Experiment- 5

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Problem 1

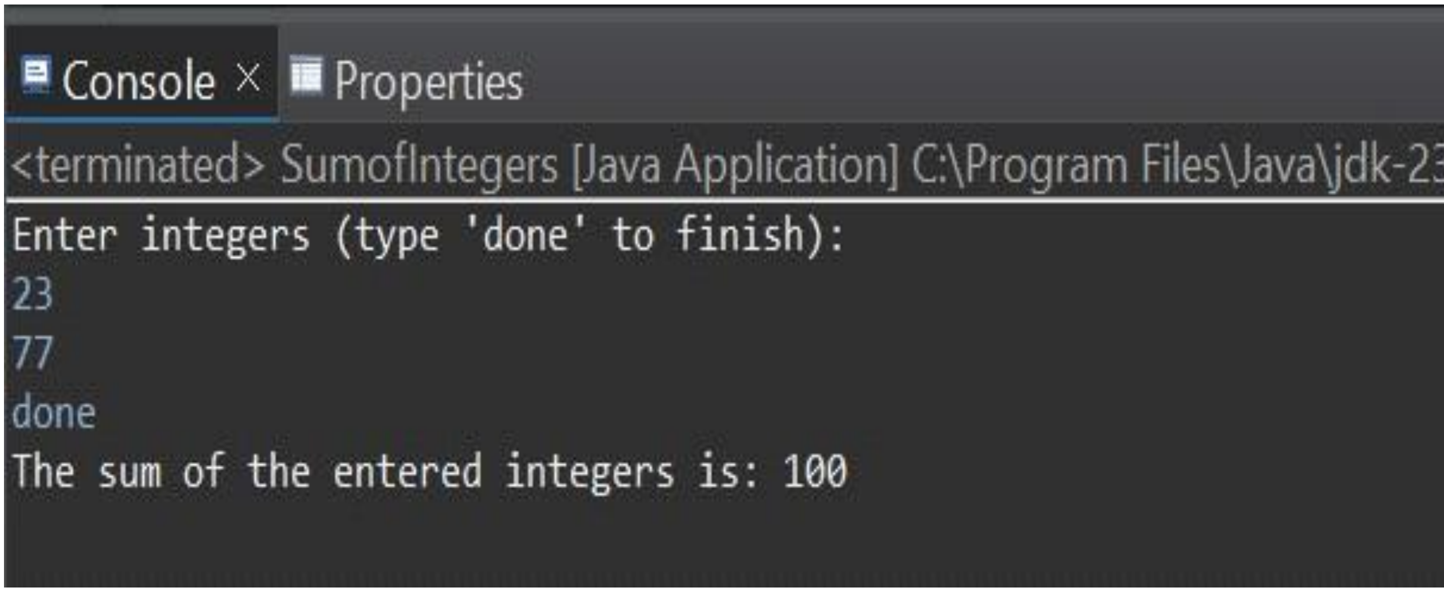
- **Aim:** To develop a Java program that calculates the sum of a list of integers using autoboxing and unboxing, and demonstrates the use of wrapper classes for parsing strings into their respective types.

- **Objective:**
  - 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()).

- **Code:**

```
package main;

import
java.util.ArrayL
ist; import
java.util.List;
import
java.util.Scanne
r;

public class SumofIntegers {
    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("do
                ne")) { break;
            }
            try {
                Integer number = Integer.parseInt(input);
                integerList.add(number);
            } catch (NumberFormatException e) {
                System.out.println("Invalid input. Please enter a valid integer.");
            }          }
        int sum = calculateSum(integerList);
        System.out.println("The sum of the entered integers is: " + sum);
        scanner.close();
    }
    private static int calculateSum(List<Integer>
        integers) { int sum = 0;
        for (Integer num :
            integers) { sum
            += num;                }
        return sum;
    }
}
```

- **Output:**



```
<terminated> SumofIntegers [Java Application] C:\Program Files\Java\jdk-23
Enter integers (type 'done' to finish):
23
77
done
The sum of the entered integers is: 100
```

Fig 1: Output for Problem 1

Problem 2

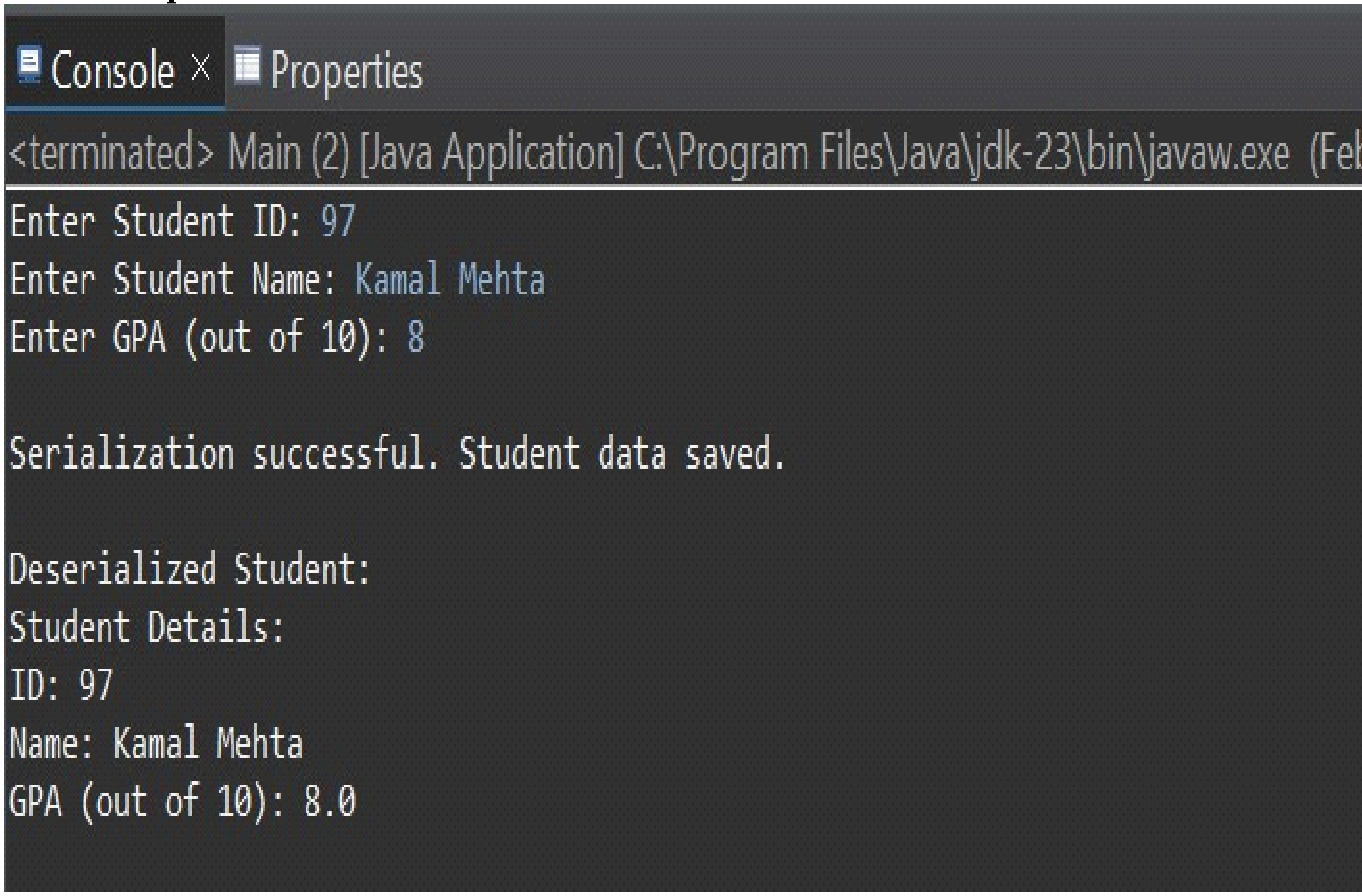
- **Aim:** Create a Java program to serialize and deserialize a Student object.
- **Objective:**
  - To Serialize a Student object (containing id, name, and GPA) and save it to a file.
  - Deserialize the object from the file and display the student details.
  - Handle FileNotFoundException,
    IOException, and
    ClassNotFoundException using exception
    handling.
- **Code:**

```
package Main;

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

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;
    }
    @Override
    public String
        toString() { return
        "Student
        Details:\n" +
               "ID: " + id + "\n" +


               "Name: " + name +
               "\n" + "GPA (out of
               10): " + gpa;
    }
}
public class Main {
    public static void main(String[]
        args) { Scanner scanner = new
        Scanner(System.in);

        try {
```

```
System.out.print("Enter
Student ID: "); int id =
scanner.nextInt()
scanner.nextLine();

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

System.out.print("Enter GPA (out of
10): "); double gpa =
scanner.nextDouble();
Student student = new Student(id,


name, gpa); try


(ObjectOutputStream oos =


    new ObjectOutputStream(new FileOutputStream("student_data.ser"))) {

   oos.writeObject(student);
   System.out.println("\nSerialization successful. Student data saved.");

} catch (IOException e) {
   System.err.println("Error during serialization: " + e.getMessage());
}

try (ObjectInputStream ois =
    new ObjectInputStream(new FileInputStream("student_data.ser"))) {

   Student deserializedStudent = (Student) ois.readObject();
   System.out.println("\nDeserialized Student:\n" + deserializedStudent);
```

```
            } catch (ClassNotFoundException | IOException e) {
                System.err.println("Error during deserialization: " +
                e.getMessage());
            }
        } finally {
            scanner.
            close();
        }
    }
}
```

- **Output:**



```
Console ✕   Properties
<terminated> Main (2) [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (Fe
Enter Student ID: 97
Enter Student Name: Kamal Mehta
Enter GPA (out of 10): 8

Serialization successful. Student data saved.

Deserialized Student:
Student Details:
ID: 97
Name: Kamal Mehta
GPA (out of 10): 8.0
```

Fig 2: Output for Problem 2

<u>Problem 3</u>

- **Aim:** To develop a menu-based Java application that manages employee records, demonstrating file handling, data storage, and retrieval.

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

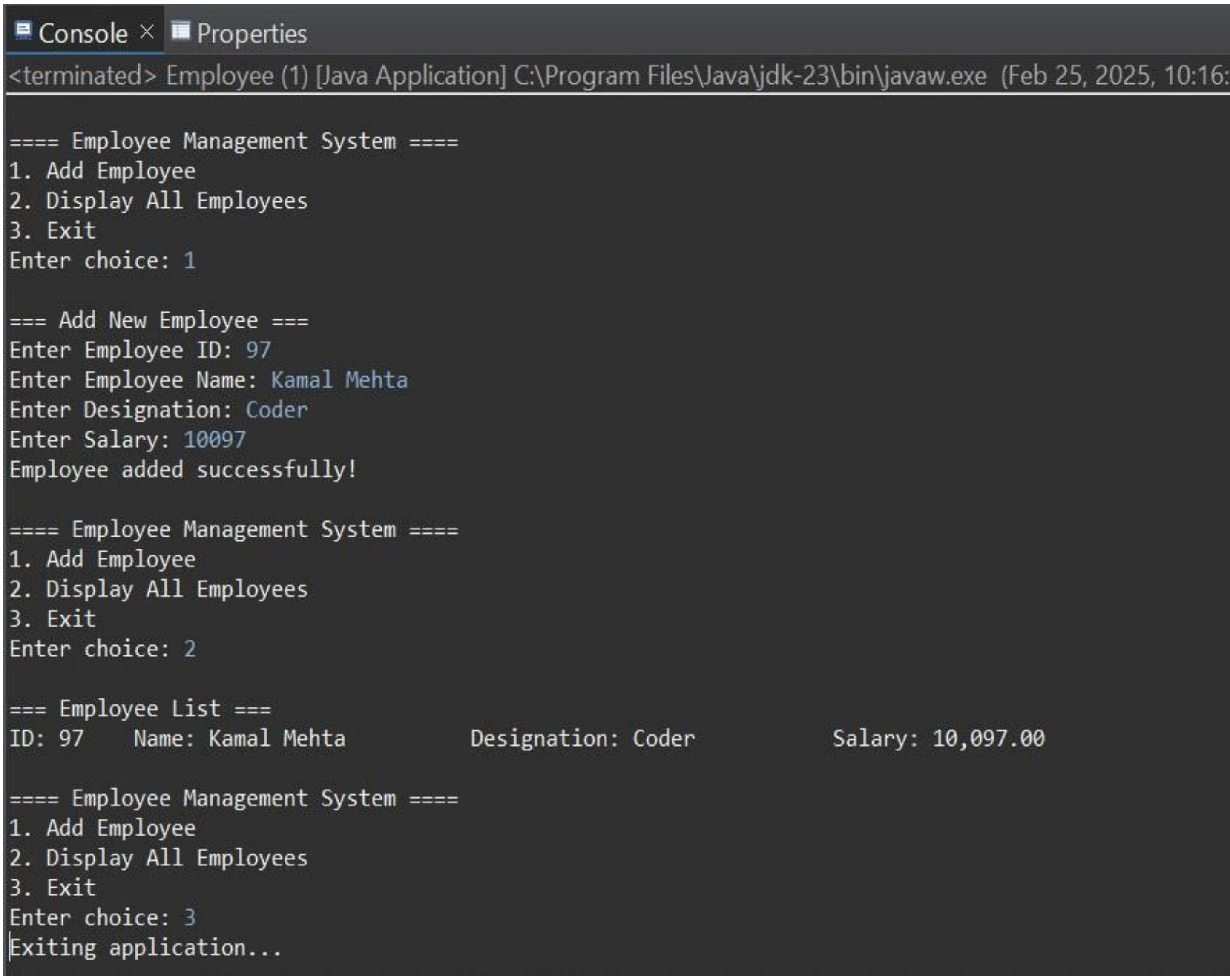
- **Code:**

```
package main;

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

public class Employee {
   private static final String FILE_NAME = "employees.txt";

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

      do {
         printMenu();
```

```
        choice = getIntInput(scanner, "Enter choice: ");

        switch(choice) {




            case 1:
                addEmployee(sca
                nner); break;
            case 2:
                displayEm
                ployees();
                break;
            case 3:
                System.out.println("Exiting
                application..."); break;
            default:
                System.out.println("Invalid choice! Please try again.");
        }
    } while(choice != 3);

    scanner.close();
}

private static void printMenu() {
    System.out.println("\n==== Employee Management System ====");
    System.out.println("1. Add Employee");
    System.out.println("2. Display All Employees");
    System.out.println("3. Exit");
}

private static void addEmployee(Scanner scanner) {
    System.out.println("\n=== Add New Employee
    ===");
```

```
        int id = getIntInput(scanner, "Enter Employee ID: ");
        scanner.nextLine(); // Clear buffer
        String name = getStringInput(scanner, "Enter Employee
        Name: "); String designation = getStringInput(scanner, "Enter
        Designation: "); double salary = getDoubleInput(scanner,
        "Enter Salary: ");

        try (BufferedWriter writer = new BufferedWriter(new
    FileWriter(FILE_NAME, true))) {
            String record = String.format("%d|%s|%s|%.2f", id, name, designation, salary);


            writer.write(rec
            ord);
            writer.newLine(
            );
            System.out.println("Employee added successfully!");
        } catch (IOException e) {
            System.out.println("Error saving employee data: " + e.getMessage());
        }
      }
      private static void displayEmployees() {
        System.out.println("\n=== Employee List ===");

        File file = new
        File(FILE_NAME);
        if(!file.exists()) {
            System.out.println("No employees found in the
            system."); return;
        }

        try (BufferedReader reader = new BufferedReader(new
        FileReader(FILE_NAME)))
    {
            String line;
            while((line = reader.readLine()) !=
                null) { String[] parts =
                line.split("\\|"); if(parts.length ==
                4) {
                    System.out.printf("ID: %-5d Name: %-20s Designation: %-15s Salary:

                                                                                                    %,.2f%n",

                                                                                                              }

Integer.parseInt(parts[0]), parts[1],
parts[2], Double.parseDouble(parts[3]));

            }
        }
 catch (IOException e) {
            System.out.println("Error reading employee data: " + e.getMessage());
        } catch (NumberFormatException e) {
            System.out.println("Error parsing data: Invalid number format");
        }


    }
    private static int getIntInput(Scanner scanner, String
        prompt) { while(true) {
            try {
                System.out.print(pro
                mpt); return
                scanner.nextInt();
            } catch (Exception e) {
                System.out.println("Invalid input! Please enter a valid
                integer."); scanner.nextLine();
            }
        }
    }
    private static double getDoubleInput(Scanner scanner, String prompt) {
        while(true) {
            try {
                System.out.print(pro
                mpt); return
                scanner.nextDouble(
                );
            } catch (Exception e) {
                System.out.println("Invalid input! Please enter a valid
                number."); scanner.nextLine();
            }
        }
    }
    private static String getStringInput(Scanner scanner, String prompt) {
        System.out.print(prompt);
        return scanner.nextLine().trim();
    }
}
```

- **Output:**



```
<terminated> Employee (1) [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe  (Feb 25, 2025, 10:16:

==== Employee Management System ====
1. Add Employee
2. Display All Employees
3. Exit
Enter choice: 1

=== Add New Employee ===
Enter Employee ID: 97
Enter Employee Name: Kamal Mehta
Enter Designation: Coder
Enter Salary: 10097
Employee added successfully!

==== Employee Management System ====
1. Add Employee
2. Display All Employees
3. Exit
Enter choice: 2

=== Employee List ===
ID: 97    Name: Kamal Mehta         Designation: Coder          Salary: 10,097.00

==== Employee Management System ====
1. Add Employee
2. Display All Employees
3. Exit
Enter choice: 3
Exiting application...
```

Fig 3: Output for Problem 3

- **Learning Outcome:**

  - **Wrapper Classes and Autoboxing:** Understood and effectively used Java's wrapper classes and the concepts of autoboxing and unboxing to handle primitive data types and objects seamlessly.

- **Serialization and Deserialization:** Gained proficiency in serializing and deserializing objects for data persistence, enabling the storage and retrieval of object states in Java applications.

- **Exception Handling:** Developed robust exception handling skills to manage file and I/O-related exceptions, ensuring reliable and error- resistant code.
- **File Handling:** Learned file operations, including reading and writing data, to efficiently manage data storage and retrieval in Java applications.
- **Interactive Application Design:** Enhanced ability to design and implement interactive, menu-driven applications that facilitate user interaction and data management.
- **Data Management:** Learned to gather, store, and retrieve complex data structures using file handling techniques, crucial for real-world applications.
- **Problem-Solving and Integration:** Improved problem-solving skills and integrate various Java concepts to create efficient and effective software solutions.