



Assignment Code: DA-AG-013

# Introduction to Power BI, Charts, DAX & Creating Reports

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## 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.
    - This assignment covers Power BI from basics to advanced concepts (visualizations, data modeling, and DAX).
    - Use the **Sample Superstore** dataset throughout.
    - Use screenshots to support your answers for practical and scenario-based tasks.
    - Submit your assignment as a PDF (do not zip the files).
- Each question carries **20 marks**.

DATASET LINK : [Global superstore2](#)

**Total Marks:** 200

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**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 Desktop**

Power BI Desktop is a free, downloadable Windows application used to create and design reports and visualizations. It is the primary authoring tool for the ecosystem and is where the majority of data modeling and report creation occurs.

- **Key functions:** Connects to more than 100 data sources, transforms and cleans data using Power Query, and builds data models with Data Analysis Expressions (DAX).
- **Workflow:** After connecting to and preparing the data, users can build interactive visuals like charts, maps, and tables on the report canvas. These reports are then published to the Power BI Service.

### **Power BI Service**

The Power BI Service is the cloud-based, Software as a Service (SaaS) platform where users can publish, share, and collaborate on reports and dashboards. It is accessible through a web browser and is essential for distributing insights across an organization.

- **Key functions:** Provides workspaces for team collaboration, allows users to combine visuals from multiple reports into a single dashboard, and automates data refreshes.
- **User interaction:** Enables end-users to interact with shared content by filtering data, setting alerts for Key Performance Indicators (KPIs), and monitoring real-time data.

### **Power BI Mobile**

Power BI Mobile consists of native apps for iOS and Android devices that enable users to access and interact with their reports and dashboards on the go. The apps are optimized for a touch-based experience, ensuring that business leaders and other stakeholders can stay connected to critical data insights anytime, anywhere.

- **Key functions:** Offers a user-friendly interface to view and interact with data, provides real-time alerts and notifications, and supports features like QR code scanning and location-based filtering.
- **Availability:** Reports and dashboards created in Power BI Desktop and published to the Power BI Service are automatically available through the mobile apps.

### **Power BI Gateway**

The Power BI Gateway is a software application that acts as a secure bridge between the Power BI Service (cloud) and on-premises data sources, such as local databases or files on a

network. It ensures that dashboards and reports connected to local data can be kept up to date.

- **Key functions:** Provides secure data transfer, supports automated and scheduled data refreshes, and enables live queries (DirectQuery) against on-premises data without moving the data to the cloud.
- **Modes:** It can be installed in "Personal Mode" for individual use or "Standard Mode" for multiple users and centralized management in an enterprise environment.



## Question 2 :

Compare the following Power BI visuals:

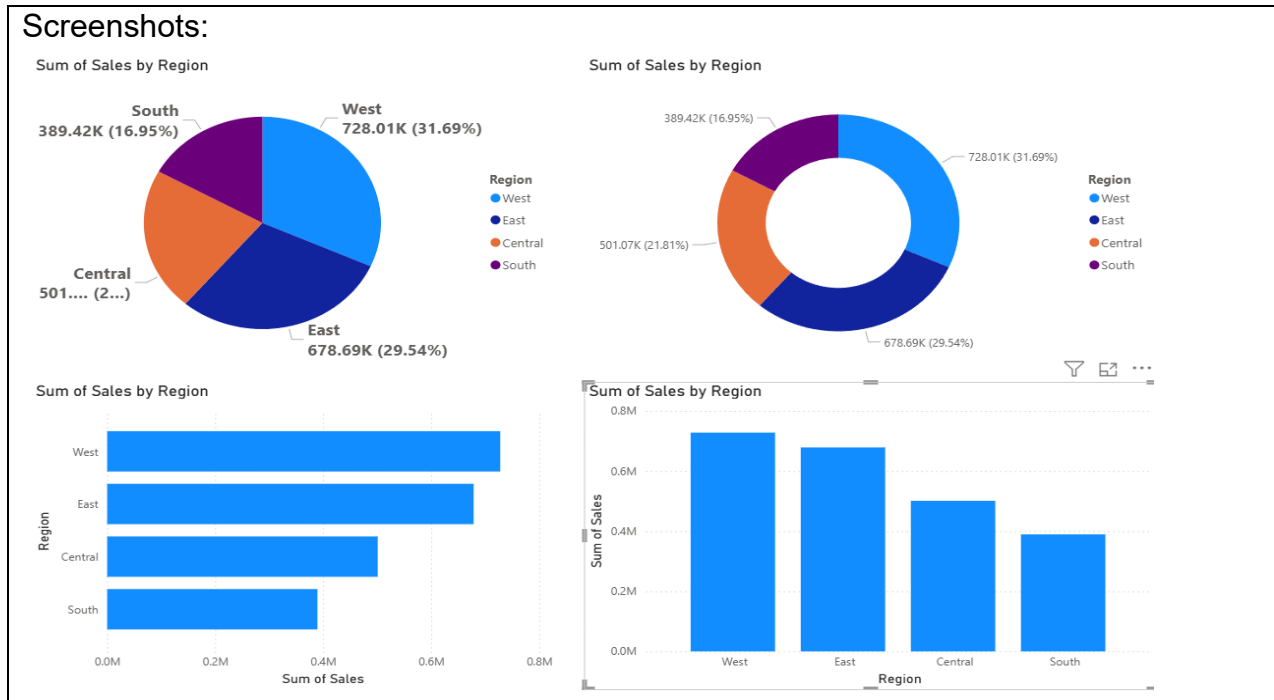
- Pie Chart vs Donut Chart
  - Bar Chart vs Column Chart
- When would you prefer one over the other? Give one example for each pair.

## Answer :

Aspect	Pie Chart	Donut Chart
<b>Definition</b>	Displays data as slices of a circle, representing parts of a whole.	Similar to a pie chart but with a hollow center (like a ring).
<b>Appearance</b>	A complete circle divided into slices.	A circular chart with a hole in the middle.
<b>Center Area</b>	Fully filled with slices.	Has an empty center area — often used for labels or totals.
<b>Label Placement</b>	Labels are placed outside or along slices.	Labels can be placed around or inside the ring; center can show summary text.
<b>Ease of Reading</b>	Easier to compare parts when there are few categories.	Slightly harder to read proportions due to missing center but visually cleaner.
<b>Use Case</b>	Good for showing <b>percentage contribution</b> of categories to a total.	Preferred when you want to <b>emphasize total value</b> in the center (e.g., KPI or total sales).

<b>Visual Appeal</b>	Simple and classic look.	Modern and compact; saves space for central information.
<b>Example in Power BI</b>	Showing percentage of calls handled by each department.	Showing same data, but center displays “Total Calls = 10,000.”
<b>Aspect</b>	<b>Bar Chart</b>	<b>Column Chart</b>
<b>Orientation</b>	Horizontal (bars go left to right).	Vertical (bars go bottom to top).
<b>Axes</b>	Categories on the <b>Y-axis</b> , values on the <b>X-axis</b> .	Categories on the <b>X-axis</b> , values on the <b>Y-axis</b> .
<b>Best For</b>	Comparing <b>long category names</b> or when there are <b>many categories</b> .	Comparing <b>fewer categories</b> or showing <b>trends over time</b> .
<b>Readability</b>	Easier to read long text labels since they appear horizontally.	Labels may overlap if category names are long.
<b>Visual Focus</b>	Highlights <b>category comparison</b> .	Highlights <b>time or sequential trend</b> (e.g., months, quarters).
<b>Common Use Cases</b>	- Number of calls handled by each agent. - Survey responses by category.	- Monthly revenue comparison. - Year-over-year sales growth.
<b>Visual Appearance</b>	Bars stretch sideways.	Bars rise vertically.
<b>User Preference</b>	Often used in HR, survey, or categorical dashboards.	Common in financial and time-series dashboards.

## Screenshots:





### 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 :

Aspect	Star Schema	Snowflake Schema
Structure	Central <b>Fact Table</b> connected directly to multiple <b>Dimension Tables</b> .	Fact Table connects to <b>normalized</b> Dimension Tables (dimensions split into sub-dimensions).
Complexity	<b>Simple</b> and easy to understand.	<b>More complex</b> due to multiple table joins.
Performance	<b>Faster</b> — fewer joins, ideal for Power BI performance.	<b>Slower</b> — more joins due to normalization.
Storage	Uses <b>more storage space</b> (redundant data).	Uses <b>less storage</b> (data redundancy removed).
Maintenance	Easy to maintain and query.	More complex to maintain.
Use Case	Best for <b>reporting and dashboards</b> (Power BI best practice).	Useful for <b>data warehouses</b> needing data consistency.
Example	<b>Fact Table:</b> Sales <b>Dimensions:</b> Date, Product, Customer, Region.	<b>Fact Table:</b> Sales <b>Dimensions:</b> Product → Product Category → Product Subcategory.

Concept	Definition	Where It Appears	Purpose in Power BI
Primary Key (PK)	A unique identifier for each record in a table. It ensures that each row is distinct.	Usually in <b>Dimension Tables</b> (e.g., CustomerID, AgentID, ProductID).	Defines the “ <b>one</b> ” side of a relationship.

**Foreign Key (FK)**

A field in one table that references the primary key in another table.

Usually in **Fact Tables** (e.g., Sales[CustomerID], Calls[AgentID]).

Defines the “**many**” side of a relationship and connects data across tables.

**Why is cardinality important in Power BI?**

In Power BI, **cardinality** defines the nature of the relationship between two tables by indicating how many rows in one table are related to how many rows in another. It is important for several key reasons:

- **Enables correct filtering:** Cardinality determines how filters are applied and propagated across your data model. An incorrect cardinality setting can lead to misleading or inaccurate aggregations in your reports.
- **Optimizes performance:** The type of cardinality directly impacts query performance. For example, a star schema with simple "one-to-many" relationships is highly optimized for Power BI's engine (VertiPaq) and offers faster query performance than a complex "many-to-many" relationship.
- **Maintains data integrity:** Setting the right cardinality ensures data consistency. It prevents orphaned records and other referential integrity issues that can arise from broken or mismatched relationships.
- **Simplifies modeling:** Understanding cardinality helps you build an efficient and intuitive data model. It guides decisions on how to structure your tables and when to use techniques like bridge tables to resolve complex relationships.
- **Influences DAX calculations:** Many DAX functions behave differently depending on the relationship's cardinality and cross-filter direction. A proper understanding is necessary to write correct and efficient measures.

**Question 4 :**

Differentiate between:

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

**ANSWER:**

Aspect	Calculated Column	Measure
<b>Definition</b>	A new column <b>added to a table</b> that performs a row-by-row calculation.	A <b>calculation created at the model level</b> that performs aggregations or computations based on filters.
<b>Where It's Stored</b>	Stored <b>physically in the data model</b> (increases file size).	Calculated <b>on the fly</b> during query or visualization.
<b>Evaluation Context</b>	Evaluated <b>for each row</b> in a table (uses <b>Row Context</b> ).	Evaluated <b>based on filters</b> applied to visuals (uses <b>Filter Context</b> ).
<b>Performance</b>	Slower for large datasets (uses memory).	More efficient (computed dynamically).
<b>Use Case</b>	When you need a value <b>per row</b> , e.g., profit per transaction.	When you need <b>aggregated results</b> , e.g., total profit, average call time.

Context Type	Definition	Applies To	Example
<b>Row Context</b>	The context of the <b>current row</b> when DAX calculates an expression.	<b>Calculated Columns</b> or row-level iteration functions (SUMX, FILTER).	Example: In a Calculated Column → Profit = Sales[Revenue] - Sales[Cost] → each row's profit is computed individually.
<b>Filter Context</b>	The set of <b>filters applied</b> by visuals, slicers, or relationships when evaluating a measure.	<b>Measures</b>	Example: In a Measure → Total Sales = SUM(Sales[Revenue]) → total changes dynamically based on selected product, region, or date in the report.

**Question 5:**

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

**ANSWER:**

Aspect	Report	Dashboard
Definition	A <b>multi-page</b> collection of visuals built on a <b>single dataset</b> for detailed data exploration.	A <b>single-page</b> (canvas) view that provides a <b>high-level summary</b> using visuals <b>pinned</b> from one or more reports.
Pages	Can have <b>multiple pages/tabs</b> (like worksheets in Excel).	Always <b>one page</b> (designed for quick insights).
Data Source	Based on <b>one dataset</b> only.	Can include <b>multiple datasets and reports</b> .
Interactivity	Highly interactive — supports <b>filters, slicers, drill-through, and visuals</b> .	Limited interactivity — mainly <b>click to open underlying reports</b> .
Creation Platform	Created and viewed in <b>Power BI Desktop</b> or <b>Power BI Service</b> .	Created only in <b>Power BI Service</b> (by pinning visuals from reports).
Purpose	Used for <b>in-depth analysis</b> and <b>data exploration</b> .	Used for <b>monitoring KPIs</b> and <b>quick decision-making</b> .
Update Behavior	Refreshes when the underlying dataset refreshes.	Reflects updates from the <b>pinned report visuals</b> .
Example (Call Center)	Report: Detailed pages for <b>Agent Performance, Call Volume, Resolution Time, Customer Satisfaction</b> .	Dashboard: One page showing <b>Total Calls, Avg Response Time, Top Agents, and Customer Satisfaction %</b> .



## Question 6 :

Using the Sample Superstore dataset:

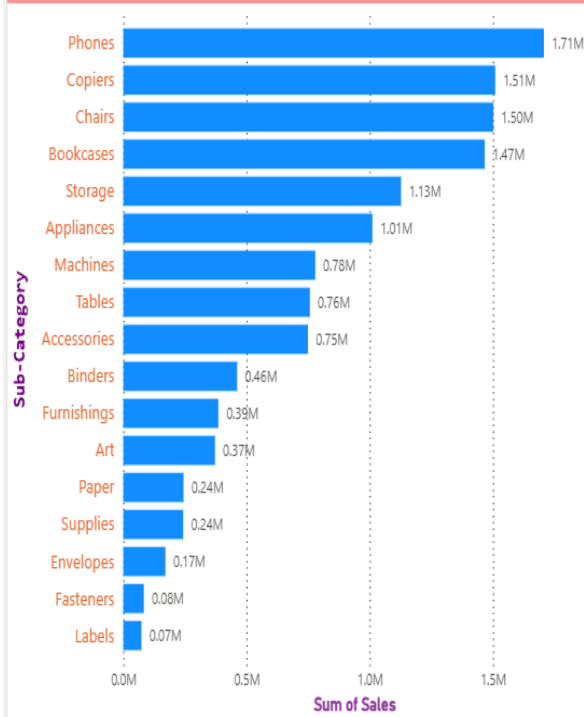
- Create a **Clustered Bar Chart** to display **Total Sales by Sub-Category**
- Create a **Donut Chart** for **Sales % by Region**
- Provide screenshots of both visuals.

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

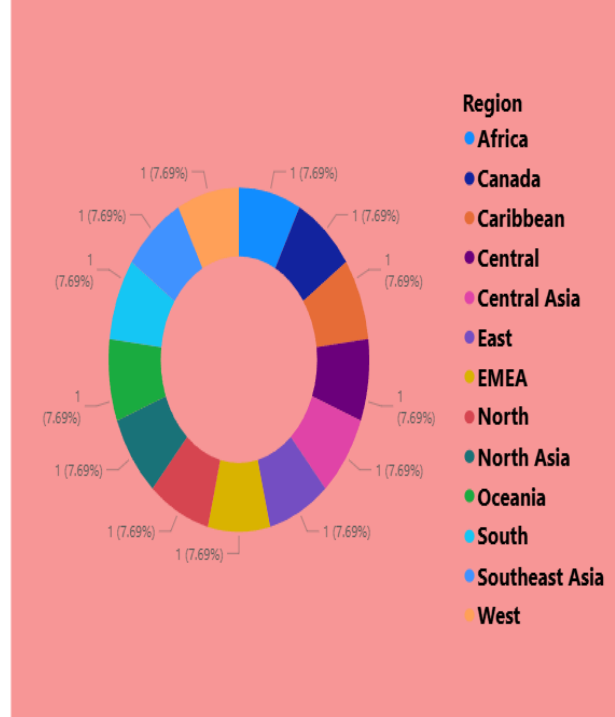
**ANSWER:**



Sum of Sales by Sub-Category



Sales% by Region

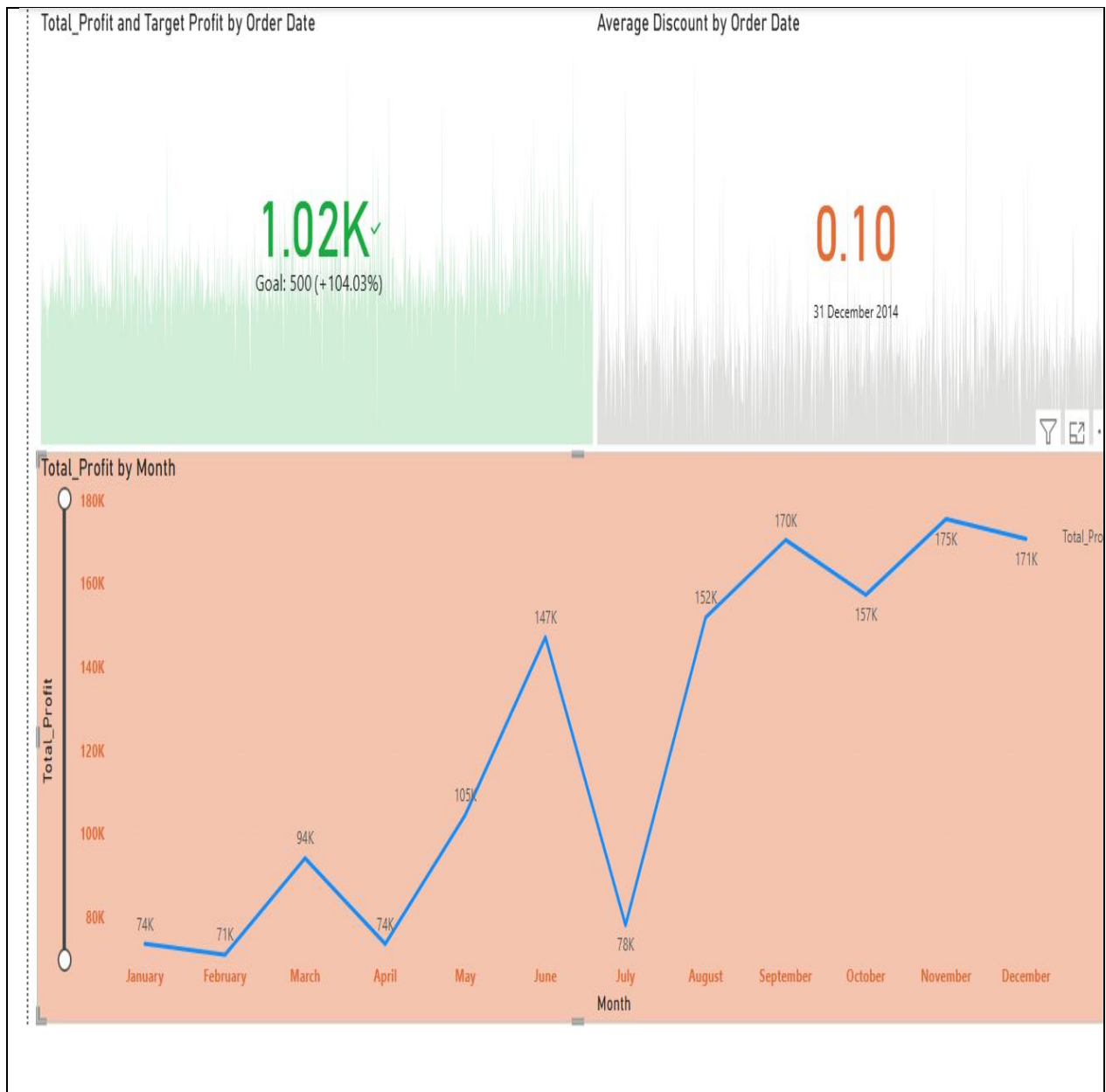


Write and apply the following measures:

- Total Profit =  $\text{SUM}([\text{Profit}])$
- Average Discount =  $\text{AVERAGE}([\text{Discount}])$   
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:**





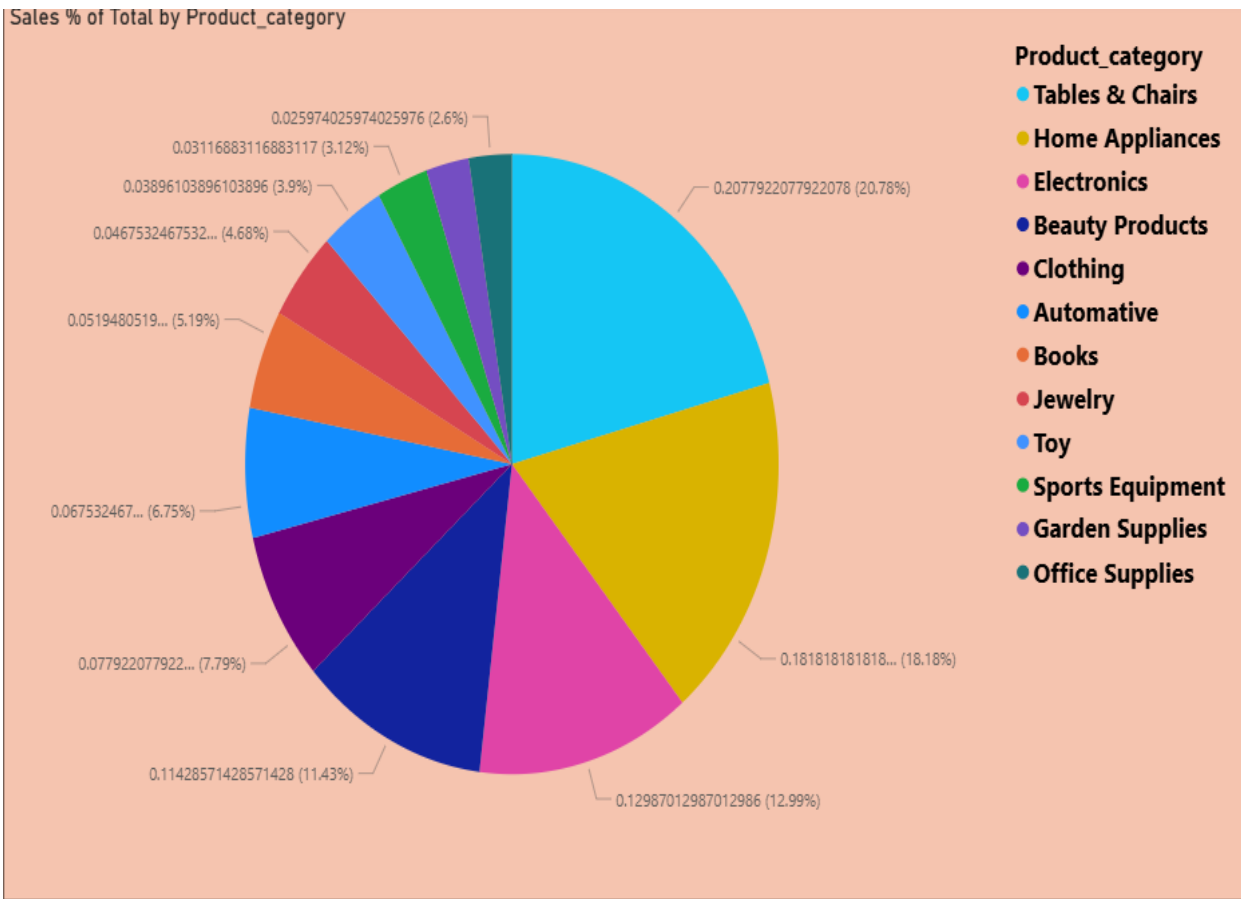
**Question 8 :**

**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

1. Sales % of Total =  
DIVIDE([Total\_Sales],CALCULATE([Total\_Sales],ALL(Sheet1[Product\_category ])))
2. Total\_Sales = SUM(Sheet1[Sales\_Amount ])



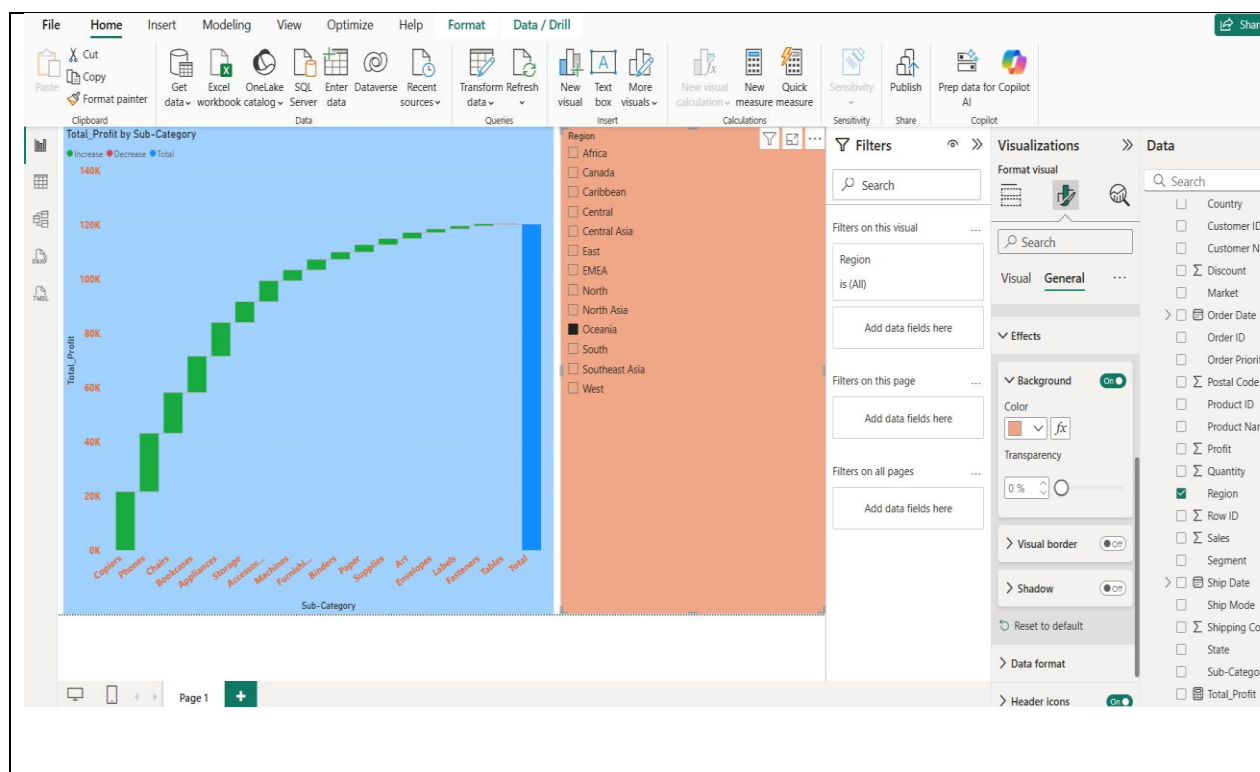


### Question 9 :

- **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](#)



**DAX formula: Total\_Profit = SUM(Global\_Superstore2[Profit])**

**Business Insights:**

- ☐ Tables & Chairs and Home Appliances are the largest profit contributors, while Sports Equipment and Office Supplies have low or negative contribution.
- ☐ Profit is unevenly distributed; a few Sub-Categories dominate overall results.
- ☐ Filtering by region shows that some regions perform better than others, highlighting regional opportunities.
- ☐ Discounts or operational costs in low-profit categories may be impacting total profit.

**Data-Driven Recommendations:**

1. **Focus on high-profit Sub-Categories:** Allocate more marketing, inventory, and promotions to Tables & Chairs, Home Appliances, and Electronics.
2. **Optimize low-performing categories:** Review costs, pricing, or bundling for Sports Equipment, Office Supplies, and Toys.
3. **Regional strategy:** Target high-profit regions with personalized promotions and optimize supply chain for low-performing regions to improve profitability.



**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

DATASET LINK: [Health\\_activity\\_data](#)

**Answer:**





