Introduction to Power BI, Charts, DAX & Creating Reports

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).

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 analytics tool from Microsoft used to collect data from different sources, analyze it, and present insights through interactive dashboards and reports. It helps users understand data, spot trends, and make better decisions without deep technical skills.

Key components of the Power BI ecosystem

1. Power BI Desktop
This is a Windows application used to create reports. You connect to data sources, clean and transform data using Power Query, build data models, and design visualizations. Once the report is ready, it can be published to the Power BI Service.

2. Power BI Service
 This is the online cloud platform. It is used to publish, share, and collaborate on reports and dashboards. Users can schedule data refreshes, control access, and view reports through a web browser.

3. Power BI Mobile
 This is the mobile app available on Android, iOS, and Windows devices. It allows users to view and interact with reports and dashboards anytime, anywhere. It is mainly for monitoring and quick decision making, not report creation.

4. Power BI Gateway
 The gateway acts as a bridge between on-premises data sources like SQL Server or Excel files and the Power BI Service. It allows secure data refresh and live connections without moving data 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.

Answer : Pie Chart vs Donut Chart

Pie Chart
 A pie chart shows how a whole is divided into parts. Each slice represents a category's contribution to the total. It is simple and works best when there are very few categories.

Donut Chart
 A donut chart is similar to a pie chart but has a hole in the center. The center space can be used to show a total value or label, making it slightly more informative and visually cleaner.

When to prefer

- Use a **pie chart** when you want a very simple view of proportions with 2–3 categories.

- Use a **donut chart** when you want to display percentages along with a total value in the center.

Example

- Pie chart: Market share of three smartphone brands.

- Donut chart: Percentage contribution of product categories to total sales, with total sales shown in the center.

Bar Chart vs Column Chart

Bar Chart
A bar chart displays data horizontally. It is useful when category names are long or when there are many categories to compare.

Column Chart
A column chart displays data vertically. It is commonly used to compare values across categories or to show changes over time.

When to prefer

- Use a **bar chart** when labels are long or you have many categories.

- Use a **column chart** when showing trends over time or simple category comparisons.

Example

- Bar chart: Sales comparison of products with long names.

- Column chart: Monthly sales performance over a year.

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
In a star schema, the fact table is directly connected to dimension tables. The structure is simple and easy to understand. It gives better performance in Power BI because there are fewer joins and the model is easier to optimize.

Snowflake schema
In a snowflake schema, dimension tables are further split into related sub tables. This reduces data redundancy but increases complexity. It can slow down performance and makes the data model harder to manage in Power BI.

Significance
Star schema is preferred in Power BI for faster queries, simpler relationships, and easier report building. Snowflake schema is used only when normalization is necessary due to data size or maintenance needs.

Primary key vs Foreign key in relationships (Power BI)

Primary key
A primary key uniquely identifies each row in a table. In Power BI, it is usually found in dimension tables and must contain unique and non null values.

Foreign key
A foreign key is a column that references the primary key of another table. In Power BI, fact tables use foreign keys to connect to dimension tables.

Significance
Primary and foreign keys define how tables relate to each other and allow Power BI to filter and aggregate data correctly across tables.

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
A calculated column is created at the table level and is calculated row by row when

data is loaded or refreshed. The result is stored in the data model, which increases model size. Calculated columns are mainly used for categorization, filtering, or creating new fields.

Measure
A measure is calculated at query time and is not stored in the data model. It responds to filters and slicers in the report. Measures are mainly used for calculations like totals, averages, and percentages.

Key difference
Calculated columns work on each row and use more memory, while measures are dynamic and depend on the report's filter context.

Question 5:

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

Answer:

Report

A report is a collection of pages with detailed visuals created in Power BI Desktop. It is built from a single dataset and allows deep analysis through filters, slicers, and drill down features. Reports are interactive and mainly used for exploration and detailed insights.

Example
A sales report with multiple pages showing regional sales, product wise performance, and monthly trends.

Dashboard

A dashboard is a single page view created in the Power BI Service. It is made by pinning visuals from one or multiple reports or datasets. Dashboards provide a high level summary and are mainly used for monitoring key metrics.
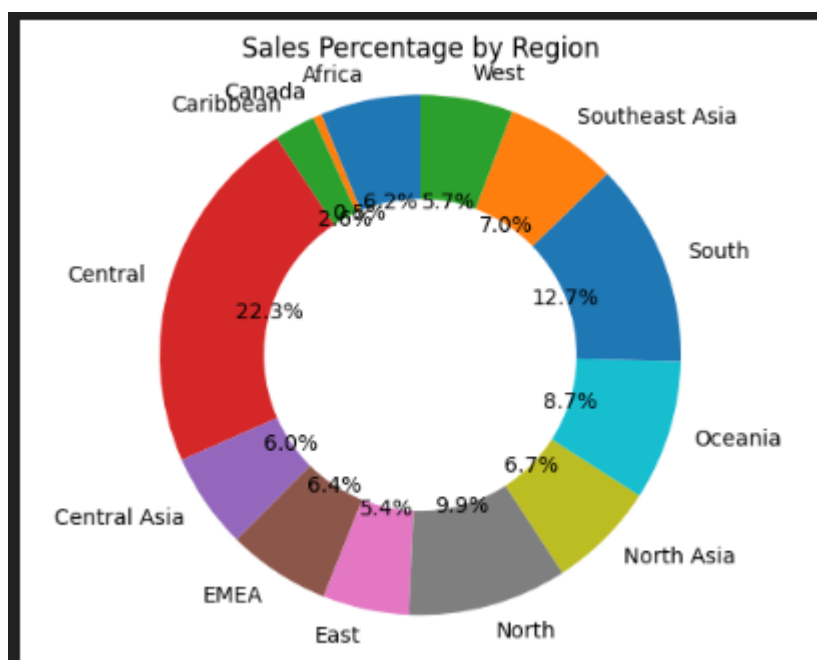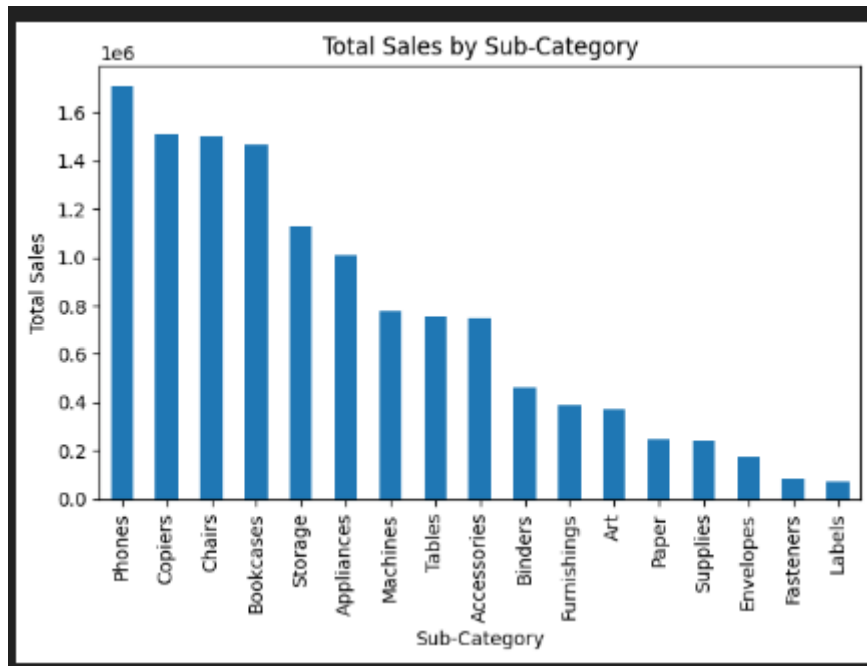
Example
A management dashboard showing total revenue, profit, and top performing products at a glance.

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 :

KPI Card for Total Profit

1. Select **Card** visual

2. Drag **Total Profit** into the Values field

3. Rename the title to **Total Profit**

KPI Card for Average Discount

1. Select another **Card** visual

2. Drag **Average Discount** into the Values field

3. Rename the title to **Average Discount**

1. Select **Line Chart** visual

2. Drag **Order Date** to the **X-axis**

● Use **Month** or **Month-Year**

3. Drag **Total Profit** to the **Y-axis**

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 :

Step 1: Understand the Requirement

We need a DAX measure that calculates each product category's sales as a percentage of total sales.

Step 2: Create DAX Measures

Assume the table name is Sales_Data and the column names are:

- Product_category

- Sales_Amount

Step 3: Apply the Measure in a Visual

1. Insert a **Table** or **Bar Chart**

2. Add **Product_category** to Rows / Axis

3. Add **Sales % of Total** to Values

4. Format the measure as **Percentage**

Step 4: Explanation (for Writing in Exam)

The DAX measure calculates total sales for each product category and divides it by the overall total sales using the ALL function. This removes category-level filters and allows correct percentage calculation of total sales.

Question 9 : Step 1: Create DAX Measure for Total Profit

● 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 :

Step 2: Create Waterfall Chart (Profit by Sub-Category)

1. Select Waterfall Chart visual

2. Drag Sub-Category → Category

3. Drag Total Profit → Y-axis (Values)

The waterfall chart will show how each sub-category adds to or reduces total profit.

Step 3: Add Region Slicer

1. Select Slicer visual

2. Drag Region → Field

3. Place the slicer beside the waterfall chart

Now you can filter profit contribution by region (Central, South, North, etc.).

Step 4: Screenshot Requirement (Important)

● Apply Region filter if needed

● Ensure Sub-Category names and profit bars are clearly visible

● Take one screenshot showing:

    ○ Waterfall Chart

    ○ Region Slicer

Step 5: Business Insights (4–5 Lines)

1. The waterfall chart shows that sub-categories like **Copiers and Phones** contribute the highest positive profit.

2. Some sub-categories such as **Tables and Bookcases** show negative or low profit impact.

3. Profit contribution varies significantly across regions when filtered using the slicer.

4. High sales volume does not always guarantee high profit, indicating margin issues in certain categories.

5. Regional filtering highlights areas where cost control or pricing strategy needs improvement.

Step 6: Data-Driven Recommendations (2–3 Points)

1. Focus on promoting high-profit sub-categories like **Copiers and Phones** through targeted regional campaigns.

2. Review pricing, discounts, and supplier costs for low or negative profit sub-categories such as **Tables**.

3. Use region-wise analysis to reduce excessive discounts in regions where profit margins are weak.

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 : Scenario Overview

VitaTrack Wellness aims to analyze users' daily habits and health vitals to promote balanced lifestyles and reduce heart-related risks. A one-page Power BI dashboard is designed to provide actionable insights using health and lifestyle data.

Step 1: Data Preparation in Power BI

1. Open **Power BI Desktop**

2. Load the dataset containing:

   - Age, Gender, BMI

   - Steps, Calories, Sleep

   - Heart Rate, Blood Pressure

   - Smoking, Alcohol, Exercise

   - Diabetic, Heart Disease

3. Ensure:

   - Age is numeric

   - Yes/No fields are categorical

   - Blood Pressure split into **Systolic** and **Diastolic** if needed

Step 2: Dashboard Layout (One Page)

Top Filters (Slicers)

- Gender

- Age Group

- Smoking

- Alcohol

- Heart Disease

Question-wise Visual Design & Insights

1. Are users maintaining a balanced lifestyle?

Visuals Used:

- KPI Cards:

  - Average Steps

  - Average Sleep (hours)

  - Average Calories Burned

- Bar Chart: Average Steps & Sleep by Age Group

Insight:
Users with higher daily steps tend to maintain healthier sleep patterns and calorie balance, while sedentary users show poor lifestyle balance.

2. Lifestyle patterns indicating heart disease risk

Visuals Used:

- Clustered Bar Chart:

  - Heart Disease vs Smoking, Alcohol, High BMI

- Pie Chart:

  - Heart Disease distribution

Insight:
Smoking, alcohol consumption, and high BMI are strongly associated with higher heart disease cases

3. Relationship between Sleep and Physical Activity

Visual Used:

- Scatter Plot:

  - X-axis: Steps

  - Y-axis: Sleep Hours

  - Legend: Heart Disease

Insight:
Users with regular physical activity tend to achieve better sleep. Low activity and poor sleep are common among heart-risk users.

4. BMI variation across Age Groups and Gender

Visual Used:

- Clustered Column Chart:

    - Axis: Age Group

    - Values: Average BMI

    - Legend: Gender

Insight:
BMI increases with age, especially among middle-aged groups. Male users show slightly higher BMI variation than females.

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

Visuals Used:

- Bar Charts:

    - Avg Heart Rate by Smoking & Alcohol

    - Avg Blood Pressure by Smoking & Alcohol

Insight:
Smokers and alcohol consumers show elevated heart rate and blood pressure, indicating higher cardiovascular stress.

6. Segmentation for lifestyle suggestions

Visual Used:

- Table or Matrix with conditional formatting

- Categories:

    - Active & Healthy

- Moderately Active

- High Risk