

Introduction to Power BI, Charts, DAX & Creating Reports | Assignment

THEORY QUESTIONS

Question 1 : Define Power BI and What are the key components of the Power BI ecosystem? Briefly explain:

- **Power BI Desktop**
- **Power BI Service**
- **Power BI Mobile**
- **Power BI Gateway**

Answer :

Power BI is a business intelligence and data visualization tool developed by Microsoft. It allows users to connect to various data sources, clean and transform data, build data models, create interactive reports and dashboards, and share insights across an organization. Power BI helps in making data-driven decisions by converting raw data into meaningful insights.

Key Components of the Power BI Ecosystem

1. Power BI Desktop

- A Windows application used for creating reports.
- It includes:
 - Power Query for data cleaning and transformation
 - Data Modeling to build relationships and create DAX measures
 - Report View to design visuals and dashboards
- Used mainly by analysts to build, design, and publish reports.

2. Power BI Service (Cloud platform)

- A web-based platform (app.powerbi.com).
- Used for:
 - Publishing reports created on Power BI Desktop
 - Sharing dashboards with teams
 - Scheduling automatic data refresh
 - Creating dashboards by pinning visuals
- Enables collaboration, sharing, and real-time access to reports.

3. Power BI Mobile

- A mobile application available for Android and iOS.
- Allows users to:
 - View dashboards and reports on their mobile devices
 - Receive real-time alerts and notifications
 - Access insights anywhere with mobile-friendly layouts

4. Power BI Gateway

- A bridge that connects on-premises data sources (SQL Server, folders, Excel files, local databases) with the Power BI Service.
- It allows secure scheduled data refresh.
- Two modes:
 - Personal Gateway → Used by individual users
 - Enterprise Gateway → For organizational data connections and multi-user access

Question 2 : Compare the following Power BI visuals:

- **Pie Chart vs Donut Chart**
- **Bar Chart vs Column Chart**

When would you prefer one over the other? Give one example for each pair.

Answer :

Pie Chart vs Donut Chart

Pie Chart

- Displays data as slices of a circle.
- Best for showing parts of a whole when categories are limited (3–5 categories).
- Simple and easy to interpret.

Donut Chart

- Similar to a pie chart but has a hole in the center.
- Allows placing additional information or KPIs in the center.
- Visually cleaner and better for dashboards.

When to prefer which?

- **Pie Chart Example:** Showing the market share of 4 companies.
- **Donut Chart Example:** Showing Sales % by Region with Total Sales displayed at the center.

Bar Chart vs Column Chart

Bar Chart

- Displays horizontal bars.
- Better when category names are long or when comparing many categories.
- Easier to read for large categorical data.

Column Chart

- Displays vertical bars.
- Best for time-based data (Month, Year) or when analyzing trends.

When to prefer which?

- **Bar Chart Example:** Sales by Sub-Category (because names are long: "Tables & Chairs", "Office Supplies").
- **Column Chart Example:** Monthly Sales Trend (months on X-axis and sales values on Y-axis).

Question 3 : Explain the significance of:

- **Star schema vs Snowflake schema**
- **Primary key vs Foreign key in relationships (Power BI)**
Why is cardinality important?

Answer :

Star Schema vs Snowflake Schema

Star Schema

- Consists of one central Fact table connected to multiple Dimension tables.
- Very simple, clean, and optimized for reporting.

- Best for Power BI because it gives fast performance, easy relationships, and accurate measures.
- Example:
Fact Table → Sales
Dimension Tables → Customers, Products, Region, Date

Snowflake Schema

- More normalized version of star schema.
- Dimension tables are split into multiple related tables.
- More complex and slower for BI engines because of multiple joins.
- Example:
Product Dimension split into: Product → Sub-Category → Category tables.

Primary Key vs Foreign Key in Relationships

Primary Key

- Unique identifier for each row in a table.
- Exists on the Dimension side.
- Example: `Customer[CustomerID]` uniquely identifies each customer.

Foreign Key

- Column in another table that references the primary key.
- Exists on the Fact side.
- Example: `Orders[CustomerID]` → links to `Customer[CustomerID]`.

Power BI uses these relationships to filter and aggregate data correctly.

Why is Cardinality Important?

Cardinality defines how tables relate to each other:

- **1:1** → one record matches one record
- **1:Many (1:*)** → one dimension row links to many fact rows
- **Many-to-Many (:)** → complex, often problematic

Importance:

- Ensures correct data filtering between visuals.
- Prevents wrong totals, duplicate results, and incorrect DAX calculations.
- Helps Power BI optimize performance.

Correct cardinality = correct insights.

Question 4 : Differentiate between:

- **Calculated column vs Measure**

Also, define Row context and Filter context with simple examples.

Answer :

Calculated Column vs Measure

1. Calculated Column

- Calculated row-by-row during data refresh.
- The result is stored in the dataset.
- Used when you need a value per row (e.g., for slicing, grouping, relationships).

Example:

```
SalesAmount = Orders[Quantity] * Orders[UnitPrice]
```

Here, every row gets its own SalesAmount value.

2. Measure

- Calculated dynamically based on filters in visuals and slicers.
- Not stored computed on the fly.
- Used for aggregations like SUM, AVG, YoY%, ratios, etc.

Example:

```
Total Sales = SUM(Orders[SalesAmount])
```

This changes depending on the category, region, or date selected.

Row Context & Filter Context

Row Context

- Means Power BI evaluates the expression for each row individually.
- Exists in calculated columns or when using iterators like SUMX.

Example of Row Context:

```
LineTotal = Orders[Quantity] * Orders[UnitPrice]
```

Each row calculates its own LineTotal.

Filter Context

- Means Power BI applies filters from visuals, slicers, or DAX functions before calculating the result.
- Measures always work in filter context.

Example of Filter Context:

```
Sales West = CALCULATE([Total Sales], Orders[Region] = "West")
```

This calculates Total Sales only for the West region.

Question 5: What is the difference between a report and a dashboard in Power BI?

Answer:

Power BI Report

- A report is a multi-page interactive document.
- Created in Power BI Desktop or Power BI Service.
- Contains multiple visuals such as charts, KPIs, tables, maps, etc.
- Supports drill-down, drill-through, slicers, filters, and bookmarks.
- Designed mainly for analysis and detailed exploration.

Example:

A report with 3 pages Sales Overview, Profit Analysis, Customer Insights.

Power BI Dashboard

- A single page canvas created only in Power BI Service.
- Consists of pinned tiles from one or more reports.
- Used for high-level monitoring (KPIs, summary metrics).

- Less interactive than reports no drill-through or page navigation.
- Used mainly by managers for quick decision-making.

Example:

A dashboard showing total sales, profit, top regions, and alerts on one page.

Key Differences Table

| Feature | Report | Dashboard |
|----------------|----------------------------|---|
| Pages | Multiple | Single page |
| Created in | Desktop + Service | Only in Service |
| Visual Sources | From one dataset | Can include tiles from multiple reports |
| Interactivity | High (drill-down, slicers) | Limited |
| Purpose | Detailed analysis | High-level monitoring |

PRACTICAL QUESTIONS

Question 6 : Using the Sample Superstore dataset:

- Create a **Clustered Bar Chart** to display **Total Sales by Sub-Category**
- Create a **Donut Chart** for **Sales % by Region**
Provide screenshots of both visuals.

Answer:

Steps: A) Create a Clustered Bar Chart to Display Total Sales by Sub-Category

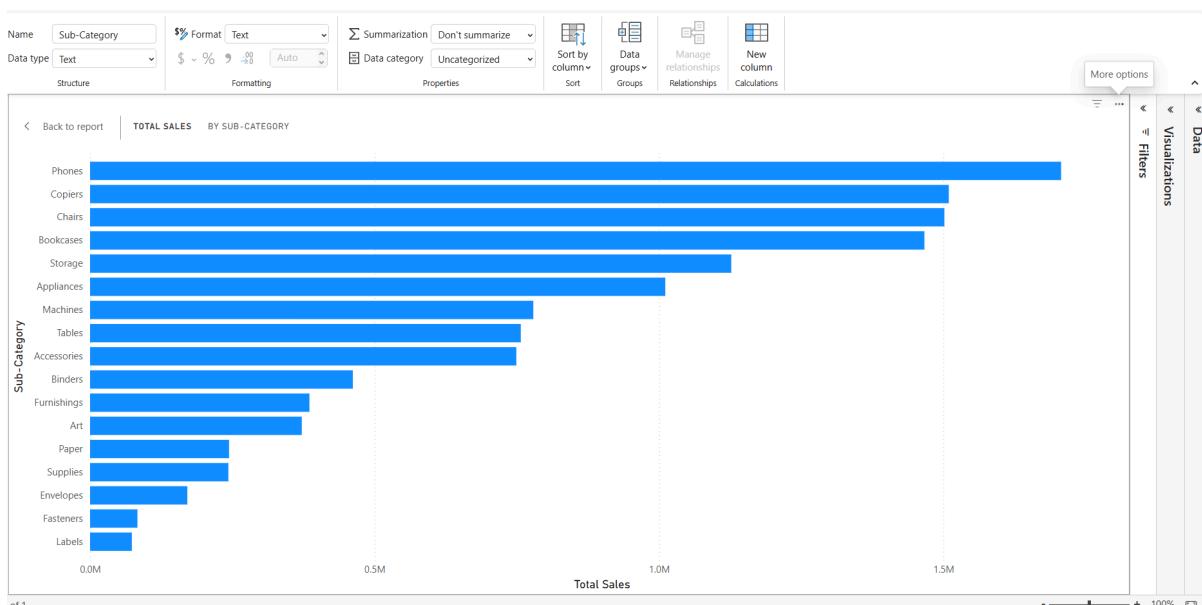
Step 1: Create the Measure for Total Sales

In Power BI Desktop then Modeling then New Measure:

```
Total Sales = SUM(Global_Superstore2[Sales])
```

Step 2: Build the Clustered Bar Chart

1. Go to Report View.
2. Insert a Clustered Bar Chart visual.
3. Drag the following fields:
 - o Axis → Sub-Category
 - o Values → Total Sales
4. Click the 3 dots then Sort by Total Sales then Descending.
5. Go to Format then Turn on Data Labels.



Using the Global Superstore2 dataset, a Clustered Bar Chart was created to visualize Total Sales by Sub-Category.

The chart helps identify top-performing sub-categories such as Phones and Copiers, while highlighting low-performing categories like Labels and Fasteners.

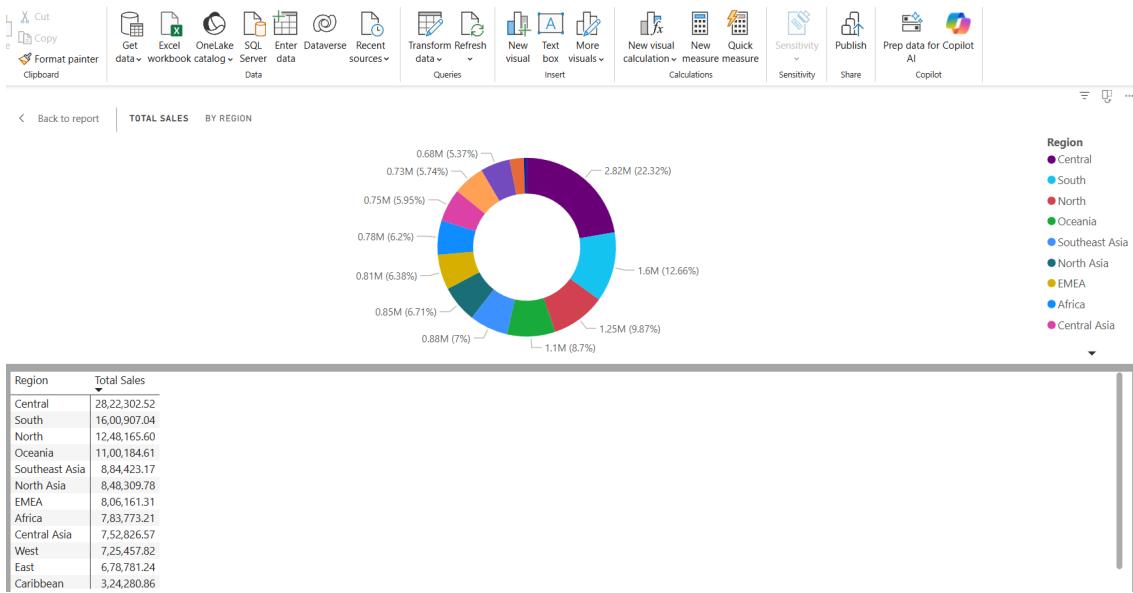
This visualization makes it easier to compare sales performance across different product sub-categories.

B) Create a Donut Chart for Sales % by Region

Step 1: Use the Same Total Sales Measure

Step 2: Build the Donut Chart

1. Insert a **Donut Chart** visual.
2. Add fields:
 - o **Legend → Region**
 - o **Values → Total Sales**
3. Go to Format → **Detail Labels** → Turn ON
4. Change **Label Style → Percentage**
5. Add chart title: “Sales Percentage by Region”.



A Donut Chart was created using the Global Superstore2 dataset to represent the percentage contribution of Total Sales by Region.

The chart shows that the Central region contributes the highest share of total sales, followed by South and North regions.

This visualization helps in understanding regional sales distribution and identifying high-performing regions.

Question 7:

Write and apply the following measures:

• **Total Profit = SUM([Profit])**

• **Average Discount = AVERAGE([Discount])**

Display both in a KPI Card, and use a Line Chart to show profit trend over months.

Add visuals and DAX formulas.

Answer:

Steps:

Step 1: Create the Total Profit Measure

1. Open **Power BI Desktop**.
2. Go to the **Modeling** tab.
3. Click on **New Measure**

Enter the following DAX formula:

```
Total Profit = SUM(Global_Superstore2[Profit])
```

4. Press **Enter** to save the measure.

Step 2: Create the Average Discount Measure

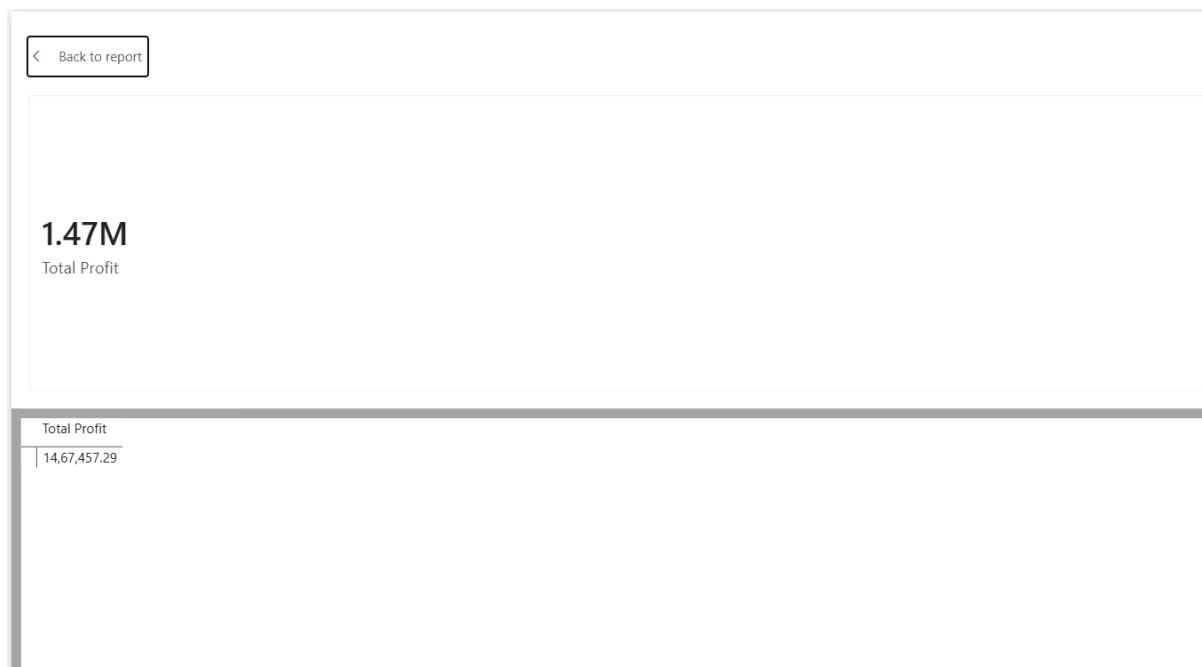
1. In the **Modeling** tab, click **New Measure** again.
2. Enter the following DAX formula:

```
Average Discount = AVERAGE(Global_Superstore2[Discount])
```

3. Press **Enter**.

Step 3: Display Total Profit in a KPI Card

1. Go to the **Report View**.
2. Click on a blank area of the report canvas.
3. From the **Visualizations** pane, select the **Card** visual.
4. Drag the **Total Profit** measure into the card.
5. Resize and format the card as required.



Step 4: Display Average Discount in a KPI Card

1. Click on a blank area of the report canvas.
2. Insert another **Card** visual.
3. Drag the **Average Discount** measure into the card.
4. Format the card (percentage format if required).



Step 5: Create a Line Chart for Profit Trend Over Months

1. Click on a blank area of the report canvas.
2. From the **Visualizations** pane, select the **Line Chart**.
3. Drag **Order Date** to the **X-axis**.
4. From the date hierarchy, select **Month**.
5. Drag **Total Profit** to the **Y-axis**.
6. Format the chart and add a title such as "*Total Profit by Month*".



Outcome

- Total Profit and Average Discount were calculated using DAX measures.
- KPI Cards provide a quick overview of business performance.
- The Line Chart shows monthly profit trends and helps identify seasonal patterns.

Question 8: Implement a DAX measure that calculates the percentage of total sales by product category.

| Product Category | Sales Amount |
|------------------|--------------|
| Electronics | 5000 |
| Clothing | 3000 |
| Home Appliances | 7000 |
| Books | 2000 |
| Tables & Chairs | 8000 |
| Toy | 1500 |

| Product Category | Sales Amount |
|------------------|--------------|
| Electronics | 5000 |
| Sports Equipment | 1200 |
| Office Supplies | 1000 |
| Beauty Products | 4400 |
| Garden Supplies | 1000 |
| Jewelry | 1800 |
| Automotive | 2600 |

Answer:

Steps:

Step 1: Create Total Sales Measure

1. Open **Power BI Desktop**.
2. Go to the **Modeling** tab.
3. Click on **New Measure**.
4. Enter the following DAX formula:

```
Total Sales = SUM(ProductTable[Sales_Amount])
```

5. Press **Enter**.

This measure calculates the total sales across all product categories.

Step 2: Create Percentage of Total Sales Measure

1. In the **Modeling** tab, click **New Measure** again.
2. Enter the following DAX formula:

```
Sales % of Total =
```

```
DIVIDE(
```

```
[Total Sales],
```

```

CALCULATE(
    [Total Sales],
    ALL(Global_Superstore2[Category])
)

```

3. Press **Enter**.
4. Format the measure as **Percentage**.

Explanation of the DAX Logic

- `SUM(Sales_Amount)` calculates sales per category.
- `ALL(Product_category)` removes category-level filters.
- `DIVIDE()` safely calculates the percentage.
- The result shows how much each product category contributes to total sales.

Calculated Percentage Results

| Product Category | Sales % of Total |
|------------------|------------------|
| Tables Chairs | 20.78% |
| Home Appliances | 18.18% |
| Electronics | 12.99% |
| Beauty Products | 11.43% |
| Clothing | 7.79% |

| | |
|------------------|-------|
| Automotive | 6.75% |
| Books | 5.19% |
| Jewelry | 4.68% |
| Toy | 3.90% |
| Sports Equipment | 3.12% |
| Office Supplies | 2.60% |
| Garden Supplies | 2.60% |

Conclusion

The DAX measure successfully calculates the percentage contribution of each product category to total sales. This helps identify top-performing categories and supports better business decision-making.

Question 9 :

- Create a DAX Measure for Total Profit
- Use it in a **Waterfall Chart** to analyze how different **Sub-Categories** contribute to overall profit
- Add a **Slicer** for **Region** to filter the visual

- Write brief business insights (4–5 lines) from the chart and provide **2–3 data-driven recommendations** to improve profit.

Provide a steps, screenshot of the Waterfall chart and the DAX formula

Answer:

Steps:

Step 1: Create a DAX Measure for Total Profit

DAX Formula:

```
Total Profit = SUM(Global_Superstore2[Profit])
```

Steps:

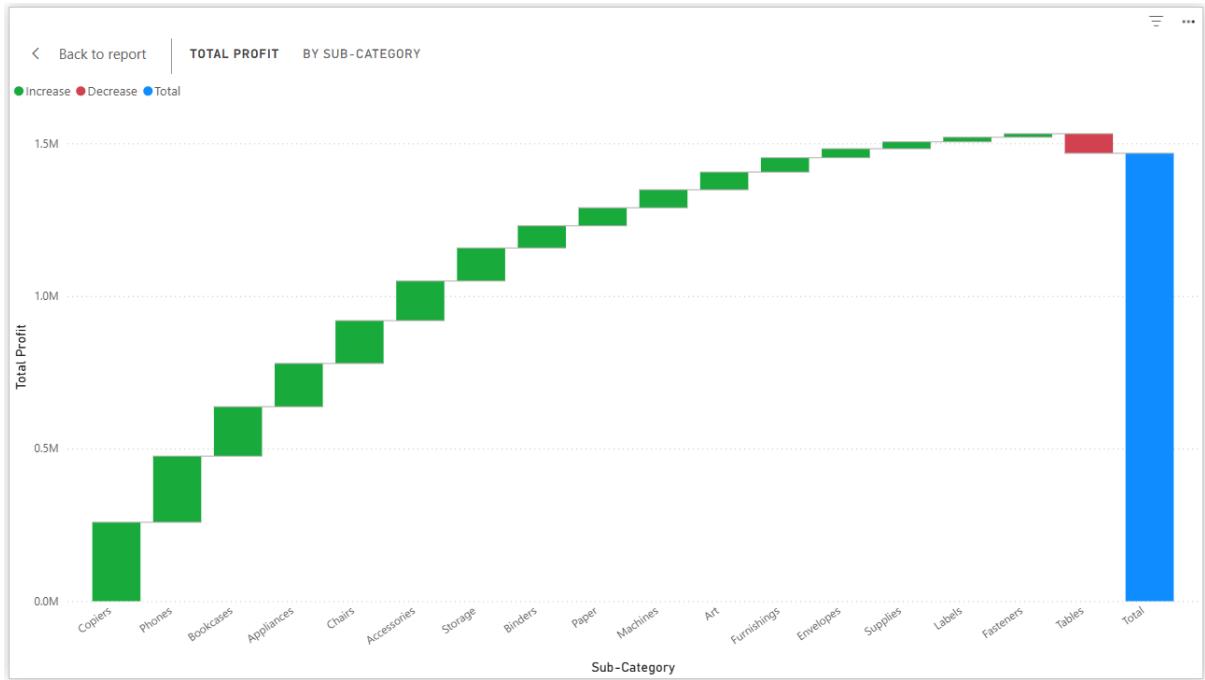
1. Open **Power BI Desktop**.
2. Go to the **Modeling** tab.
3. Click on **New Measure**.
4. Enter the above DAX formula.
5. Press **Enter** to save the measure.

Step 2: Create a Waterfall Chart to Analyze Profit by Sub-Category

Steps:

1. Go to **Report View**.
2. Click on a blank area of the canvas.
3. From the **Visualizations** pane, select **Waterfall Chart**.
4. Drag **Sub-Category** to the **Category** field.
5. Drag **Total Profit** to the **Y-axis (Values)** field.
6. Sort the chart if required for better readability.

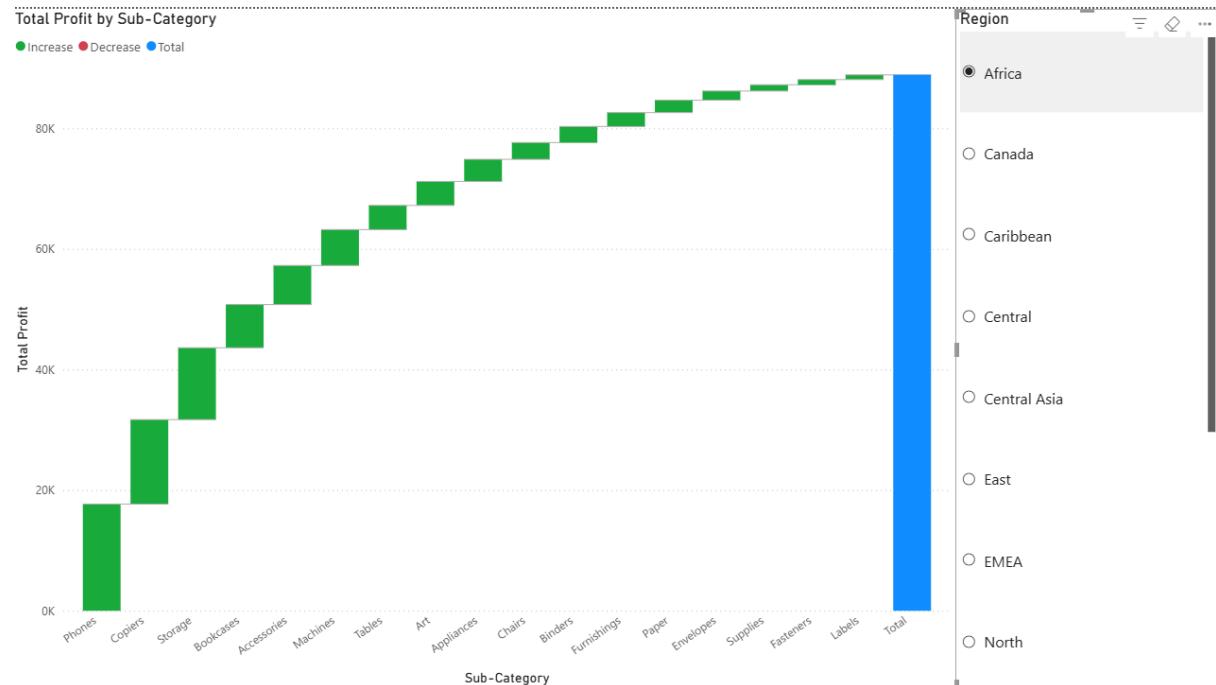
Total Profit by Sub-Category

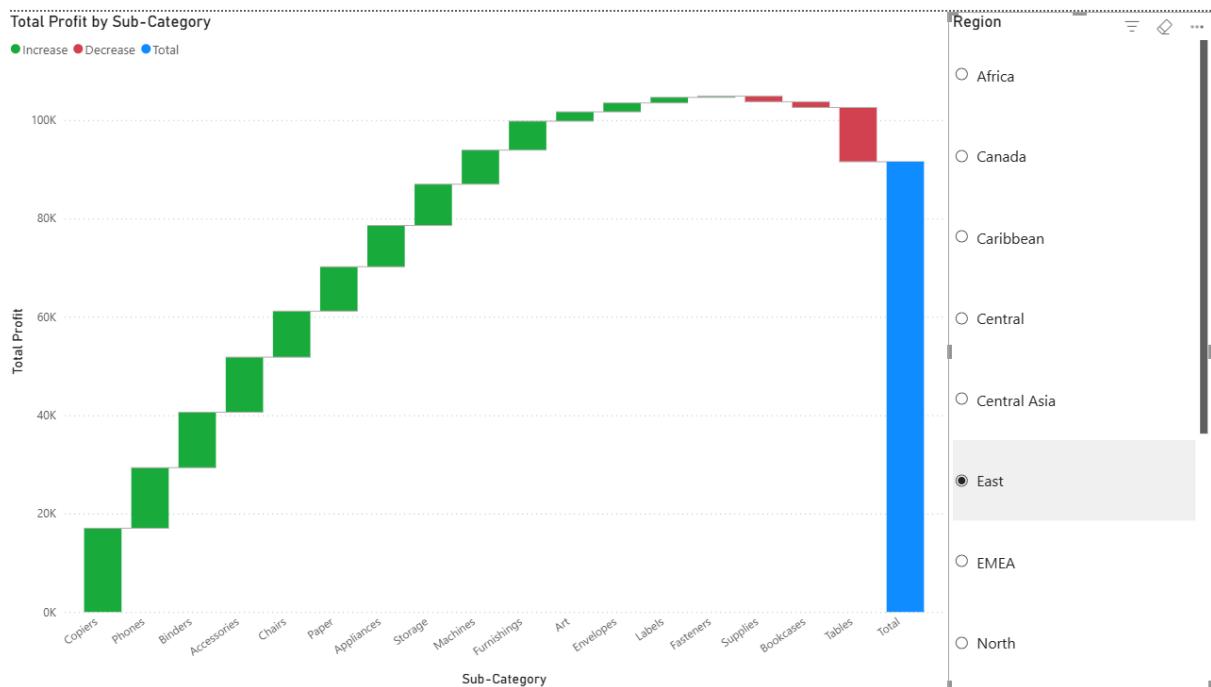


Step 3: Add a Region Slicer to Filter the Waterfall Chart

Steps:

1. Click on a blank area of the report canvas.
2. Select **Slicer** from the Visualizations pane.
3. Drag **Region** into the slicer field.
4. Place the slicer next to the Waterfall chart.
5. Select different regions to see how profit contribution changes.





Business Insights from the Waterfall Chart

1. Technology-related sub-categories such as Phones and Copiers contribute the highest positive profit.
2. Some sub-categories like Tables show a negative impact on overall profitability.
3. The majority of profit is driven by a small number of high-performing sub-categories.
4. Profit contribution varies significantly when filtered by different regions.
5. Loss-making sub-categories reduce the cumulative profit and require attention.

Data-Driven Recommendations to Improve Profit

1. Focus sales and marketing efforts on high-profit sub-categories to maximize revenue.
2. Review pricing and discount strategies for sub-categories showing negative profit.
3. Optimize regional strategies by promoting profitable products in low-performing regions.

Summary

- A DAX measure was created to calculate Total Profit.
- A Waterfall Chart was used to visualize profit contribution by Sub-Category.
- A Region slicer was added to enable interactive filtering.
- Business insights and actionable recommendations were derived from the analysis.

Question 10 :

Scenario:

VitaTrack Wellness, a digital health company in FitZone, has collected data on users' daily habits and health vitals. The analytics team is tasked with drawing actionable insights from this data to **improve lifestyle suggestions and prevent heart-related risks**.

Your Task:

Using the provided dataset (includes Age, Gender, BMI, Steps, Calories, Sleep, Heart Rate, Blood Pressure, Smoking, Alcohol, Exercise, Diabetic & Heart Disease status):

Build a one-page Power BI dashboard that answers:

1. Are users maintaining a balanced lifestyle (Steps, Sleep, Calories)
2. What lifestyle patterns (Smoking, Alcohol, BMI, etc.) indicate heart disease risk?
3. Is there any visible relationship between Sleep and Physical Activity?
4. How does BMI vary across Age Groups and Genders?
5. What is the impact of smoking and alcohol on heart rate and blood pressure?
6. Segment people based on their health activity to suggest lifestyle changes

Answer:

Steps:

Dataset Used

Health_activity_data

(Fields: Age, Gender, BMI, Daily Steps, Calories Intake, Hours of Sleep, Heart Rate, Blood Pressure, Smoking, Alcohol Consumption, Exercise, Heart Disease, Diabetic)

Objective

To analyze users' lifestyle habits and health vitals to identify risk factors related to heart disease and provide actionable lifestyle recommendations.

Dashboard Overview

The dashboard consists of KPI Cards, Bar Charts, Scatter Plot, Stacked Bar Chart, and Tables to analyze lifestyle balance, health risks, and activity-based segmentation.

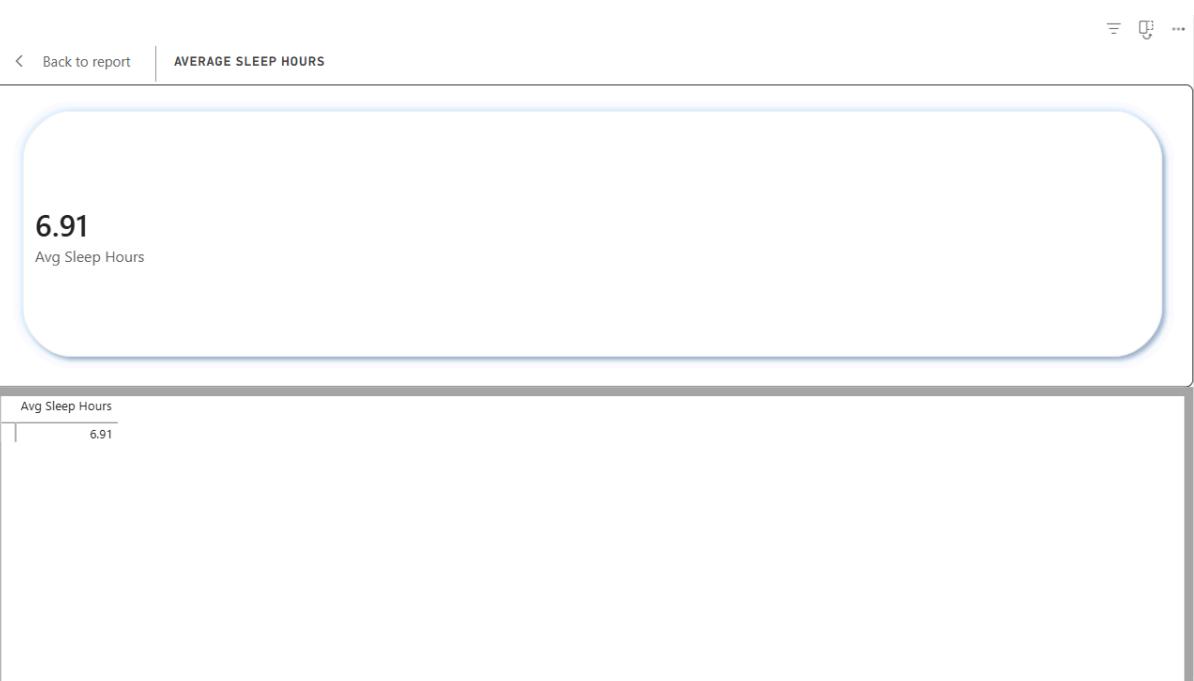
1. Are users maintaining a balanced lifestyle (Steps, Sleep, Calories)?

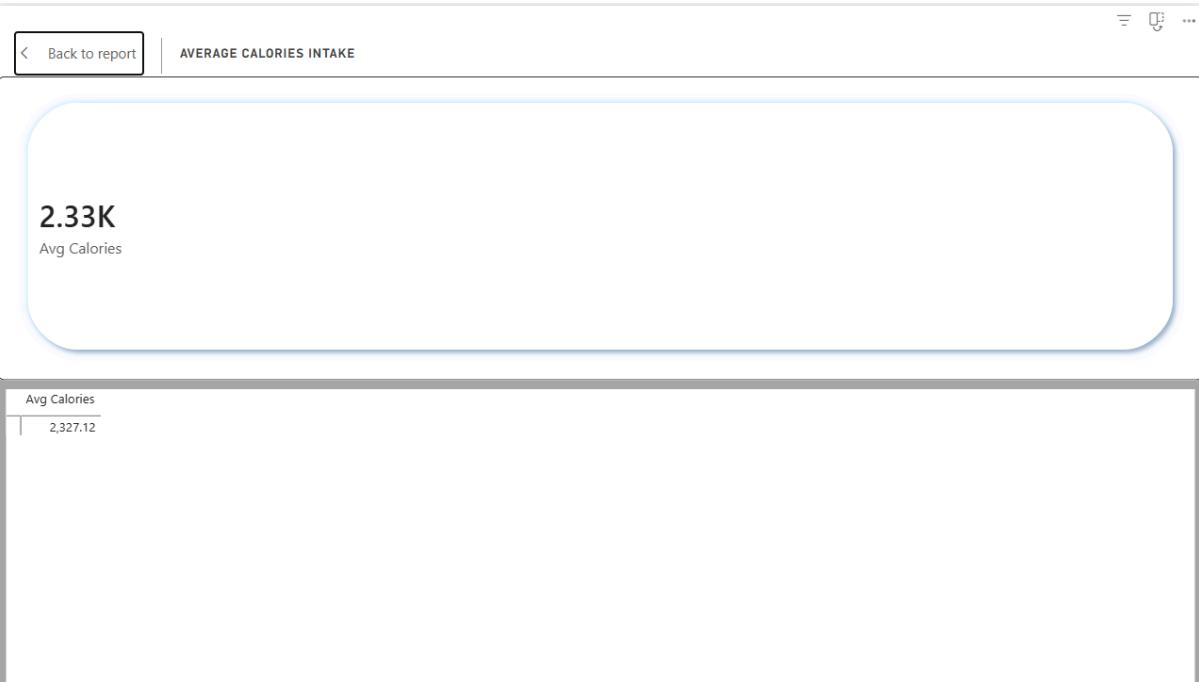
Visuals Used

- KPI Card – Average Daily Steps
- KPI Card – Average Sleep Hours
- KPI Card – Average Calories Intake

Insights

- **Average Daily Steps ≈ 10.7K**, indicating users are fairly active.
- **Average Sleep Hours ≈ 6.9 hours**, which is slightly below the recommended 7–8 hours.
- **Average Calories Intake ≈ 2.33K**, which is within a normal range.





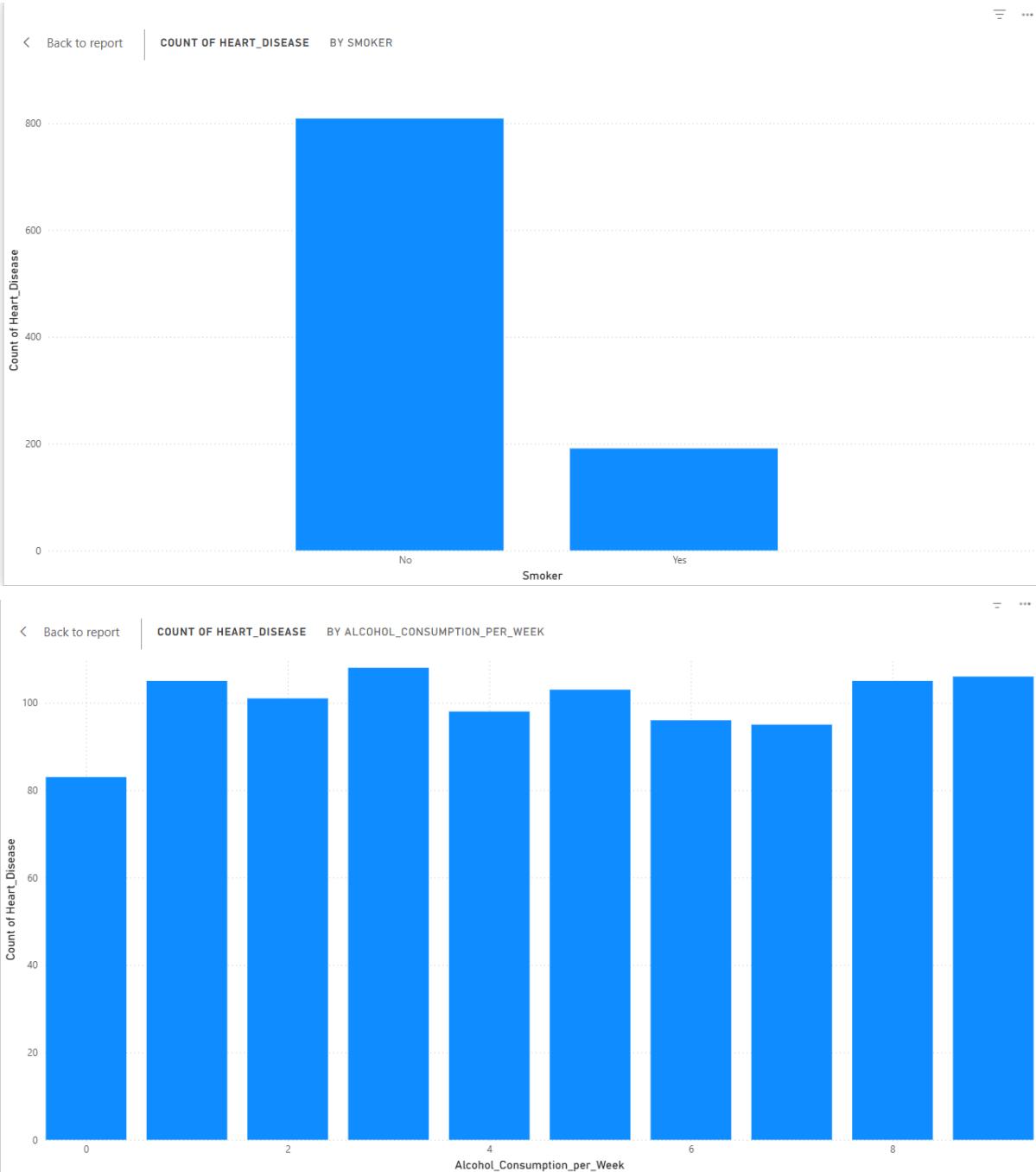
2. What lifestyle patterns indicate heart disease risk? (Smoking, Alcohol, BMI)

Visuals Used

- Bar Chart – Count of Heart Disease by Smoker
- Bar Chart – Count of Heart Disease by Alcohol Consumption per Week

Insights

- Smokers show a noticeably higher count of heart disease cases compared to non-smokers.
- Higher alcohol consumption levels are associated with increased heart disease counts.
- This indicates smoking and frequent alcohol intake are major contributors to heart disease risk.



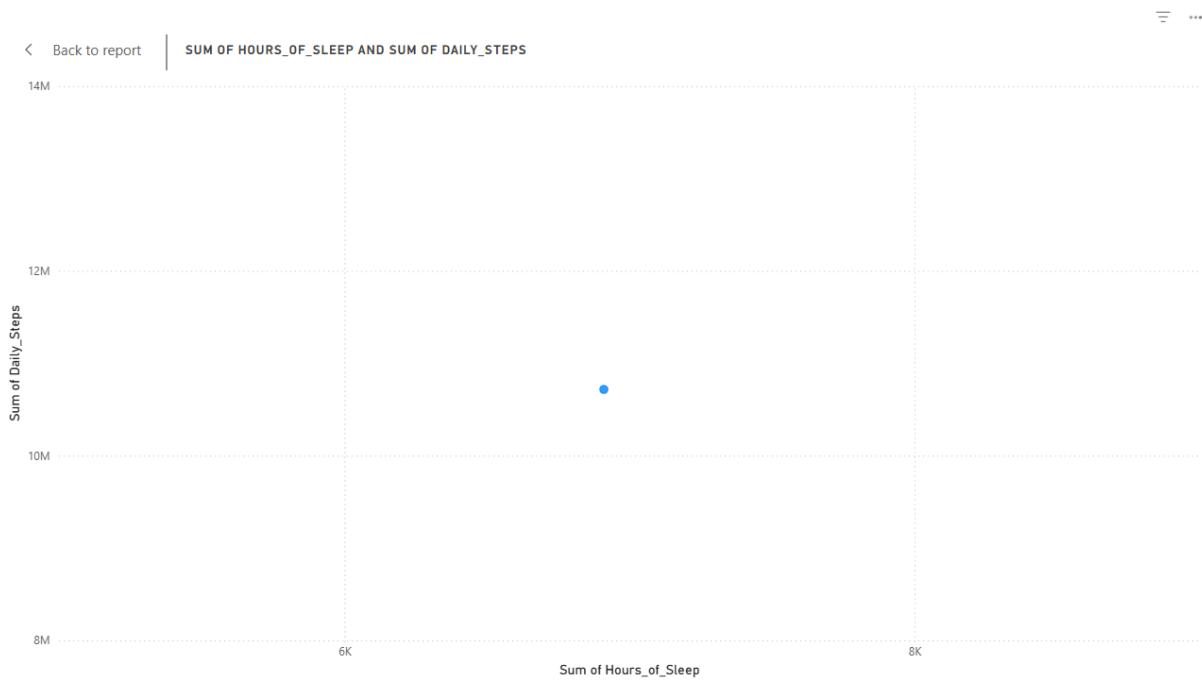
3. Is there a relationship between Sleep and Physical Activity?

Visual Used

- Scatter Plot
 - X-axis: Hours of Sleep
 - Y-axis: Daily Steps

Insights

- Users with higher sleep duration tend to have higher daily steps.
- Poor sleep is often associated with lower physical activity.
- This suggests a positive relationship between adequate sleep and physical activity levels.



4. How does BMI vary across Age Groups and Gender?

Preparation

Created a calculated column for Age Group:

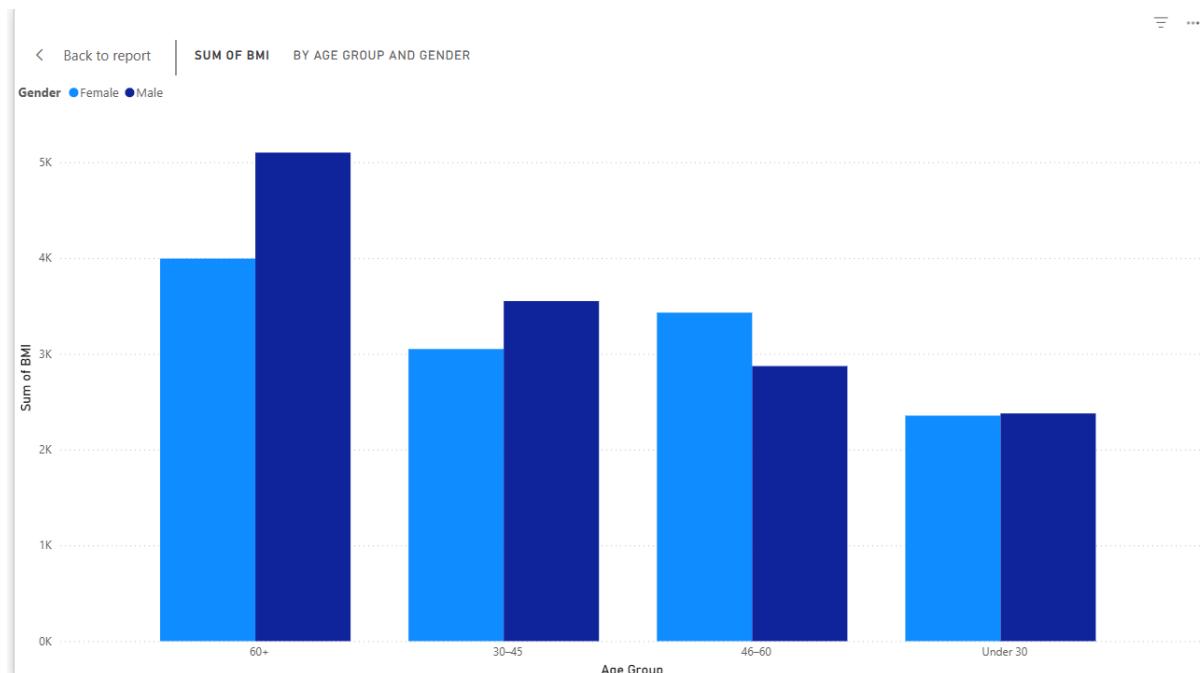
- Under 30
- 30–45
- 46–60
- 60+

Visual Used

- Clustered Column Chart
 - X-axis: Age Group
 - Y-axis: BMI
 - Legend: Gender

Insights

- BMI increases significantly in the 46–60 and 60+ age groups.
- Male users show slightly higher BMI values compared to females in older age groups.
- This highlights increased obesity risk with age, especially among males.



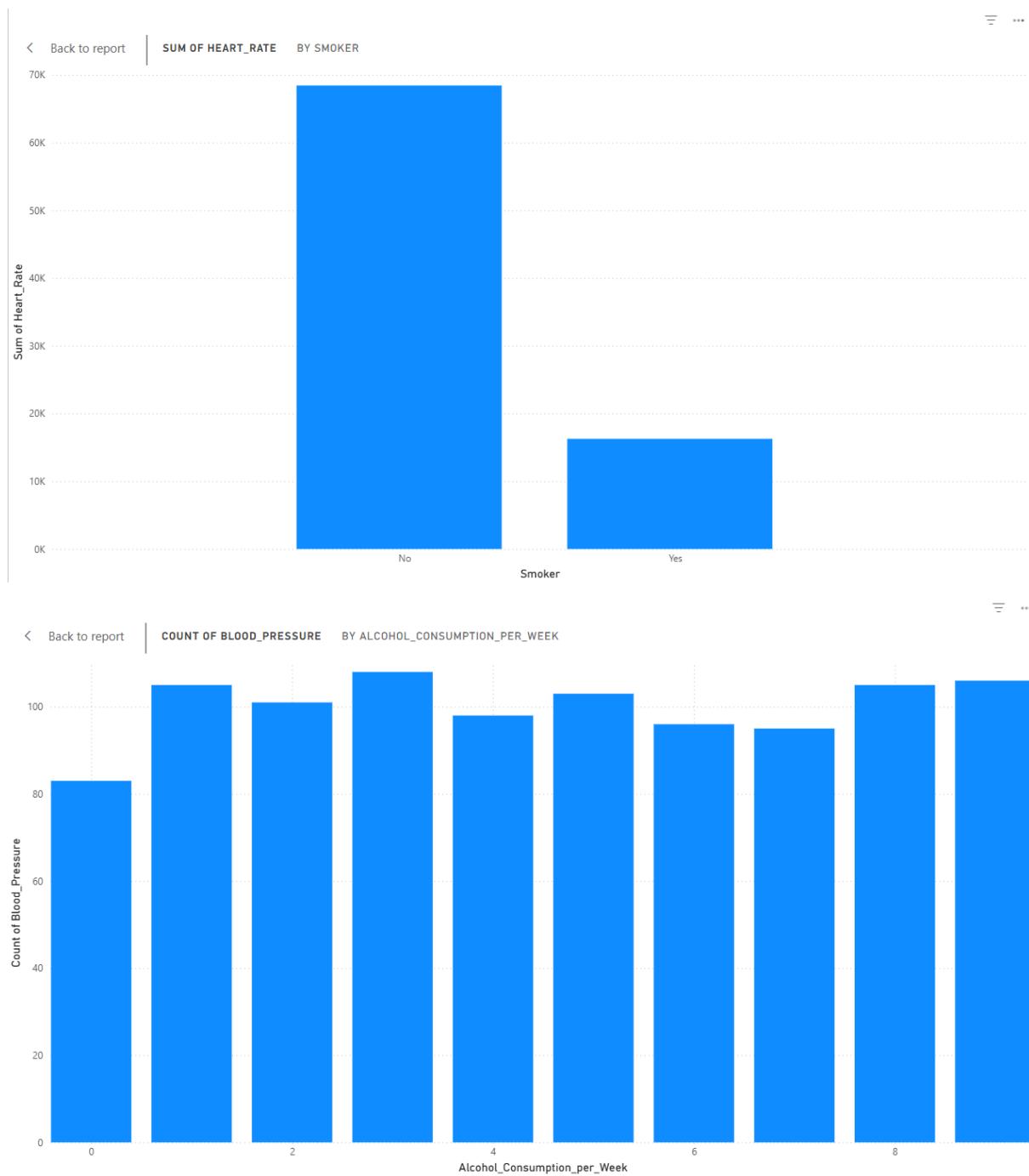
5. Impact of Smoking and Alcohol on Heart Rate and Blood Pressure

Visuals Used

- Bar Chart – Heart Rate by Smoker
- Bar Chart – Blood Pressure by Alcohol Consumption

Insights

- Smokers exhibit higher average heart rate compared to non-smokers.
- Increased alcohol consumption correlates with higher blood pressure levels.
- These patterns indicate elevated cardiovascular stress among smokers and heavy drinkers.



6. Segmentation of People Based on Health Activity

Activity Levels

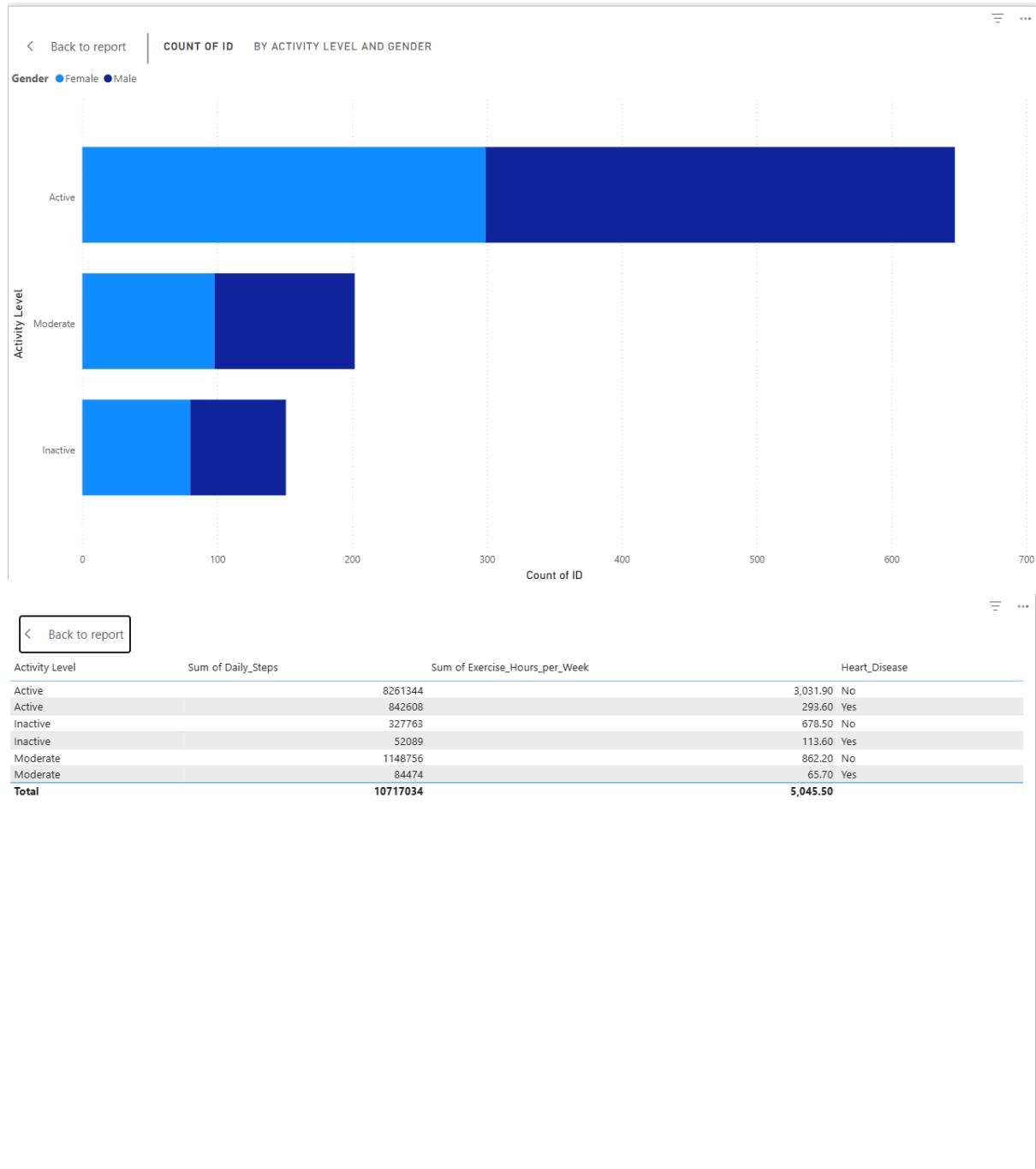
- Active
- Moderate
- Inactive

Visual Used

- **Stacked Bar Chart**
 - **X-axis: Count of Users**
 - **Y-axis: Activity Level**
 - **Legend: Gender**

Insights

- **The majority of users fall into the Active category.**
- **Inactive users represent a smaller but critical group requiring intervention.**
- **Gender-wise distribution shows similar activity trends among males and females.**



Final Business Insights

- Users are moderately active but sleep duration needs improvement.
- Smoking and alcohol consumption significantly increase heart disease risk.
- Higher BMI and older age groups show greater health risk exposure.
- Adequate sleep is strongly linked to higher physical activity.

Recommendations

- 1. Encourage smoking cessation and reduced alcohol intake through wellness programs.**
- 2. Promote better sleep hygiene to improve physical activity and overall health.**
- 3. Design targeted fitness plans for older and high-BMI users to reduce cardiovascular risk.**