

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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Experiment-5

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Branch: BE-CSE

Semester: 6th

Subject Name: Project Based Learning in
Java

UID:22BCS13750

Section/Group: 643/B

D.Performance:27/02/2025

Subject Code: 22CSH-359

1. Aim : Develop Java programs using autoboxing, serialization, file handling, and efficient data processing and management.

2. Easy Level:

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()).

3. Implementation/Code:

```
import java.util.*;
```

```
public class AutoboxingExample {
    public static int calculateSum(List<Integer> numbers) {
        int sum = 0;
        for (int num : numbers) { // Unboxing happens here
            sum += num;
        }
        return sum;
    }

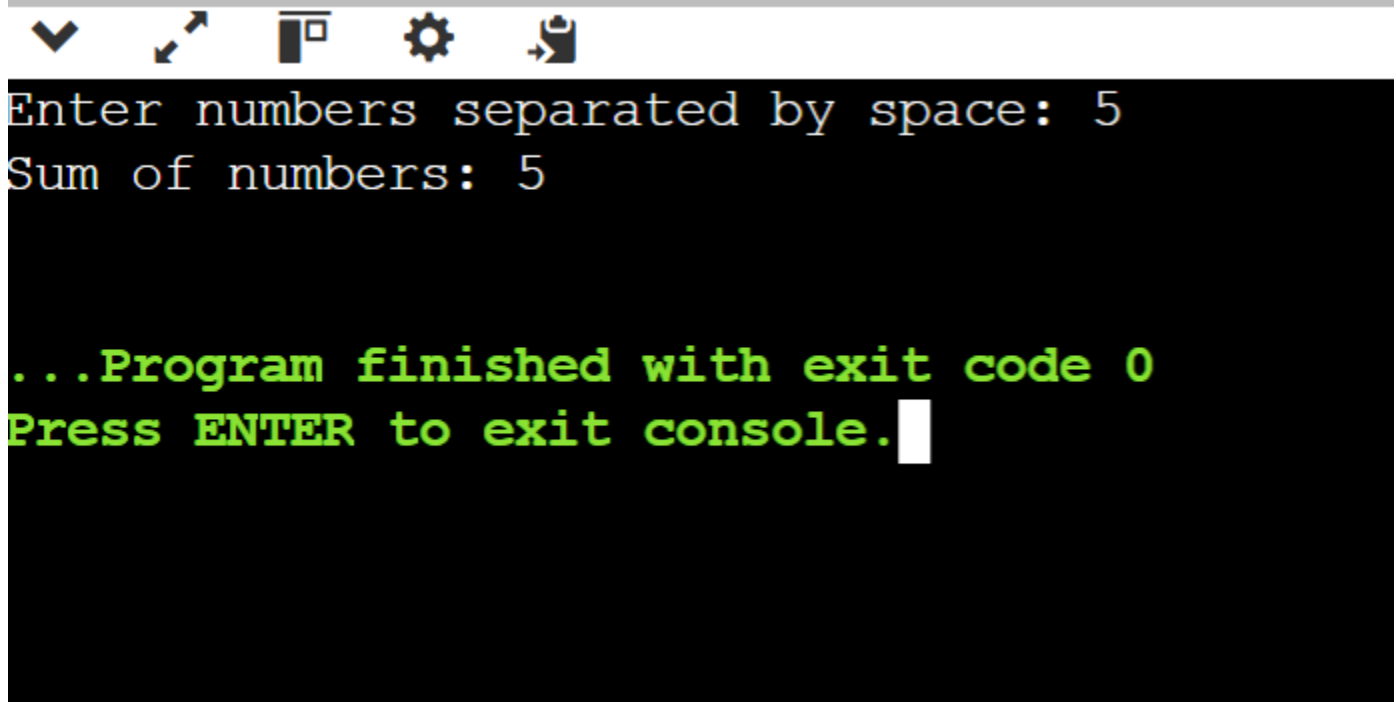
    public static void main(String[] args) {
        List<Integer> numbers = new ArrayList<>();
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter numbers separated by space: ");
        String[] inputs = scanner.nextLine().split(" ");

        for (String input : inputs) {
            numbers.add(Integer.parseInt(input)); // Autoboxing from int to Integer
        }

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

4. OUTPUT:



The screenshot shows a Java IDE window with a toolbar at the top containing icons for a dropdown menu, a zoom in/out icon, a window icon, a settings gear, and a clipboard. The main area displays the following text in a monospaced font:

```
Enter numbers separated by space: 5
Sum of numbers: 5

...Program finished with exit code 0
Press ENTER to exit console.
```

Output for Easy Level:

Medium Level:

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.

5. Code:

```
import java.io.*;

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

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

    public void display() {
        System.out.println("ID: " + id + ", Name: " + name + ", GPA: " + gpa);
    }
}

public class StudentSerialization {
    private static final String FILE_NAME = "student.ser";

    // Serialize object
    public static void serializeStudent(Student student) {
        try (ObjectOutputStream out = new ObjectOutputStream(new FileOutputStream(FILE_NAME))) {
            out.writeObject(student);
            System.out.println("Student object serialized.");
        } catch (IOException e) {
            e.printStackTrace();
        }
    }
}
```

```
}  
}  
  
// Deserialize object  
public static Student deserializeStudent() {  
    try (ObjectInputStream in = new ObjectInputStream(new FileInputStream(FILE_NAME))) {  
        return (Student) in.readObject();  
    } catch (FileNotFoundException e) {  
        System.out.println("File not found.");  
    } catch (IOException | ClassNotFoundException e) {  
        e.printStackTrace();  
    }  
    return null;  
}  
  
public static void main(String[] args) {  
    Student student = new Student(101, "Alice", 3.8);  
    serializeStudent(student);  
  
    Student deserializedStudent = deserializeStudent();  
    if (deserializedStudent != null) {  
        System.out.println("Deserialized Student:");  
        deserializedStudent.display();  
    }  
}  
}
```

6. Output:

```
StudentSerializatio... : student.ser :  
1 -i sr Student .....D...gpaI...idL...namet...Ljava/lang/String;xp@.ffffff...et...Alice  
  
Student object serialized.  
Deserialized Student:  
ID: 101, Name: Alice, GPA: 3.8  
  
...Program finished with exit code 0  
Press ENTER to exit console.[]
```

7. Hard Level:

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.

8. Code:-

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

```
class Employee implements Serializable {  
    private static final long serialVersionUID = 1L;  
    int id;  
    String name, 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;  
  
}
```

@Override

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

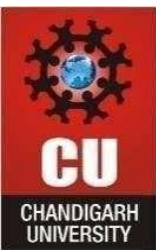
```
public class EmployeeManagement {  
    private static final String FILE_NAME = "employees.dat";
```

// Add employee to file

```
public static void addEmployee(Employee emp) {  
    List<Employee> employees = loadEmployees();  
    employees.add(emp);  
    saveEmployees(employees);  
    System.out.println("Employee added successfully.");  
}
```

// Display all employees

```
public static void displayEmployees() {  
    List<Employee> employees = loadEmployees();  
    if (employees.isEmpty()) {  
        System.out.println("No employees found.");  
        return;  
    }  
    for (Employee emp : employees) {  
        System.out.println(emp);  
    }  
}
```



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```
}  
}
```

```
// Save employee list to file
```

```
private static void saveEmployees(List<Employee> employees) {  
    try (ObjectOutputStream out = new ObjectOutputStream(new FileOutputStream(FILE_NAME))) {  
        out.writeObject(employees);  
    } catch (IOException e) {  
        e.printStackTrace();  
    }  
}
```

```
// Load employee list from file
```

```
@SuppressWarnings("unchecked")
```

```
private static List<Employee> loadEmployees() {  
    try (ObjectInputStream in = new ObjectInputStream(new FileInputStream(FILE_NAME))) {  
        return (List<Employee>) in.readObject();  
    } catch (FileNotFoundException e) {  
        return new ArrayList<>(); // Return empty list if file does not exist  
    } catch (IOException | ClassNotFoundException e) {  
        e.printStackTrace();  
        return new ArrayList<>();  
    }  
}
```

```
public static void main(String[] args) {
```

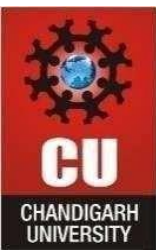
```
    Scanner scanner = new Scanner(System.in);
```

```
    int choice;
```

```
    while (true) {
```

```
        System.out.println("\n1. Add Employee\n2. Display All Employees\n3. Exit");
```

```
        System.out.print("Enter choice: ");
```



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```
choice = scanner.nextInt();
```

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

```
switch (choice) {
```

```
    case 1:
```

```
        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();
```

```
        addEmployee(new Employee(id, name, designation, salary));
```

```
        break;
```

```
    case 2:
```

```
        displayEmployees();
```

```
        break;
```

```
    case 3:
```

```
        System.out.println("Exiting program.");
```

```
        scanner.close();
```

```
        return;
```

```
    default:
```

```
        System.out.println("Invalid choice. Try again.");
```

```
    }
```

```
}
```

```
}
```


}

9. Output:-

```
1. Add Employee
2. Display All Employees
3. Exit
Enter choice: 1
Enter Employee ID: 101
Enter Name: Aditya
Enter Designation: adi
Enter Salary: 9000
Employee added successfully.

1. Add Employee
2. Display All Employees
3. Exit
Enter choice: 2
ID: 101, Name: Aditya, Designation: adi, Salary: 9000.0

1. Add Employee
2. Display All Employees
3. Exit
Enter choice: █
```

10. Learning outcomes:

- 1. Collections in Java:** Learn ArrayList, HashMap, and Collection interfaces for efficient data storage and retrieval.
- 2. CRUD Operations:** Implement basic operations like Add, Update, Remove, and Search using Java collections.
- 3. Multithreading & Synchronization:** Use synchronized and ReentrantLock to handle concurrent access and prevent race conditions.
- 4. Thread Priorities:** Assign priorities (MAX_PRIORITY, NORM_PRIORITY) to ensure important tasks (e.g., VIP bookings) execute first.