1 . E-commerce Platform Search Function

public class Main {

    public static void main(String[] args) {

        Product[] products = {

            new Product(104, "Shoes", "Footwear"),

            new Product(101, "Laptop", "Electronics"),

            new Product(105, "Watch", "Accessories"),

            new Product(102, "Mobile", "Electronics"),

            new Product(103, "Shirt", "Apparel")

        };

        int searchId = 102;

        // Linear Search

        Product foundLinear = SearchEngine.linearSearch(products, searchId);

        System.out.println(" Linear Search Result:");

        if (foundLinear != null)

            System.out.println(foundLinear);

        else

            System.out.println("Product not found.");

        // Binary Search (after sorting)

        SearchEngine.sortByProductId(products);

        Product foundBinary = SearchEngine.binarySearch(products, searchId);

        System.out.println("\n Binary Search Result:");

        if (foundBinary != null)

            System.out.println(foundBinary);

        else

            System.out.println("Product not found.");

    }

}

A screen shot of a computer

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**Analysis**

**Time Complexity Comparison**

* **Linear Search**:
  + Time Complexity: **O(n)**
  + It checks each product one by one.
  + Slower when there are many products.
* **Binary Search**:
  + Time Complexity: **O(log n)**
  + It searches by dividing the sorted product list in half repeatedly.
  + Much faster than linear search.

2 . Financial Forecasting

import java.util.Scanner;

public class Forecast {

    public static double forecastRecursive(int year, double initialValue, double growthRate) {

        if (year == 0) {

            return initialValue;

        }

        return forecastRecursive(year - 1, initialValue, growthRate) \* (1 + growthRate);

    }

    public static double forecastIterative(int year, double initialValue, double growthRate) {

        double result = initialValue;

        for (int i = 1; i <= year; i++) {

            result \*= (1 + growthRate);

        }

        return result;

    }

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the initial value (e.g., investment): ");

        double initialValue = scanner.nextDouble();

        System.out.print("Enter annual growth rate (as a percentage, e.g., 10 for 10%): ");

        double growthRatePercent = scanner.nextDouble();

        double growthRate = growthRatePercent / 100;

        System.out.print("Enter number of years to forecast: ");

        int years = scanner.nextInt();

        double recursiveResult = forecastRecursive(years, initialValue, growthRate);

        double iterativeResult = forecastIterative(years, initialValue, growthRate);

        System.out.printf("\n[Recursive] Predicted value after %d years:  %.2f\n", years, recursiveResult);

        System.out.printf("[Iterative] Predicted value after %d years:  %.2f\n", years, iterativeResult);

        scanner.close();

    }

}

A screenshot of a computer program

AI-generated content may be incorrect.

**Analysis**

* Linear Search takes O(n) time.  
  It checks each item one by one. Slower for large data.
* Binary Search takes O(log n) time.  
  It works only on sorted data, but it's much faster.

Binary search is better for an e-commerce platform because it is faster and works well with large product lists.