**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.

**package src;**

import java.util.HashMap;

public class Forecast {

// Memoization cache to avoid recomputation

private static HashMap<Integer, Double> memo = new HashMap<>();

// Recursive method to calculate future value

public static double futureValue(double initialValue, double growthRate, int years) {

if (years == 0) return initialValue;

// Check memoized value

if (memo.containsKey(years)) {

return memo.get(years);

}

// Recursive call

double value = futureValue(initialValue, growthRate, years - 1) \* (1 + growthRate);

memo.put(years, value); // store in cache

return value;

}

public static void main(String[] args) {

double initialValue = 1000.0; // Rs 1000

double growthRate = 0.10; // 10% annual growth

int years = 5;

double result = futureValue(initialValue, growthRate, years);

System.out.printf("Future value after %d years: ₹%.2f%n", years, result);

}

}

**OUTPUT**

Future value after 5 years: ₹1610.51