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

class Product {

int productId;

String productName;

String category;

public Product(int id, String name, String category) {

this.productId = id;

this.productName = name;

this.category = category;

}

public String toString() {

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

}

}

class SearchEngine {

public static Product linearSearch(Product[] products, String name) {

for (Product p : products) {

if (p.productName.equalsIgnoreCase(name)) return p;

}

return null;

}

public static Product binarySearch(Product[] products, String name) {

int low = 0, high = products.length - 1;

while (low <= high) {

int mid = (low + high) / 2;

int cmp = products[mid].productName.compareToIgnoreCase(name);

if (cmp == 0) return products[mid];

else if (cmp < 0) low = mid + 1;

else high = mid - 1;

}

return null;

}

public static void sortProducts(Product[] products) {

java.util.Arrays.sort(products, (a, b) -> a.productName.compareToIgnoreCase(b.productName));

}

}

public class Main {

public static void main(String[] args) {

Product[] products = {

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

new Product(2, "Shoes", "Fashion"),

new Product(3, "Phone", "Electronics"),

new Product(4, "Watch", "Accessories")

};

Product result1 = SearchEngine.linearSearch(products, "Phone");

System.out.println("Linear Search: " + (result1 != null ? result1 : "Not Found"));

SearchEngine.sortProducts(products);

Product result2 = SearchEngine.binarySearch(products, "Phone");

System.out.println("Binary Search: " + (result2 != null ? result2 : "Not Found"));

}

}

