Experiment 5

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Subject Name: Project based Learning in Java **Subject Code: 22ITH-352**

Problem 1:

Aim: Write a Java program to calculate the sum of a list of integers using autoboxing and unboxing.

Objective:

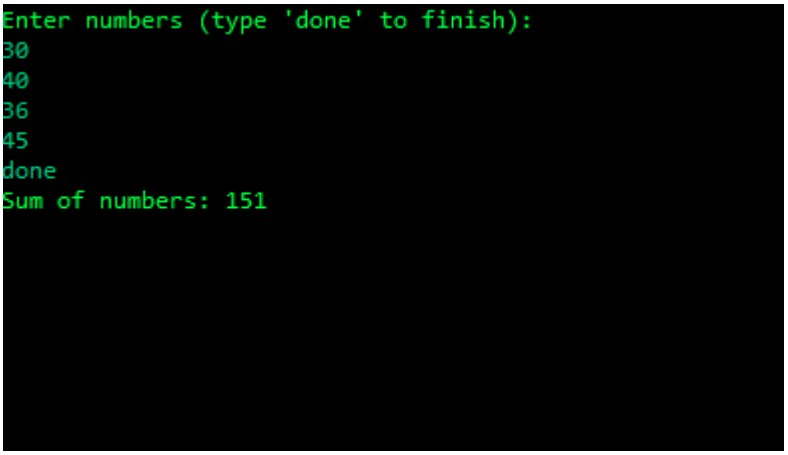
- understanding of **wrapper classes, autoboxing/unboxing, parsing techniques, and exception handling** in Java.
- Understand how wrapper classes help in converting primitive data types into objects.
- Using **Integer.parseInt()** to convert string inputs into integer values.

Code:

```
package autoboxingunboxing;

import java.util.ArrayList;

import java.util.Scanner;


public class AutoBoxingExample {

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);

        ArrayList<Integer> numbers = new ArrayList<>();


        System.out.println("Enter numbers (type 'done' to finish): ");

        while (scanner.hasNext()) {

            String input = scanner.next();

            if (input.equalsIgnoreCase("done")) break;

            try {
```

```
            numbers.add(Integer.parseInt(input)); // Autoboxing
        } catch (NumberFormatException e) {
            System.out.println("Invalid input! Please enter a valid integer.");
        }
    }

    int sum = 0;
    for (Integer num : numbers) {
        sum += num; // Unboxing
    }

    System.out.println("Sum of numbers: " + sum);
    scanner.close();
  }
}
```

OUTPUT:



Learning Outcomes:

- Gain knowledge of **autoboxing and unboxing** and their role in Java.
- Learn to **parse string inputs into wrapper classes** using Integer.parseInt().
- Use **ArrayList** to dynamically store numbers instead of fixed-size arrays.

Problem 2 :

Aim: Create a Java program to serialize and deserialize a Student object.

Objective:

- Understand object serialization in Java.
- Learn to write an object to a file using ObjectOutputStream.
- Handle FileNotFoundException, IOException, and ClassNotFoundException.

CODE:

```
package studentSerialization;

import java.io.*;
import java.util.ArrayList;
import java.util.List;

class Student implements Serializable {
    private static final long serialVersionUID = 1L;
    int id;
    String name;
    double cgpa;

    public Student(int id, String name, double cgpa) {
        this.id = id;
        this.name = name;
        this.cgpa = cgpa;
    }

    public void display() {
        System.out.println("Student ID: " + id);
        System.out.println("Name: " + name);
        System.out.println("CGPA: " + cgpa);
        System.out.println("------------------------");
    }
```

```
}

public class StudentSerialization {
    public static void main(String[] args) {
        String filename = "students.ser";

        // Creating two student objects
        List<Student> students = new ArrayList<>();
        students.add(new Student(10258, "Anuj Yadav", 7.8));
        students.add(new Student(15806, "Diksha", 8.5));

        // Serialization
        try (ObjectOutputStream out = new ObjectOutputStream(new FileOutputStream(filename))) {
            out.writeObject(students);
            System.out.println("Serialization successful! Students saved to file.");
        } catch (IOException e) {
            System.out.println("IOException during serialization: " + e.getMessage());
        }

        // Deserialization
        try (ObjectInputStream in = new ObjectInputStream(new FileInputStream(filename))) {
            List<Student> deserializedStudents = (List<Student>) in.readObject();
            System.out.println("\nDeserialized Student Details:");
            for (Student student : deserializedStudents) {
                student.display();
            }
        } catch (FileNotFoundException e) {
            System.out.println("File not found: " + e.getMessage());
        } catch (IOException | ClassNotFoundException e) {
            System.out.println("Error during deserialization: " + e.getMessage());
        }
    }
}
```

OUTPUT:

```
Serialization successful! Students saved to file.

Deserialized Student Details:
Student ID: 10258
Name: Anuj Yadav
CGPA: 7.8
------------------------
Student ID: 15806
Name: Diksha
CGPA: 8.5
------------------------
```

Learning Outcomes:

1. Learn the concept of serialization and deserialization.
2. Understand the importance of serialVersionUID in serialized classes.
3. Implement file handling for saving and loading objects.

Problem 3:

Aim: Create a menu-based Java application with the following options. 1.Add an Employee 2. Display All 3. Exit If option 1 is selected.

Objective:

- To use file handling using FileOutputStream and FileInputStream.
- Store and retrieve **multiple objects** using **serialization** (List<Employee>).
- Ensure **data consistency** by writing and reading a list of employees.

Code:

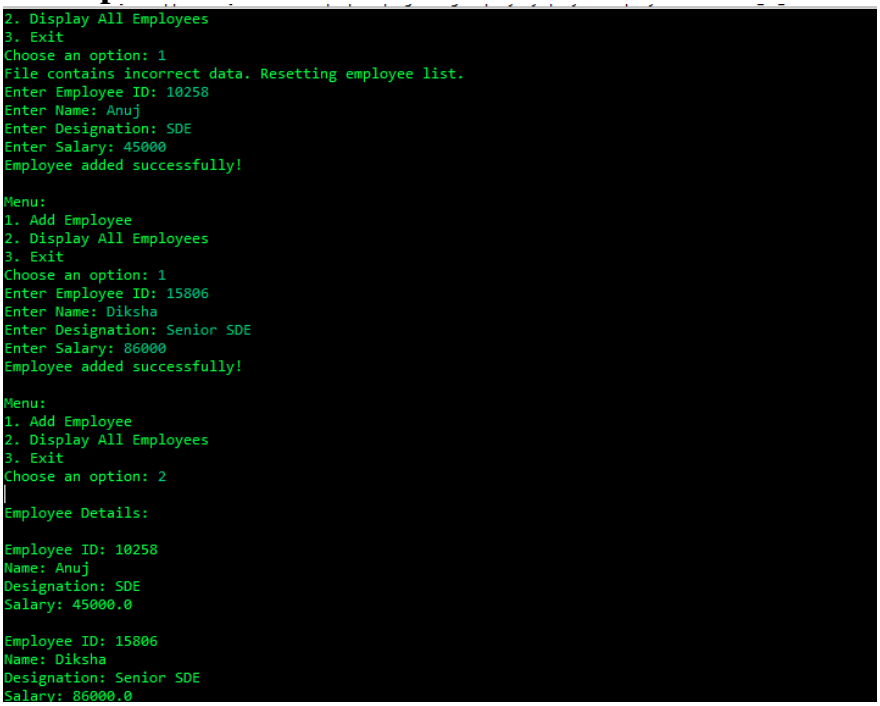
```
package employeeManagement123;
import java.io.*;
import java.util.ArrayList;
import java.util.List;
import java.util.Scanner;

class Employee implements Serializable {
    private static final long serialVersionUID = 1L;
    int id;
    String name;
    String designation;
    double salary;

    public Employee(int id, String name, String designation, double salary) {
        this.id = id;
        this.name = name;
        this.designation = designation;
        this.salary = salary;
    }

    public void display() {
        System.out.println("\nEmployee ID: " + id);
        System.out.println("Name: " + name);
        System.out.println("Designation: " + designation);
        System.out.println("Salary: " + salary);
    }
}

public class EmployeeManagement123 {
```

```
    private static final String FILE_NAME = "employees.dat";

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        while (true) {
            System.out.println("\nMenu:");
            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(); // Consume newline

            switch (choice) {
                case 1:
                    addEmployee(scanner);
                    break;
                case 2:
                    displayEmployees();
                    break;
                case 3:
                    System.out.println("Exiting program...");
                    scanner.close();
                    System.exit(0);
                default:
                    System.out.println("Invalid option! Please try again.");
            }
        }
    }

    private static void addEmployee(Scanner scanner) {
        List<Employee> employees = readEmployees(); // Read existing employees

        System.out.print("Enter Employee ID: ");
        int id = scanner.nextInt();
        scanner.nextLine(); // Consume newline

        System.out.print("Enter Name: ");
        String name = scanner.nextLine();

        System.out.print("Enter Designation: ");
        String designation = scanner.nextLine();
```

```
        System.out.print("Enter Salary: ");
        double salary = scanner.nextDouble();

        employees.add(new Employee(id, name, designation, salary)); // Add new employee

        // Write the updated list back to the file
        try (ObjectOutputStream out = new ObjectOutputStream(new FileOutputStream(FILE_NAME))) {
            out.writeObject(employees);  // Store the entire List<Employee>
            System.out.println("Employee added successfully!");
        } catch (IOException e) {
            System.out.println("Error while adding employee: " + e.getMessage());
        }
    }

    private static void displayEmployees() {
        List<Employee> employees = readEmployees();
        if (employees.isEmpty()) {
            System.out.println("No employees found!");
        } else {
            System.out.println("\nEmployee Details:");
            for (Employee emp : employees) {
                emp.display();
            }
        }
    }

    private static List<Employee> readEmployees() {
        File file = new File(FILE_NAME);
        if (!file.exists()) {
            return new ArrayList<>(); // Return an empty list if file does not exist
        }

        try (ObjectInputStream in = new ObjectInputStream(new FileInputStream(FILE_NAME))) {
            Object obj = in.readObject();

            // Ensure we read a List<Employee> and not a single Employee object
            if (obj instanceof List) {
                return (List<Employee>) obj;
            } else {
                System.out.println("File contains incorrect data. Resetting employee list.");
                return new ArrayList<>();
            }

        } catch (FileNotFoundException e) {
```

```
            return new ArrayList<>();
        } catch (IOException | ClassNotFoundException e) {
            System.out.println("Error while reading employee data: " + e.getMessage());
            return new ArrayList<>();
        }
    }
}
```

Output:



Learning Outcomes:

- Learn to store and retrieve multiple objects using List<Employee>.
- Understand the difference between writing a single object vs. a list of objects.
- Handle data persistence using object streams.