Question: Customer Purchase Behavior Analysis

A retail company collects transaction data from its customers, storing purchase amounts in a **2D NumPy array**, where each row represents a customer and each column represents daily transactions over a month. The company wants to analyze spending patterns.

Problem Statement:

Using NumPy, analyze customer purchase behavior by performing the following tasks:

1. Create a **2D NumPy array** to represent purchase amounts.
2. Compute the **total spending** of each customer over the month.
3. Find the **average daily spending** per customer.
4. **Finds customers** who **spent more than $3000**

Question: Stock Market Data Analysis

A financial company tracks daily stock prices of multiple companies in a **2D NumPy array**, where each row represents a stock and each column represents daily closing prices. The company wants to analyze stock trends and risks.

Problem Statement:

Using NumPy, perform the following stock market analysis:

1. Create a **2D NumPy array** to store stock prices.
2. Find the **maximum and minimum prices** for each stock.
3. Compute the **cumulative sum** of each stock .
4. Sort stocks based on **average return**.

Question : Traffic Flow Analysis Using IoT Sensors

A smart city initiative installs IoT sensors on roads to monitor traffic congestion. The sensor data is stored in a **2D NumPy array**, where each row represents a different road, and each column represents hourly traffic counts.

Problem Statement:

Using NumPy, analyze traffic patterns by performing the following operations:

1. Create a **2D NumPy array** to store traffic data.
2. Find the **average vehicle count** per road over the day.
3. Identify roads with **peak congestion periods** (highest values).
4. Detect roads with traffic exceeding a **critical congestion threshold**.
5. Compute the **cumulative sum** of vehicles passing each road.

6. Identify **hourly trends** by reshaping data into time blocks (e.g., morning/evening).
7. Simulate **future traffic data** using NumPy's random functions.

Question : Patient Health Monitoring in Hospitals

A hospital monitors patient health metrics (heart rate, blood pressure, oxygen levels) using wearable devices. The data is stored in a **2D NumPy array**, where each row represents a patient and each column represents daily health readings.

Problem Statement:

Using NumPy, analyze patient health trends and detect anomalies:

1. Create a **2D NumPy array** to represent patient health metrics.
2. Find the **mean and standard deviation** for each metric.
3. Identify patients with **critical readings** (above or below thresholds).
4. Sort patients based on **average heart rate**.
5. Detect patients with **anomalous readings** using standard deviation thresholds.
6. Reshape the dataset to analyze **weekly health trends**.
7. Simulate **new patient health readings** using NumPy's random functions.

Question : Sales Forecasting and Demand Analysis

A company tracks daily sales of multiple products in a **2D NumPy array**, where each row represents a product and each column represents sales data over time. The company wants to forecast future demand.

Problem Statement:

Using NumPy, analyze sales trends and perform demand forecasting:

1. Create a **2D NumPy array** to store sales data.
2. Find the **total sales** for each product.
3. Identify **seasonal trends** by reshaping data into weeks/months.
4. Sort products based on **growth rate** (percentage change over time).
5. Detect products with **declining sales** using trend analysis.

Question : Energy Consumption Monitoring in Smart Homes

A smart home system collects electricity usage data from different appliances. The data is stored in a **2D NumPy array**, where each row represents an appliance and each column represents hourly energy consumption.

Problem Statement:

Using NumPy, analyze energy consumption patterns:

1. Create a **2D NumPy array** to store energy consumption data.
2. Compute the **total energy usage** of each appliance.
3. Compute the **average daily energy consumption** per appliance.
4. Compute the **cumulative energy usage** over time.
5. Reshape the data to analyze **weekly and monthly trends**.