Introduction to Power BI, Charts, DAX & Creating Reports

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 and data visualization tool developed by Microsoft that helps users collect data from multiple sources, analyze it, and create interactive reports and dashboards to support better decision-making.

Key Components of the Power BI Ecosystem

1. Power BI Desktop

- A **free Windows-based application** used to create reports.
- Allows users to **connect to data sources**, clean and transform data using **Power Query**, and build data models using **DAX**.
- Reports created here can be **published to Power BI Service**.

2. Power BI Service

- A **cloud-based platform** (SaaS) used to publish, share, and collaborate on reports.
- Enables creation of **dashboards**, scheduled data refresh, and sharing with other users.
- Supports collaboration, security, and access control.

3. Power BI Mobile

- Mobile applications available for **Android, iOS, and Windows**.
- Allows users to **view and interact with dashboards and reports** anytime, anywhere.
- Provides real-time alerts and touch-friendly visualizations.

4. Power BI Gateway

- Acts as a **bridge between on-premises data sources** (like SQL Server, Excel) and Power BI Service.
- Ensures **secure data transfer** without moving data to the cloud permanently.
- Used for **scheduled refresh** and live queries.

Conclusion

The Power BI ecosystem integrates Desktop (report creation), Service (sharing & collaboration), Mobile (access on the go), and Gateway (secure connectivity) to provide a complete end-to-end business intelligence solution.

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: Comparison of Power BI Visuals
1. Pie Chart vs Donut Chart

Pie Chart

- Displays data as **slices of a circle**.
- Best for showing **simple percentage or proportional data**.
- Easier to understand when there are **few categories (2–5)**.

Preferred when:
You want a **clear and simple comparison of parts to a whole**.

Example:
Market share of companies: Apple 40%, Samsung 35%, Others 25%.

Donut Chart

- Similar to a pie chart but has a **hole in the center**.

- The center can be used to display **total value or key insight**.
- Looks more **visually appealing** in dashboards.

Preferred when:
You want to show **proportions along with a highlighted total or KPI**.

Example:
Sales contribution by product categories with **total sales shown in the center**.

2. Bar Chart vs Column Chart

Bar Chart

- Bars are displayed **horizontally**.
- Ideal when category names are **long or numerous**.
- Makes comparison easier when there are many categories.

Preferred when:
You have **many categories or long labels**.

Example:
Comparing sales across different departments with long names like
“Customer Relationship Management”, “Human Resources”, etc.

Column Chart

- Bars are displayed **vertically**.
- Best suited for showing **trends over time**.
- Commonly used and easy to interpret.

Preferred when:
You want to show **changes or comparisons over time**.

Example:
Monthly revenue comparison from January to December.

Conclusion

- **Pie vs Donut:** Choose based on simplicity vs visual emphasis.
- **Bar vs Column:** Choose based on label length and time-based comparison.

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: ***1. Star Schema vs Snowflake Schema***

Star Schema

- Consists of a **central fact table** connected directly to **dimension tables**.
- The structure looks like a **star**.
- Simple design with **fewer joins**.
- Faster query performance in Power BI.

Significance:
Preferred in Power BI because it improves **performance**, is **easy to understand**, and supports efficient DAX calculations.

Example:
Sales Fact table connected to Customer, Product, Time, and Region tables.

Snowflake Schema

- Dimension tables are **further normalized** into sub-dimension tables.
- The structure looks like a **snowflake**.
- Requires **more joins** and is more complex.

Significance:
Saves storage space but **reduces performance** and increases complexity in Power BI models.

Example:
Product table split into Product → Category → Sub-category tables.

Comparison Summary

Basis	Star Schema	Snowflake Schema
Complexity	Simple	Complex
Performance	Faster	Slower
Joins	Fewer	More
Power BI Suitability	Highly suitable	Less suitable

2. ***Primary Key vs Foreign Key (in Power BI Relationships)***

Primary Key

- A column with **unique values** in a table.
- Used to **identify each record uniquely**.
- Located mostly in **dimension tables**.

Example:
CustomerID in Customer table.

Foreign Key

- A column that **refers to the primary key** of another table.
- Used to **create relationships** between tables.
- Located in **fact tables**.

Example:
CustomerID in Sales table referring to Customer table.

Significance in Power BI

- Enables **correct filtering and aggregation**.
- Ensures accurate report visuals and calculations.
- Supports efficient relationship modeling.

3. Why is Cardinality Important?

Cardinality

Cardinality defines the **nature of the relationship** between two tables in Power BI.

Types of Cardinality:

- **One-to-One (1:1)**
- **One-to-Many (1:*)** *(most common in Power BI)*
- **Many-to-Many (*:*)**

Importance of Cardinality

- Determines **how filters flow** between tables.
- Affects **accuracy of calculations and totals**.
- Impacts **performance and DAX behavior**.
- Incorrect cardinality can lead to **duplicate values or incorrect results**.

Example:
One Customer → Many Sales
(Customer table → Sales table = One-to-Many)

Conclusion

- **Star schema** with correct **primary–foreign key relationships** is ideal for Power BI.

- **Cardinality** ensures proper data relationships, correct filtering, and reliable analytics.

Question 4 : Differentiate between: ● Calculated column vs Measure Also, define Row context and Filter context with simple examples.
Answer: 1. ***Calculated Column vs Measure***

Calculated Column

- Created using **DAX** and stored **row by row** in the table.
- Calculated **during data refresh**.
- Uses **row context** by default.
- Increases **model size**.

Used when:
You need a value **per row** (e.g., classification or categorization).

Example:
`TotalPrice = Quantity × UnitPrice` (calculated for each sales row)

Measure

- Calculated using **DAX** at **query time** (not stored).
- Depends on **filter context**.
- Does **not increase model size**.
- Used for **aggregations and KPIs**.

Used when:
You need **dynamic calculations** based on filters and slicers.

Example:
```
Total Sales = SUM(Sales[TotalPrice])
```

Difference Summary

Basis	Calculated Column	Measure
Calculation Time	Data refresh	Query time
Storage	Stored in model	Not stored
Context	Row context	Filter context
Usage	Per-row values	Aggregated values

2. *Row Context*

Definition

Row context refers to **calculation performed on the current row** of a table.

Simple Example

In a Sales table:

- Quantity = 5
- Price = ₹100

Calculated Column:

```
LineTotal = Quantity × Price
```

Power BI calculates this **for each row separately**.

➡ This is **row context**.

3. Filter Context

Definition

Filter context refers to **filters applied to data** due to slicers, visuals, or report-level filters.

Simple Example

Measure:

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

If a slicer filters **Year = 2024**, the measure calculates **sales for 2024 only**.

➡ This is **filter context**.

Key Difference Between Contexts

Context	Applies To	Example
Row Context	Calculated Column	Each row's calculation
Filter Context	Measure	Sales filtered by year/region

Conclusion

- Use **calculated columns** for **row-level logic**.
- Use **measures** for **dynamic, aggregated insights**.
- Understanding **row context and filter context** is essential for writing correct **DAX formulas**.

Question 5: What is the difference between a report and a dashboard in Power BI?
Answer: Difference Between Report and Dashboard in Power BI

Power BI Report

- A **report** is a **multi-page**, detailed collection of visualizations.
- Created mainly in **Power BI Desktop**.
- Can include **complex visuals, filters, slicers, and drill-downs**.
- Based on **a single dataset**.
- Used for **in-depth data analysis**.

Example:
A sales performance report with separate pages for regional sales, product-wise sales, and time-based trends.

Power BI Dashboard

- A **dashboard** is a **single-page**, high-level view of key metrics.
- Created only in **Power BI Service**.
- Contains **pinned visuals (tiles)** from one or multiple reports/datasets.
- Provides a **quick snapshot** of business performance.
- Limited interactivity compared to reports.

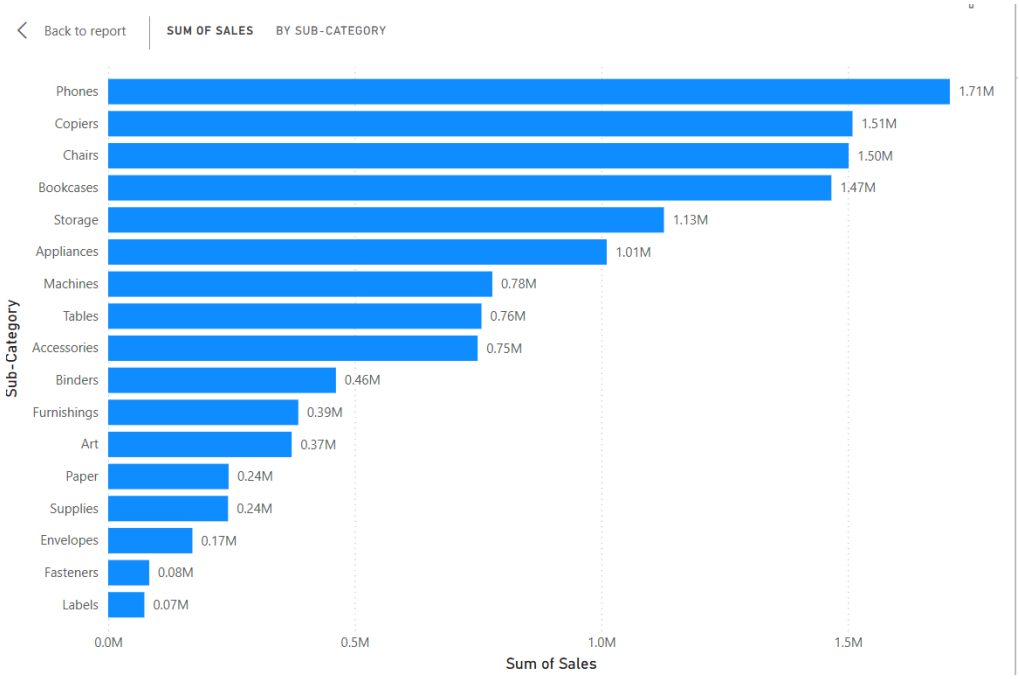
Example:
A management dashboard showing total sales, profit, and top-performing products on one screen.

Key Differences

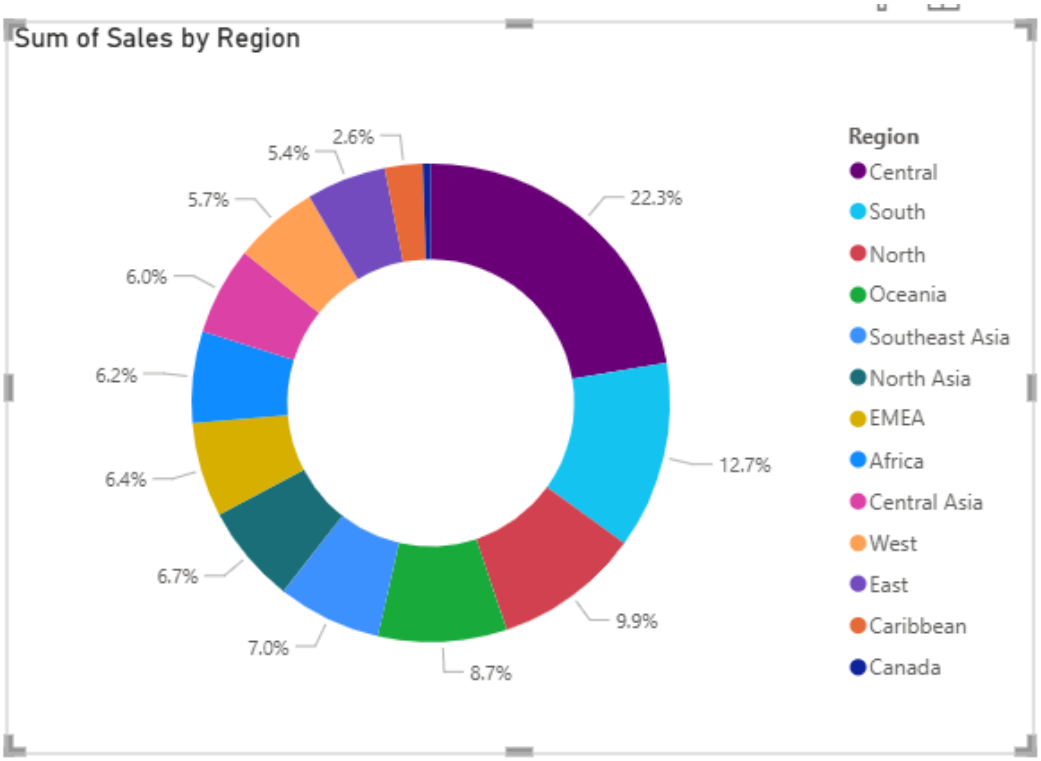
Basis	Report	Dashboard
Pages	Multiple	Single
Creation Tool	Power BI Desktop	Power BI Service
Data Source	One dataset	Multiple datasets
Detail Level	Detailed analysis	Summary view
Interactivity	High	Limited

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: 1. **Clustered Bar Chart to display Total Sales by Sub-Category**



2. **Donut Chart for Sales % by Region**



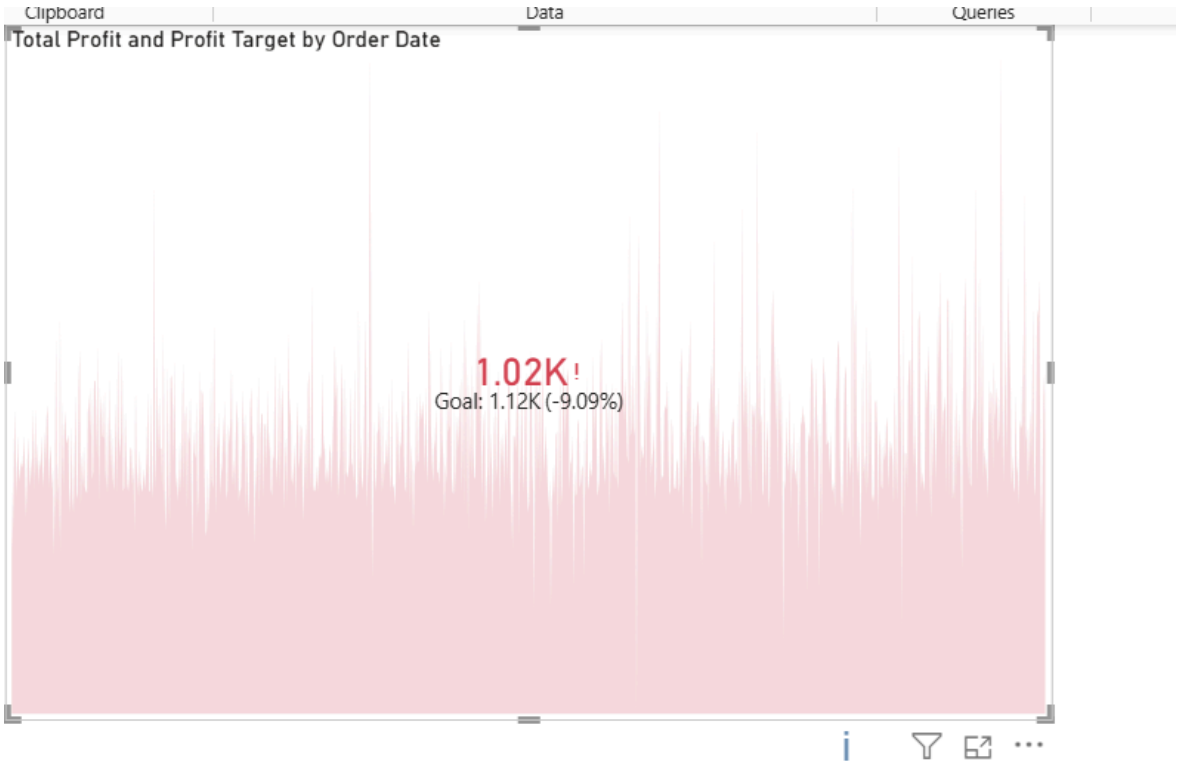
Question 7 : Write and apply the following measures: ● Total Profit = SUM([Profit]) ● Average Discount = AVERAGE([Discount]) Display both in a KPI Card, and use a Line Chart to show profit trend over months. Add visuals and DAX formulas.
Answer: **DAX Measures Created**

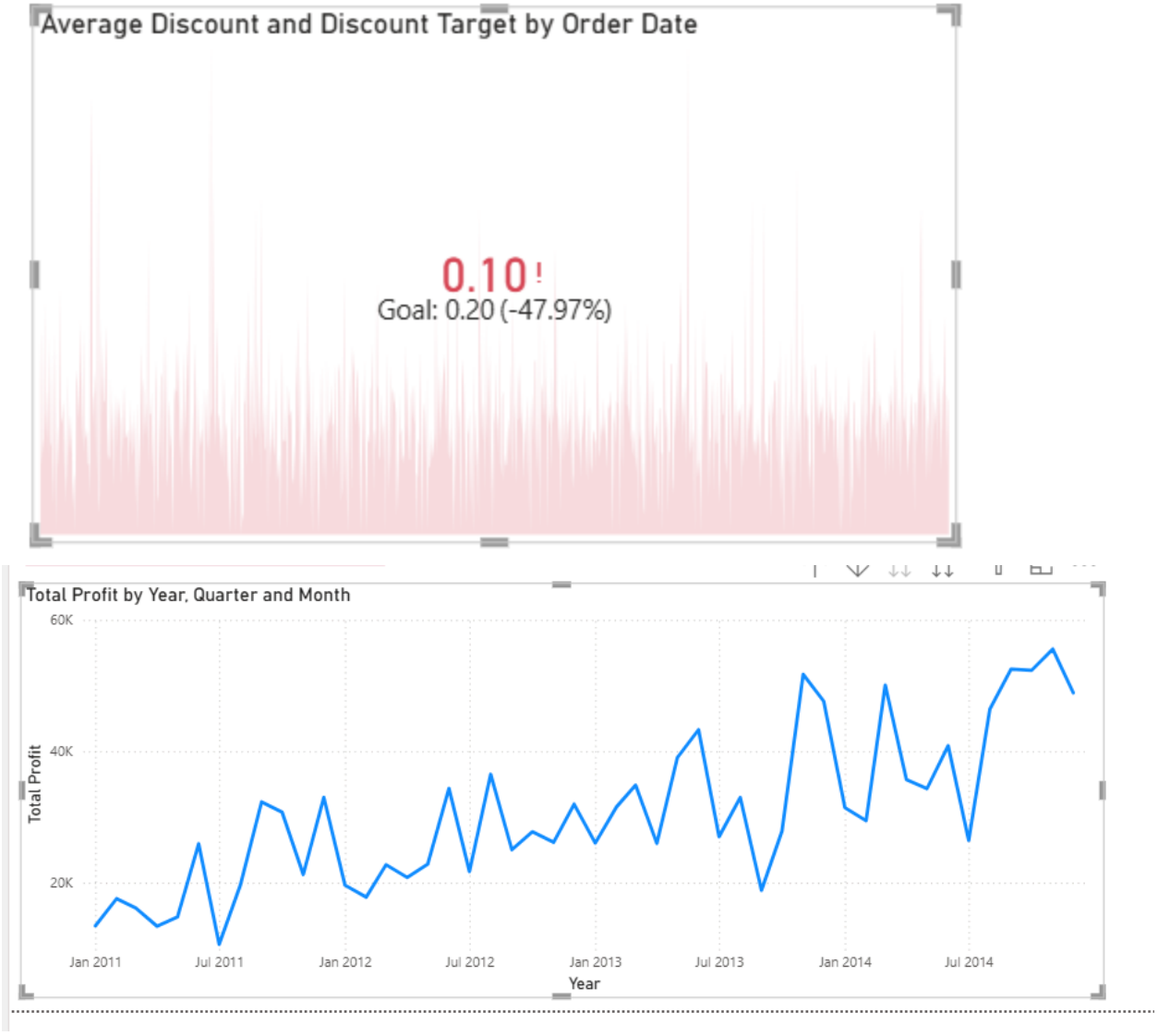
1. Total Profit

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

2. Average Discount

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





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
Automative	2600

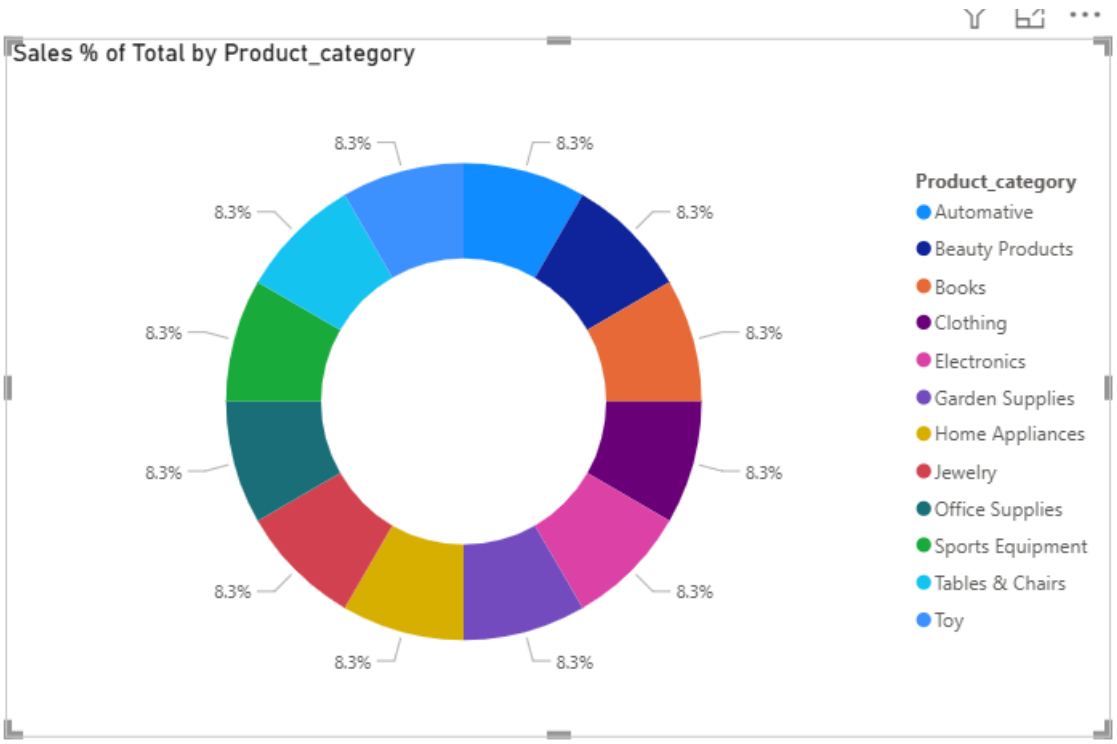
Answer: **Create DAX Measures**

Total Sales Measure

```
Total Sales = SUM('Table'[Sales_Amount])
```

Percentage of Total Sales Measure

```
Sales % of Total =
DIVIDE(
    SUM('Table'[Sales_Amount]),
    CALCULATE(
        SUM('Table'[Sales_Amount]),
        ALL('Table'[Product_Category])
    )
)
```



Result

The donut chart displays the percentage contribution of each product category to the total sales, enabling easy comparison among categories.

Conclusion

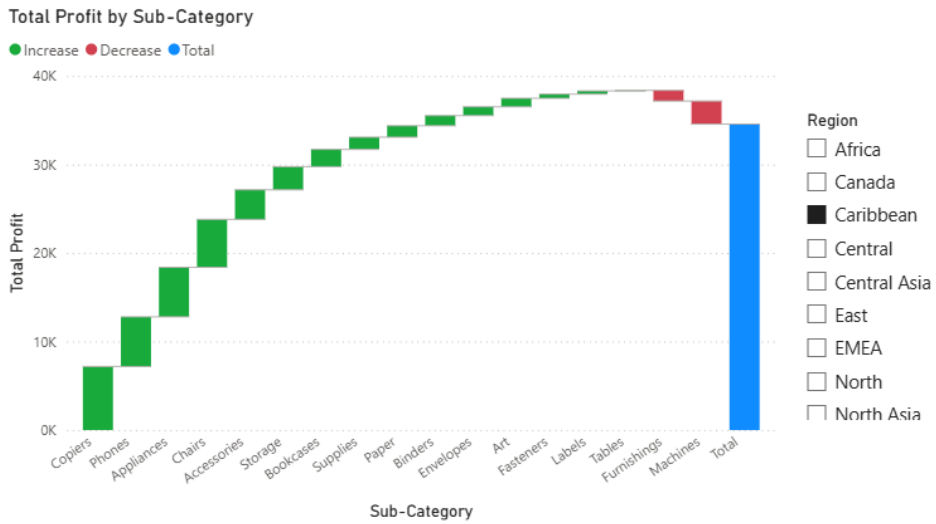
The DAX measure successfully calculates the percentage of total sales by removing category-level filters using the ALL function. This helps in analyzing the relative contribution of each product category to overall sales.

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: Create DAX Measure (Total Profit)

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

Waterfall Chart to analyze how different Sub-Categories contribute to overall profit



Business Insights

- The Waterfall chart shows that certain sub-categories such as **Copiers and Phones** contribute positively to overall profit.
- Some sub-categories like **Tables or Bookcases** may reduce total profit due to losses.
- Profit contribution varies significantly across regions, as seen using the Region slicer.
- High-profit sub-categories play a major role in driving overall business performance.

Data-Driven Recommendations

1. Focus marketing and inventory efforts on **high-profit sub-categories** such as Copiers and Phones.
2. Review pricing, cost structure, or discount strategy for **loss-making sub-categories**.

3. Use region-wise analysis to **replicate successful product strategies** in underperforming regions.

Conclusion

The Waterfall chart effectively highlights how individual sub-categories impact total profit. Combined with a Region slicer, it provides valuable insights for strategic decision-making and profit optimization.

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

Create Age Groups (Calculated Column)

```
Age Group =
SWITCH(
    TRUE(),
    'health_activity_data'[Age] < 30, "Below 30",
    'health_activity_data'[Age] <= 45, "30–45",
    'health_activity_data'[Age] <= 60, "46–60",
    "Above 60"
)
```

STEP 3: Key Measures (DAX)

Average Metrics

```
Avg Steps = AVERAGE('health_activity_data'[Steps])
```

```
Avg Sleep = AVERAGE('health_activity_data'[Sleep])
```

```
Avg Calories = AVERAGE('health_activity_data'[Calories])
```

```
Avg BMI = AVERAGE('health_activity_data'[BMI])
```

```
Avg Heart Rate = AVERAGE('health_activity_data'[Heart Rate])
```

```
Avg Blood Pressure = AVERAGE('health_activity_data'[Blood Pressure])
```

1. Balanced Lifestyle Analysis

Visuals:

- KPI Cards: Avg Steps, Avg Sleep, Avg Calories
- Clustered Column Chart: Steps vs Sleep

Insight Purpose:
Check if users meet healthy daily activity and rest levels.

2️⃣ Heart Disease Risk Patterns

Visuals:

- Stacked Bar Chart
    - Axis: BMI Category
    - Values: Count of Heart Disease
- Slicer: Smoking, Alcohol

Insight Purpose:
Identify unhealthy habits contributing to heart disease risk.

3️⃣ Sleep vs Physical Activity Relationship

Visual:

- Scatter Plot
-