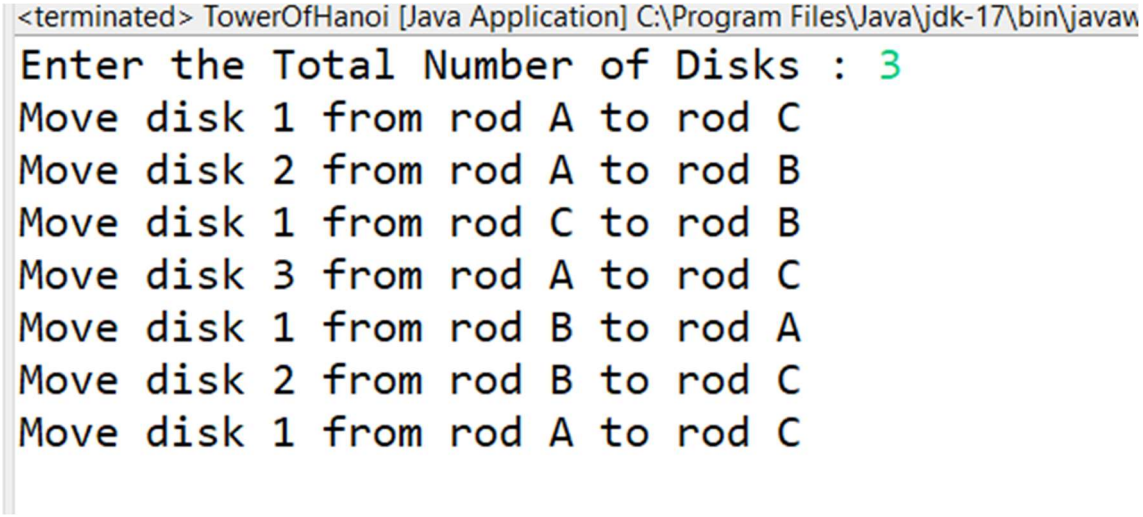
Day 13 and 14:
Task 1: Tower of Hanoi Solver
Create a program that solves the Tower of Hanoi puzzle for n disks. The solution should use recursion to move disks between three pegs (source, auxiliary, and destination) according to the game's rules. The program should print out each move required to solve the puzzle.

```
package com.dsassignment.day13_14;

import java.io.BufferedReader;
import java.io.IOException;
import java.io.InputStreamReader;

public class TowerOfHanoi {

	public static void main(String[] args) throws
NumberFormatException, IOException {

		BufferedReader reader = new BufferedReader(new
InputStreamReader(System.in));

		System.out.print("Enter the Total Number of
Disks : ");
		int n = Integer.parseInt(reader.readLine()); //
Number of disks
		towerOfHanoi(n, 'A', 'C', 'B'); // A, B and C
are names of rods

	}
	static void towerOfHanoi(int n, char from_rod, char
to_rod, char aux_rod)
	{
		if (n == 1)
		{
			System.out.println("Move disk 1 from rod "
+ from_rod + " to rod " + to_rod);
			return;
		}
		towerOfHanoi(n-1, from_rod, aux_rod, to_rod);
		System.out.println("Move disk " + n + " from rod
" + from_rod + " to rod " + to_rod);
		towerOfHanoi(n-1, aux_rod, to_rod, from_rod);
	}
```

```
}
```

Output:

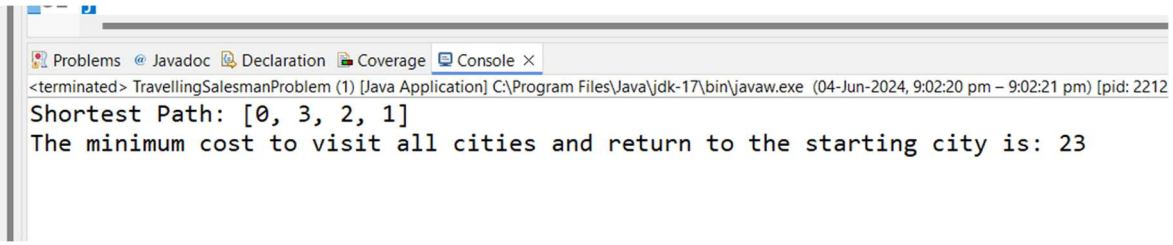


Task 2: Traveling Salesman Problem
Create a function int FindMinCost(int[,] graph) that takes a 2D array representing the graph where graph[i][j] is the cost to travel from city i to city j. The function should return the minimum cost to visit all cities and return to the starting city. Use dynamic programming for this solution.

```
package com.dsassignment.day13_14;

import java.util.ArrayList;
import java.util.List;

public class TravellingSalesmanProblem {

	private static int[][] distances = { { 0, 16, 11, 6 }, { 8, 0, 13, 16 }, { 4, 7, 0, 9 }, { 5,
12, 2, 0 } };

	public static List<Integer> findMinCost(int[][] graph) {
		int n = graph.length;
		int[] cities = new int[n];
		for (int i = 0; i < n; i++) {
			cities[i] = i;
		}

		List<Integer> shortestPath = new ArrayList<>();
		int shortestDistance = Integer.MAX_VALUE;

		do {
			int currentDistance = calculatePathDistance(cities, graph);
			if (currentDistance < shortestDistance) {
				shortestDistance = currentDistance;
```

```
                        shortestPath.clear();
                        for (int city : cities) {
                            shortestPath.add(city);
                        }
                    }
                } while (nextPermutation(cities));

                return shortestPath;
            }

            private static int calculatePathDistance(int[] path, int[][] graph) {
                int distance = 0;
                for (int i = 0; i < path.length - 1; i++) {
                    distance += graph[path[i]][path[i + 1]];
                }
                distance += graph[path[path.length - 1]][path[0]]; // Return to the starting
city
                return distance;
            }

            private static boolean nextPermutation(int[] array) {
                int i = array.length - 2;
                while (i >= 0 && array[i] >= array[i + 1]) {
                    i--;
                }
                if (i < 0) {
                    return false;
                }
                int j = array.length - 1;
                while (array[j] <= array[i]) {
                    j--;
                }
                swap(array, i, j);
                reverse(array, i + 1);
                return true;
            }

            private static void swap(int[] array, int i, int j) {
                int temp = array[i];
                array[i] = array[j];
                array[j] = temp;
            }

            private static void reverse(int[] array, int start) {
                int i = start;
                int j = array.length - 1;
                while (i < j) {
                    swap(array, i, j);
                    i++;
                    j--;
                }
```

```
	}

	public static void main(String[] args) {
		List<Integer> shortestPath = findMinCost(distances);
		System.out.println("Shortest Path: " + shortestPath);
		System.out.println("The minimum cost to visit all cities and return to the
starting city is: "
				+ calculatePathDistance(shortestPath.stream().mapToInt(i ->
i).toArray(), distances));
	}
}
```



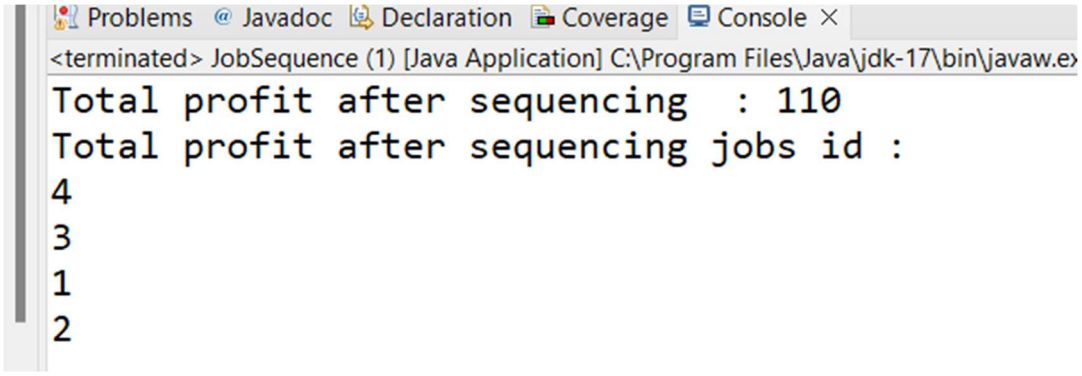
Task 3: Job Sequencing Problem

Define a class Job with properties int Id, int Deadline, and int Profit. Then implement a function List<Job> JobSequencing(List<Job> jobs) that takes a list of jobs and returns the maximum profit sequence of jobs that can be done before the deadlines. Use the greedy method to solve this problem.

```java
package com.dsassignment.day13_14;

import java.util.ArrayList;

class Job {
	int id;
	int deadline;
	int profit;
	public Job(int id, int deadline, int profit) {
		this.id = id;
		this.deadline = deadline;
		this.profit = profit;
	}
}
public class JobSequence {
	public static void main(String[] args) {
		List<Job> jobs = new ArrayList<>();
		jobs.add(new Job(1, 3, 35));
```

```
        jobs.add(new Job(2, 4, 30));
        jobs.add(new Job(3, 4, 25));
        jobs.add(new Job(4, 2, 20));
        jobs.add(new Job(5, 3, 15));
        jobs.add(new Job(6, 1, 12));
        doJobSequence(jobs);
    }
    private static void doJobSequence(List<Job> jobs) {
        jobs.sort((a, b) -> b.profit - a.profit);
        int maxDeadLine = Integer.MIN_VALUE;
        for (Job job : jobs) {
            maxDeadLine = Math.max(maxDeadLine,
job.deadline);
        }
        boolean[] filledSlots = new
boolean[maxDeadLine];
        int[] results = new int[maxDeadLine];
        int totalProfit=0;
        for (Job job : jobs) {
            for (int i = job.deadline - 1; i >= 0; i--)
{
                if (!filledSlots[i]) {
                    filledSlots[i] = true;
                    results[i] = job.id;
                    totalProfit +=job.profit;
                    break;
                }
            }
        }
        System.out.println("Total profit after
sequencing  : " + totalProfit);
        System.out.println("Total profit after
sequencing jobs id :");
        for(int id: results) {
            System.out.println(id + "  " );
        }
    }
}
```

Output:


Problems
Javadoc
Declaration
Coverage
Console
<terminated> JobSequence (1) [Java Application] C:\Program Files\Java\jdk-17\bin\javaw.ex
Total profit after sequencing : 110
Total profit after sequencing jobs id :
4
3
1
2