Power BI Assignment

Q1) 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
Ans1)Power BI is a business analytics and data visualization tool by Microsoft that helps users connect to data, transform it, and create interactive reports and dashboards to make data-driven decisions.
The key components of the Power BI ecosystem are: Power BI Desktop, Power BI Service, Power BI Mobile, Power BI Gateway.

a)Power BI Desktop : - A free Windows application used to Connect to data sources, Clean and transform data (Power Query), Build data models and create reports.
-It is mainly used by developers and analysts to design reports.

b)Power BI Service : - A cloud-based platform (web portal) where you Publish reports from Power BI Desktop, Create dashboards, Share and collaborate with others and Schedule data refresh.
-Used for collaboration and report distribution.

c)Power BI Mobile : - Mobile apps for Android, iOS, and Windows that allow users to View dashboards and reports on phones/tablets, Get real-time alerts and Access data anywhere.
-Designed for on-the-go decision making.

d)Power BI Gateway : - A bridge between on-premises data sources (like SQL Server, Excel files, local servers) and the Power BI Service.
- It allows Power BI Service to Refresh data securely and Access local data without moving it to the cloud.

Q2) 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.
Ans2) a) Pie Chart vs Donut Chart

Feature	**Pie Chart**	**Donut Chart**
Shape	Full circle	Circle with a hole in the center
Data Display	Shows part-to-whole relationships	Same as pie, but allows center space for KPIs
Readability	Best for 3–5 categories	Slightly better for labels due to center space
Best Use	Simple percentage distribution	When you want to show a total or KPI in center

Pie Chart: When you only need to show category share clearly.
Donut Chart: When you want to display a key number (like total sales) in the center.

Example: Showing market share of mobile brands.
Pie = % share | Donut = % share + total units in center.

b) Bar Chart vs Column Chart

Feature	**Bar Chart**	**Column Chart**
Orientation	Horizontal	Vertical
Best for	Long category names	Time-based or numeric progression
Space usage	Better for many categories	Better for trends
Readability	Easier to compare many items	Easier to show growth/decline

Bar Chart: When categories have long names or many items.
Column Chart: When showing trends over time (months, years).
Example: - Employee count by department → Bar Chart
- Monthly revenue trend → Column Chart

Q3)Explain the significance of:
● Star schema vs Snowflake schema
● Primary key vs Foreign key in relationships (Power BI)
Why is cardinality important?
Ans3) a) Star schema vs Snowflake schema

Feature	**Star Schema**	**Snowflake Schema**
Structure	One fact table connected directly to dimension tables	Dimension tables are further normalized into sub-tables
Complexity	Simple and easy to understand	More complex due to multiple joins
Performance	Faster query performance in Power BI	Slower than star due to extra joins
Maintenance	Easy to maintain	Harder to maintain
Best Use	Recommended for Power BI models	Used when dimensions are very large and normalized

Significance: Power BI performs best with a star schema because it reduces model complexity, improves performance, and makes DAX calculations easier.

b) Primary key vs Foreign key in relationships (Power BI)

Feature	Primary Key	Foreign Key
Definition	Unique identifier in a table	Column that refers to a primary key in another table
Role	Identifies each row uniquely	Creates a relationship between tables
Example	CustomerID in Customers table	CustomerID in Sales table
Purpose	Ensures data uniqueness	Enables table connections

Significance: They define how tables relate so Power BI can filter and aggregate data correctly.

Cardinality : Cardinality defines how tables are related:
1) One-to-Many (1:*) → most common (Customers → Sales)
2) Many-to-One (*:1)
3) One-to-One (1:1)
4) Many-to-Many (*:*)

Importance of Cardinality :
1) Controls how filters flow between tables
2) Prevents incorrect totals and duplicate counts
3) Improves model performance
4) Ensures accurate DAX results

Q4) Differentiate between:
● Calculated column vs Measure
Also, define Row context and Filter context with simple examples.
Ans4) Calculated column vs Measure

Feature	Calculated Column	Measure
When it is calculated	During data refresh	At report run time
Stored in model	Yes (uses memory)	No (calculated on the fly)
Used in	Rows, columns, filters, slicers	Values in visuals
Depends on	Row context	Filter context
Performance	Slower for large data	Faster and more efficient
Example	Total = Sales[Qty] * Sales[Price]	Total Sales = SUM(Sales[Qty] * Sales[Price])

- Use calculated columns when you need the value per row (like a category, flag, or label).
- Use measures when you need dynamic totals, averages, KPIs, etc.

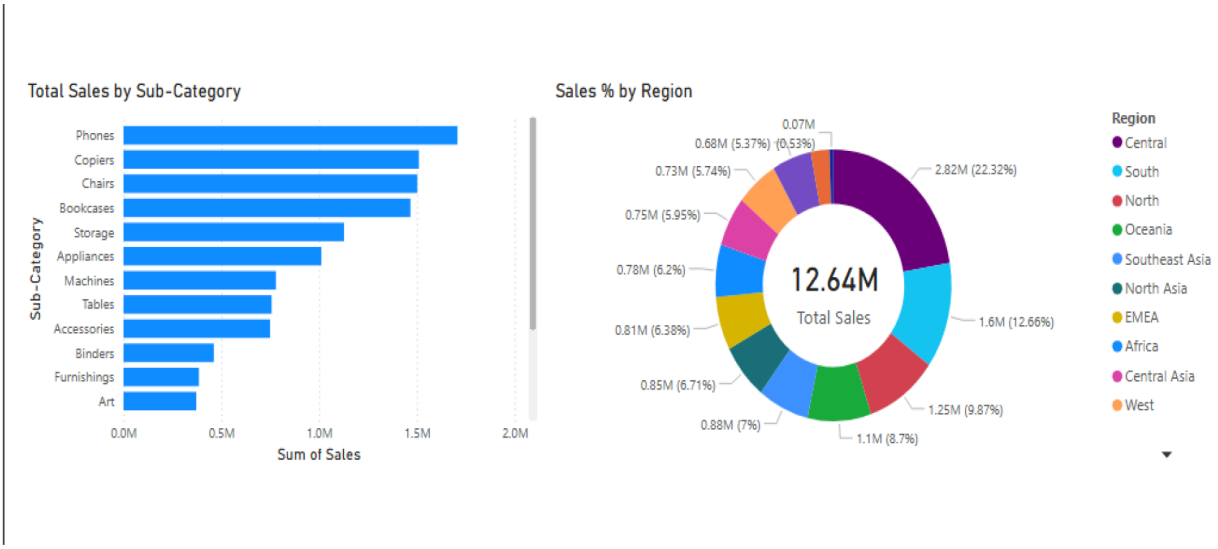
Row context : Row context means DAX is evaluating one row at a time.
Example - DiscountFlag = IF(Sales[Amount] > 1000, "High", "Low")

Filter context : Filter context means DAX calculates values based on applied filters (slicers, visual filters, page filters).
Example - Total Sales = SUM(Sales[Amount])

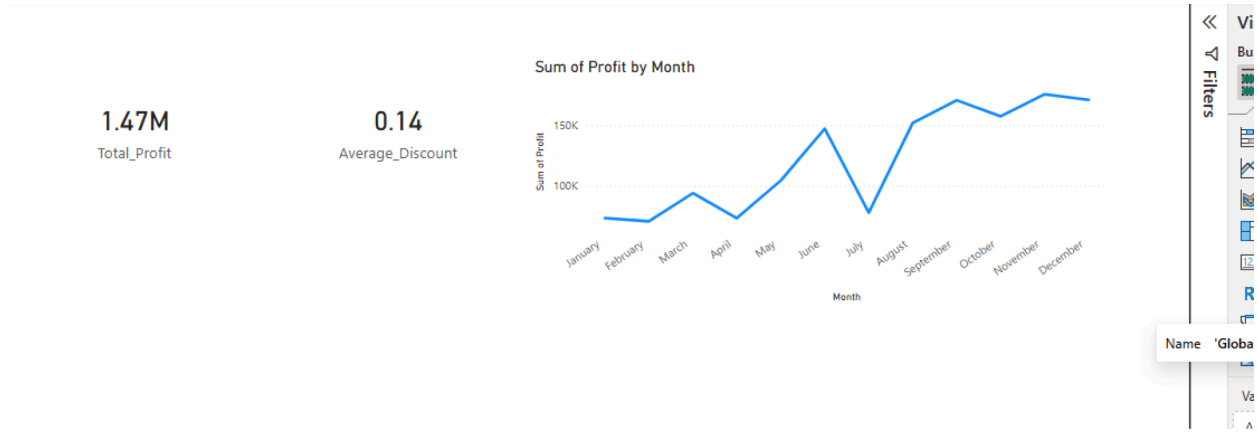
Q5) What is the difference between a report and a dashboard in Power BI?
Ans5)

Feature	Report	Dashboard
Pages	Can have multiple pages	Single page only
Data source	Can use multiple datasets	Uses one dataset
Interactivity	Highly interactive (filters, slicers, drill-down)	Limited interactivity
Creation	Created in Power BI Desktop	Created in Power BI Service
Purpose	Detailed data analysis	High-level business overview
Sharing	Shared as a report	Shared as a dashboard
Visuals	Many visuals per page	Key visuals pinned as tiles
Example	A sales report with 5 pages (region, product, time trends).	One page showing total sales, top products, and KPIs for management.

Q6)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.
Ans6)



Q7)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.
Ans7) DAX Formulas : Total_Profit = Sum(Global_Superstore2[Profit])
Average_Discount = AVERAGE(Global_Superstore2[Discount])



Q8)Implement a DAX measure that calculates the percentage of total sales by product category.
Ans8) DAX Measures :
Total_Sales = SUM(Global_Superstore2[Sales])
% of Total_Sales = DIVIDE([Total_Sales],CALCULATE([Total_Sales],
ALL(Global_Superstore2[Sub-Category])))

Sub-Category	Sum of Sales	% of Total_Sales
Accessories	7,49,237.02	0.06
Appliances	10,11,064.30	0.08
Art	3,72,091.97	0.03
Binders	4,61,911.51	0.04
Bookcases	14,66,572.24	0.12
Chairs	15,01,681.76	0.12
Copiers	15,09,436.27	0.12
Envelopes	1,70,904.30	0.01
Fasteners	83,242.32	0.01
Furnishings	3,85,578.26	0.03
Labels	73,404.03	0.01
Machines	7,79,060.07	0.06
Paper	2,44,291.72	0.02
Phones	17,06,824.14	0.14
Storage	11,27,085.86	0.09
Supplies	2,43,074.22	0.02
Tables	7,57,041.92	0.06
Total	**1,26,42,501.91**	**1.00**

Q9) ● 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.
Ans9) DAX Measure for Total Profit:

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Total_Profit = SUM(Global_Superstore2[Profit])
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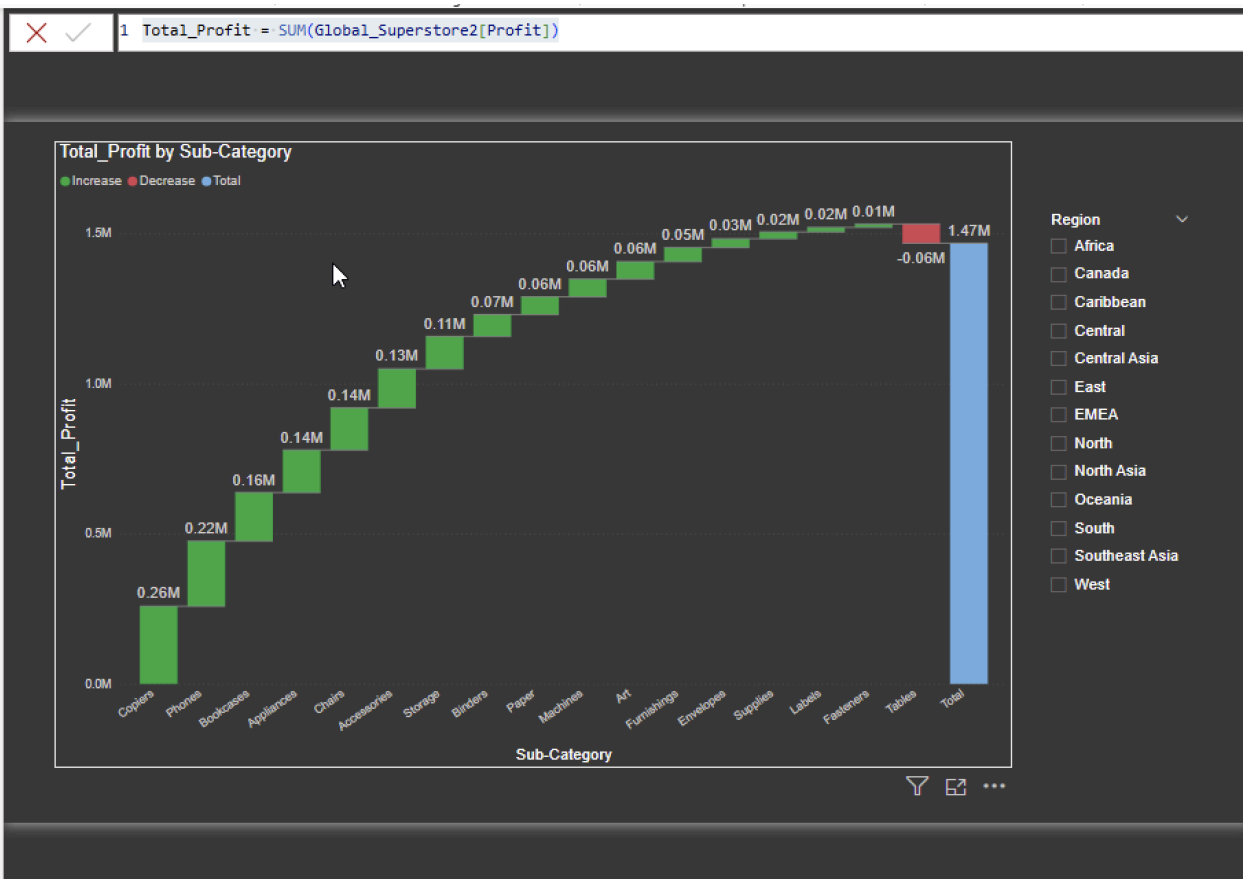

Business Insights :

- Copiers, Phones, and Bookcases are the top profit-driving sub-categories.
- Tables is the only major sub-category with significant losses, pulling down overall profit.
- Mid-tier contributors include Chairs, Appliances, Accessories, and Storage.
- Smaller categories (Fasteners, Labels, Supplies) contribute very little to total profit.
- Profit is highly concentrated in a few sub-categories, indicating dependency risk.

Data-Driven Recommendations:

- Double down on Copiers & Phones – increase inventory, promotions, and bundling.
- Optimize low-impact items – reduce SKUs in very low-profit categories or upsell with high-margin products.
- Fix or reprice Tables – investigate cost, discounting, or supplier issues causing losses.