Experiment 5.1

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Subject Name: Project based learning in Java
Subject Code: 22CSH-359

1. **Aim:** 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()).
2. **Objective:** Demonstrate autoboxing and unboxing in Java by converting string numbers into Integer objects, storing them in a list, and computing their sum.
3. **Algorithm:**

Step 1: Initialize the Program

1. Start the program.
2. Import ArrayList and List classes.
3. Define the AutoboxingExample class.

Step 2: Convert String Array to Integer List

1. Define the method parseStringArrayToIntegers(String[] strings).
2. Create an empty ArrayList.
3. Iterate through the string array:
   - o Convert each string to an Integer using Integer.parseInt(str).
   - o Add the integer to the list (autoboxing happens here).
4. Return the list of integers.

Step 3: Calculate the Sum of Integers

1. Define the method calculateSum(List numbers).
2. Initialize a variable sum to 0.
3. Iterate through the list:
   - o Extract each integer (unboxing happens here).
   - o Add it to sum.
4. Return the total sum.

Step 4: Execute Main Function

1. Define main(String[] args).
2. Create a string array with numeric values.
3. Call parseStringArrayToIntegers() to convert it into a list of integers.
4. Call calculateSum() to compute the sum.
5. Print the result.

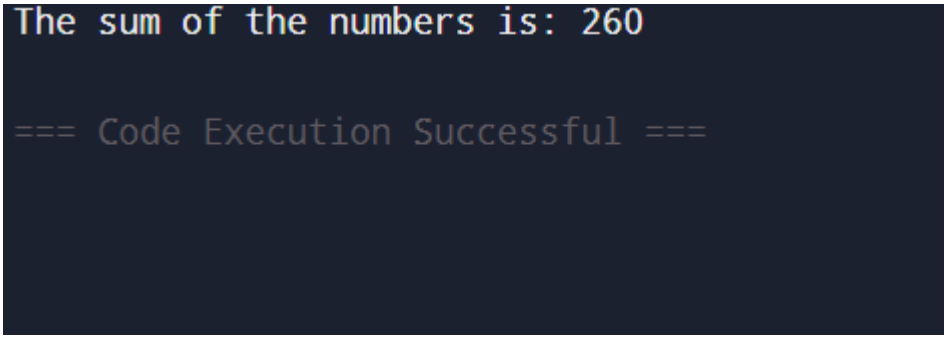
Step 5: Terminate the Program

1. End the execution.

4. Implementation/Code:

```
import java.util.ArrayList;
import java.util.List;
public class AutoboxingExample {
 public static void main(String[] args) {
 String[] numberStrings = {"50", "40", "60", "20", "90"};
 List<Integer> numbers = parseStringArrayToIntegers(numberStrings);
 int sum = calculateSum(numbers);
 System.out.println("The sum of the numbers is: " + sum);
 }
 public static List<Integer> parseStringArrayToIntegers(String[] strings) {
 List<Integer> integerList = new ArrayList<>();
 for (String str : strings) {
 integerList.add(Integer.parseInt(str));
 }
 return integerList;
 }
 public static int calculateSum(List<Integer> numbers) {
 int sum = 0;
 for (Integer num : numbers) {
 sum += num;
 }
 return sum;
 }
}
```

5. Output



6. Learning Outcomes

- Understand the concept of autoboxing and unboxing in Java and how primitive types are automatically converted to their wrapper classes and vice versa.
- Learn how to convert string values into Integer objects using Integer.parseInt() and store them in a list.
- Gain experience in working with ArrayLists to store and manipulate a collection of numbers dynamically.
- Develop proficiency in iterating through collections and performing arithmetic operations like summation.

Experiment 5.2

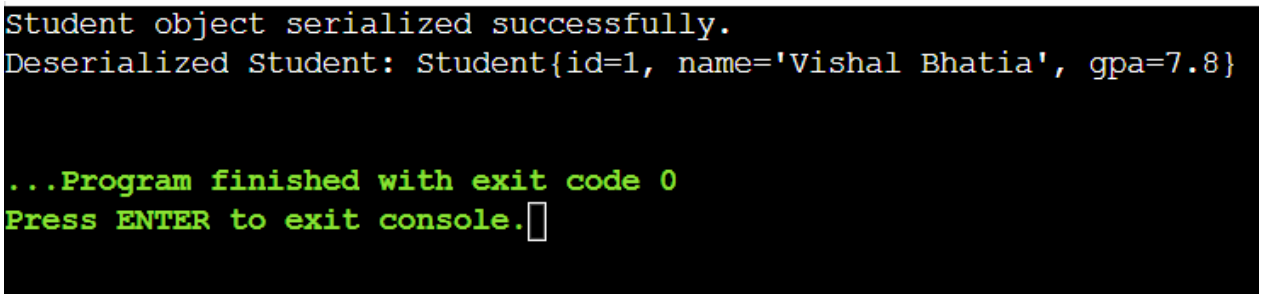
1. Aim: Create a Java program to serialize and deserialize a Student object. The program should:
   • Serialize a Student object (containing id, name, and GPA) and save it to a file.
   • Deserialize the object from the file and display the student details.
   • Handle FileNotFoundException, IOException, and ClassNotFoundException using exception handling.
2. Objective: The objective is to serialize and deserialize a Student object, store and retrieve its id, name, and GPA from a file, and handle exceptions like FileNotFoundException, IOException, and ClassNotFoundException.

3. **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 String toString() {
 return "Student{id=" + id + ", name='" + name + "', gpa=" + gpa + "}";
 }}
public class Main {
 private static final String FILE_NAME = "student.ser";
 public static void main(String[] args) {
 Student student = new Student(1, "Vishal Bhatia", 7.8);
 serializeStudent(student);
 deserializeStudent();
 }
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.err.println("File not found: " + e.getMessage());
 } catch (IOException e) {
 System.err.println("IOException occurred: " + e.getMessage());
 }}
 public static void deserializeStudent() {
 try (ObjectInputStream ois = new ObjectInputStream(new
FileInputStream(FILE_NAME))){
 Student student = (Student) ois.readObject();
 System.out.println("Deserialized Student: " + student);
 } catch (FileNotFoundException e) {
```

```
System.err.println("File not found: " + e.getMessage());
} catch (IOException e) {
System.err.println("IOException occurred: " + e.getMessage());
} catch (ClassNotFoundException e) {
   System.err.println("Class not found: " + e.getMessage());
}
}
}
```

4. **Output**



5. **Learning Outcomes:**
   - Understand object serialization and deserialization in Java.
   - Learn how to use ObjectOutputStream and ObjectInputStream for file operations.
   - Implement exception handling for FileNotFoundException, IOException, and ClassNotFoundException.
   - Gain hands-on experience in storing and retrieving objects from a file.
   - Develop skills in data persistence and file management using Java.

Experiment 5.3

1. **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, 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.

2. **Objective**: The objective is to develop a menu-based Java application that allows users to add employee details, store them in a file, and display all stored employee records, with an option to exit the program.

3. **Implementation / Code:**

```
import java.io.*;
import java.util.*;
class Employee implements Serializable {
private static final long serialVersionUID = 1L;
private int id;
private String name;
private String designation;
private 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 String toString() {
return "Employee ID: " + id + ", Name: " + name + ", Designation: " +
designation + ", Salary: " + salary;
} }
public class EmployeeManagementSystem {
private static final String FILE_NAME = "employees.ser";
private static List employees = new ArrayList<>();
public static void addEmployee() {
Scanner scanner = new Scanner(System.in);
System.out.print("Enter Employee ID: ");
int id = scanner.nextInt();
scanner.nextLine();
System.out.print("Enter Employee Name: ");
String name = scanner.nextLine();
System.out.print("Enter Designation: ");
String designation = scanner.nextLine();
System.out.print("Enter Salary: ");
double salary = scanner.nextDouble();
Employee employee = new Employee(id, name, designation, salary);
employees.add(employee);
saveEmployees();
System.out.println("Employee added successfully!"); }
```

```
public static void displayAllEmployees() {
loadEmployees();
if (employees.isEmpty()) {
System.out.println("No employees found.");
}
else {
for (Employee employee : employees) {
 System.out.println(employee);
} } }
private static void saveEmployees() {
try (ObjectOutputStream oos = new ObjectOutputStream(new
FileOutputStream(FILE_NAME))) {
oos.writeObject(employees);
}
catch (IOException e) {
System.err.println("Error saving employees: " + e.getMessage());
} }
private static void loadEmployees() {
try (ObjectInputStream ois = new ObjectInputStream(new
FileInputStream(FILE_NAME))) {
employees = (List) ois.readObject();
}
catch (FileNotFoundException e) {
employees = new ArrayList<>();
}
catch (IOException | ClassNotFoundException e) {
System.err.println("Error loading employees: " + e.getMessage());
} }
public static void main(String[] args) {
Scanner scanner = new Scanner(System.in);
while (true) {
System.out.println("\nEmployee Management System");
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: ");
int choice = scanner.nextInt();
scanner.nextLine();
switch (choice) {
case 1: addEmployee();
break;
case 2: displayAllEmployees();
```

```
break;
case 3: System.out.println("Exiting...");
return;
default: System.out.println("Invalid choice! Please try again.");
} } } }
```

4. Output:

```
Employee Management System
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 1
Enter Employee ID: 132
Enter Employee Name: Anwar
Enter Designation: HR
Enter Salary: 75000
Employee added successfully!

Employee Management System
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 1
Enter Employee ID: 125
Enter Employee Name: Vedant
Enter Designation: Director
Enter Salary: 100000
Employee added successfully!

Employee Management System
1. Add an Employee
2. Display All Employees
3. Exit
Enter your choice: 2
Employee ID: 132, Name: Anwar, Designation: HR, Salary: 75000.0
Employee ID: 125, Name: Vedant, Designation: Director, Salary: 100000.0
```

5. Learning Outcomes:

- Understand file handling and serialization in Java to store and retrieve objects persistently.
- Learn how to implement a menu-driven console application using loops and conditional statements.
- Gain experience in object-oriented programming (OOP) by defining and managing Employee objects.
- Practice exception handling to manage file-related errors like FileNotFoundException and IOException.
- Develop skills in list manipulation and user input handling using ArrayList and Scanner.