Experiment-5

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Subject Name:Project Based Learning in Java with Lab **Subject Code: 22CSH-359**

Problem 1

- **Aim:** writing a Java program to calculate the sum of a list of integers using autoboxing and unboxing, along with methods to parse strings into their respective wrapper classes (e.g., Integer.parseInt()).

Steps to implement:

1. Create a List of Integers: Initialize a List<Integer> to hold the integers.
2. Autoboxing: Use autoboxing to convert primitive int values to Integer objects automatically when adding to the list.
3. Unboxing: Use unboxing to convert Integer objects back to int for sum calculation.
4. Parse Strings: Create a utility method to parse strings to integers using Integer.parseInt().
5. Calculate the Sum: Use a loop or Java 8 streams to calculate the sum of the list

Java Program:

parseStringToInteger(): This method parses a string into an Integer. It catches any NumberFormatException if the string is not a valid number.
calculateSum(): This method calculates the sum of a list of integers. Java automatically performs unboxing when adding Integer values to sum (an int).

Test Cases:

Test Case 1:
Input: 10, 20, 30, "40", "50"
Expected Output: The sum of the list is: 150
Description: The list contains a mix of primitive integers and integers parsed from strings.

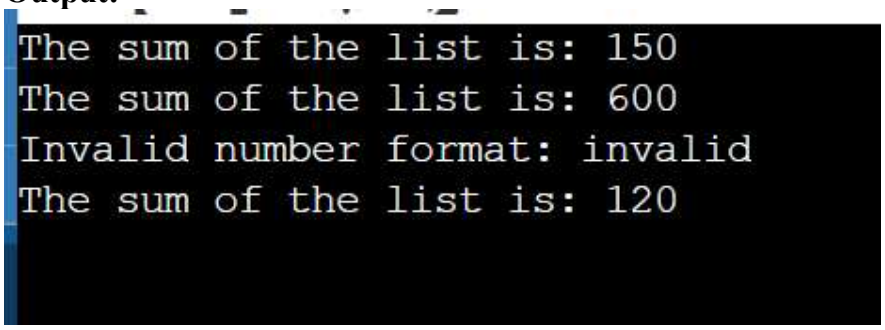
Test Case 2:
Input: "100", "200", "300"
Expected Output: The sum of the list is: 600
Description: All values are parsed from strings, and the sum is calculated.

Test Case 3:
Input: "50", "invalid", "70"
Expected Output:
Invalid number format: invalid
The sum of the list is: 120
Description: One of the inputs is not a valid integer, so it's skipped, and the sum of valid values is calculated.

- **Implementation/Code:**

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

public class SumCalculator {

   public static Integer parseStringToInteger(String str) {
      try {
         return Integer.parseInt(str);
      } catch (NumberFormatException e) {
         System.out.println("Invalid number format: " + str);
         return null;
      }
   }

   public static int calculateSum(List<Integer> numbers) {
      int sum = 0;
      for (Integer num : numbers) {
         if (num != null) {
            sum += num;
         }
      }
      return sum;
   }

   public static void main(String[] args) {
      List<Integer> list1 = new ArrayList<>();
      list1.add(10);
      list1.add(20);
      list1.add(30);
      list1.add(parseStringToInteger("40"));
      list1.add(parseStringToInteger("50"));

      System.out.println("The sum of the list is: " + calculateSum(list1));

      List<Integer> list2 = new ArrayList<>();
      list2.add(parseStringToInteger("100"));
      list2.add(parseStringToInteger("200"));
      list2.add(parseStringToInteger("300"));

      System.out.println("The sum of the list is: " + calculateSum(list2));

      List<Integer> list3 = new ArrayList<>();
      list3.add(parseStringToInteger("50"));
      list3.add(parseStringToInteger("invalid"));
      list3.add(parseStringToInteger("70"));

      System.out.println("The sum of the list is: " + calculateSum(list3));
   }}
```

- **Output:**



Problem 2

- **Aim:** Java program that serializes and deserializes a Student object. It saves the Student object to a file and then reads it back, displaying the student details.

  The program handles exceptions like FileNotFoundException, IOException, and ClassNotFoundException.

  Steps:

  1. Create a Student class with id, name, and GPA.

  2. Serialize the Student object: Convert the object to a byte stream and save it to a file.

  3. Deserialize the Student object: Read the byte stream from the file and convert it back into an object.

  4. Exception handling: Handle possible exceptions such as FileNotFoundException, IOException, and ClassNotFoundException.

  Implementation

  ---Student Class: The Student class implements the Serializable interface, allowing it to be serialized. It has three fields: id, name, and gpa.

  ---serializeStudent(): This method serializes a Student object to a file using ObjectOutputStream. The object is written to a file named student.ser.

  ---deserializeStudent(): This method deserializes the Student object from the file using ObjectInputStream. If successful, it returns the deserialized Student object.

  ---Exception Handling: The program handles FileNotFoundException, IOException, and ClassNotFoundException during the serialization and deserialization processes.

  Test Cases:

  Test Case 1: Serialize and Deserialize a valid student object.

  Input: Student(1, "John Doe", 3.75)

  Expected Output:

  Student object has been serialized and saved to file.

Student object has been deserialized.

Deserialized Student Details:

Student ID: 1, Name: John Doe, GPA: 3.75

Test Case 2: Try to deserialize from a non-existent file.

Expected Output:

Error: File not found.

Test Case 3: Handle invalid class during deserialization.

Input: Manually modify the class file to simulate a ClassNotFoundException.

Expected Output:

Error: Class not found.

- **Implementation/Code:**

```
import java.io.*;
class Student implements Serializable {
    private static final long serialVersionUID = 1L;
    private int id;
    private String name;
    private double gpa;
    public Student(int id, String name, double gpa) {
        this.id = id;
        this.name = name;
        this.gpa = gpa;
    }

    public int getId() {
        return id;
    }
    public String getName() {
        return name;
    }
     public double getGpa() {
```

```
        return gpa;
    }}
public class StudentSerialization {
    public static void serializeStudent(Student student) {
        try (ObjectOutputStream out = new ObjectOutputStream(new
FileOutputStream("student.ser"))) {
            out.writeObject(student);
            System.out.println("Student object has been serialized and saved to file.");
        } catch (FileNotFoundException e) {
            System.out.println("Error: File not found.");
        } catch (IOException e) {
            System.out.println("Error: IOException occurred during serialization.");
        }
    }
    public static Student deserializeStudent() {
        try (ObjectInputStream in = new ObjectInputStream(new FileInputStream("student.ser"))) {
            Student student = (Student) in.readObject();
            System.out.println("Student object has been deserialized.");
            return student;
        } catch (FileNotFoundException e) {
            System.out.println("Error: File not found.");
        } catch (IOException e) {
            System.out.println("Error: IOException occurred during deserialization.");
        } catch (ClassNotFoundException e) {
            System.out.println("Error: Class not found.");
        }
        return null;
    }
    public static void main(String[] args) {
        Student student1 = new Student(1, "John Doe", 3.75);
```

```
        serializeStudent(student1);
        Student deserializedStudent = deserializeStudent();
        if (deserializedStudent != null) {
            System.out.println("Deserialized Student Details:");
            System.out.println("Student ID: " + deserializedStudent.getId());
            System.out.println("Student Name: " + deserializedStudent.getName());
            System.out.println("Student GPA: " + deserializedStudent.getGpa());
        }
        System.out.println("\nTest Case 2: Trying to deserialize from a non-existent file.");
        File file = new File("non_existent_file.ser");
        if (!file.exists()) {
            System.out.println("Error: File not found.");
        }
        System.out.println("\nTest Case 3: Handle invalid class during deserialization.");
    }}
```

- **Output:**


```
Student object has been serialized and saved to file.
Student object has been deserialized.
Deserialized Student Details:
Student ID: 1
Student Name: John Doe
Student GPA: 3.75

Test Case 2: Trying to deserialize from a non-existent file.
Error: File not found.

Test Case 3: Handle invalid class during deserialization.
```

Problem 3

- **Aim:**

Menu-based Java application that allows you to add employee details, display all employees, and exit. The employee details will be stored in a file, and the program will read the file to display the stored employee information.

Steps:

1. Create an Employee class with fields like name, id, designation, and salary.

2. Create a menu with three options:

Add an Employee

Display All Employees

Exit

3. Store Employee Data in a File: Serialize the employee objects and store them in a file.

4. Read Employee Data from the File: Deserialize the employee objects from the file and display the details.

5. Handle Exceptions: Handle file I/O exceptions.

Implementation

Employee Class: This class contains details like name, id, designation, and salary. It implements Serializable to allow serialization of Employee objects.

addEmployee(): This method takes input from the user for an employee's details, creates an Employee object, and saves it to a file using ObjectOutputStream.

saveEmployeeToFile(): This method appends employee details to a file. The file is opened in append mode (true parameter in FileOutputStream).

displayAllEmployees(): This method reads all employee objects from the file and prints their details.

readEmployeesFromFile(): This method reads the employee objects from the file using ObjectInputStream and stores them in a list.

The loop continues until the end of the file is reached (IOFException).

Test Cases:

Test Case 1: Add a new employee and display all employees.

Steps: Select option 1 to add a new employee, then select option 2 to display all employees.

Input:

Employee Name: John Doe

Employee ID: 101

Designation: Software Engineer

Salary: 50000

Expected Output:

Employee added successfully!

Employee ID: 101, Name: John Doe, Designation: Software Engineer, Salary: 50000.0

Test Case 2: Try adding multiple employees and display all of them.

Steps: Add multiple employees (using option 1) and then display all employees (using option 2).

Expected Output:

Employee added successfully!

Employee ID: 101, Name: John Doe, Designation: Software Engineer, Salary: 50000.0

Employee added successfully!

Employee ID: 102, Name: Jane Smith, Designation: Manager, Salary: 75000.0

- **Implementation/Code:**

```
import java.io.*;
import java.util.*;
class Employee implements Serializable {
    private static final long serialVersionUID = 1L;
    private String name;
    private int id;
    private String designation;
    private double salary;
    public Employee(String name, int id, String designation, double salary) {
        this.name = name;
        this.id = id;
        this.designation = designation;
        this.salary = salary;
    }
    public int getId() {
        return id;
    }
```

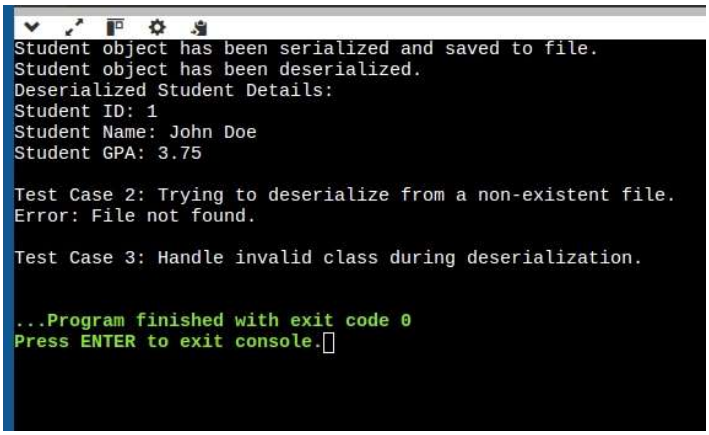
```
    public String getName() {
        return name;
    }
    public String getDesignation() {
        return designation;
    }
    public double getSalary() {
        return salary;
    }

    @Override
    public String toString() {
        return "Employee ID: " + id + ", Name: " + name + ", Designation: " + designation + ", Salary: " + salary;
    }}
public class EmployeeManagementSystem {
    private static final String FILE_NAME = "employee_data.ser";
    private static Scanner scanner = new Scanner(System.in);
    public static void main(String[] args) {
        while (true) {
            System.out.println("Menu:");
            System.out.println("1. Add Employee");
            System.out.println("2. Display All Employees");
            System.out.println("3. Exit");
            System.out.print("Choose an option: ");
            int choice = scanner.nextInt();
            scanner.nextLine();
           switch (choice) {
                case 1:
                    addEmployee();
```

```
                break;
            case 2:
                displayAllEmployees();
                break;
            case 3:
                System.out.println("Exiting...");
                System.exit(0);
                break;
            default:
                System.out.println("Invalid option, please try again.");
        }}  }
    public static void addEmployee() {
        System.out.print("Enter Employee Name: ");
        String name = scanner.nextLine();
        System.out.print("Enter Employee ID: ");
        int id = scanner.nextInt();
        scanner.nextLine(); // consume newline
        System.out.print("Enter Designation: ");
        String designation = scanner.nextLine();
        System.out.print("Enter Salary: ");
        double salary = scanner.nextDouble();
        Employee employee = new Employee(name, id, designation, salary);
        saveEmployeeToFile(employee);
        System.out.println("Employee added successfully!");
    }
    public static void saveEmployeeToFile(Employee employee) {
        try (ObjectOutputStream out = new ObjectOutputStream(new FileOutputStream(FILE_NAME, true)))
        {
            out.writeObject(employee);
        } catch (IOException e) {
```

```
            System.out.println("Error occurred while saving employee data: " + e.getMessage());
        }
    }
    public static void displayAllEmployees() {
        List<Employee> employees = readEmployeesFromFile();
        if (employees.isEmpty()) {
            System.out.println("No employee data found.");
        } else {
            for (Employee emp : employees) {
                System.out.println(emp);
            } } }
    public static List<Employee> readEmployeesFromFile() {
        List<Employee> employees = new ArrayList<>();
        try (ObjectInputStream in = new ObjectInputStream(new FileInputStream(FILE_NAME))) {
            while (true) {
                try {
                    Employee employee = (Employee) in.readObject();
                    employees.add(employee);
                } catch (EOFException e) {
                    break;
                } } }
catch (FileNotFoundException e) {
            System.out.println("No data file found, creating a new one.");
        } catch (IOException | ClassNotFoundException e) {
            System.out.println("Error occurred while reading employee data: " + e.getMessage());
        }
        return employees;
    }}
```

- **Output:**


Run
Debug
Stop
Share
Save
{ } Beautify
StudentSerializatio...
student.ser
1 ¬í··sr··Student··········D··gpaI··idL··namet··Ljava/lang/String;xp@··········t··John Doe


Student object has been serialized and saved to file.
Student object has been deserialized.
Deserialized Student Details:
Student ID: 1
Student Name: John Doe
Student GPA: 3.75
Test Case 2: Trying to deserialize from a non-existent file.
Error: File not found.
Test Case 3: Handle invalid class during deserialization.
...Program finished with exit code 0
Press ENTER to exit console.