Data Structures Assignment # 1

Deadline : To be decided

1 Problem # 1

Given a string of a, b, c, find the number of substrings with equal number of a, b and c. If the input string is : "abacbcba", the output will be 3 ("acb", "cba", "acbcba")

1.1 Input Specification

Integer N followed by N input strings, each on a separate line.

1.2 Output Specification

For each string output the number of substrings with equal a, b and c.

1.3 Sample Input

2
abacbcba
abab

1.4 Sample Output

3
0

2 Problem # 2

Given an array of integers and an integer k, find the kth smallest element in the array. (You can assume that k will be smaller than the size of the array)
Constraint : Your solution should be more efficient than any of the sorting algorithms.

2.1 Input Specification

Integer N followed by N test cases. Each test case will be of three lines, first line will be an integer NA (size of the array), next line will contain the array in space separated format and third line will be the value of k.

2.2 Output Specification

Print the kth smallest elemnt in the array.

2.3 Sample Input

```
2
4
21 1 2 78
2
1
1
1
```

2.4 Sample Output

```
2
1
```

3 Problem # 3

You are given prices of stock of a particular company in an array A, such that $A[i]$ is the value of stock on i^{th} day. You have to buy and sell the stock in such a way that you maximize the profit.

3.1 Input Specification

Integer N followed by N test cases. Each test case will be of two lines, first line will be an integer NA (size of the array) , next line will contain the array in space separated format.

3.2 Output Specification

For each test case, Print the mazimum profit that can be obtained.

3.3 Sample Input

```
3
2
10 5
6
4 2 1 10 5 8
3
2 20 10
```

3.4 Sample Output

```
0
9
18
```

4 Problem # 4

You are given two arrays A and B which contain integer in the range of 1 to M.(array may contain duplicate elements). You need to print how many elements of A are not in B.
Constraint : M < 100, Size of the two array's < 10^7

4.1 Input Specification

Integer N followed by N test cases. Each test case will be of five lines, first line will be an integer M (maximum range of the arrays), second line will be an integer NA (size of the array A), next line will contain the array A in space separated format. Next line will be an integer NB (size of array B), the line after that will contain the Array B in space separated format.

4.2 Output Specification

For each test case, print the number of elements of A, which are not present in B.

4.3 Sample Input

```
1
10
4
2 10 1 9
5
3 9 5 4 7
```

4.4 Sample Output

3

5 Problem # 5

You are given an array A of size N such that one particular element occurs more than N/2 times in this array. Find this element.

Constraint : Your solution should be $O(N)$.

5.1 Input Specification

Integer N followed by N test cases. Each test case consists of two lines, first line contains the integer NA (size of the array A) and second line contains the array A in space separated format.

5.2 Output Specification

For each test case output a single line containing the desired element.

5.3 Sample Input

```
3
4
3 2 3 3
7
12 12 9 8 12 12 11
10
1 2 3 4 5 4 4 4 4 4
```

5.4 Sample Output

```
3
12
4
```

6 Problem # 6

You are given two strings s_1 and s_2, each consisting of distinct characters. Also s_2 contains a subset of characters of s_1. Find all permutations of characters of string s_1 such that s_2 is not a substring of any of these permutations.

Note : You are supposed to output the permutations in lexicographic order.

6.1 Input Specification

Integer N followed by N test cases. Each test case consists of two lines, the first line contains the string s_1 and second line contains the string s_2.

6.2 Output Specification

For each test case output the permutations one after the other in lexicographic order. Output each permutation on a separate line.

6.3 Sample Input

```
1
abcd
bcd
```

6.4 Sample Output

```
abdc
acbd
acdb
adbc
adcb
bacd
badc
bcad
bdac
bdca
cabd
cadb
cbad
cbda
cdab
cdba
dabc
dacb
dbac
dbca
```

dcab
dcba

7 Problem # 7

A number is called a *palindrome* when it is the same when read from left to right and right to left. Your task is, given a number K (of less than 10^6 digits), to find the smallest palindrome that is larger than K.

Note : The number of digits (i.e. length) of number K can be at max 10^6.

7.1 Input Specification

Integer N followed by N test cases. Each test case consists of a single line containing the number K.

7.2 Output Specification

For each test case output the palindrome on separate line.

7.3 Sample Input

```
3
2133
4587
99
```

7.4 Sample Output

```
2222
4664
101
```

8 Problem # 8

Given an array of integers, A, find a contiguous sequence in the array which has the maximum sum. Output the maximum sum.

8.1 Input Specification

Integer N followed by N test cases. Each test case consists of two lines, first line contains an integer NA (size of the array A) and the second line contains the array A in space separated format.

8.2 Output Specification

For each test case output the maximum sum on separate line.

8.3   Sample Input

```
2
5
10 -2 -3 13 -8
6
12 -23 13 -5 4 2
```

8.4   Sample Output

```
18
14
```