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

Ans. Definition of Power BI

Power BI is a business analytics and data visualization tool developed by Microsoft that helps users collect, transform, analyze, and visualize data from multiple sources. It enables organizations to create interactive reports and dashboards to support data-driven decision-making.

Key Components of the Power BI Ecosystem

The Power BI ecosystem consists of several integrated components that work together to create, publish, and consume data insights.

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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 with **DAX (Data Analysis Expressions)**.

- Used primarily by **report developers and analysts**.

- Reports created in Power BI Desktop can be published to the Power BI Service.

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2. Power BI Service

- A **cloud-based platform (SaaS)** used to publish, share, and manage reports and dashboards.

- Enables **collaboration**, scheduled data refresh, and access control.

- Users can create **dashboards**, share reports, and integrate with other Microsoft services like **Excel, Teams, and SharePoint**.

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3. Power BI Mobile

- Mobile applications available for **Android, iOS, and Windows** devices.

- Allows users to **view and interact with reports and dashboards** on the go.

- Optimized for mobile screens with touch-friendly features.

- Ideal for executives and field users who need real-time insights.

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4. Power BI Gateway

- Acts as a **bridge between on-premises data sources and the Power BI Service**.

- Enables **secure data refresh** and live queries from local databases (e.g., SQL Server).

- Two modes:

    - **Personal Mode** – for individual use.

    - **Standard Mode** – for enterprise and shared use.

- Essential when data cannot be moved to the cloud.

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.

Ans. **Pie Chart**

- Displays data as **slices of a circle**, showing each category's proportion of the total.

- Best suited when there are **few categories (usually 5 or less)**.

- Simple and easy to understand.

Donut Chart

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

- The center space can be used to show **additional information** (e.g., total value or key metric).

- Offers a slightly more modern and visually appealing look.

When to Prefer One Over the Other

- Use a **Pie Chart** when you want a **straightforward comparison of proportions**.

- Use a **Donut Chart** when you want to **display extra context or a KPI** in the center.

Question 3 : Explain the significance of:
● Star schema vs Snowflake schema
● Primary key vs Foreign key in relationships (Power BI) Why is cardinality important?

Ans. # 1. Star Schema vs Snowflake Schema

Star Schema

- Consists of a **central fact table** connected directly to **dimension tables**.

- Dimension tables are **denormalized** (contain all related attributes in one table).

- Simple design with **fewer joins**, leading to **better performance** in Power BI.

- Easier to understand and maintain.

Snowflake Schema

- Similar to star schema, but **dimension tables are normalized** into multiple related tables.

- Results in **more tables and joins**.

- Slightly more complex and may impact performance.

Significance:
Snowflake schema reduces **data redundancy** and storage but increases model complexity. It is less commonly used in Power BI compared to star schema.

2. Primary Key vs Foreign Key in Power BI Relationships

Primary Key

- A column that **uniquely identifies each row** in a table.

- Located typically in **dimension tables**.

- Cannot contain duplicate or null values.

Foreign Key

- A column in one table that **references the primary key** of another table.

- Usually located in **fact tables**.

- Can contain repeated values.

Significance:
Primary and foreign keys define **relationships between tables**, allowing Power BI to filter and aggregate data correctly across the model.

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

Ans. **Question 4: Power BI & DAX Concepts**

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1. Calculated Column vs Measure

Calculated Column

- Created using **DAX** and stored **physically in the table**.

- Calculated **row by row** at the time of data refresh.

- Uses **row context** by default.

- Increases **data model size**.

- Best used for **categorization or static values**.

Example:
```
Profit = Sales[Revenue] - Sales[Cost]
```
(Calculated for each row in the Sales table)

Measure

- Calculated **on the fly** during report interaction.

- **Not stored** in the table; consumes less memory.

- Uses **filter context**.

- Responds to **slicers, filters, and visuals** dynamically.

- Best used for **aggregations and KPIs**.

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

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

Ans. Power BI Report

- A **report** is a **multi-page**, detailed collection of visuals.

- Created in **Power BI Desktop**.

- Can connect to **one or multiple related datasets**.

- Highly **interactive**: users can filter, drill down, drill through, and use slicers.

- Used for **in-depth data analysis**.

Example:
A sales performance report with multiple pages showing sales by region, product, and time.


Power BI Dashboard

- A **dashboard** is a **single-page canvas**.

- Created only in the **Power BI Service** (not in Desktop).

- Made by **pinning visuals** from one or more reports.

- Provides a **high-level summary** of key metrics.

- Limited interactivity compared to reports.

Example:
An executive dashboard showing total revenue, profit, and top-performing regions.

Question 6 : Using the Sample Superstore dataset:
● Create a Clustered Bar Chart to display Total Sales by Sub-Category
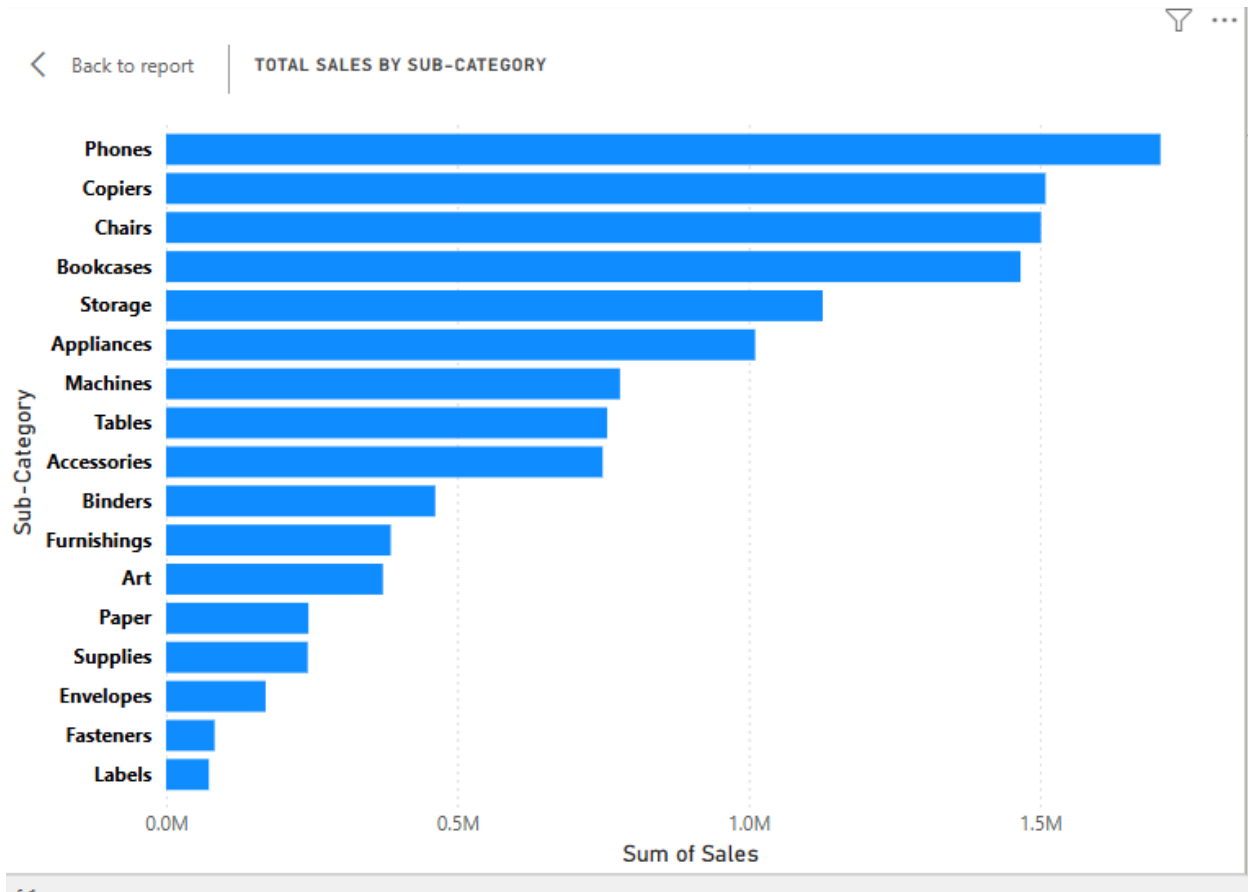
● Create a Donut Chart for Sales % by Region Provide screenshots of both visuals.

Donut chart: Sales % by Region

- Central: 22.32% (22.32%)
- South: 12.66% (12.66%)
- North: 9.87% (9.87%)
- Oceania: 8.70% (8.7%)
- Southeast Asia: 7.00% (7%)
- North Asia: 6.71% (6.71%)
- EMEA: 6.38% (6.38%)
- Africa: 6.20% (6.2%)
- Central Asia: 5.95% (5.95%)
- West: 5.74% (5.74%)
- East: 5.37% (5.37%)
- Caribbean: 2.57% (2.57%)
- Canada

Region
- Central
- South
- North
- Oceania
- Southeast Asia
- North Asia
- EMEA
- Africa
- Central Asia
- West
- East
- Caribbean
- Canada