

# Smallest Range Covering Elements from K Lists

## LeetCode

You have k lists of sorted integers in **non-decreasing order**. Find the **smallest** range that includes at least one number from each of the k lists.

Example: [[4,10,15,24,26],[0,9,12,20],[5,18,22,30]]

Output: [20, 24]

### Approach 1: Function to find the smallest range covering elements from multiple arrays

- **Functionality:**
  - Finds the smallest range covering elements from multiple arrays using a min heap.
- **Explanation:**
  - Initializes a min heap (**priority\_queue**) to keep track of the smallest element from each array.
  - Initializes **mini** and **maxi** to **INT\_MAX** and **INT\_MIN** respectively.
  - Pushes the first element from each array into the min heap, updating **mini** and **maxi** accordingly.
  - Continues processing until the min heap is not empty:
    - Pops the minimum element from the heap (**temp**).
    - Updates **mini** with the popped element's value.
    - Checks if the range (**maxi - mini**) is smaller than the current smallest range (**end - start**). If so, updates **start** and **end**.
    - Checks if there are more elements in the same array. If yes, pushes the next element from the same array into the heap.
  - Returns the smallest range as a pair (**start, end**).
- **Time Complexity:**
  - **Overall Time Complexity:  $O(N \log K)$** , where N is the total number of elements across all arrays, and K is the number of arrays.
- **Space Complexity:**
  - **$O(K)$**  - The min heap stores at most one element from each array.