Indian Institute of Technology (Indian School of Mines) Dhanbad
Data Structures Lab (NCSC104)
B.Tech (CSE)

Assignment- 12 (Searching) [4+3+3]

1. Given an array, arr[] of size N and an integer K which means there are N piles of coins and the ith contains arr[i] coins. The task is to adjust the number of coins in each pile such that for any two piles if a be the number of coins in the first pile and b be the number of coins in the second pile then |a – b| <= K. One can remove coins from different piles to decrease the number of coins in those piles but cannot increase the number of coins in a pile by adding more coins. Find the minimum number of coins to be removed in order to satisfy the given condition.

   Hint: Input: arr[] = {2, 2, 2, 2}, K = 0

   Output: 0

   For any two piles the difference in the number of coins is <= 0.
   So, no need to remove any coins.

   Input: arr[] = {1, 5, 1, 2, 5, 1}, K = 3

   Output: 2

   If we remove one coin each from both the piles containing
   5 coins, then for any two piles the absolute difference
   in the number of coins is <= 3.

2. Given n and q, i.e, the number of ranges and number of queries, find the kth smallest element for each query (assume k>1).Print the value of kth smallest element if it exists, else print -1.

   Hint: Input : arr[] = {{1, 4}, {6, 8}}
   queries[] = {2, 6, 10};

   Output : 2, 7, -1

   After combining the given ranges, the numbers become 1 2 3 4 6 7 8. As here 2nd element is 2, so we print 2. As 6th element is 7, so we print 7 and as 10th element doesn't exist, so we print -1.

Input : arr[] = {{2, 6}, {5, 7}}
queries[] = {5, 8};
Output : 6, -1
After combining the given ranges, the numbers become 2 3 4 5 6 7. As here 5th element is 6, so we print 6 and as 8th element doesn't exist, so we print -1.

3. Given an array arr[] where no two adjacent elements are same, find the index of a peak element. An element is considered to be a peak element if it is strictly greater than its adjacent elements. If there are multiple peak elements, return the index of any one of them.
   Note: Consider the element before the first element and the element after the last element to be negative infinity.
   Hint: Input: arr[] = [1, 2, 4, 5, 7, 8, 3]
   Output: 5
   Explanation: arr[5] = 8 is a peak element because arr[4] < arr[5] > arr[6].

   Input: arr[] = [10, 20, 15, 2, 23, 90, 80]
   Output: 1 or 5
   Explanation: arr[1] = 20 and arr[5] = 90 are peak elements