Assignment 5

1. Minimum Number of Platforms Required

Problem Description:
Given the arrival and departure times of trains at a railway station, determine the minimum number of platforms required so that no train has to wait.
Test Case:
arrival = [900, 940, 950, 1100, 1500, 1800]
departure = [910, 1200, 1120, 1130, 1900, 2000]
Expected Output: Minimum Platforms = 3
Explanation:

- At 900: Train 1 arrives (Platforms needed = 1)
- At 910: Train 1 departures (Platforms needed = 0)
- At 940: Train 2 arrives (Platforms needed = 1)
- At 950: Train 3 arrives (Platforms needed = 2)
- At 1100: Train 4 arrives (Platforms needed = 3)
- At 1120: Train 3 departs (Platforms needed = 2)
- At 1130: Train 4 departs (Platforms needed = 1)
- At 1200: Train 2 departs (Platforms needed = 0)
- At 1500: Train 5 arrives (Platforms needed = 1)
- At 1800: Train 6 arrives (Platforms needed = 2)
- At 1900: Train 5 departs (Platforms needed = 1)
- At 2000: Train 6 departs (Platforms needed = 0)

2. Optimal Merge Pattern:

Problem Description:
Given n files with sizes represented in an array, find the minimum cost of merging all the files into a single file. The cost of merging two files is the sum of their sizes. (Use heaps)
Test Case:
file_sizes = [4, 3, 2, 6]
Expected Output: Minimum Cost = 29
Explanation:

- Merge files of sizes 2 and 3 (cost = 5). New heap: [4, 5, 6]
- Merge files of sizes 4 and 5 (cost = 9). New heap: [6, 9]
- Merge files of sizes 6 and 9 (cost = 15). New heap: [15]
- Total cost = 5 + 9 + 15 = 29.

3. Tree Path Queries:

Problem Description:
Given a tree and several queries. Each query has two nodes and output should be Sum, Max and Min of all the values between the two nodes.
Test Case:

The first line has a tree input. The second line is an array of integer pairs, where each pair has node values.

Queries: [(2, 4), (5, 1)]
Output:
Sum: [10, 9] (sum of values on paths 2 -> 1 -> 3 -> 4 and 5 -> 3 -> 1)
Max: [4,5]
Min: [1,1]