Experiment 6

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Semester: 6th **DOP:04/03/25**
Subject: Java **Subject Code:22CSH-359**

Code:1

Aim: Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.

Objective: Write a program to sort a list of Employee objects (name, age, salary) using lambda expressions

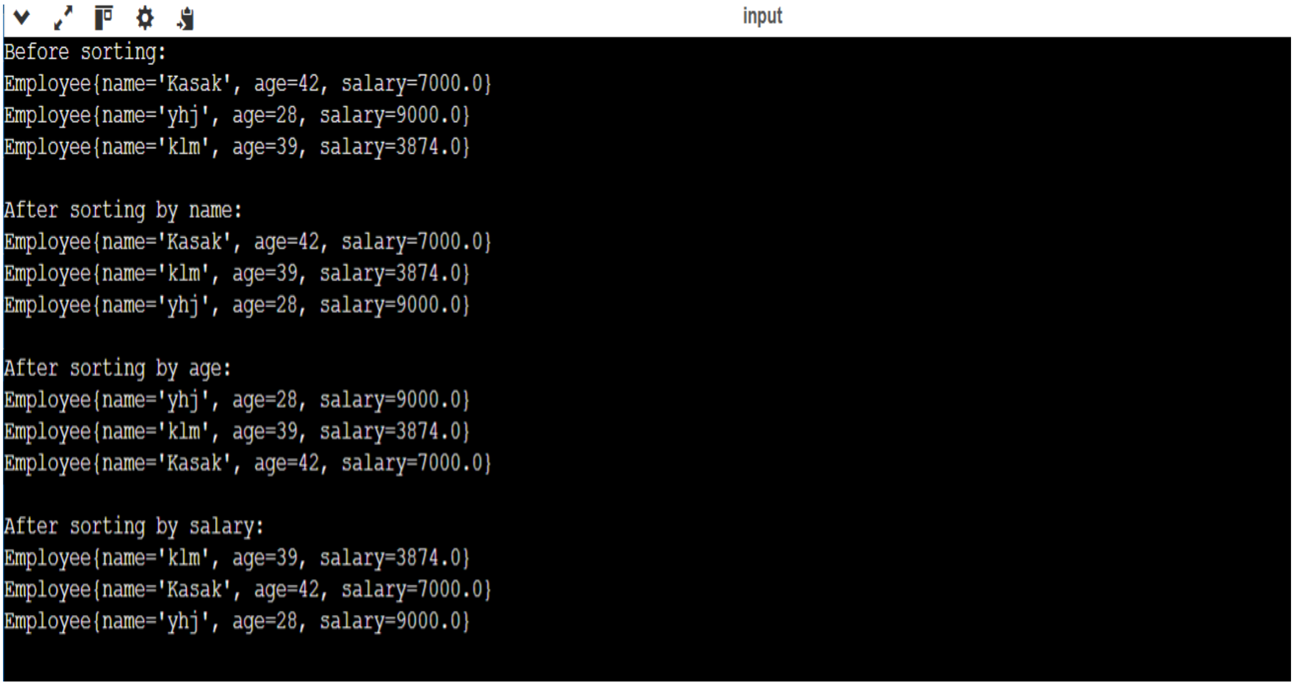
Algorithm:

1. **Define the Employee Class:**
   - Create an Employee class with attributes: name, age, and salary.
   - Include a constructor to initialize these attributes.
   - Override the toString method for easy display of Employee objects.
2. **Create the List of Employee Objects:**
   - Create an ArrayList of Employee objects.
   - Populate the list with sample Employee objects.
3. **Sort the List Using Lambda Expressions:**
   - Use the Collections.sort method to sort the list.
   - Pass a Comparator with a lambda expression to specify the sorting criteria.
4. **Display the Sorted List:**
   - Print the list before and after sorting to compare the results.

Code:

```
import java.util.ArrayList;
import java.util.Collections;
import java.util.Comparator;
import java.util.List;

class Employee {
    String name;
    int age;
    double salary;

    Employee(String name, int age, double salary) {
        this.name = name;
        this.age = age;
        this.salary = salary;
    }
    public String toString() {
        return "Employee{name='" + name + "', age=" + age + ", salary=" + salary + "}";
    }
}
public class classwork3 {
    public static void main(String[] args) {
        List<Employee> employees = new ArrayList<>();

        employees.add(new Employee("Kush", 45, 67000));
        employees.add(new Employee("abc", 38, 80000));
        employees.add(new Employee("xyz", 49, 65874));

        System.out.println("Before sorting:");
        employees.forEach(System.out::println);

        Collections.sort(employees, Comparator.comparing(employee -> employee.name));
        System.out.println("\nAfter sorting by name:");
        employees.forEach(System.out::println);

        Collections.sort(employees, Comparator.comparingInt(employee -> employee.age));
        System.out.println("\nAfter sorting by age:");
        employees.forEach(System.out::println);

        Collections.sort(employees, Comparator.comparingDouble(employee -> employee.salary));
        System.out.println("\nAfter sorting by salary:");
        employees.forEach(System.out::println);
    }
}
```

Output:



```
Before sorting:
Employee{name='Kasak', age=42, salary=7000.0}
Employee{name='yhj', age=28, salary=9000.0}
Employee{name='klm', age=39, salary=3874.0}

After sorting by name:
Employee{name='Kasak', age=42, salary=7000.0}
Employee{name='klm', age=39, salary=3874.0}
Employee{name='yhj', age=28, salary=9000.0}

After sorting by age:
Employee{name='yhj', age=28, salary=9000.0}
Employee{name='klm', age=39, salary=3874.0}
Employee{name='Kasak', age=42, salary=7000.0}

After sorting by salary:
Employee{name='klm', age=39, salary=3874.0}
Employee{name='Kasak', age=42, salary=7000.0}
Employee{name='yhj', age=28, salary=9000.0}
```

Code: 2

Aim: Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.

Objective: Create a program to use lambda expressions and stream operations to filter students scoring above 75%, sort them by marks, and display their names

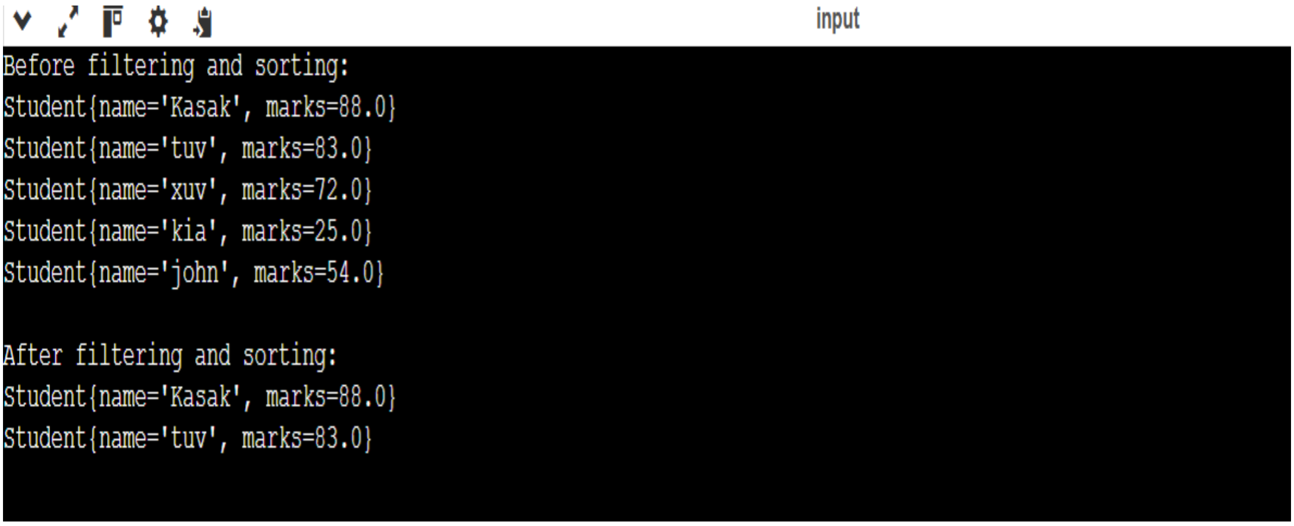
Algorithm:

1) **Define the Student Class:**
   - Create a Student class with attributes: name and marks.
   - Include a constructor to initialize these attributes.
   - Override the toString method for easy display of Student objects.
2) **Create the List of Student Objects:**
   - Create an ArrayList of Student objects.
   - Populate the list with sample Student objects.
3) **Filter and Sort Using Lambda Expressions and Stream Operations:**
   - Use the stream() method to create a stream from the list.
   - Apply the filter() method to filter students scoring above 75%.
   - Apply the sorted() method to sort the filtered students by their marks in descending order.
   - Collect the filtered and sorted students into a new list using the collect() method.
4) **Display the Filtered and Sorted List:**
   - Print the list before and after filtering and sorting to compare the results.

Code:

```
import java.util.ArrayList;
import java.util.List;
import java.util.stream.Collectors;

class Student {
    String name;
    double marks;

    Student(String name, double marks) {
        this.name = name;
        this.marks = marks;
    }

    public String toString() {
        return "Student{name='" + name + "', marks=" + marks + "}";
    }
}

public class classwork3 {
    public static void main(String[] args) {
        List<Student> students = new ArrayList<>();

        students.add(new Student("Kush", 98));
        students.add(new Student("abc", 73));
        students.add(new Student("xyz", 82));
        students.add(new Student("pqr", 35));
        students.add(new Student("klm", 44));

        System.out.println("Before filtering and sorting:");
        students.forEach(System.out::println);

        List<Student> students1 = students.stream()
                .filter(student -> student.marks > 75)
                .sorted((s1, s2) -> Double.compare(s2.marks, s1.marks))
                .collect(Collectors.toList());

        System.out.println("\nAfter filtering and sorting:");
        students1.forEach(System.out::println);
    }
}
```

Output:



```
Before filtering and sorting:
Student{name='Kasak', marks=88.0}
Student{name='tuv', marks=83.0}
Student{name='xuv', marks=72.0}
Student{name='kia', marks=25.0}
Student{name='john', marks=54.0}

After filtering and sorting:
Student{name='Kasak', marks=88.0}
Student{name='tuv', marks=83.0}
```

Code: 3

Aim: Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.

Objective: Write a Java program to process a large dataset of products using streams. Perform operations such as grouping products by category, finding the most expensive product in each category, and calculating the average price of all products.

Algorithm:

1. **Create a Product class:**
   - Define attributes: name, category, and price.
   - Implement a constructor to initialize these attributes.
   - Override the toString() method for readable output.
2. **Create a ProductProcessor class:**
   - Implement the main method to perform the required operations.
3. **Initialize the product list:**
   - Create a List<Product> to store product instances.
   - Add various products to the list with different categories and prices.
4. **Group products by category:**
   - Use the stream() method on the product list.
   - Apply the collect() method with Collectors.groupingBy() to group products by their category.
   - Store the result in a Map<String, List<Product>>.
5. **Print products grouped by category:**
   - Iterate over the Map and print each category along with the list of products in that category.
6. **Find the most expensive product in each category:**
   - Use the stream() method on the product list.
   - Apply the collect() method with Collectors.groupingBy() and Collectors.maxBy() to find the most expensive product in each category.
   - Store the result in a Map<String, Optional<Product>>.
7. **Print the most expensive product in each category:**
   - Iterate over the Map and print each category along with the most expensive product in that category.
8. **Calculate the average price of all products:**
   - Use the stream() method on the product list.
   - Apply the collect() method with Collectors.summarizingDouble() to calculate summary statistics for the product prices.
   - Extract the average price from the statistics.
9. **Print the average price of all products:**

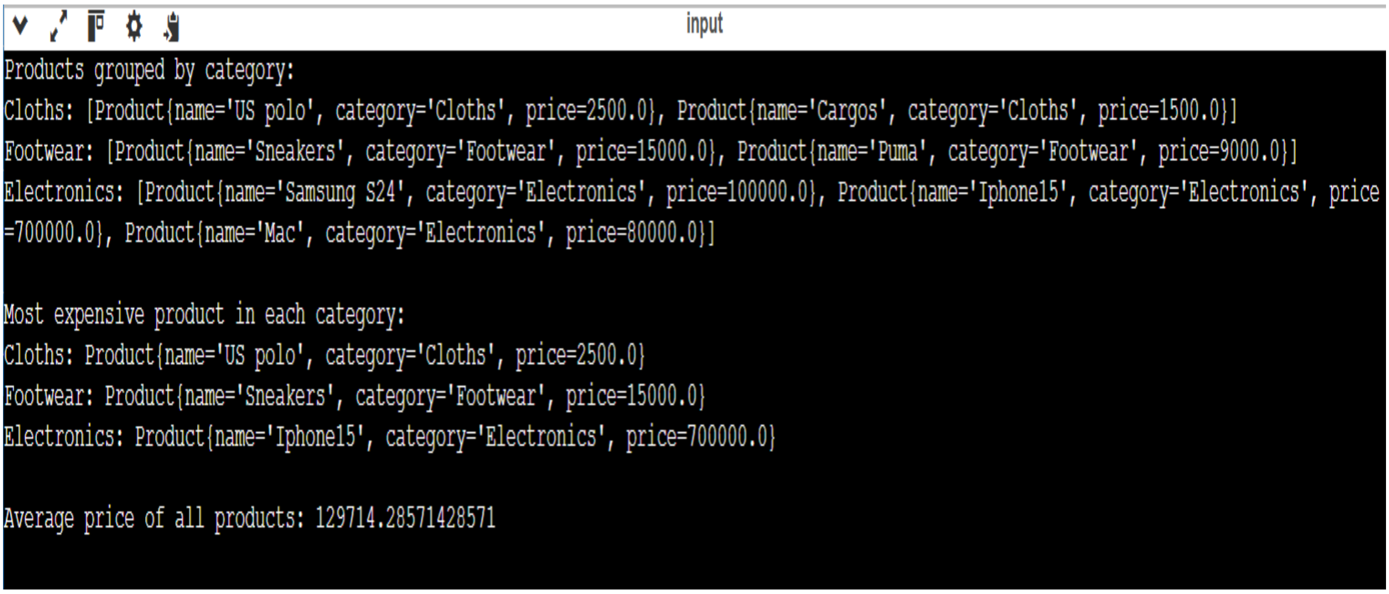
- Print the calculated average price.

Code:

```
import java.util.ArrayList;
import java.util.DoubleSummaryStatistics;
import java.util.List;
import java.util.Map;
import java.util.Optional;
import java.util.stream.Collectors;

class Product {
    String name;
    String category;
    double price;

    Product(String name, String category, double price) {
        this.name = name;
        this.category = category;
        this.price = price;
    }

    public String toString() {
        return "Product{name='" + name + "', category='" + category + "', price=" + price + "}";
    }
}

public class classwork3 {
    public static void main(String[] args) {
        List<Product> products = new ArrayList<>();

        products.add(new Product("PoloShirt", "Cloths", 1500));
        products.add(new Product("Sneakers", "Footwear", 15000));
        products.add(new Product("Iphone16A", "Electronics", 90000));
        products.add(new Product("SamsungS25Ultra", "Electronics", 127000));
        products.add(new Product("Mac", "Electronics", 80000));
        products.add(new Product("Jogers", "Cloths", 2500));
        products.add(new Product("JordanAir1", "Footwear", 120000));

        Map<String, List<Product>> products1 = products.stream()
                .collect(Collectors.groupingBy(product -> product.category));

        System.out.println("Products grouped by category:");
        products1.forEach((category, productList) -> {
            System.out.println(category + ": " + productList);
        });

        Map<String, Optional<Product>> categoryassending = products.stream()
```

```
                .collect(Collectors.groupingBy(product -> product.category,
                        Collectors.maxBy((p1, p2) -> Double.compare(p1.price, p2.price))));

        System.out.println("\nMost expensive product in each category:");
        categoryassending.forEach((category, product) -> {
            System.out.println(category + ": " + product.orElse(null));
        });

        DoubleSummaryStatistics statistics = products.stream()
                .collect(Collectors.summarizingDouble(product -> product.price));

        System.out.println("\nAverage price of all products: " + statistics.getAverage());
    }
}
```

Output:



```
Products grouped by category:
Cloths: [Product{name='US polo', category='Cloths', price=2500.0}, Product{name='Cargos', category='Cloths', price=1500.0}]
Footwear: [Product{name='Sneakers', category='Footwear', price=15000.0}, Product{name='Puma', category='Footwear', price=9000.0}]
Electronics: [Product{name='Samsung S24', category='Electronics', price=100000.0}, Product{name='Iphone15', category='Electronics', price
=700000.0}, Product{name='Mac', category='Electronics', price=80000.0}]

Most expensive product in each category:
Cloths: Product{name='US polo', category='Cloths', price=2500.0}
Footwear: Product{name='Sneakers', category='Footwear', price=15000.0}
Electronics: Product{name='Iphone15', category='Electronics', price=700000.0}

Average price of all products: 129714.28571428571
```

Learning Outcomes:

1. Demonstrate: Apply key concepts to real-world scenarios to showcase understanding.
2. Analyze: Critically evaluate information, identify patterns, and draw meaningful conclusions.
3. Create: Develop original work, including presentations, reports, or projects, to exhibit comprehension and skills.