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

Power BI is a business analytics tool developed by Microsoft for data visualization and business intelligence. It allows users to create interactive reports and dashboards.

Differences from Excel:

- **Visualization**: Power BI provides more advanced, dynamic visualizations.
- **Data Modeling**: Power BI supports relationships between tables like a database.
- **Data Handling**: Power BI handles large datasets more efficiently.
- **Automation**: Scheduled data refreshes and real-time updates are possible.
- **Sharing**: Easier report sharing via Power BI Service.

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

Data modeling involves connecting tables through relationships, creating a data structure that supports analysis. Power BI uses a star schema with fact and dimension tables. It also supports calculated columns, measures, and hierarchies.

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

- **Import**: Loads data into Power BI.
- **DirectQuery**: Queries data in real time from the source.
- **Live Connection**: Used with tools like SSAS (SQL Server Analysis Services).
- **Composite Model**: Mix of Import and DirectQuery in one model.

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

Using **Power Query Editor**, you can:

- Remove duplicates, nulls
- Change data types
- Merge and append queries
- Create conditional columns
- Split or combine columns

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

DAX is a formula language used to create custom calculations. It's essential for:

- Creating **measures** and **calculated columns**
- Filtering data
- Creating KPIs and time intelligence functions (YTD, QTD, etc.)

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6) Difference between calculated columns and measures:

Feature	Calculated Column	Measure
Evaluation	Row by row	Aggregated context
Storage	Stored in model	Not stored; calculated at runtime
Use Case	Create new fields	For aggregations and summarizations

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

- Use **Manage Relationships** to define one-to-many or many-to-one relationships.
- You can set **active/inactive** relationships.
- **Cardinality and cross-filter direction** must be set correctly.

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

A gateway connects on-premises data sources to Power BI Service, allowing:

- Scheduled data refresh
- Live queries from cloud to local databases

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

- After publishing, go to the dataset in Power BI Service.
- Under **Scheduled refresh**, configure frequency, credentials, and gateway.

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10) Explain row-level security in Power BI.

Row-level security (RLS) restricts data access for users. You can:

- Define roles with DAX filters (e.g., `[Region] = "West"`).
- Assign users to roles in Power BI Service.

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

Feature	Power BI Desktop	Power BI Service
Platform	Windows application	Cloud-based (browser)
Usage	Create, model, and design reports	Share, schedule refresh, manage access
Publish Option	Used to publish to Power BI Service	Host published reports

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12) Explain Direct Query in Power BI.

Direct Query allows Power BI to connect directly to the data source and fetch results in real-time. It doesn't import data, hence:

- Real-time analysis
- Limited transformation features
- Dependent on source performance

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

`.pbit` files store the report structure without the data. They are useful for:

- Reusability across teams
- Sharing standard report designs
- Applying new data sources easily

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

- Define parameters (e.g., RangeStart, RangeEnd).
- Apply filter in Power Query.
- Configure in Power BI Service under dataset settings.
  Useful for large datasets to update only recent data.

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

Power Query is the ETL (Extract, Transform, Load) tool within Power BI used for:

- Importing data
- Cleaning and shaping data
- Merging datasets

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16) Difference between calculated columns and calculated tables:

- **Calculated Column**: Adds a new field to an existing table using DAX.
- **Calculated Table**: A new table created using DAX, often used for aggregations, summarizations, or lookups.

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

- Use R or Python scripts for visualizations.
- Use **Power BI Developer Tools** to create and import visuals via JavaScript.
- Download custom visuals from the **AppSource Marketplace**.

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18) Best practices for optimizing performance in Power BI:

- Use star schema modeling.
- Limit calculated columns and use measures.
- Filter data before importing.
- Disable unnecessary visuals.
- Use variables in DAX.
- Use summary tables and aggregations.

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

- **Azure Synapse** or **Azure Data Lake** as data sources.
- **Azure ML** for predictive analytics.
- **Excel** for exporting reports.

- **SharePoint** and **Teams** for embedding dashboards.
- **Power Automate** for triggering workflows.

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20) Explain the concept of aggregations in Power BI.

Aggregations reduce data size by summarizing details (e.g., sales by month). Improves performance by:

- Reducing query time
- Allowing drill-down to detailed data if needed

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

- Use **Power Query** to detect errors (nulls, mismatches).
- Use tools like **Data Profiling**, **Column Quality**, and **Keep Errors/Remove Errors**.
- Create DAX expressions with `IFERROR`, `ISBLANK`.

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

Power BI Embedded allows developers to embed Power BI reports into apps or websites. Used when:

- You want to provide BI to users without them logging into Power BI Service.
- You're building SaaS or enterprise apps with data visualization.