1. Array

1.1 Find the last index of the last duplicate number in a sorted array. ex input: 1,2,5,6,6,7,9 output: 4(index)

1.2 Given a string, check if it is can be reorganized such that the same char is not next to each other, If possible, output a possible result. Example, input: google, one possible output: gogole

1.3 You are given with a large paragraph and N words. You have to find a min length subparagraph of the paragraph which contain all those N words in any order. Here length of a paragraph is the count of words in the paragraph.

1.4 Write a function that given a string would print the 'expanded' version of it. For example a2[bc2[c]]d would print out abcccbcccd. Note: The number before the opening and closing square brackets is the multiplier for the characters within the square brackets.
Method Signature [Java]:
public String expanded(String str)

1.5 Given a dictionary, generate the shortest string, both palindrome and pangram. Each word can be used only once and unlimited words can be used.

1.6 Give you a pattern (digit in the pattern matches the correspondingnumber of letters, letter means match the letter itself), a string to determine whether match: ex:
abc -> 'abc' true
'1oc3' -> 'aoczzz', 'bocabc' true

1.7 Given an array a[] and an integer k, a[i] means flower at position a[i] will blossom at day i. Find the first day that there are k slots between two blooming flowers.

1.8 Given a string that represents time like "15:31", find the next time that is formed by the numbers in the string(a number can be used more than once). For "15:31", the answer should be "15:33".

1.9 Find the Kth most Frequent Number in an Array. Example: arr[] = {1, 2, 3, 2, 1, 2, 2, 2, 3}, k = 2, Result: 3. Because '3' is the second most occurring element. Follow up: What if the array is extremely large?

1.10 Check if the string is a panagram & print all the missing characters if the string is not a panagram in sorted order.

1.11 There is a dictionary already implemented. Write a method , which takes input String without space, to replace the characters from the strings which are not present in dictionary with –
Example: Dictionary – a*
…………Input- aaabaa
…………Output- aaa_aa

1.12 Find valid bracket from provided string. Only { [(are involved as brackets. A valid bracket contains with a enclose companion.
Example: {} is valid, [[] Invalid
Input: {[()]}[]() Result: Valid
Input: {}[]()(Result: Invalid

1.13 given n player competition, a bool canbeat (int a, int b) can return a whether beat b. Asked to return a sequence, the sequence only requires two adjacent to the front beat behind. Example, 1 beat 2, 2 beat 3, 3 beat 4, 3 beat 1, 4 beat 1 You can return "1234", that is, although 3,4 can beat 1, but not adjacent does not matter

1.14 To A and B two list, B is A shuffle obtained, find the mapping used shuffle, To be able to handle duplicate elements. Follow-up: Requirements space O (1)

1.15 Find the maximum sum of subset of size K in an array

1.16 To a binary array, if you want to move 1 to the array side, 0 to the other side, Can only swap two adjacent elements each time, ask the least number of swap Why? For example, the number of min swaps for [0, 1, 1, 0, 0] is 2 (01100 -> 10100 -> 11000)

1.17 Given a List determine if contiguous elements of the List sum to an input number. For example: Array/List [6 5 3 2 1 7], and input number 8. The numbers 5 + 3 = 8. Or suppose an input number 10, the elements of the list 2 + 1 + 7 = 10.

2. Binary Tree

2.1 Given an ArrayList of Nodes, with each Node having an ID and a parent ID, determine whether the List is given in preorder.

2.2 Write a program to return nearest elements from a binary search tree for input element.

2.3 Two binary tree, to determine whether the two trees "similar", similar refers to the corresponding node in each tree in the left child and right child can be the same or in the opposite order, such as the following two trees, D, E where DE And DE can also be DE and ED, BC is the same, but the parent child relationship must be the same.
Followup is if left and right can be the same how to do,

```
  A
  / \
  B C
 / \
D E
```

```
   A
  / \
 C  B
    / \
   D E
```

2.4 You are given a binary tree in which each node contains an integer value. Find the number of paths that sum to a given value. The path does not need to start at root, but need to end at a leaf, and it must go downwards (traveling only from parent nodes to child nodes).

3. Matrix

3.1 Assuming your budget is N, you need to buy a rectangular land. Give a matrix of land prices and ask what is the largest area available for buying land. Land prices must be non-negative. For example, the budget is 11.

1 2 3 1
0 1 4 2
1 9 10 4
The output should be.
1 2 3
0 1 4

Such a matrix, because 1 +2 +3 +0 +1 +4 = 11. And the largest area.

3.2 The grid is n by m. Each cell contains a unique number on it. Maga is at the left-top and wants to go to right-bottom. But there is a condition. Maga can go through only two way - right and down. And the path of your move is called the nodes you have passed through over them. The path is called the most beautiful if the following condition is satisfied: The sorted of the path has to be lexicographic smallest as possible as. Output the most beautiful path for given grid.
Input:
In the first line you are given two numbers: the dimensions of grid - n and m. The next n lines contains m numbers. Each number is unique.
Output:
Output the most beautiful path.

4 2
3 1

Return 1 2 4
There are 2 ways to reach at (2,2) cell. The pathes are 4, 3, 1 or 4, 2, 1 respectively. So The most beautiful of them is 4, 2, 1 because if looking the sorted of them it looks like these : 1, 3, 4 and 1, 2, 4 respectively. So 1, 2, 4 is lexicographic smaller than the other. So the ans is 1 2 4.

3.3 Give a two-dimensional array, which represents the value of the jump to the four directions, asked whether from the upper left corner to the lower right corner, follow up the shortest distance

4. Others

4.1 assuming there is a freeway, n cars on the road, each car has a different integer speed, but are in the 1-n range. Now give you an array that represents the speed of each car. The starting order of the vehicle is the order of the array, ask the final formation of several clusters, the size of each cluster is how much? It can be understood that, although the vehicle speed is different, but even behind the car faster than the previous car, because you cannot pass, the last must only travel at the speed of the previous car, which formed a cluster. For example [2,4,1,3], finally [2,4] is a cluster, [1,3] is a cluster.
Follow up is now suppose you want to add a car, the speed of the car than other large, but not sure the car's starting order, so that the final output of each possible cluster (List of List). Requirements can be adjusted and call the previous function, but can only be called once

4.2 There is a stream of data <Symbol, timestamp, price>, and possibly also Correction Data <Symbol, timestamp, price> and then addData (symbol, timestamp, price) and correctData , Update minPrice, maxPrice, recentPrice in these two functions.

4.3 Create a simple stack which takes a list of elements. Each element contains a stack operator (push, pop, inc) and a value to either push/pop or two values, n and m, which increment the bottom n values by m. Then print the topmost value of the stack after every operation. If the stack is empty, print "empty"

4.4 how to implement the standard JSON.stringify and JSON.parse method

4.5 Given a list of input tasks to run, and the cooldown interval, output the minimum number of time slots required to run them.
// Tasks: 1, 1, 2, 1, 2
// Recovery interval (cooldown): 2
// Output: 8 (order is 1 _ _ 1 2 _ 1 2)
Whats the time and space complexity ? What's the ideal case of space complexity ?

4.6 design a zigzag iterator, implement the prev() and hasPrev function

4.7 0 change to 01,1 change to 10. Line 0 is 0, the first line is 01, the second line is 0110, the third line 01101001. . . Keep asking what is the vale at kth row and jth col

4.8 Give a bunch of rectangles, randomly return a point within the rectangle, the probability to be proportional to the size of the rectangle.
Follow up1: If you want to repeatedly call the function to generate random points how to do.
Follow up2: If the rectangles overlap how to do?

4.9 A smart-set is a set of distinct numbers in which all the elements have the same number of 1s in their binary form. The set of all smallest elements from each smart-set that can be formed from a given array of distinct positive numbers is known as the smartest-set. So given an array of distinct numbers, outline the elements of the smartest-set in ascending sorted order.
Input Format
The first line of input consists of an integer t. This is the number of test cases. For each test case,

the first line of input contains an integer n. Here n is the number of elements in the array. The next line contains n space separated distinct integers which are the elements
of the array.

Output Format
The output will space separated integer elements of the smartest-set in ascending order.

Constraints
$0 < t < 1000$ (This is the number of test cases
$2 < n < 10000$ (This is the number of integer elements of the array)
$1 < X_i < 100000$ (This is the size of each element of the array)
Python coding

4.10 Given an extremely large file that contains parenthesis, how would you say that the parenthesis are balanced? The file cannot fit in the memory. How would you process the file and how would you store the intermediate results. Walk me through the entire algorithm. Examples: {[()]}, {[](){}}, [] are some valid examples.

4.11 Mark likes to listen to music while travelling. His iPod™ contains N songs and he wants to listen to L (not necessarily different) songs during a trip. So he creates a playlist such that:
- Every song is played at least once.
- A song can be played again only if at least K other songs have been played

Mark wants to know how many different playlists are possible. Can you help Mark determine this number? As the number can be very large, display number modulo 1,000,000,007. You are given N, K and L.

4.12 Given the width, height, start point, end point of the grid, and a list of points, you have to go through these points, ask how many paths are there from the start point to the end point, you can only move from (i, j) down and right.

4.13 The design of two functions, cyclecount (num, mod), cycleHistogram (low, high, mod). Probably, cyclecount (num, mod) do digits square sum mod operation. For example mod (12), mod (5) -> square (1) + square (2) mod 5 = 0 -> square (0) mod 5 = 0. Stop return 2. Finished digits square sum after take mod, mod and before the formation of a repetitive cycle. Return form the size before the cycle. CycleHistogram (low, high, mod) will give a [low, high]. Then return a histogram which stores the number of [low, high] inside the cycle size 1,2,3,4,5.

4.14 Bob And GCD
Bob has an array A of size N. He doesn't like arrays in which the GCD of all elements is not K. He can perform multiple operations on an array. In each operation, he can either increase or decrease the value of an element by 1. You have to tell the minimum operation Bob will take to make GCD of all elements in an array equal to KK ? GCD here is Greatest Common Divisor.
Input Format
The first line contains T, the number of test cases.
For Each Testcase :
The first line contains 2 integers - K and N respectively, separated by a space.
The second line contains N integers, separated by a space, in order of their position in array.
Input Constraints

1≤T≤10
1≤N≤10^6
1≤A[i]≤10^6
1≤K≤10^6
Output Format
For each test case, print minimum number of operations Bob take in a new line.
Sample Input
1
5 3
4 5 6
Ans – 2

4.15 Implement a job scheduler which takes in a function `f` and an integer `n`, and calls `f` after `n` milliseconds.

4.16 There is a set, there are some balls, different balls have different weights, for example: [red ball 4, yellow ball 1, green ball 2, blue ball 2]
Ask for the first k-weight combination in this case, if k is 5 then:.
[Red, yellow, green, blue] 9
[Red, green, blue] 8
[Red, yellow, green] 7
[Red, yellow, blue] 7
[Red, Blue] 6 (or [Red, Green])

4.17 Consider there is a streaming service, which outputs Log object to your service. The Log object has fields like {timeStamp, userId, hashtag(used in the tweet), @userAddressUsedInTweet} etc. Imagine this streaming service has very high QPS. Design your service in such a way that it can output top K userId's within a configurable time window(example: last 1 hour, last 24 hour etc). This service should be extendable to get any top K category (Example: TopK userId's, TopK hashtags etc). What would you use to design such a service. Top K is defined by its frequency, example: 1,2,3,4,1,2,1,2,1,1,5 are the userIDs then the top 2 users are userId 1 and 2.

@EdgeCase:
1. Take into consideration how to store data in that window to get the topK user's.
2. The service should be highly available and should return the results quickly
3. Design and implement this service

4.18 How would you like to efficently find the total number of possible ways with which given string may be converted to whole dictionary words.
Example :
String = “Dogeatscare”
possible combinations – “Dog, eat, scare ” and “Dog, eats, care”
output is 2.

5. Multiple Thread

5.1 There are three threads and a counter that will increase from 1 to 100. Catch is that thread 1 increments counter from 1 to 20. Thread 2 increments from 21 to 80. Thread 3 increments from 81 to 100.