



Experiment 4

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Subject Name: PBLJ

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1. Aim: Develop Java programs using core concepts such as data structures, collections, and multithreading to manage and manipulate data.

A) Easy Level:

- Write a Java program to implement an ArrayList that stores employee details (ID, Name, and Salary). Allow users to add, update, remove, and search employees.

B) Medium Level:

- Create a program to collect and store all the cards to assist the users in finding all the cards in a given symbol using Collection interface.

C) Hard Level:

- Develop a ticket booking system with synchronized threads to ensure no double booking of seats. Use thread priorities to simulate VIP bookings being processed first.

2. Objectives:

- ❖ To understand how to use Java Collections, specifically ArrayList, to manage dynamic data efficiently.
- ❖ To understand collection interfaces like Map, List, and how to store and retrieve grouped data.
- ❖ To understand multithreading, thread synchronization, and thread priorities in Java.
- ❖ To illustrate basic thread handling, synchronization, and concurrency concepts.
- ❖ To simulate a real-world scenario of priority-based resource allocation.

3. JAVA script and output:



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EASY-LEVEL PROBLEM

```
import java.util.*;

class Employee {
    int id;
    String name;
    double salary;

    Employee(int id, String name, double salary) {
        this.id = id;
        this.name = name;
        this.salary = salary;
    }
    public String toString() {
        return "ID: " + id + ", Name: " + name + ", Salary: " + salary;
    }
}

public class EmployeeList {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        ArrayList<Employee> list = new ArrayList<>();

        while (true) {
            System.out.println("\n1. Add Employee");
            System.out.println("2. Update Employee");
            System.out.println("3. Remove Employee");
            System.out.println("4. Search Employee");
            System.out.println("5. Display All Employees");
            System.out.println("6. Exit");
            System.out.print("Enter choice: ");
            int choice = sc.nextInt();

            switch (choice) {
                case 1:
                    System.out.print("Enter ID: ");
                    int id = sc.nextInt();
```



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```
sc.nextLine();
System.out.print("Enter Name: ");
String name = sc.nextLine();
System.out.print("Enter Salary: ");
double salary = sc.nextDouble();
list.add(new Employee(id, name, salary));
System.out.println("Employee added.");
break;
```

case 2:

```
System.out.print("Enter ID to update: ");
int uid = sc.nextInt();
boolean foundUpdate = false;
for (Employee e : list) {
    if (e.id == uid) {
        sc.nextLine();
        System.out.print("Enter new Name: ");
        e.name = sc.nextLine();
        System.out.print("Enter new Salary: ");
        e.salary = sc.nextDouble();
        System.out.println("Employee updated.");
        foundUpdate = true;
        break;
    }
}
if (!foundUpdate) System.out.println("Employee not found.");
break;
```

case 3:

```
System.out.print("Enter ID to remove: ");
int rid = sc.nextInt();
boolean removed = list.removeIf(e -> e.id == rid);
if (removed) System.out.println("Employee removed.");
else System.out.println("Employee not found.");
break;
```

case 4:

```
System.out.print("Enter ID to search: ");
int sid = sc.nextInt();
boolean found = false;
```



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```
        for (Employee e : list) {
            if (e.id == sid) {
                System.out.println(e);
                found = true;
                break;
            }
        }
        if (!found) System.out.println("Employee not found.");
        break;

    case 5:
        if (list.isEmpty()) System.out.println("No employees.");
        else for (Employee e : list) System.out.println(e);
        break;

    case 6:
        System.out.println("Exiting...");
        sc.close();
        return;

    default:
        System.out.println("Invalid choice.");
    }
}
}
```

Output:



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Output

1. Add Employee
2. Update Employee
3. Remove Employee
4. Search Employee
5. Display All Employees
6. Exit

Enter choice: 1

Enter ID: 11

Enter Name: Diksha

Enter Salary: 20000

Employee added.

1. Add Employee
2. Update Employee
3. Remove Employee
4. Search Employee
5. Display All Employees
6. Exit

Enter choice: 2

Enter ID to update: 13

Employee not found.

1. Add Employee
2. Update Employee
3. Remove Employee
4. Search Employee
5. Display All Employees
6. Exit

Enter choice: 6

Exiting...

=== Code Execution Successful ===



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MEDIUM LEVEL PROBLEM:

```
import java.util.*;

class Card {
    String symbol;
    String value;
    Card(String symbol, String value) {
        this.symbol = symbol;
        this.value = value;
    }
    public String toString() {
        return value + " of " + symbol;
    }
}

public class CardCollection {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        Collection<Card> cards = new ArrayList<>();
        cards.add(new Card("Hearts", "A"));
        cards.add(new Card("Hearts", "2"));
        cards.add(new Card("Diamonds", "K"));
        cards.add(new Card("Spades", "Q"));
        cards.add(new Card("Hearts", "10"));
        cards.add(new Card("Clubs", "J"));

        System.out.print("Enter symbol to search (Hearts/Diamonds/Clubs/Spades): ");
        String symbol = sc.nextLine();
```



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```
boolean found = false;
for (Card c : cards) {
    if (c.symbol.equalsIgnoreCase(symbol)) {
        System.out.println(c);
        found = true;
    }
}
if (!found) {
    System.out.println("No cards found with symbol: " + symbol);
}
sc.close();
}
```

Output:

Output
Enter symbol to search (Hearts/Diamonds/Clubs/Spades): Hearts A of Hearts 2 of Hearts 10 of Hearts === Code Execution Successful ===



HARD LEVEL PROBLEM

```
class TicketBookingSystem {
    private int availableSeats;
    TicketBookingSystem(int seats) {
        this.availableSeats = seats;
    }
    public synchronized void bookSeat(String customer) {
        if (availableSeats > 0) {
            System.out.println(customer + " booked a seat. Seats left: " + (availableSeats - 1));
            availableSeats--;
        } else {
            System.out.println("No seats available for " + customer);
        }
    }
}

class Customer extends Thread {
    private TicketBookingSystem system;

    Customer(String name, TicketBookingSystem system, int priority) {
        super(name);
        this.system = system;
        setPriority(priority);
    }
    public void run() {
        system.bookSeat(getName());
    }
}

public class Main {
    public static void main(String[] args) {
        TicketBookingSystem system = new TicketBookingSystem(5);

        Customer c1 = new Customer("VIP1", system, Thread.MAX_PRIORITY);
        Customer c2 = new Customer("VIP2", system, Thread.MAX_PRIORITY);
        Customer c3 = new Customer("Normal1", system, Thread.NORM_PRIORITY);
        Customer c4 = new Customer("Normal2", system, Thread.NORM_PRIORITY);
        Customer c5 = new Customer("Normal3", system, Thread.NORM_PRIORITY);
        Customer c6 = new Customer("Normal4", system, Thread.NORM_PRIORITY);
    }
}
```




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```
c1.start();
c2.start();
c3.start();
c4.start();
c5.start();
c6.start();

try {
    c1.join(); c2.join(); c3.join(); c4.join(); c5.join(); c6.join();
} catch (InterruptedException e) {
    e.printStackTrace();
}
}
```

OUTPUT:

Output

```
VIP1 booked a seat. Seats left: 4
Normal4 booked a seat. Seats left: 3
Normal3 booked a seat. Seats left: 2
Normal2 booked a seat. Seats left: 1
Normal1 booked a seat. Seats left: 0
No seats available for VIP2
```

```
=== Code Execution Successful ===
```