CSE220: Data Structures (Lab)

Fall 2024

Lab Quiz - 06

Duration: 30 Minutes

| Name: | ID: | Section: |
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### **Question 1 [15 Points]**

You are given several magical jars, each filled with a certain amount of liquid, represented by a min-heap. In each operation, the smallest non-zero liquid level, denoted by x, is extracted, and the liquid level in each non-empty jar is divided by x (using floor division). When a jar’s liquid level becomes 0, it is considered empty. Your task is to determine the minimum number of operations required to completely empty all the jars.

**You just need to write the extract\_min(), sink(), and the minimum\_operation\_find() methods/functions.**

| **Sample Input:** | **Sample Output:** |
| --- | --- |
| heap = [2, 3, 5, 20, 100] | 5 |

| **Explanation** | | | |
| --- | --- | --- | --- |
| Heap Array | Heap Visual | Heap Array | Heap Visual |
| **Initial Stage:**  [2, 3, 5, 20, 100] | **2**  **/ \**  **3 5**  **/ \**  **20 100** | **Step 3:**  **Extracted the minimum value 2.**  [10, 50, 0, 0, 0]  **Performed floor division by the minimum value 2.**  [5, 25 0, 0, 0] | **5**  **/ \**  **25 0**  **/ \**  **0 0** |
| **Step 1:**  **Extracted the minimum value 2**  [3, 5, 20, 100, 0]  **Performed floor division by the minimum value 2.**  [1, 2, 10, 50, 0] | **1**  **/ \**  **2 10**  **/ \**  **50 0** | **Step 4:**  **Extracted the minimum value 5.**    **Performed floor division by the minimum value 5.**  [ 5, 0, 0, 0, 0] | **5**  **/ \**  **0 0**  **/ \**  **0 0** |
| **Step 2:**  **Extracted the minimum value 1**  [2, 10, 50, 0, 0]  **Performed floor division by the minimum value 1.**  [2, 10, 50, 0, 0] | **2**  **/ \**  **10 50**  **/ \**  **0 0** | **Step 5:**  **Extracted the minimum value 5**  [ 0, 0, 0, 0, 0] | **0**  **/ \**  **0 0**  **/ \**  **0 0** |