**Creating Dashboard with Visualization Tool - Assignment**

1. What is Power BI and how does it differ from Excel?

Ans:- Power BI is a business analytics tool developed by Microsoft. It helps you:

* Connect to different data sources (databases, Excel, web, etc.)
* Transform and clean data
* Create interactive dashboards and reports with rich visualizations
* Share these dashboards online or within an organization

It is mainly used for data analysis, visualization, and business intelligence (BI).

How does Power BI differ from Excel?

| Feature | Power BI | Excel |
| --- | --- | --- |
| Main use | Data analysis & interactive reporting | Spreadsheet calculations & data analysis |
| Data capacity | Handles large datasets (millions of rows) easily | Limited to smaller datasets (slower for large data) |
| Visualizations | Advanced, interactive, and dynamic visuals | Basic charts and pivot tables |
| Data refresh | Automatic scheduled refreshes from data sources | Manual refresh or limited automation |
| Data modeling | Strong data modeling (relationships, DAX formulas) | Limited (some support via Power Pivot) |
| Collaboration | Easily share via Power BI Service (cloud) | Sharing mostly via files (email, SharePoint) |
| Ease of use | Built for visual analysis & storytelling | More flexible for calculations, but less focused on BI visuals |

2) Explain the concept of data modeling in Power BI?

Ans:- Data modeling in Power BI is the process of connecting and organizing different data tables using relationships, so you can analyze and visualize them together in a meaningful way. It helps you create a clear, efficient structure by defining how tables relate (like linking sales data to product or date tables), allowing you to build accurate reports and dashboards easily.

3) What are the different types of connections available in Power BI?

Ans: - In Power BI, there are mainly two types of connections available:

1. Import — This option loads the data into Power BI, stores it in a compressed form, and allows for fast performance and full modeling capabilities.
2. DirectQuery — This keeps the data in the original source and queries it live each time you interact with the report; useful for working with very large datasets or when you need real-time data.

Additionally, there's also Live Connection, mainly used to connect directly to Analysis Services models or Power BI datasets without importing or creating a local model.

4) How do you handle data transformation in Power BI?

Ans:- Data transformation in Power BI is handled using Power Query Editor, a built-in tool where you can clean, shape, and prepare data before loading it into your model. You can perform actions like removing duplicates, filtering rows, merging or splitting columns, changing data types, creating new columns, and combining data from multiple sources. All these steps are recorded as applied steps, so they can be refreshed automatically whenever the data is updated.

5) What is DAX (Data Analysis Expressions) and why is it important in Power BI?

Ans:- DAX (Data Analysis Expressions) is a formula language used in Power BI to create custom calculations and expressions on your data. It is important because it allows you to build calculated columns, measures, and tables that help perform complex calculations, analyze trends, and create dynamic reports. With DAX, you can create powerful metrics like year-to-date totals, running totals, or custom KPIs, making your data analysis more flexible and insightful.

6) Can you explain the difference between calculated columns and measures in Power BI?

Ans:- A calculated column is computed row by row during data load and stored in the data model. It adds a new column to your table, and its value is fixed for each row once calculated (like "Profit = Sales – Cost" per row).

A measure is calculated on the fly based on the context of your report (such as filters or slicers). Measures are not stored in the data model; instead, they are computed when you use them in visuals (for example, "Total Sales = SUM(Sales)").

In short: Calculated columns are static per row, while measures are dynamic and depend on report context.

7) How do you handle relationships between tables in Power BI?

Ans:- In Power BI, you handle relationships between tables using the Relationships view, where you can visually connect tables by dragging and dropping fields (usually keys) to create links.

You define relationships based on common columns (like IDs), and you can set their cardinality (one-to-one, one-to-many, or many-to-many), as well as choose the cross-filter direction (single or both).

Creating proper relationships allows you to build a data model where tables work together correctly in reports, enabling you to slice and analyze data from different tables seamlessly.

8) What is the purpose of a Power BI Gateway?

Ans:- A Power BI Gateway acts as a bridge between on-premises data (like data stored in your local SQL Server or Excel files on your company server) and Power BI cloud services.

Its main purpose is to allow you to securely refresh and access on-premises data in your Power BI reports and dashboards without moving the data to the cloud manually. It helps keep your reports up to date by scheduling automatic refreshes and enables live connections to on-premises sources.

9) How can you schedule data refresh in Power BI Service?

Ans :- In Power BI Service, you can schedule data refresh by first publishing your report to the Power BI workspace. Then, go to Datasets, click on Schedule refresh, and set up your refresh settings — including frequency (daily, weekly, multiple times per day), time zone, and specific time slots.

You can also configure credentials for your data source (like setting up a gateway for on-premises data). Once set, Power BI automatically refreshes your data according to this schedule, keeping your reports and dashboards up to date without manual intervention.

10) Explain the concept of row-level security in Power BI ?

Ans :- Row-level security (RLS) in Power BI is a feature that allows you to restrict data access for different users at the row level, so each user only sees the data they’re allowed to see.

You define RLS by creating roles with specific DAX filters on your tables (for example, [Region] = "North"). When a user with that role views the report, Power BI automatically filters the data in the background based on the rule you set.

This is especially useful for scenarios like sales dashboards where each regional manager should only see their own region's data, improving data privacy and security.

11) What is the Power BI Desktop and how does it differ from Power BI Service?

Ans :- Power BI Desktop is a free Windows application that you install on your local computer to create reports. It lets you connect to data sources, transform data using Power Query, build data models, create visuals, and design interactive reports.

On the other hand, Power BI Service is an online (cloud-based) platform where you publish and share reports and dashboards created in Desktop. In the Service, you can collaborate with others, set up data refresh schedules, create dashboards, share content, and access reports from anywhere.

In short, Power BI Desktop is mainly for creating and designing reports, while Power BI Service is for sharing, collaborating, and managing reports online.

12) Explain the concept of Direct Query in Power BI?

Ans :- DirectQuery in Power BI is a connection mode that allows Power BI to connect directly to a data source (like SQL Server, Azure, or SAP) without importing the data into Power BI.

Instead of storing data in the Power BI model, every time you interact with a visual (like applying a filter or clicking a slicer), Power BI sends a live query to the underlying data source and fetches updated results on the fly.

This is useful when working with very large datasets or when you need real-time or near real-time data. However, it depends on the performance and limitations of the data source, and some modeling and transformation features are more limited compared to the Import mode.

13) What are Power BI templates and how are they useful?

Ans :- Power BI templates (with the extension .pbit) are pre-built Power BI files that include the report design, data model, queries, and visuals — but do not contain the actual data (only the structure and connections).

They are useful because they allow you to reuse report layouts and data models easily, share standardized report designs across teams, and let others connect to their own data sources using the same structure.

For example, if your organization needs the same sales report for different regions or clients, you can create a template once and distribute it, so each user can generate their own report quickly by just entering connection parameters.

14) How do you handle incremental data refresh in Power BI?

Ans :- Incremental data refresh in Power BI is used to refresh only new or changed data, instead of reloading the entire dataset every time, which saves time and improves performance — especially for large datasets.

To set it up, you define RangeStart and RangeEnd parameters in Power BI Desktop to specify the date or time range for data partitions. Then, in Power BI Service, you enable incremental refresh on a table and configure how many periods of data to keep (for example, store data for 5 years but refresh only the last 1 month).

When published to the service, Power BI refreshes only the specified recent data incrementally, while older data remains unchanged, making the refresh process faster and more efficient.

15) What is the role of Power Query in Power BI?

Ans :- Power Query in Power BI is a tool used for connecting to, importing, and transforming data before it’s loaded into your data model.

It allows you to clean and shape your data using a wide range of operations, such as removing duplicates, filtering rows, merging tables, pivoting/unpivoting columns, changing data types, and adding custom columns.

Power Query uses a language called M behind the scenes to record all these transformation steps as a sequence, which can be automatically reapplied whenever the data is refreshed.

In short, Power Query helps prepare your raw data and make it ready for analysis in Power BI.

16) Explain the difference between calculated columns and calculated tables in Power BI ?

Ans :- A calculated column is created using DAX and adds a new column to an existing table. It is evaluated row by row, and the results are stored in the data model. Calculated columns are useful when you want to add additional information to each row, such as a profit column (Profit = Sales – Cost).

A calculated table, on the other hand, is a new table you create using a DAX expression. Instead of adding a column to an existing table, you generate an entirely new table that can be based on existing tables, filtered, summarized, or aggregated as needed. For example, you might create a summary table showing total sales per region.

In short:

Calculated column → Adds new data to an existing table (row level).

Calculated table → Creates a whole new table (table level) for analysis or modeling.

17) How do you create custom visuals in Power BI?

Ans :- create custom visuals in Power BI in two main ways:

1. Using pre-built custom visuals from AppSource:

* Go to the Visualizations pane in Power BI Desktop.
* Click on the three dots (…) > Get more visuals.
* Browse and import visuals created by the community or Microsoft from AppSource.

2. Developing your own custom visuals:

* You use the Power BI Developer Tools, which require knowledge of TypeScript and the Power BI visuals SDK.
* You write the visual code, package it, and then import it into Power BI as a .pbiviz file.
* Once imported, you can use it like any other visual in your reports.

Custom visuals allow you to create tailored, unique ways of displaying data beyond the default charts, which is especially useful for specialized business needs or branding.

18) What are the best practices for optimizing performance in Power BI?

Ans :- To optimize performance in Power BI, it’s important to design an efficient data model by using a star schema (fact and dimension tables) and removing unnecessary columns or rows to reduce model size. Use measures instead of calculated columns whenever possible, as they are computed on demand and consume less memory. Limit the use of complex DAX calculations and avoid heavy use of calculated tables if they can be replaced by simpler queries or transformations in Power Query. Reduce cardinality (the number of unique values) in columns, and turn off auto date/time hierarchies when not needed. Also, filter data during import to only bring in relevant records, and enable **incremental refresh** for large datasets to speed up data updates. Finally, regularly monitor your model using the Performance Analyzer tool to identify slow visuals and optimize them.

19) How can you integrate Power BI with other Microsoft products like Azure and Office 365?

Ans :- You can integrate Power BI with other Microsoft products like Azure and Office 365 in many powerful ways to create a seamless analytics and collaboration experience.

With Azure, you can connect to services like Azure SQL Database, Azure Synapse Analytics, Azure Data Lake, and Azure Analysis Services to pull large-scale or real-time data directly into Power BI for analysis. You can also use Azure Machine Learning models within Power BI to add advanced predictive analytics.

With Office 365, Power BI integrates smoothly with tools like Excel (importing data models or using "Analyze in Excel"), SharePoint (embedding reports on pages), Teams (sharing and discussing reports directly within channels), and OneDrive (automatic report updates from files stored in the cloud).

These integrations help you easily share insights, collaborate with teams, and use secure, scalable data sources — all within the Microsoft ecosystem.

20) Explain the concept of aggregations in Power BI?

Ans :- The concept of aggregations in Power BI refers to creating summarized versions of detailed data to improve performance and speed up report queries, especially when working with large datasets.

Instead of always querying millions of rows in a detailed fact table, you create an aggregation table that stores pre-summarized data (for example, total sales by product and month). When users interact with visuals, Power BI can first check if the aggregation table has the needed data and use it instead of querying the full dataset.

This reduces the amount of data scanned, improves report responsiveness, and optimizes resource usage. Aggregations are especially useful when using DirectQuery mode with very large databases, helping to combine detailed analysis capability with high performance.

21) How do you handle error handling and data quality in Power BI?

Ans :- In Power BI, error handling and data quality are mainly managed in the Power Query Editor before loading data into your model.

You can handle errors by using steps like removing errors, replacing error values with defaults, or filtering out invalid rows. You can also apply data type checks, remove duplicates, fill in missing values, and perform validations to ensure the data is clean and consistent.

Additionally, using conditional columns and custom logic in Power Query (with M language) or using DAX for calculated columns and measures helps enforce business rules and correct data issues.

By thoroughly cleaning and validating data at the transformation stage, you improve overall data quality, avoid calculation errors, and ensure that visuals and reports show accurate, reliable insights.

22) What is the purpose of Power BI Embedded and when would you use it?

Ans :- Power BI Embedded is a Microsoft Azure service that allows you to embed Power BI reports and dashboards into your own custom applications, websites, or portals.

The main purpose is to let your users (customers, partners, or employees) interact with rich, interactive Power BI visuals directly inside your app — without needing them to go to the Power BI Service or have a separate Power BI license.

You would use Power BI Embedded when you want to provide analytics capabilities seamlessly within your product or internal tools, give a consistent user experience, and control authentication and data security yourself. This is commonly used by software vendors (ISVs) and organizations that want to offer advanced reporting features to their clients as part of their application.

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