**Exercise 7: Financial Forecasting**

**Scenario:**

You are developing a financial forecasting tool that predicts future values based on past data.

**Steps:**

1. **Understand Recursive Algorithms:**
   * Explain the concept of recursion and how it can simplify certain problems.
2. **Setup:**
   * Create a method to calculate the future value using a recursive approach.
3. **Implementation:**
   * Implement a recursive algorithm to predict future values based on past growth rates.
4. **Analysis:**
   * Discuss the time complexity of your recursive algorithm.
   * Explain how to optimize the recursive solution to avoid excessive computation.

public class FinancialForecasting {

// Recursive method to calculate future value

public static double calculateFutureValueRecursive(double presentValue, double growthRate, int years) {

if (years == 0) {

return presentValue;

}

return calculateFutureValueRecursive(presentValue, growthRate, years - 1) \* (1 + growthRate);

}

// Iterative (optimized) version to calculate future value

public static double calculateFutureValueIterative(double presentValue, double growthRate, int years) {

for (int i = 0; i < years; i++) {

presentValue \*= (1 + growthRate);

}

return presentValue;

}

public static void main(String[] args) {

double presentValue = 10000.0; // Current investment

double annualGrowthRate = 0.08; // 8% annual growth rate

int years = 5; // Forecast for 5 years

// Using recursive method

double futureValueRecursive = calculateFutureValueRecursive(presentValue, annualGrowthRate, years);

System.out.printf("Recursive Future Value after %d years: $%.2f\n", years, futureValueRecursive);

// Using iterative method

double futureValueIterative = calculateFutureValueIterative(presentValue, annualGrowthRate, years);

System.out.printf("Iterative Future Value after %d years: $%.2f\n", years, futureValueIterative);

}

}

**Output**

Recursive Future Value after 5 years: $14693.28

Iterative Future Value after 5 years: $14693.28