**Exercise 2: E-commerce Platform Search Function**

**Scenario:**

You are working on the search functionality of an e-commerce platform. The search needs to be optimized for fast performance.

**Steps:**

1. **Understand Asymptotic Notation:**
   * Explain Big O notation and how it helps in analyzing algorithms.
   * Describe the best, average, and worst-case scenarios for search operations.
2. **Setup:**
   * Create a class **Product** with attributes for searching, such as **productId, productName**, and **category**.
3. **Implementation:**
   * Implement linear search and binary search algorithms.
   * Store products in an array for linear search and a sorted array for binary search.
4. **Analysis:**
   * Compare the time complexity of linear and binary search algorithms.
   * Discuss which algorithm is more suitable for your platform and why.

**Source Code:**

**Product.java:**

**package** mypro.search;

**public** **class** Product

{

**int** pId;

String pName;

String cat;

**public** Product(**int** pId, String pName, String cat)

{

**this**.pId=pId;

**this**.pName=pName;

**this**.cat=cat;

}

@Override

**public** String toString()

{

**return** productId+"-"+productName+"("+category+")";

}

}

**Search.java:**

**package** mypro.search;

**public** **class** Search {

**public** **static** Product linearSearch(Product[] pros, String key)

{

**for** (Product pro:pros)

{

**if** (pro.proName.equalsIgnoreCase(key))

{

**return** pro;

}

}

**return** **null**;

}

**public** **static** Product binarySearch(Product[] pros, String key)

{

**int** l=0, r=pros.length-1;

**while** (l<=r)

{

**int** mid=(l+r)/2;

**int** cmp=pros[mid].proName.compareToIgnoreCase(key);

**if** (cmp==0) {

**return** pros[mid];

}

**else** **if**(cmp<0)

{

l=mid+1;

}

**else**

{

r=mid-1;

}

}

**return** **null**;

}

}

**SearchTest.java:**

**package** mypro.search;

**import** java.util.Arrays;

**import** java.util.Comparator;

**import** java.util.Scanner;

**public** **class** SearchTest{

**public** **static** **void** main(String[] args)

{

Scanner sc=**new** Scanner(System.***in***);

Product[] pros = {

**new** Product(1,"Laptop","Electronics"),

**new** Product(2,"Shoes","Footwear"),

**new** Product(3,"Earrings","Accessories"),

**new** Product(4,"Chair","Furniture"),

**new** Product(5,"Shirt","Cloaths")

};

System.***out***.print("Enter product name:");

String key=scanner.nextLine();

Product res1=Search.*linearSearch*(pros, key);

System.***out***.println("Linear Search Result:"+(res1!=**null** ? res1:"Not Found"));

Arrays.*sort*(pros, Comparator.*comparing*(p->p.proName.toLowerCase()));

Product res2=Search.*binarySearch*(pros, key);

System.***out***.println("Binary Search Result:" + (res2!= **null** ?res2 :"Not Found"));

scanner.close();

}

}

**Output:**

Enter product name:Laptop

Linear Search Result:1-Laptop(Electronics)

Binary Search Result:1-Laptop(Electronics)