**Data Modeling**

1. **What are the different types of relationships in Power BI? Explain active and inactive relationships.**
   * **Types of Relationships:**
     + **One-to-Many (1:\*):** One record in the first table relates to multiple records in the second.
     + **Many-to-One (\*:1):** Multiple records in the first table relate to a single record in the second.
     + **Many-to-Many (*:*):** Multiple records in both tables can relate to each other.
   * **Active vs Inactive Relationships:**
     + **Active Relationship:** The relationship used by default in Power BI.
     + **Inactive Relationship:** Not used by default but can be activated with DAX functions like USERELATIONSHIP.
2. **How do you handle circular dependencies in data models?**
   * Circular dependencies occur when tables reference each other in a loop, causing an error. To handle this:
     + Identify and eliminate redundant relationships.
     + Redesign the model, possibly by introducing intermediary tables.
     + Use bi-directional filtering with caution and avoid unnecessary cross-filters.
3. **What is the difference between a star schema and a snowflake schema? Which one is preferred in Power BI and why?**
   * **Star Schema:**
     + A central fact table with direct relationships to dimension tables.
     + Simpler and better for performance in Power BI.
   * **Snowflake Schema:**
     + Dimension tables are normalized into additional related tables.
     + More complex but reduces redundancy.
   * **Preferred in Power BI:** Star schema, as it is simpler, more intuitive, and optimized for performance.
4. **Explain the concept of cardinality and its impact on performance in Power BI.**
   * Cardinality refers to the uniqueness of data in a relationship.
     + High cardinality (many unique values) can increase model complexity and reduce performance.
     + Low cardinality (few unique values) leads to better performance.
     + Optimize cardinality by reducing unnecessary relationships and using aggregated tables.
5. **How do you use calculation groups in Power BI for managing measures?**
   * Calculation groups allow you to define reusable calculations across multiple measures.
   * Use them to create standardized calculations like YTD, MTD, and QTD, and manage different time-based measures with a single group.
   * They simplify the model and improve measure consistency.

**DAX (Data Analysis Expressions)**

1. **What is the difference between CALCULATE and FILTER in DAX?**
   * **CALCULATE:** Changes the filter context for a given calculation.
   * **FILTER:** Returns a filtered table based on a condition and is used within CALCULATE or other DAX functions.
2. **How do you optimize DAX queries for better performance?**
   * Avoid complex iterators (SUMX, FILTER) when not necessary.
   * Use variables to store intermediate results.
   * Leverage CALCULATE efficiently to change filter context.
   * Minimize the use of row-level calculations in large datasets.
3. **Explain the difference between SUMX and SUM. When would you use one over the other?**
   * **SUM:** Adds values in a column.
   * **SUMX:** Iterates through a table or expression and sums the result.
   * Use SUM for simple column summation and SUMX when you need to evaluate expressions row-by-row.
4. **What are row context and filter context? How do they interact in DAX calculations?**
   * **Row Context:** The context of a single row during row-by-row calculations.
   * **Filter Context:** The set of filters applied to the data, often influenced by slicers or report filters.
   * They interact as filter context affects how row context is calculated in aggregated measures.
5. **Write a DAX formula to calculate year-over-year growth for a sales dataset.**

DAX

Copy code

YoYGrowth =

(SUM(Sales[Amount]) - CALCULATE(SUM(Sales[Amount]), SAMEPERIODLASTYEAR(Calendar[Date])))

/ CALCULATE(SUM(Sales[Amount]), SAMEPERIODLASTYEAR(Calendar[Date]))

1. **How does the ALL function work, and when would you use it?**
   * The ALL function removes filters from a table or column, returning all data.
   * Use it to calculate values like total sales regardless of current filters, or when you want to compare a value to an overall total.
2. **What is a disconnected table in Power BI? Provide an example of how to use it.**
   * A disconnected table is a table with no relationships to other tables in the data model.
   * Example: Creating a table of KPI selection options and using DAX to switch between metrics (e.g., Sales vs Profit) based on user selection.
3. **Explain the use of RELATED and RELATEDTABLE functions.**
   * **RELATED:** Returns a related value from another table using a relationship.
   * **RELATEDTABLE:** Returns a related table and is used in row-by-row context.

**Visualization**

1. **What are the best practices for designing Power BI dashboards for performance and usability?**
   * Limit the number of visuals per report page.
   * Optimize data models with star schema.
   * Use summary metrics over detailed tables where possible.
   * Avoid complex visuals like maps with large datasets.
   * Optimize DAX and use aggregated tables.
2. **How can you handle conditional formatting in a table or matrix visual?**
   * Use the "Conditional Formatting" option in the formatting pane.
   * Format based on field values, scale, or custom DAX expressions.
3. **What is the difference between slicers and filters in Power BI?**
   * **Slicer:** A visual element used for interactive filtering by the report viewer.
   * **Filter:** Can apply to visuals, pages, or reports and is set by the report creator.
4. **How do you enable drill-through functionality in Power BI?**
   * Create a dedicated drill-through page.
   * Set up the fields for drill-through in the "Drillthrough" section.
   * Right-click on a visual and select "Drillthrough" to navigate to the detailed page.
5. **Explain how to create a dynamic title in Power BI visuals based on slicer selections.**
   * Create a measure using SELECTEDVALUE or IF statements to return a dynamic title based on slicer input.
   * Set the title to the measure in the "Title" section of the formatting pane.
6. **How would you handle large datasets in visuals to avoid performance issues?**
   * Use aggregation tables.
   * Limit the number of visuals per page.
   * Apply filters to reduce the data load.
   * Use DirectQuery for real-time data sources.
7. **Can you describe how to use bookmarks to enhance interactivity in Power BI?**
   * Create multiple views in your report.
   * Set up bookmarks for each view (e.g., KPIs, detailed data).
   * Use buttons to navigate between bookmarks, enhancing interactivity.

**Power Query (M Language)**

1. **What are the key differences between M and DAX languages?**
   * **M:** Used for data transformation in Power Query before data is loaded into the model.
   * **DAX:** Used for calculations on the data model after it's loaded into Power BI.
2. **How would you use parameters in Power Query to create dynamic datasets?**
   * Create a parameter in Power Query to dynamically filter data.
   * Use parameters in query steps to adjust data loading behavior based on user input.
3. **Explain the purpose of the Group By function in Power Query and provide an example.**
   * **Group By:** Groups data based on one or more columns and performs aggregation functions (e.g., SUM, COUNT).
   * Example: Group sales by region and calculate the total sales.
4. **How do you optimize Power Query steps for better refresh performance?**
   * Reduce the number of steps.
   * Use query folding to push transformations to the data source.
   * Filter data early in the process.
5. **What is the difference between merging and appending queries?**
   * **Merging:** Combines columns from two queries based on a common column.
   * **Appending:** Stacks rows from two queries with the same structure.

**Performance Optimization**

1. **What techniques would you use to improve Power BI report performance?**
   * Optimize data models.
   * Reduce the complexity of DAX queries.
   * Use aggregated tables.
   * Limit visuals and slicers.
2. **How do you decide when to use DirectQuery, Import, or a hybrid mode?**
   * **DirectQuery:** Use when real-time data access is needed.
   * **Import:** Use when performance and historical data are a priority.
   * **Hybrid:** Use when a combination of real-time and historical data is required.
3. **What are aggregations in Power BI, and how can they improve performance?**
   * Aggregations store summarized data in memory to improve query performance on large datasets.
   * They allow queries to run against aggregated tables instead of detailed tables.
4. **How do you monitor and analyze Power BI report performance?**
   * Use the Performance Analyzer tool in Power BI Desktop.
   * Track load times, DAX queries, and resource usage.
5. **Explain how you would troubleshoot slow report rendering in Power BI.**
   * Optimize data models.
   * Simplify visuals.
   * Reduce unnecessary calculations and optimize DAX expressions.

**Advanced Features**

1. **What are Power BI Dataflows, and how do they differ from datasets?**
   * **Dataflows:** Extract, transform, and load (ETL) data into Power BI from multiple sources.
   * **Datasets:** Data models within Power BI created from dataflows or other data sources.
2. **How can you use Row-Level Security (RLS) to restrict data access in Power BI?**
   * Set up roles and define DAX filter expressions for each role.
   * Assign users to roles in Power BI Service.
3. **Explain the use of custom visuals and when to prefer them over default visuals.**
   * Custom visuals can be used when default visuals don't meet the specific needs of the report.
   * Use them when you need a specialized visualization or more advanced interactivity.
4. **How do you handle incremental refresh in Power BI?**
   * Set up incremental refresh by defining the date range and the data refresh policy.
   * Incremental refresh loads only new or changed data instead of reloading the entire dataset.
5. **What is composite modeling, and how is it used in Power BI?**
   * Composite modeling allows combining DirectQuery and Import data sources in a single report.
   * It is useful when you need real-time data and high-performance analytics from historical data.

**Integration and Collaboration**

1. **How do you publish and share Power BI reports securely?**
   * Publish to Power BI Service.
   * Use role-based access and RLS for security.
   * Share reports with specified users or groups.
2. **What is the role of Power BI Service, and how does it differ from Power BI Desktop?**
   * **Power BI Service:** Cloud-based platform for sharing and collaboration.
   * **Power BI Desktop:** Local application for report development and data modeling.
3. **How do you integrate Power BI with other Microsoft tools like Excel or Power Automate?**
   * Power BI integrates with Excel for seamless data analysis.
   * Power Automate can automate data workflows and trigger actions based on Power BI data.
4. **Explain the use of Power BI REST APIs in custom applications.**
   * Power BI REST APIs allow programmatic access to Power BI service features, including embedding reports, managing datasets, and automating report workflows.
5. **How do you embed Power BI reports into web applications or SharePoint?**
   * Use Power BI Embedded service to embed reports into web apps.
   * Use the "Embed for SharePoint" option for embedding reports directly into SharePoint sites.

**Scenario-Based Questions**

1. **A report you created has slow refresh times. How would you troubleshoot and resolve the issue?**
   * Review data model and optimize.
   * Check for large, unoptimized tables.
   * Use incremental refresh and optimize DAX calculations.
2. **How would you handle a requirement to display data at both summary and detail levels in the same report?**
   * Use drill-through and drill-down functionality.
   * Create summary visuals on the main report and detailed ones on drill-through pages.
3. **A client wants real-time data in a Power BI dashboard. How would you implement this?**
   * Use DirectQuery for live data connections.
   * Utilize Power BI Streaming datasets for real-time updates.
4. **How would you design a Power BI report to handle multi-language support?**
   * Use dynamic measures with translated labels based on the user's language preference.
5. **Describe a challenging Power BI project you worked on and how you resolved the challenges.**
   * Provide an example where complex data models or performance issues were tackled using optimization techniques like composite models, incremental refresh, and efficient DAX.