

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 Definition of Power BI

- Power BI is a business analytics tool by Microsoft that enables users to connect to multiple data sources, clean and transform data, and create interactive dashboards and reports.
- It empowers organizations to make data-driven decisions by providing visualization, reporting, and collaboration features.

#### Key Components of Power BI Ecosystem (in lines)

- Power BI Desktop → A free Windows application used to design and build reports. It allows connecting to multiple data sources, performing data modeling and transformations, and creating interactive visualizations. Mainly used by analysts and developers.
- Power BI Service → A cloud-based platform hosted on Microsoft Azure. It enables publishing reports created in Power BI Desktop, building

dashboards, scheduling data refreshes, and collaborating with team members. It also supports role-based access and sharing.

- Power BI Mobile → Mobile applications available on iOS, Android, and Windows devices. They allow users to access and interact with dashboards and reports on the go, with touch-optimized visuals and push notifications for updates.
- Power BI Gateway → A secure bridge between on-premises data sources and the Power BI Service. It ensures safe data transfer without moving data to the cloud. Supports scheduled refreshes and live queries. Comes in two types: Personal Gateway (for individual use) and Enterprise Gateway (for organization-wide use).

### Considerations & Challenges

- Data Security: Gateways must be properly configured to avoid breaches.
- Performance: Large datasets may require optimization for smooth visualization.
- Collaboration: While the Service enables sharing, governance policies must be enforced to prevent unauthorized access.

- Licensing: Some advanced features (like sharing outside the organization) require Power BI Pro or Premium licenses.

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 proportions of a whole.
  - Simple and easy to understand, but can get cluttered with too many categories.
- Donut Chart
  - Similar to a pie chart but with a hole in the center.
  - The hole can be used to display additional information (like total value).
  - Often considered more modern and visually appealing.

When to prefer one over the other:

- Use a Pie Chart when you want a straightforward view of proportions.
- Use a Donut Chart when you want to emphasize the total or add context in the center.

Example:

- Pie Chart → Showing the percentage of sales by product category.
- Donut Chart → Showing the same breakdown but with the total sales figure displayed in the middle.

## Bar Chart vs Column Chart

- Bar Chart
- Horizontal bars.
- Best when category names are long or when comparing many categories side by side.
- Easier to read for ranked or sorted data.
- Column Chart
- Vertical bars.
- Best for showing time-based trends or comparisons across fewer categories.
- Works well when the x-axis represents sequential data (like months or years).

When to prefer one over the other:

- Use a Bar Chart when category labels are lengthy or when you want to highlight ranking.
- Use a Column Chart when comparing values over time or across a small set of categories.

Example:

- Bar Chart → Comparing revenue across different countries with long names (e.g., “United Arab Emirates,” “United States of America”).
- Column Chart → Showing monthly sales performance for the year.

In short:

- Pie vs Donut → Both show proportions, but donut adds flexibility with the center space.
- Bar vs Column → Both compare values, but bar suits long labels, while column suits time-series data.

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
- Structure: A central fact table (contains measures like sales, revenue) surrounded by dimension tables (like customer, product, time).
- Simpler design, easy to understand and query.
- Best for performance in BI tools like Power BI because fewer joins are required.
- Example: A sales fact table linked directly to product, customer, and date dimensions.
- Snowflake Schema
- Structure: Similar to star schema but dimensions are normalized into multiple related tables.
- More complex, requires additional joins.
- Useful when you want to reduce redundancy and maintain normalized data.
- Example: A product dimension split into product → category → subcategory tables.

Significance:

- Star schema is generally preferred in Power BI because it's faster and easier for end-users.
- Snowflake schema is chosen when data integrity and normalization are more important than query speed.

## Primary Key vs Foreign Key in Relationships (Power BI)

- Primary Key
- A unique identifier in a table (e.g., CustomerID in the Customer table).
- Ensures each record is distinct.
- Foreign Key
- A field in one table that refers to the primary key in another table.
- Creates relationships between tables (e.g., CustomerID in the Sales table linking back to Customer table).

### Significance in Power BI:

- Relationships between tables are defined using primary and foreign keys.
- This allows Power BI to filter, aggregate, and slice data correctly across multiple tables.

### Why Cardinality is Important?

- Cardinality refers to the uniqueness of values in a column and the type of relationship between tables.
- In Power BI, relationships can be:

- One-to-One (1:1) → Each record in one table matches exactly one record in another.
- One-to-Many (1: )\* → A single record in one table relates to multiple records in another (most common).
- Many-to-Many (:) → Multiple records in one table relate to multiple records in another (complex, requires careful handling).

Why it matters:

- Cardinality determines how filters and aggregations propagate across tables.
- Incorrect cardinality can lead to wrong totals, duplicated values, or missing data in reports.
- Example: If Sales table (many) is linked to Customer table (one), filtering by a customer correctly shows all their sales.

In summary:

- Star schema → simpler, faster, preferred in Power BI.
- Snowflake schema → normalized, more complex, used for data integrity.
- Primary vs Foreign key → define relationships between tables.

- Cardinality → ensures relationships behave correctly and reports show accurate results.

Question 4 : Differentiate between:

- Calculated column vs Measure Also, define Row context and Filter context with simple examples.

ANSWER Calculated Column vs Measure

- Calculated Column
  - Created at the row level in a table.
  - Uses DAX (Data Analysis Expressions) to add a new column with values computed for each row.
  - Stored in the data model, increasing memory usage.
  - Example: Adding a column for each row in the Sales table.
- Measure
  - Calculated at query time, not stored in the table.
  - Uses DAX to perform aggregations (SUM, AVERAGE, COUNT, etc.) based on filters applied.
  - More efficient because it doesn't increase model size.

- Example: Creating a measure that calculates dynamically depending on filters (e.g., by region, by year).

Key Difference:

- Calculated columns are row-based and static.
- Measures are aggregation-based and dynamic, responding to filters and slicers in reports.

## Row Context vs Filter Context

- Row Context
  - Exists when a calculation is performed for each row in a table.
  - Automatically applied in calculated columns or iterating functions like , .
  - Example: In a calculated column , Power BI evaluates the formula for each row in the Sales table.
- Filter Context
  - Refers to the set of filters applied to data when a measure is calculated.
  - Comes from slicers, filters, or visuals in a report.
  - Example: A measure will return different results depending on whether the report is filtered by Year = 2024 or Region = Asia.

## In Summary

- Calculated Column → Row-level, stored in the model, increases size.
- Measure → Aggregation-level, dynamic, efficient.
- Row Context → Evaluates formulas per row.
- Filter Context → Defines which subset of data is aggregated.

Quick analogy:

- Row Context is like grading each student's exam individually.
- Filter Context is like calculating the average score of the class, but only for students in Grade 10.

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

ANSWER : A Power BI report is a multi-page, detailed, interactive document built from one dataset, while a Power BI dashboard is a single-page, high-level view that combines visuals

from multiple reports or datasets for quick monitoring.

## Power BI Report

- Definition: A report is a detailed presentation of data with multiple pages.
- Data Source: Built from a single dataset.
- Features:
- Can contain multiple visuals (charts, tables, maps).
- Supports deep analysis, drill-down, and filtering.
- Interactive exploration of data.
- Use Case: Best for in-depth analysis.
- Example: A sales report with pages for revenue trends, product performance, and regional breakdowns.

## Power BI Dashboard

- Definition: A dashboard is a single-page canvas that provides a snapshot of key metrics.
- Data Source: Can combine visuals from multiple datasets and reports.
- Features:
- Focused on monitoring KPIs at a glance.

- Interactive but limited compared to reports.
- Often used by executives for quick decision-making.
- Use Case: Best for high-level monitoring.
- Example: A dashboard showing total sales, profit margin, and customer satisfaction scores across different regions.

## Power BI Report

- A report is a multi-page document with detailed visuals.
- It is built from a single dataset.
- Designed for in-depth analysis with drill-downs, filters, and interactive exploration.
- Typically used by analysts or data professionals.
- Example: A sales report with pages for revenue trends, product performance, and regional breakdowns.

## Considerations

- Reports are heavier and require more design effort but allow deep exploration.
- Dashboards are lighter, ideal for quick insights, but limited in detail.

- Choosing between them depends on whether the goal is analysis (report) or monitoring (dashboard).

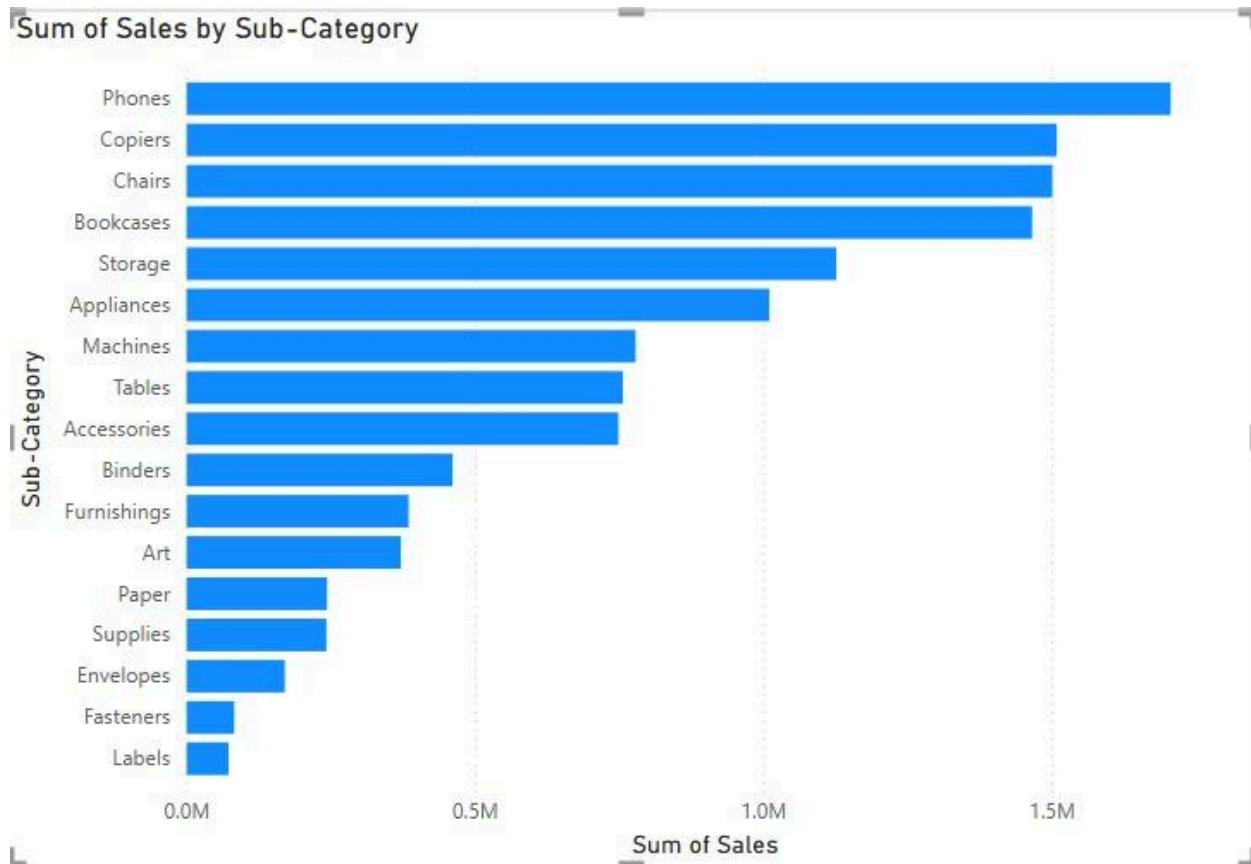
In summary:

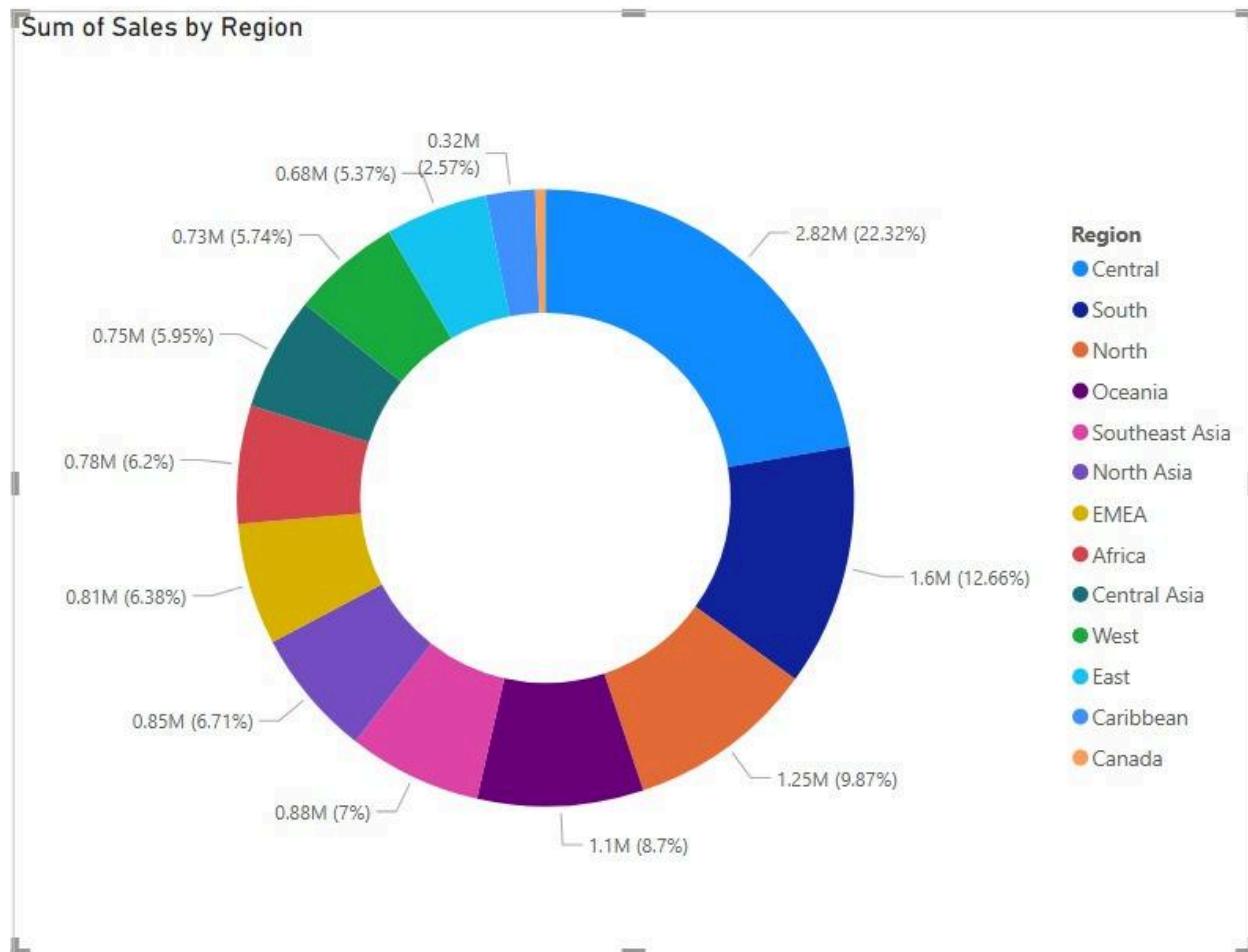
- Report = detailed, multi-page, single dataset, analysis tool.
- Dashboard = single-page, multiple datasets, monitoring tool.

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. DATASET LINK : [Global\\_superstore2](#)

# ANSWER

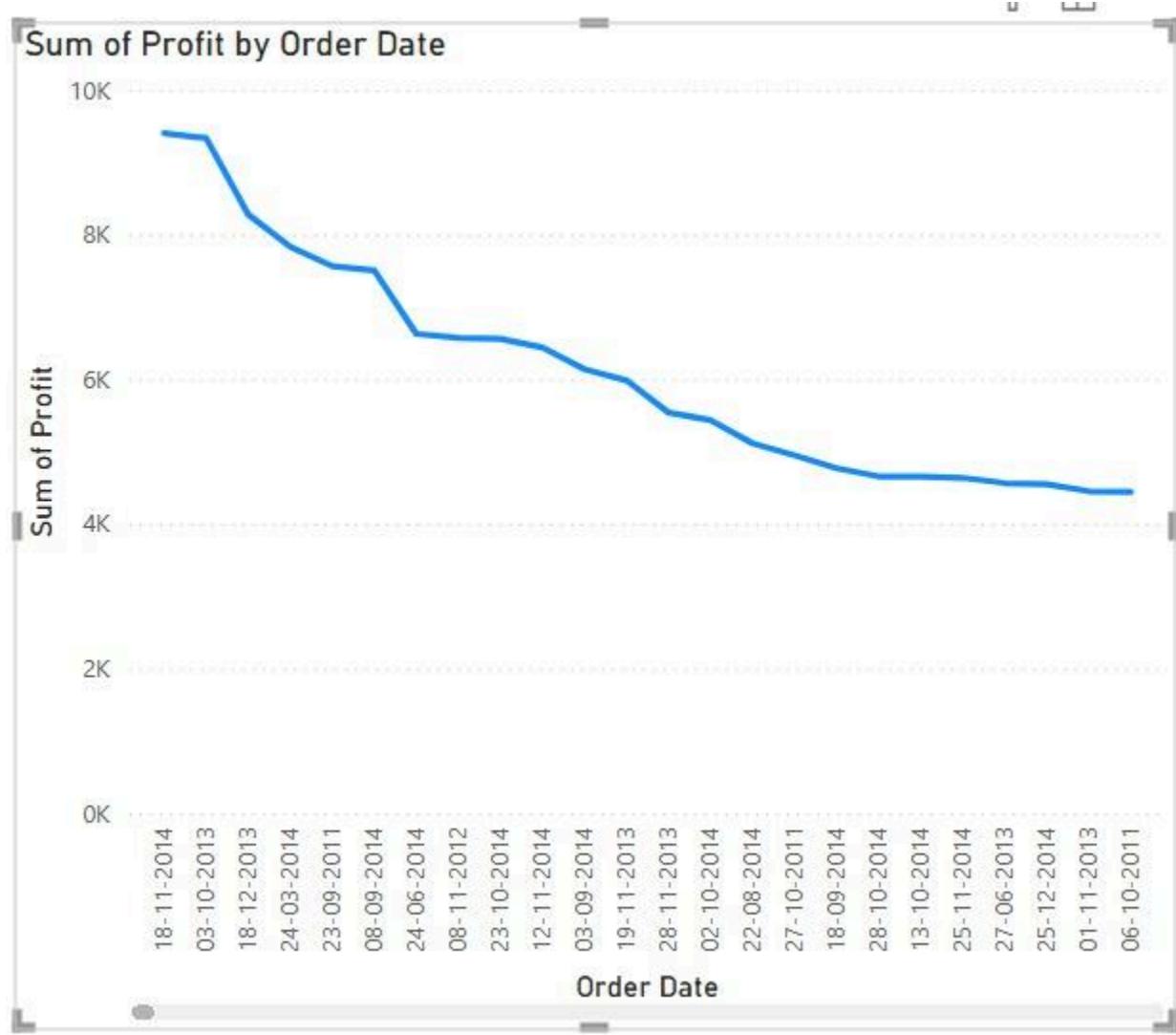




Question 7 : Write and apply the following measures:

- 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. DATASET LINK : Global\_superstore2

# ANSWER

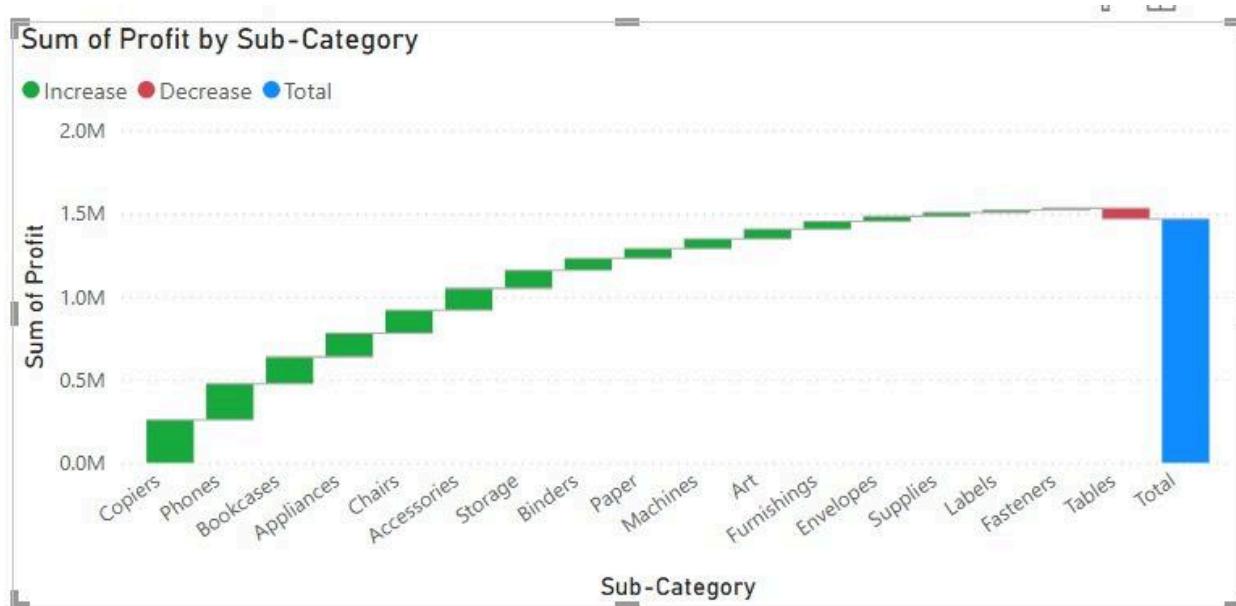


Question 8 : Implement a DAX measure that calculates the percentage of total sales by product category. Product\_category Sales\_Amount  
Electronics 5000 Clothing 3000 Home Appliances 7000 Books 2000 Tables & Chairs 8000 Toy 1500 Sports Equipment 1200 Office Supplies 1000 Beauty

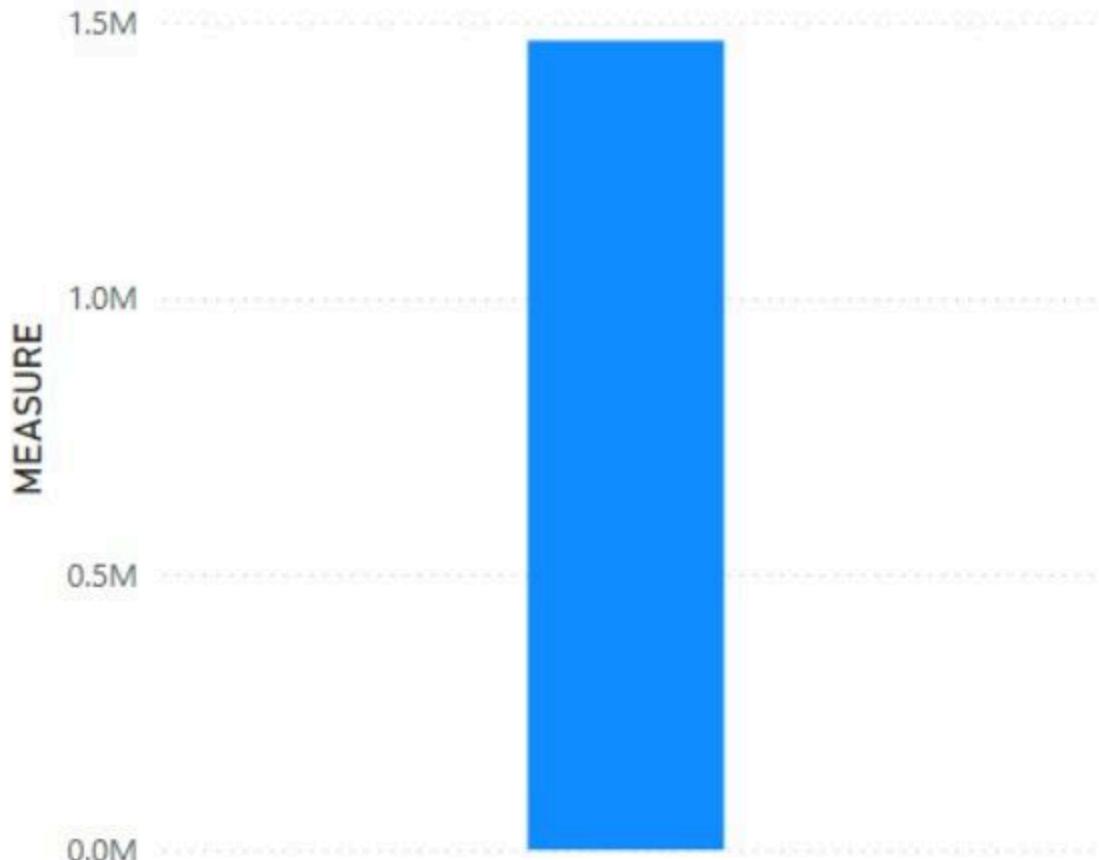
Products 4400 Garden Supplies 1000 Jewelry 1800  
Automotive 2600

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 [DATASET LINK](#) : Global\_superstore2

ANSWER :



## MEASURE



### Business Insights (4–5 lines)

Technology sub-categories contribute the highest profit overall.

Furniture sub-categories show mixed performance with some losses.

Office Supplies provide stable but moderate profit contribution.

Profit varies significantly by region, showing regional demand differences.

Some sub-categories consistently reduce total profit.

Recommendations (2–3 points)

Focus marketing and inventory on high-profit sub-categories.

Review pricing or costs for loss-making sub-categories.

Optimize regional strategies based on profitable regions.

Region
<input type="checkbox"/> Africa
<input type="checkbox"/> Canada
<input type="checkbox"/> Caribbean
<input type="checkbox"/> Central
<input type="checkbox"/> Central Asia
<input type="checkbox"/> East
<input type="checkbox"/> EMEA
<input type="checkbox"/> North
<input type="checkbox"/> North Asia
<input type="checkbox"/> Oceania
<input type="checkbox"/> South
<input type="checkbox"/> Southeast Asia
<input type="checkbox"/> West

## 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:

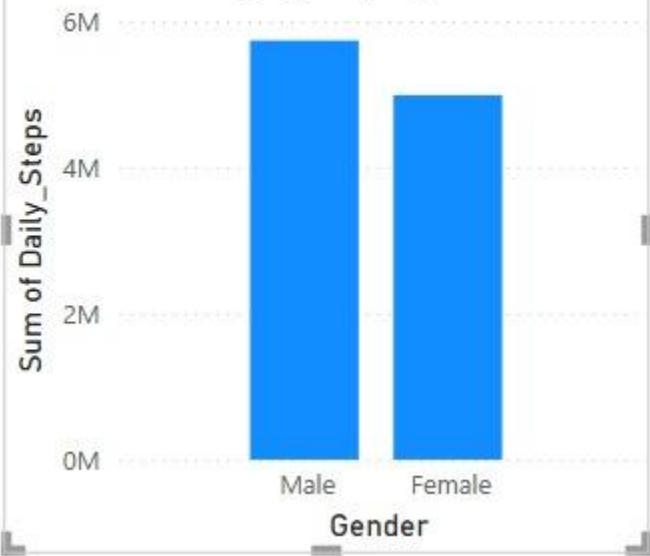
1. Are users maintaining a balanced lifestyle (Steps, Sleep, Calories)
2. What lifestyle patterns (Smoking, Alcohol, BMI, etc.) indicate heart disease risk?
3. Is there any visible relationship between Sleep and Physical Activity?
4. How does BMI vary across Age Groups and Genders?
5. What is the impact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

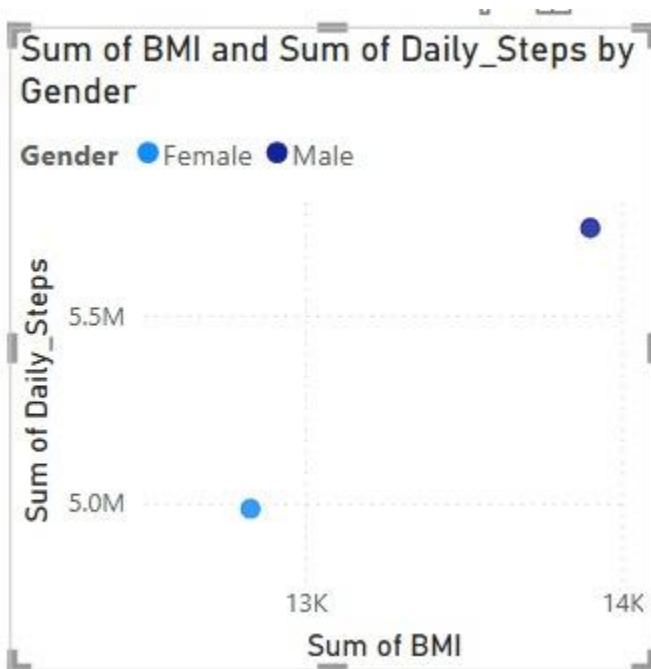
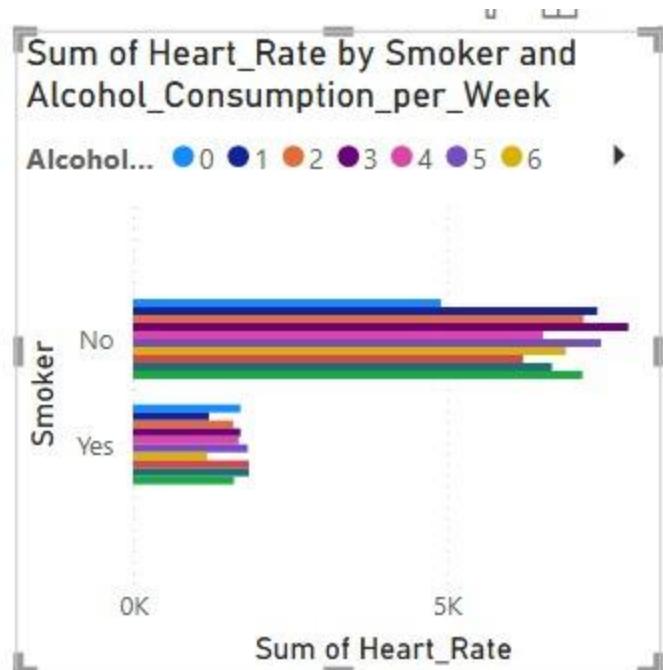
ANSWER :

### Sum of Daily\_Steps and Sum of BMI by Hours\_of\_Sleep



### Sum of Daily\_Steps, Sum of BMI and Sum of Hours\_of\_Sleep by Gender





- ① Are users maintaining a balanced lifestyle?  
Users with higher daily steps and adequate sleep tend to have healthier BMI and heart rate, indicating a generally balanced lifestyle.

## ② Lifestyle patterns & heart disease risk

Smoking and higher alcohol consumption are associated with increased heart rate and blood pressure, increasing heart disease risk.

## ③ BMI vs Physical Activity

Higher physical activity (daily steps) is linked to lower BMI, showing an inverse relationship.

## ④ Age & Gender trends

Heart rate and BMI tend to increase with age. Male users show slightly higher heart risk indicators.

## ⑤ Smoking & Alcohol impact

Smokers and high alcohol consumers show elevated heart rate and blood pressure, indicating higher cardiovascular risk.

## ⑥ Health-based segmentation

Users with low activity, high BMI, smoking habits, and poor sleep form a high-risk health segment.

### STEP 4: Recommendations (FINAL)

Encourage daily walking goals (8,000–10,000 steps)

Promote better sleep routines (7–8 hours)

Reduce smoking and alcohol through awareness programs

Provide personalized exercise plans for high-risk users

