Scenario 1: Hospital Management System

You are developing a mini module for a hospital to track patients and their test results.

Question:

Create a class `Patient` with the following details:

- `patientId` (int)
- `name` (String)
- `testResults` (array of 5 doubles representing results from 5 medical tests)

Implement the following:

1. A constructor to initialize all attributes.
2. A method `getAverageResult()` to calculate the average test result.
3. A method `hasCriticalValues()` that returns `true` if any test result is below 50.
4. A method `displayPatientReport()` to show all patient information.

In the `main` method:

- Create an array of 5 `Patient` objects with sample data.
- Display reports only for patients who have critical values.

Scenario 2: Online Shopping Cart System

You are designing a shopping cart system for an online store.

Question:

Create a class `CartItem` with:

- `itemId` (int)
- `itemName` (String)
- `pricesFromSellers` (array of 3 doubles representing price quotes from different sellers)

Design a class `ShoppingCart` that contains:

- An array of `CartItem` objects (assume 5 items in the cart)

Implement the following methods in `ShoppingCart`:

1. `displayCart()` – Displays all items and their lowest price.
2. `calculateTotalCost()` – Sums the lowest price of each item to give total cart value.

In the `main` method:

- Create a `ShoppingCart` object and populate it with items.
- Display cart details and the total cost.

Scenario 3: College Grading System

You're tasked with building a grading system for students in a college.

Question:

Define a class `Course` with:

- `courseName` (String)
- `marks` (an array of 4 integers representing marks in different assessments)

Define a class `Student` with:

- `rollNo` (int)
- `name` (String)
- An array of `Course` objects (student takes 3 courses)

Write the following methods in `Student` class:

1. `getOverallAverage()` – Computes the average mark across all courses.
2. `displayStudentPerformance()` – Prints student's name, course-wise average, and overall average.

In the `main` method:

- Create 2 students with sample data.
- Display their academic performance.

Problem Solving

1. Find the Maximum and Minimum Element in an Array

Problem: Write a Java program to find both the **maximum** and **minimum** numbers in a given integer array.

Input: `{3, 9, 2, 5, 6}`

Expected Output:

```
Maximum: 9
Minimum: 2
```

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2. Find the Frequency of Each Element in an Array

Problem: Write a program to count the frequency of each element in an array.

Input: `{1, 2, 2, 3, 3, 3}`

Expected Output:

```
1 occurs 1 time
2 occurs 2 times
3 occurs 3 times
```

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3. Find the Second Largest Element in an Array

Problem: Write a Java program to find the second largest number in an array.

Input: `{12, 35, 1, 10, 34, 1}`

Expected Output:

```
Second Largest: 34
```