SET A

```
public class MinHeap {
    // Extract Min function
    public int extractMin() {
        if (heapSize == 0) {
            throw new IllegalStateException("Heap underflow");
        }

        int minValue = arr[1];

        arr[1] = arr[heapSize];
        arr[heapSize] = 0;
        heapSize--;

        sink(1);

        return minValue;
    }

    // Sink function
    private void sink(int index) {
        while (2 * index <= heapSize) {
            int child = 2 * index;
            if (child < heapSize && arr[child] > arr[child + 1]) {
                child++;
            }
            if (arr[index] <= arr[child]) {
                break;
            }
            // Swap with the smaller child
            int temp = arr[index];
            arr[index] = arr[child];
            arr[child] = temp;
            index = child;
        }
    }

    // minOperation method
    public int minOperation() {
        int operations = 0;
        while (heapSize > 0) {
            int minVal = extractMin();
            int originalSize = heapSize;
            for (int i = 1; i <= originalSize; i++) {
                arr[i] -= minVal;
            }
            operations++;
        }
        return operations;
    }
```

```
}
```

SET B

```
// Min operation: floor divide all remaining non-zero values by the
extracted minimum
    public int minOperation() {
        int operations = 0;
        while (heapSize > 0) {
            int minVal = extractMin();

            int originalSize = heapSize;

            for (int i = 1; i <= originalSize; i++) {
                if (arr[i] > 0) {
                    arr[i] = arr[i] / minVal;
                }
            }
            operations++;
        }

        return operations;
    }
```

Rest Is similar to SET A

SL	Points to meet	Marks (15)
1	In the sink function, accurate child index calculation and comparison	3
2	In the sink function, proper swapping mechanism and loop termination	3
3	Heap emptiness check	1
4	Heap reorganization	2
5	Correct loop structure and termination	2
6.	Correct Calculation (subtraction for set A and floor division conditions for set B)	3
7.	Correct Output return	1
Total		**15**