**Implementing the Factory Method Pattern**

**Product.java**

public class Product {

private int productId;

private String productName;

private String category;

public Product(int productId, String productName, String category) {

this.productId = productId;

this.productName = productName;

this.category = category;

}

public int getProductId() {

return productId;

}

public String getProductName() {

return productName;

}

public String getCategory() {

return category;

}

@Override

public String toString() {

return "ID: " + productId + ", Name: " + productName + ", Category: " + category;

}

}

**SearchUtil.java**

public class SearchUtil {

// Linear Search by product name

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

for (Product p : products) {

if (p.getProductName().equalsIgnoreCase(name)) {

return p;

}

}

return null;

}

// Binary Search by product name (products must be sorted by name)

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

int low = 0;

int high = products.length - 1;

while (low <= high) {

int mid = (low + high) / 2;

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

if (cmp == 0) {

return products[mid];

} else if (cmp < 0) {

low = mid + 1;

} else {

high = mid - 1;

}

}

return null;

}

}

**SearchTest.java**

import java.util.Arrays;

import java.util.Comparator;

public class SearchTest {

public static void main(String[] args) {

Product[] products = {

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

new Product(102, "Shoes", "Fashion"),

new Product(103, "Mobile", "Electronics"),

new Product(104, "Watch", "Accessories"),

new Product(105, "Bag", "Fashion")

};

// Linear Search Test

String searchName = "Mobile";

Product result = SearchUtil.linearSearch(products, searchName);

System.out.println("Linear Search Result for '" + searchName + "': " + (result != null ? result : "Not Found"));

// Sort products by name for Binary Search

Arrays.sort(products, Comparator.comparing(Product::getProductName));

// Binary Search Test

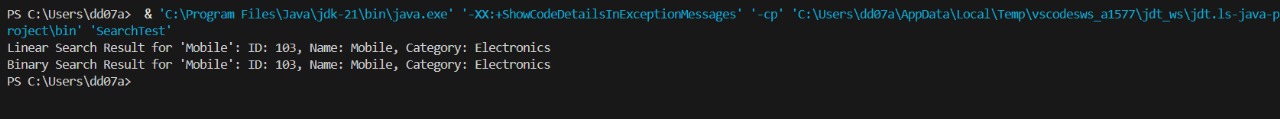
result = SearchUtil.binarySearch(products, searchName);

System.out.println("Binary Search Result for '" + searchName + "': " + (result != null ? result : "Not Found"));

}

}

**Output:**

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