**🛍️ Market Basket Analysis & Store Optimization**

**Type:** Group Project | Job Simulation | Retail Analytics  
**Tech Stack:** Python, SQL, Power BI, Excel

**🧩 Business Simulation Context**

You are hired as a **Retail Data Strategy Team** for **“SmartMart”**, a growing mid-size supermarket chain with 40+ outlets across metro cities. They have observed that while sales have increased, **profit margins are declining**, **popular items run out too quickly**, and some **products are never bought together**, leading to poor shelf placement and waste.

The management is now launching an initiative to optimize store layout and promotions using **Market Basket Analysis** and expects your team to deliver actionable insights to:

* Identify which products are commonly bought together
* Help reposition or bundle products for better customer experience and sales
* Optimize shelf space and stock placement
* Recommend pricing and promotion strategies based on association rules

**🛠️ Tools & Technologies**

* Python (Pandas, mlxtend - Apriori algorithm)
* SQL (MySQL/PostgreSQL for querying sales & stock tables)
* Power BI (Dashboard building and data storytelling)
* Excel (Initial profiling and pivot analysis)

**👥 Team Role Distribution (Not Mandatory)**

| **Intern** | **Role** | **Responsibilities** |
| --- | --- | --- |
| 1 | Data Wrangler | Data Cleaning in Python/Excel |
| 2 | Python Analyst | Apriori Model + Association Rule Mining |
| 3 | SQL Analyst | SKU Analysis, Stock Optimization Queries |
| 4 | BI Developer | Power BI Dashboard |
| 5 | Strategy Analyst | Insights & Recommendations |
| 6 | QA & Project Lead | Coordination, Final Report, Quality Checks |

**📈 Expected Deliverables**

1. Python Notebook
2. SQL scripts with stock/sales queries
3. Power BI dashboard (.pbix) file
4. Excel file with pivots and charts
5. Final PDF Report (5–8 pages) including:
   * Problem Statement
   * Team Roles & Contributions
   * Technical Approach
   * Key Findings & Visuals
   * Strategic Recommendations

**💬 Interview Questions**

**🔹 Python & Market Basket Analysis**

1. What is the Apriori algorithm? How does it work?
2. What is support, confidence, and lift? What values are considered strong?
3. How do you handle large transaction datasets for market basket analysis?
4. What is the difference between association rule mining and classification?
5. Why might you prune rules with high confidence but low lift?

**🔹 SQL**

1. How would you find the top-selling products by month using SQL?
2. Write a query to identify items that were never sold together.
3. How can you optimize SQL queries on large datasets?
4. How do you calculate inventory turnover rate using SQL?
5. Explain joins with an example from this project.

**🔹 Excel**

1. How did you use pivot tables for initial analysis?
2. What Excel formulas did you use to explore product patterns?
3. How did you clean data in Excel before moving to Python?

**🔹 Power BI**

1. How did you structure your Power BI dashboard?
2. What visuals did you use to represent association rules or stock performance?
3. What are slicers, and how did you apply them?
4. How would a stakeholder use your dashboard to take action?

**🔹 Business/General**

1. What actionable insights did your team generate from this analysis?
2. How would you explain association rules to a non-technical store manager?
3. What challenges did you face working in a team, and how did you overcome them?
4. How can market basket analysis improve profitability in retail?
5. If you had more time, what improvements would you make in this project?

**📚 Learning Outcomes**

* Real-world implementation of market basket analysis
* Retail data analytics from transactional, stock, and customer behavior angles
* Dashboard storytelling for business decisions
* SQL proficiency for business intelligence
* Collaboration in a multi-role data team
* Interview-readiness through hands-on, end-to-end analytics