Experiment 5

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Semester: 6th **Date of Performance:** 18-02-25
Subject Name: Project based learning in Java **Subject Code:** 22ITH-359

Problem 1: Write a Java program to calculate the sum of a list of integers using autoboxing and unboxing. Include methods to parse strings into their respective wrapper classes (e.g., Integer.parseInt()).

1. Objectives:

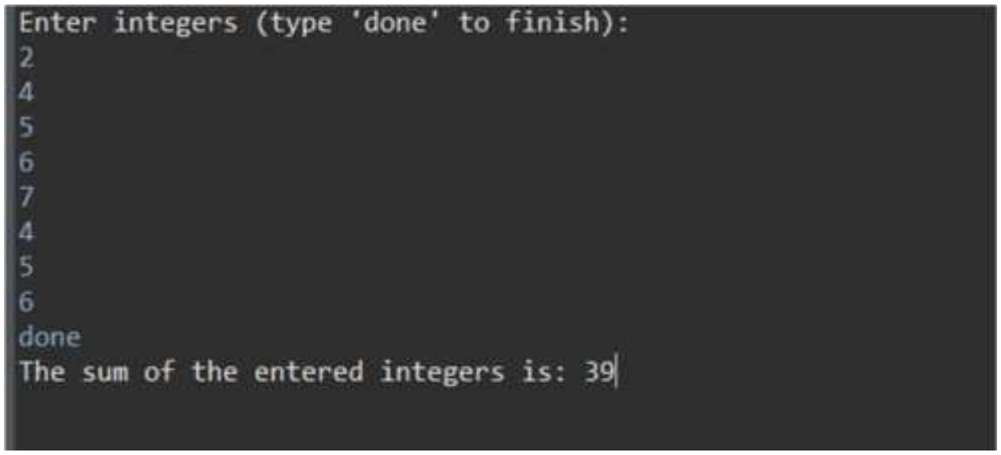
- Demonstrate the use of autoboxing (automatic conversion of primitive types to their wrapper class objects) and unboxing (automatic conversion of wrapper class objects to primitive types) while performing arithmetic operations.
- Implement methods to convert string representations of numbers into their respective wrapper classes using methods like Integer.parseInt().
- Sum the list of integers while ensuring the use of autoboxing and unboxing to demonstrate their effect.

2. Code:

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

public class SumOfIntegers {

   // Method to parse a string into an Integer
   public static Integer parseStringToInteger(String str) { try { return
         Integer.parseInt(str);
      } catch (NumberFormatException e) {
         System.out.println("Invalid input: " + str + " is not a valid integer."); return
   null; // Return null if parsing fails } }

   // Method to calculate the sum of a list of integers public static
   int calculateSum(List<Integer> integers) { int sum = 0;
      for (Integer number : integers) { //
         Unboxing: Integer to int sum +=
         number;
      }
```

```
        return sum;
    }

        public static void main(String[] args) {
            Scanner scanner = new Scanner(System.in);
            List<Integer> integerList = new ArrayList<>(); System.out.println("Enter

            integers (type 'done' to finish):");

            while (true) {
                String input = scanner.nextLine(); if
                (input.equalsIgnoreCase("done")) {
                    break; // Exit the loop if the user types 'done'
                }
                Integer number = parseStringToInteger(input);
                if (number != null) { // Autoboxing: int to
                Integer integerList.add(number);
                }
            }

            // Calculate the sum of the integers in the list int
            sum = calculateSum(integerList);
            System.out.println("The sum of the entered integers is: " + sum);

            scanner.close();
        }
      }
```

3. Output:



```
Enter integers (type 'done' to finish):
2
4
5
6
7
4
5
6
done
The sum of the entered integers is: 39
```

Fig:1 Sum of elements of array

4. Learning Outcomes:

- Learn how Java automatically converts primitive types to their corresponding wrapper classes (autoboxing) and vice versa (unboxing).
- Recognize the importance of autoboxing/unboxing in arithmetic operations and collections like ArrayList<Integer>.
- Gain experience in working with Java wrapper classes (Integer, Double, etc.).
- Learn how to convert string representations of numbers into their respective wrapper types using methods like Integer.parseInt().

Problem 2: Create a Java program to serialize and deserialize a Student object. The program should:

- Serialize a Student object (containing id, name, and GPA) and save it to a file.
- Deserialize the object from the file and display the student details.
- Handle FileNotFoundException, IOException, and ClassNotFoundException using exception handling.

1. Objectives:

- Serialize a Student object (id, name, GPA) and save it to a file.
- Deserialize the object from the file and display student details.
- Handle FileNotFoundException, IOException, and ClassNotFoundException using exception handling.

2. Code:

```
import java.io.*; import
java.util.Scanner;

class Student implements Serializable { private static final long
   serialVersionUID = 1L; // For serialization 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;
     }

     @Override
     public String toString() {
        return "Student ID: " + id + ", Name: " + name + ", GPA: " + gpa; }
}

public  class  StudentSerialization  {  private  static  final

    String FILE_NAME = "student.ser";

    public static void serializeStudent(Student student) {
        try (ObjectOutputStream oos = new ObjectOutputStream(new
FileOutputStream(FILE_NAME)))                                  {
            oos.writeObject(student);
            System.out.println("Student object serialized successfully.");
        } catch (FileNotFoundException e) {
            System.out.println("File not found: " + e.getMessage());
        } catch (IOException e) {
            System.out.println("IOException  occurred:  "  +  e.getMessage());
        }
    }

    public static Student deserializeStudent() { Student
        student = null;
        try (ObjectInputStream ois = new
                ObjectInputStream(new FileInputStream(FILE_NAME))) {
            student = (Student) ois.readObject();
            System.out.println("Student object deserialized successfully.");
        } catch (FileNotFoundException e) {
            System.out.println("File not found: " + e.getMessage());
        } catch (IOException e) {
            System.out.println("IOException occurred: " + e.getMessage());
        } catch (ClassNotFoundException e) {
            System.out.println("Class not found: " + e.getMessage());
        }
        return student;
    }

    public   static   void   main(String[]   args)   {
        Scanner scanner = new Scanner(System.in);
        int choice;
        do {
            System.out.println("\nMenu:");
            System.out.println("1. Serialize Student");
            System.out.println("2. Deserialize Student");
            System.out.println("3. Exit");
            System.out.print("Enter your choice: "); choice
            = scanner.nextInt();
```

```
                scanner.nextLine(); // Consume newline

                switch (choice) { case
                    1:
                        System.out.print("Enter Student ID: "); int
                        id = scanner.nextInt(); scanner.nextLine();
                        //              Consume              newline
                        System.out.print("Enter   Student   Name:
                        ");
                        String name = scanner.nextLine();
                        System.out.print("Enter Student GPA: ");
                        double gpa = scanner.nextDouble();

                        Student student = new Student(id, name, gpa);
                        serializeStudent(student);
                        break;

                    case 2:
                        Student deserializedStudent = deserializeStudent(); if
                        (deserializedStudent != null) {
                          System.out.println("Deserialized Student Details: " + deserializedStudent);
                        }
                        break;

                    case 3:
                        System.out.println("Exiting the program."); break;
default:
                        System.out.println("Invalid choice. Please try again."); }
            } while (choice != 3);

            scanner.close();
        }
    }
```

3. Output:

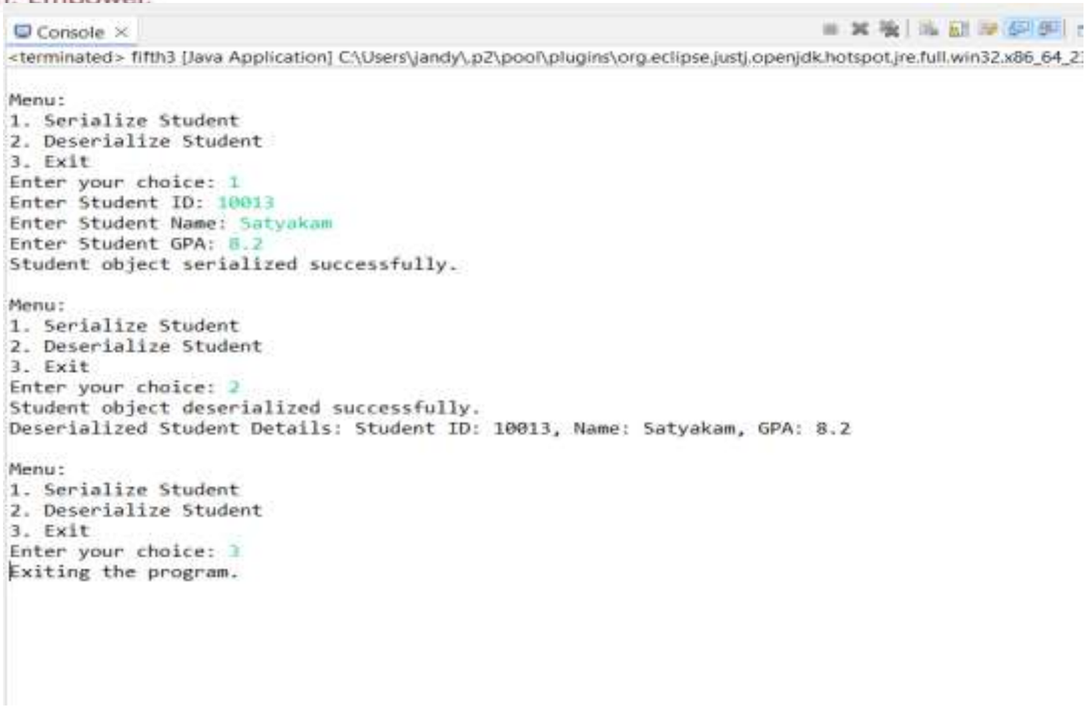

```
Console
<terminated> fifth3 [Java Application] C:\Users\jandy\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_2

Menu:
1. Serialize Student
2. Deserialize Student
3. Exit
Enter your choice: 1
Enter Student ID: 10013
Enter Student Name: Satyakam
Enter Student GPA: 8.2
Student object serialized successfully.

Menu:
1. Serialize Student
2. Deserialize Student
3. Exit
Enter your choice: 2
Student object deserialized successfully.
Deserialized Student Details: Student ID: 10013, Name: Satyakam, GPA: 8.2

Menu:
1. Serialize Student
2. Deserialize Student
3. Exit
Enter your choice: 3
Exiting the program.
```

Fig:2 Student management system using serialization & deserialization

4. Learning Outcomes:

- Understand the concept of object serialization and deserialization in Java.
- Learn how to convert a Java object into a byte stream and save it to a file.
- Gain knowledge of reading and converting a byte stream back into a Java object.

Problem 3: Create a menu-based Java application with the following options. 1.Add an Employee 2. Display All 3. Exit If option 1 is selected, the application should gather details of the employee like employee name, employee id, designation and salary and store it in a file. If option 2 is selected, the application should display all the employee details. If option 3 is selected the application should exit.

1. Objectives:

1. Create a menu with options to add an employee, display all employees, or exit.
2. Add employee details (name, id, designation, salary) and store them in a file.
3. Display all employee details from the file.

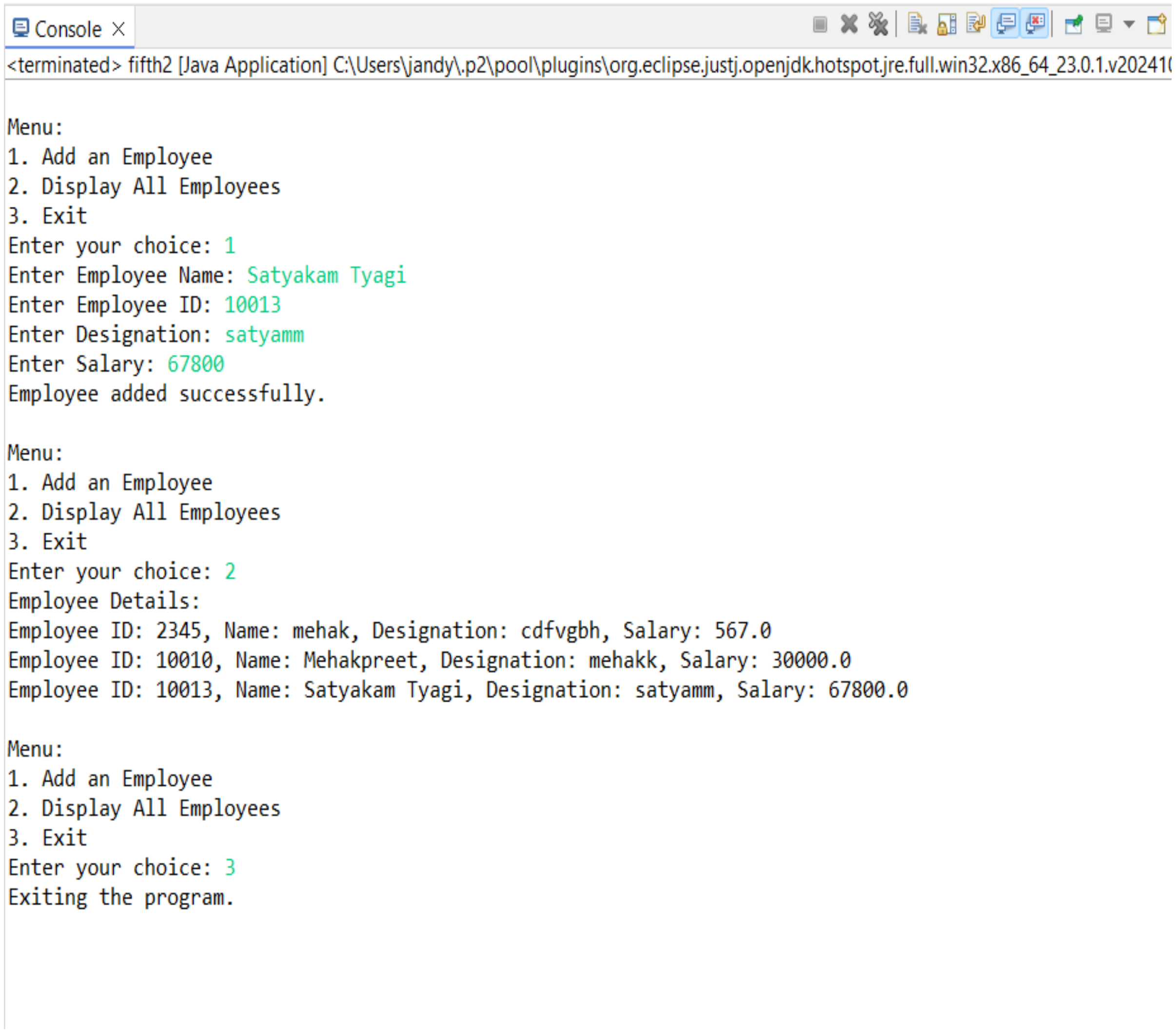
2. Code:

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

class EmployeeRecord implements Serializable { private static final
   long serialVersionUID = 1L; // For serialization private String
   name; private int id;
```

```
private String designation; private
   double salary;

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

   @Override
   public String toString() { return "Employee ID: " + id + ", Name: " + name + ",
     Designation: " + designation + ", Salary: " + salary;
   }
}

public class EmployeeManagement { private static final

   String FILE_NAME = "employees.ser";

   public static void addEmployee(EmployeeRecord employee) {
      List<EmployeeRecord> employees = readEmployees();
      employees.add(employee);
      try (ObjectOutputStream oos = new ObjectOutputStream(new
     FileOutputStream(FILE_NAME))) {
         oos.writeObject(employees);
         System.out.println("Employee added successfully.");
      } catch (IOException e) {
         System.out.println("Error saving employee: " + e.getMessage());
      }
   }

   public static List<EmployeeRecord> readEmployees() { List<EmployeeRecord>
      employees = new ArrayList<>();
      try (ObjectInputStream ois = new ObjectInputStream(new
     FileInputStream(FILE_NAME))) { employees =
         (List<EmployeeRecord>) ois.readObject();
       } catch (FileNotFoundException e) {
         // File not found, return empty list
      } catch (IOException | ClassNotFoundException e) {
         System.out.println("Error reading employees: " + e.getMessage());
      }
      return employees;
   }
   public static void displayEmployees() {
      List<EmployeeRecord> employees = readEmployees();
      if (employees.isEmpty()) {
         System.out.println("No employees found.");
```

```
        } else {
            System.out.println("Employee  Details:");  for
            (EmployeeRecord employee : employees) {
                System.out.println(employee);
            }
        }
    }

    public   static   void   main(String[]   args)   {
        Scanner scanner = new Scanner(System.in);
        int choice;

        do {
            System.out.println("\nMenu:");
            System.out.println("1. Add an Employee");
            System.out.println("2. Display All Employees");
            System.out.println("3. Exit");
            System.out.print("Enter your choice: "); choice
            = scanner.nextInt();
            scanner.nextLine(); // Consume newline

            switch (choice) { case
                1:
                    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();


                     EmployeeRecord employee = new EmployeeRecord(name, id, designation,
     salary);
                    addEmployee(employee);
                    break;

                case 2:
                    displayEmployees();
                    break;
                case 3:
                    System.out.println("Exiting the program."); break;
default:
                    System.out.println("Invalid choice. Please try again."); }
        } while (choice != 3);

        scanner.close();
    }
  }
```

3. Output:



```
Console X
<terminated> fifth2 [Java Application] C:\Users\jandy\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_23.0.1.v20241

Menu:
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 1
Enter Employee Name: Satyakam Tyagi
Enter Employee ID: 10013
Enter Designation: satyamm
Enter Salary: 67800
Employee added successfully.

Menu:
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 2
Employee Details:
Employee ID: 2345, Name: mehak, Designation: cdfvgbh, Salary: 567.0
Employee ID: 10010, Name: Mehakpreet, Designation: mehakk, Salary: 30000.0
Employee ID: 10013, Name: Satyakam Tyagi, Designation: satyamm, Salary: 67800.0

Menu:
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 3
Exiting the program.
```

Fig:3 Employee Details

4. Learning Outcomes:

- Learn how to create a menu-driven application in Java.
- Understand how to gather user input and store it in a file.
- Gain experience in reading from and displaying data stored in a file.
- Develop skills in managing application flow with user-driven options.