Power BI Skill Test Reattempt

Company Background

MetroFlow is a smart city initiative aimed at improving urban transportation. The city faces rising traffic congestion, inefficient public transport routes, and increasing pollution due to vehicular emissions. The data analytics team at MetroFlow is responsible for deriving actionable insights to optimize traffic flow, reduce commute times, and improve transportation efficiency.
To evaluate the team's proficiency in Power BI, MetroFlow has designed a Skill Test based on real-world smart city transportation challenges.

Case Study Objectives

The goal is to assess the ability to:

- Build interactive dashboards to visualize traffic congestion and transportation efficiency.
- Analyze traffic flow trends based on historical and live data.
- Use DAX and Power Query to manipulate data for decision-making.
- Apply advanced Power BI concepts such as drill-through, dynamic filters, and KPI tracking.

Data Context

MetroFlow maintains the following key datasets:

1. **Traffic Sensors Table** – Captures real-time traffic density from different locations.
2. **Public Transport Routes Table** – Details routes, schedules, and delays of buses and metro services.
3. **Accidents Table** – Logs accidents with timestamps, severity, and affected road segments.
4. **Vehicle Count Table** – Monitors the number of vehicles passing through major intersections.
5. **Pollution Levels Table** – Records emissions and air quality index (AQI) in different city zones.

Beginner-Level Scenarios (Attempt all)

1. **Identifying High-Traffic Areas**
    - The city council wants a report on locations with the highest traffic congestion.
    - **Task**: Create a heatmap showing traffic congestion levels by location.
2. **Peak Hour Traffic Analysis**
    - MetroFlow wants to understand rush hour traffic patterns.
    - **Task**: Create a line chart showing vehicle count trends over different hours of the day.
3. **Public Transport Punctuality**

- The city needs to evaluate how often buses and metro services are running on time.
- **Task**: Build a table visualization displaying public transport routes with the highest delays.

Intermediate-Level Scenarios (Attempt any 4)

4. **Accident Hotspots Analysis**
   - MetroFlow wants insights into accident-prone locations.
   - **Task**: Create a Power BI map visual displaying accident frequency per location.
5. **Vehicle Type Contribution to Traffic**
   - Understanding which vehicle type contributes the most to congestion is crucial.
   - **Task**: Create a stacked column chart comparing vehicle types (cars, buses, trucks, two-wheelers) contributing to traffic in major zones.
6. **Dynamic KPI Metrics for Traffic Efficiency**
   - **Task**: Use DAX measures to calculate and display dynamic KPIs, including:
     - Average commute time per zone
     - Percentage of on-time public transport arrivals
     - Daily vehicle count trend
7. **Pollution Impact Analysis**
   - Traffic congestion contributes to pollution.
   - **Task**: Create a correlation analysis between traffic density and AQI using a scatter plot.
8. **Alternative Route Suggestions**
   - The transport department wants insights into potential alternate routes.
   - **Task**: Design an interactive dashboard highlighting possible alternate routes for high-congestion areas.

Advanced-Level Scenarios (Attempt any 1)

9. **Predictive Traffic Model**
   - MetroFlow wants to predict future congestion trends.
   - **Task**: Use Power BI's forecasting feature to predict traffic congestion levels in the next month.
10. **Public Transport Optimization**

- The city wants to optimize the metro and bus routes for efficiency.
- **Task**: Create a Power BI report identifying underutilized and overcrowded public transport routes.

Debugging Challenges

1. **Incorrect DAX Measure for Average Commute Time Calculation**
   - A Power BI report has an incorrect DAX measure for average commute time:

```
AvgCommuteTime = SUM(Traffic[CommuteTime]) / COUNTROWS(Traffic)
```

- **Question**: Is this formula correct? If not, explain why and provide a corrected version.

2. **Incorrect Relationship in Power BI Model**
   - The Power BI model incorrectly links **Traffic Sensors Table** and **Accidents Table** using **Accident ID** instead of **Location ID**.
   - **Question**: Why is this incorrect? How would you correct the relationship?

Submission Guidelines

Format:

- Submit a Power BI (pbix) file containing all reports and dashboards.
- Include DAX formulas in the Power BI file or a separate .txt file.

Evaluation Criteria:

- Accuracy of reports and calculations.
- Efficiency of DAX formulas.
- Use of best practices (data modeling, relationships, and visual formatting).

Presentation:

- Candidates must explain their Power BI dashboards in a short live demonstration.
- The skill test is incomplete without the presentation.