
    - A bar chart showing **Top 10 customers by Total Revenue**
    - A table/heatmap showing **Top returned products by country**
3. **Build a dashboard for business insights:**
    - Allow filters for **Country**, **Product**, and **Customer ID**
    - Use KPIs for:

- Total Revenue
- Total Returns
- Repeat Customer Count

4. **Write a short business insight (2–3 sentences):**
   Based on your Tableau dashboard, what recommendations would you make to help reduce churn and increase customer loyalty?

Answer:

DATA PREPARATION STEPS

Step 1: Clean and Prepare the Data

1. Connect to `online_retail_II.xlsx` → Sheet: `Year 2010-2011`
2. Filter out:
   - Rows with **null values in Customer ID**
   - Rows where **Quantity <= 0** or **UnitPrice <= 0**
3. Create a **calculated field for Revenue**:

```
[Revenue] = [Quantity] * [UnitPrice]
```

PART 1: Answer the Analysis Questions

1) Which countries have the highest number of repeat customers?

Steps:

1. Drag `Customer ID` and `Country` to **Rows**
2. Right-click `Customer ID` → **Measure** → **Count (Distinct)**
3. Sort or filter to show customers who made **more than 1 purchase**

2) What is the return rate by product and country?

Steps:

1. Identify returns: use rows where `Invoice` starts with **"C"** (indicates a credit note)

   Create a calculated field:

   ```
   Is_Return = IF STARTSWITH([Invoice], "C") THEN 1 ELSE 0 END
   ```

2. Create a view with:

   - `Country` and `Description` in Rows
   - `Number of Returns` (SUM of `Is_Return`) and `Total Orders` (Count of Invoices)

   Calculate return rate:

   ```
   Return Rate = SUM([Is_Return]) / COUNTD([Invoice])
   ```

3. Display result as a **heatmap** or **text table**

3) What time of year do customers tend to buy the most (Seasonality)?

Steps:

1. Drag `InvoiceDate` to **Columns**
   - Right-click → Set as **Month**
2. Create Calculated Field Revenue = [Quantity] * [Price]
   - Drag `Revenue` to **Rows**
3. Create a **line chart** to show monthly trend
4. Optional: Add year as color or filter if needed

4) Are there certain customers with high order value but also high return rates?

Steps:

1. Use Customer ID as dimension
2. Create calculated fields:
   - `Total Revenue`
   - `Number of Returns`
   - `Return Rate = SUM(Is_Return) / COUNTD(Invoice)`
3. Plot a **scatter plot**:

PART 2: Create Visualizations

1. **A map showing Revenue by Country**
   a. Drag `Country` to the view
   b. Use **Filled Map** (Show Me)
   c. Drag `Revenue` to **Color**
   d. Add tooltip and label
   e. Format: color scale, add title

2. **A line chart of Monthly Sales Trend**
   a. Drag `InvoiceDate` → Columns → Set to **Month**
   b. Drag `Revenue` → Rows
   c. Format with data points and labels
   d. Title: **Monthly Revenue Trend**

3. **A bar chart showing Top 10 customers by Total Revenue**
   a. Drag `Customer ID` to Rows
   b. Drag `Revenue` to Columns
   c. Sort descending
   d. Filter → Top 10 by Revenue
   e. Format: add labels and chart title

4. **A table/heatmap showing Top Returned Products by Country**
   a. Use `Country` and `Description` in Rows/Columns
   b. Use `SUM(Is_Return)` as the measure
   c. Set **Marks type: Square** (heatmap)
   d. Optional: use filters for focus

PART 3: Build the Dashboard

Dashboard Setup

1. Click on **New Dashboard**
2. Set dashboard size: e.g., 1200 × 900 px
3. Drag and arrange the following:
    - **Map** (Revenue by Country)
    - **Line Chart** (Monthly Sales)
    - **Bar Chart** (Top 10 Customers)
    - **Heatmap** (Returned Products by Country)

Add Filters for Interactivity

- Drag **Country**, **Product Description**, and **Customer ID** to **Filters** in relevant sheets
- Right-click → **Show Filter**
- Set filters to apply to **All Using This Data Source**

Add KPIs at the Top of the Dashboard

Create individual KPI sheets:

- **Total Revenue**
  - Double-click `Revenue`
  - Format as Currency
  - Title: "Total Revenue"

- **Total Returns**
  - Double-click `Is_Return`
  - Use SUM
  - Title: "Total Returns"

- **Repeat Customer Count**
  Create a calculated field:

  ```
  IF { FIXED [Customer ID] : COUNTD([Invoice]) } > 1 THEN 1 ELSE 0 END
  ```

  - Sum this field to get count of repeat customers
  Add all three KPIs to the top of the dashboard using containers.

PART 4: Write a Business Insight

Example Insight to Include:

> The dashboard reveals that **UK, Germany, and the Netherlands** are our most profitable markets. However, certain products such as *"WHITE METAL LANTERN"* show high return rates in multiple countries.
>
> It is recommended to **analyze product quality and shipping practices**, and provide **targeted loyalty programs** to top customers with high returns but large purchase volumes, to reduce churn and enhance long-term value.