

Infosys Coding Sheet

1. Write a program in C++ to quickly swap two arrays.

Sample Input

```
a[] = {11, 12, 13, 14}  
b[] = {15, 16, 17, 18}
```

Sample Output

```
a[] = {15, 16, 17, 18}  
b[] = {11, 12, 13, 14}
```

2. Write a Program to sort a string of characters

Sample Input

```
s="prepbytes"
```

Sample Output

```
s="beepprsty"
```

3. Write a program to count the number of unique characters in a given string.

Sample Input

```
s="prepbytes"
```

Sample Output

7

4. Write a program to multiply two matrices and print the result through another matrix.

Sample Input

```
m1[m][n] = { {1, 1}, {2, 2} }  
m2[n][p] = { {1, 1}, {2, 2} }
```

Sample Output

```
result[m][p] = { {3, 3}, {6, 6} }
```

5. Given a string find the next permutation of the given string in C++.

Sample Input

```
s="dcd"
```

Sample Output

```
s="ddc"
```

6. Write a program to find the area of the incircle of a right angles triangle.

Sample Input

```
P = 5, B = 12, H = 13
```

Sample Output

```
12.56
```

7. Write a program that will find the missing characters that are needed to make the string a panagram.

Sample Input

```
welcome to prepbytes
```

Sample Output

```
adfg hijknquvxz
```

8. Write a program that converts the given temperature of Fahrenheit into celsius.

Sample Input

```
0
```

Sample Output

```
32
```

9. Write a program that will find the sum of all the prime numbers between 1 and N.

Sample Input

```
10
```

Sample Output

```
17
```

10. Write a program to make the largest number from the digits of the array.

Sample Input

```
{1, 34, 3, 98, 9, 76, 45, 4}
```

Sample Output

```
998764543431
```

11. Given an array form a triangle such that the last row of the triangle contains all the elements of the array and the row above it will contain the sum of two elements below it.

Sample Input

```
arr[] = {4, 7, 3, 6, 7};
```

Sample Output

```
81
40 41
21 19 22
11 10 9 13
4 7 3 6 7
```

12. Given the price of the stock on each day find the maximum profit you can earn by selling them.

Sample Input

```
arr[] = {100, 180, 260, 310, 40, 535, 695}
```

Sample Output

865

13. You are given a matrix that contains only 0 and 1 find the maximum size of a rectangle that contains only 1.

Sample Input

```
0 1 1 0
1 1 1 1
1 1 1 1
1 1 0 0
```

Sample Output

8

14. Given the coordinates of the endpoints of two rectangles find whether they overlap each other or not.

15. You are given two strings to find whether we can convert one string to another by rotating in two places.

Sample Input

```
string1 = "amazon", string2 = "azonam"
```

Sample Output

Yes

You are given a string that only contains lowercase characters.

The letters can be duplicated or have several copies in the strings, but non-duplicates are unique and occur just once. Use indexing beginning with 1. If no such letter exists, return -1.

constrains: $1 \leq \text{length of string} \leq 10^5$

Input	Output
statistics	3
Hack the game	3

Complete the function: GetUniqueLetter ()

He chose two integers, N and K, and decided to write down in a notebook all integer arrays of length K (in the form $a[1], a[2], \dots, a[K]$), where every number $a[i]$ is divisible by $a[i]$ (where $1 < i \leq K$).

Because the answer could be huge, print it modulo 10000.

Input:

//The first line contains an integer, n, which represents the arrays' maximum possible value.

//The following line has an integer, k, which represents the length of the arrays.

Input	Output
2	
1	
	2
2	
2	
	3
3	
2	5

How many pieces can you possibly get in total? You have an amazing N-length string S.

Input Format:

```
//S:: STRING
//The first line includes a string, S, which represents the string.
```

```
length(S) :: 1 -> 2 * 10^5
```

Sample Input	Sample Output
zzzzz	
ababcc	
abccdcabacda	2

How do you swap two arrays in C++?

Answer:

Sample Input

A[] = {21, 22, 23, 24}

B[] = {25, 26, 27, 28}

Sample Output

A[] = {25, 26, 27, 28}

B[] = {21, 22, 23, 24}

Write a program to arrange the given numbers to form the biggest number

Answer:

Sample Input

{5, 67, 2, 88, 9, 76, 52, 4}

Output

988766752452

Find the smallest and largest number in an Array

Answer:

Sample Input

[3, 1, 56, 34, 12, 9, 98, 23, 4]

Output

Smallest Number: 1

Largest Number: 98

Find the next permutation of the given string in C++

Answer:

Sample Input

s="dcd"

Output

Next permutation: ddc

How do you rotate a matrix by 90 degrees? Write a program.

Answer:

Sample Input:

1 2 3

4 5 6

7 8 9

Output:

Rotated Matrix:

7 4 1

8 5 2

9 6 3

How do you find the missing characters to make a string pangram? Write a program

Answer:

Sample Input: "A quick movement of the enemy will jeopardize six gunboats"

Output

"Missing characters: flr"

How do you find the number of unique characters in a given string? Write a program

Answer:

Sample Input: "Hello, World!"

Output

Number of unique characters is 10.

Write a Program for the Subtraction of Two Matrices

Answer:

Sample Input:

a)

1 2

3 4

b)

4 3

2 1

Output

-3 -1

1 3

How do you multiply two matrices and show results through another matrix? Write a program

Answer:

A:

1 2

3 4

B:

5 6

7 8

Output

The output of multiplying the given matrices A and B is:

19 22

43 50

How do you convert decimal numbers to binary numbers? Write a Program.

Answer:

Sample Input: 29

Output

The binary representation of the decimal number 29 is '11101'.

Problem Statement:

While playing an RPG game, you were assigned to complete one of the hardest quests in this game. There are **n** monsters you'll need to defeat in this quest. Each

monster i is described with two integer numbers – **power $_i$** and **bonus $_i$** . To defeat this monster, you'll need at least **power $_i$** experience points. If you try fighting this monster without having enough experience points, you lose immediately. You will also gain **bonus $_i$** experience points if you defeat this monster. You can defeat monsters in any order.

The quest turned out to be very hard – you try to defeat the monsters but keep losing repeatedly. Your friend told you that this quest is impossible to complete. Knowing that, you're interested, what is the maximum possible number of monsters you can defeat?

(Question difficulty level: Hardest)

Input:

- The first line contains an integer, n , denoting the number of monsters. The next line contains an integer, e , denoting your initial experience.
- Each line i of the n subsequent lines (where $0 \leq i < n$) contains an integer, power_i , which represents power of the corresponding monster.
- Each line i of the n subsequent lines (where $0 \leq i < n$) contains an integer, bonus_i , which represents bonus for defeating the corresponding monster.

Input	Output	Output Description
212378130100	2	<ul style="list-style-type: none"> • Initial experience level is 123 points. • Defeat the first monster having power of 78 and bonus of 10. Experience level is now $123+10=133$. • Defeat the second monster.
31001011003041001524	2	<ul style="list-style-type: none"> • Initial experience level is 100 points. • Defeat the second monster having power of 100 and bonus of 1. Experience level is now $100+1=101$. • Defeat the first monster having power of 101 and bonus of 100. Experience level is now $101+100=201$. • The third monster can't be defeated.

Problem Statement:

Your birthday is coming soon and one of your friends, Alex, is thinking about a gift for you. He knows that you really like integer arrays with interesting properties.

He selected two numbers, **N** and **K** and decided to write down on paper all integer arrays of length **K** (in form **a[1], a[2], ..., a[K]**), where every number **a[i]** is in range from **1** to **N**, and, moreover, **a[i+1]** is divisible by **a[i]** (where $1 < i \leq K$), and give you this paper as a birthday present.

Alex is very patient, so he managed to do this. Now you're wondering, how many different arrays are written down on this paper?

Since the answer can be really large, print it **modulo 10000**.

Input:

- The first line contains an integer, **n**, denoting the maximum possible value in the arrays.
- The next line contains an integer, **k**, denoting the length of the arrays.

Input	Output	Output Description
21	2	The required length is 1, so there are only two possible arrays: [1] and [2].
22	3	All possible arrays are [1, 1], [1, 2], [2, 2]. [2, 1] is invalid because 1 is not divisible by 2.
32	5	All possible arrays are [1, 1], [1, 2], [1, 3], [2, 2], [3, 3].

Problem Statement:

You have an array **A** of **N** integers **A₁ A₂ .. A_n**. Find the longest increasing subsequence **A_{i1} A_{i2} .. A_{ik}** ($1 \leq k \leq N$) that satisfies the following condition: For every adjacent pair of numbers of the chosen subsequence **A_{i[x]}** and **A_{i[x+1]}** ($1 < x < k$), the expression $(A_{i[x]} \& A_{i[x+1]}) * 2 < (A_{i[x]} | A_{i[x+1]})$ is true

Note: '&' is the bitwise AND operation, '|' is the bit-wise OR operation

Input:

- The first line contains an integer, **N**, denoting the number of elements in **A**.

2. Each line i of the N subsequent lines (where $0 \leq i < N$) contains an integer describing A_i .

Sample cases:

Input	Output	Output Description
5 15 6 5 12 1	2	One possible subsequence is: 5 12
6 9 17 2 15 5 2	2	One possible subsequence is: 2 15
7 17 16 12 2 8 17 17	3	One possible subsequence is: 2 8 17

Problem Statement :

You have been given a string S of length N . The given string is a binary string which consists of only 0's and 1's. Ugliness of a string is defined as the decimal number that this binary string represents.

Example:

- "101" represents 5.
- "0000" represents 0.
- "01010" represents 10.

There are two types of operations that can be performed on the given string.

- Swap any two characters by paying a cost of A coins.
- Flip any character by paying a cost of B coins
- flipping a character means converting a '1' to a '0' or converting a '0' to a '1'.

Initially, you have been given coins equal to the value defined in CASH. Your task is to minimize the ugliness of the string by performing the above mentioned operations on it. Since the answer can be very large, return the answer modulo 10^9+7 .

Note:

- You can perform an operation only if you have enough number of coins to perform it.
- After every operation the number of coins get deducted by the cost for that operation.

Input Format

- The first line contains an integer, N, denoting the number of character in the string
- The next line contains a string, S, denoting the the binary string
- The next line contains an integer, CASH, denoting the total number of coins present initially
- Next will contains an integer, A, denoting the cost to swap two characters.
- Then the next line contains an integer, B, denoting the cost to flip a character.

Constraints

- $1 \leq N \leq 10^5$
- $1 < \text{len}(S) \leq 10^5$
- $1 \leq \text{CASH} \leq 10^5$
- $1 \leq A \leq 10^5$
- $1 \leq B \leq 10^5$

Sample Input 1 :

41111712

Sample Output 1 :

1

Explanation:

3 flips can be used to create "0001" which represents 1.

Sample Input 2:

6 111011 7 1 3

Sample Output 2:

7

Explanation:

First swap 0 with the most significant 1, then use flip twice first on index one and then on index two "111011" \Rightarrow "011111" \Rightarrow "001111" \Rightarrow "000111" the value represented is 7.

Sample Input 3:

6

111011

7

3

2

Sample Output 3:

3

Explanation:

Flip the 3 most significant characters to get "000011" : the value represented by this string is 3.N

Problem Statement :

Khaled has an array A of N elements. It is guaranteed that N is even. He wants to choose at most $N/2$ elements from array A. It is not necessary to choose consecutive elements. Khaled is interested in XOR of all the elements he chooses. Here, XOR denotes the bitwise XOR operation.

For example:

- If $A=[2,4,6,8]$, then khaled can choose the subset $[2,4,8]$ to achieve $XOR=(2 \text{ XOR } 4 \text{ XOR } 8)=14$.

Khaled wants to maximize the XOR of all the elements he chooses. Your task is to help khaled to find the max XOR of a subset that he can achieve by choosing at most $N/2$ elements?

Input format:

- The first line contains an integer, N, denoting the number of elements in A.
- Each line i of the N subsequent lines (where $0 \leq i \leq N$) contains an integer describing A_i .

Constraints

- $1 \leq N \leq 120$
- $1 \leq A[i] \leq 10^6$

Sample Input 1

2
1
2

Sample Output 1

2

Explanation:

$N=2$, $A=[1,2]$ khaled can choose the subset $[2]$. The xor of the elements in the subset is 2. And the number of elements in the subset is 1 which is less than $N/2$.

Sample Input 2 4 124 7**Sample Output 2**

7

Explanation:

$N=4$, $A=[1,2,4,7]$ Khaled can choose the subset $[7]$. The xor of the elements in the subset is 7, and the number of elements in the subset is 1 which is less than $N/2$.

Problem Statement :

Wael is well-known for how much he loves the bitwise XOR operation, while kaito is well known for how much he loves to sum numbers, so their friend Resli decided to make up a problem that would enjoy both of them. Resli wrote down an array A of length N , an integer K and he defined a new function called Xor-sum as follows

- $\text{Xor-sum}(x) = (x \text{ XOR } A[1]) + (x \text{ XOR } A[2]) + (x \text{ XOR } A[3]) + \dots + (x \text{ XOR } A[N])$

Can you find the integer x in the range $[0, K]$ with the maximum Xor-sum (x) value?

Print only the value.

Input format

- The first line contains integer N denoting the number of elements in A .
- The next line contains an integer, k , denoting the maximum value of x .
- Each line i of the N subsequent lines (where $0 \leq i \leq N$) contains an integer describing A_i .

Constraints

- $1 \leq N \leq 10^5$
- $0 \leq K \leq 10^9$
- $0 \leq A[i] \leq 10^9$

Sample Input 1

1

0

989898

Sample Output 1

989898

Explanation:

$\text{Xor_sum}(0) = (0^{989898}) = 989898$

Sample Input 2

3

7

1

6

3

Sample Output 2

14

Explanation

$\text{Xor_sum}(4) = (4^1) + (4^6) + (4^3) = 14.$

Sample Input 3

4

9

7

4

0

3

Sample Output 3

46

Explanation:

$\text{Xor_sum}(8) = (8^7) + (8^4) + (8^0) + (8^3) = 46$

Problem Statement :

One of the first lessons IT students learn is the representation of natural numbers in the binary number system (base 2) This system uses only two digits, 0 and 1. In everyday life we use for convenience the decimal system (base 10) which uses ten digits, from 0 to 9. In general, we could use any numbering system.

Computer scientists often use systems based on 8 or 16. The numbering system based on K uses K digits with a value from 0 to K-1. Suppose a natural number M is given, written in the decimal system To convert it to the corresponding writing in the system based on K, we successively divide M by K until we reach a quotient that is less than K

The representation of M in the system based on K is formed by the final quotient (as first digit) and is followed by the remainder of the previous divisions

For example :

- If $M=122$ and $K=8$, 122 in base 10 = 172 in base 8 This means that the number
- In decimal system = 172 in octal system.
- 172 in base 8 = $1 \cdot 8^2 + 7 \cdot 8 + 2 = 122$

You made the following observation in applying the above rule of converting natural numbers to another numbering system

- In some cases in the new representation all the digits of the number are the same. For example 63 in base 10 = 333 in base 4

Given a number M in its decimal representation, your task is find the minimum base B such that in the representation of M at base B all digits are the same.

Input Format

- The first line contains an integer, M, denoting the number given

Constraints

- $1 \leq M \leq 10^{12}$

Sample Input 1 :

41

Sample Output 1 :

40

Explanation :

Here 41 in base 40. will be 11 so it has all digits the same, and there is no smaller base satisfying the requirements

Sample Input 2 :

34430

Sample Output 2 :

312

Explanation :

Here 34430 in base 312 will have all digits the same and there is no smaller base satisfying the requirements

Problem Statement :

Andy wants to go on a vacation to de-stress himself. Therefore he decides to take a trip to an island. It is given that he has as many consecutive days as possible to rest, but he can only make one trip to the island. Suppose that the days are numbered from 1 to N . Andy has M obligations in his schedule, which he has already undertaken and which correspond to some specific days. This means that i th obligation is scheduled for day D_i . Andy is willing to cancel at most k of his obligations in order to take more holidays.

Your task is to find out the maximum days of vacation Andy can take by canceling at most K of his obligations.

Input Format

- The first line contains an integer N , denoting the total number of days
- The next line contains an integer M denoting the total number of obligations.
- The next line contains an integer K denoting the largest number of obligations he could cancel

- Each line i of the M subsequent lines (where $0 \leq i \leq M$) contains an integer describing D_i .

Constraints

- $1 \leq N \leq 10^6$
- $1 \leq M \leq 2 \cdot 10^6$
- $1 \leq K \leq 2 \cdot 10^6$
- $1 \leq D[i] \leq 10^6$

Sample Input 1:

10

5

2

6

9

3

2

7

Sample Output 1 :

5

Explanation:

Here he could cancel his 3rd and 4th obligation which makes vacation length 5.

Sample input 2:

7

2

034

Sample Output 2:

3

Explanation:

Here he could not cancel any obligation since $K=0$, so the vacation length is 3.

Problem Statement :

You need to build a road in a rugged terrain. You know the sea level of each segment of the rugged terrain, i.e., the i -th segment is L_i meters from sea level.

You need to transform the terrain into a strictly downward sloping terrain for the road, i.e., for each i -th segment where $2 \leq i \leq N$, resultant $L_{i-1} > L_i$. To do so, you employ a powerful digging team to help you dig and reduce the sea level of the segments. On day D , the team can reduce the sea level for each segment that you scheduled that day by $2D-1$ meters each.

You are allowed to assign the team to dig on multiple segments and/or dig on the same segments for multiple days.

Your task is to find the minimum number of days needed to transform the terrain as per your requirements.

Input Format

N :: INTEGER The first line contains an integer, N , denoting the number of elements in L . $N :: 1 \rightarrow 10^5$

L :: INTEGER ARRAY Each line i of the N subsequent lines (where $0 < i \leq N$) contains an integer describing L_i , the sea level of the i -th segment. $L[i] :: -10^9 \rightarrow 10^9$

Sample Input 1: 233

Sample Output 1: 1

Sample input 2: 25-3

Sample Output 2: 0

Problem Statement :

You are given an array of size N . You need to change this array into a mountain. By mountain we mean, the either ends of the array should have equal elements.

Then as we move towards the middle from both ends, the next element is just one more than the previous one. So, it would have a peak in the middle and decrease if you go towards either end, just like a mountain.

Examples of mountains are [1, 2, 3, 2, 1] or [6, 7, 8, 8, 7, 6]. But the array [1, 2, 4, 2, 1] is not a mountain because from 2 to 4 the difference is 2. The array [1, 2, 3, 1] is also not a mountain because the elements 2 and 3 are not equal from both ends.

You need to find the minimum number of elements that should be changed to make the array a mountain. You can make the elements negative or zero as well.

Input Format N :: INTEGER The first line contains an integer, N, denoting the number of elements in array. $N :: 1 \rightarrow 10^5$

array :: INTEGER ARRAY Each line i of the N subsequent lines (where $0 \leq i < N$) contains an integer describing i-th element of array. $\text{array}[i] :: 1 \rightarrow 10^6$

Sample Input 1: 5 1 2 3 4 5

Sample Output 1: 2

Sample input 2: 9 1 1 1 2 3 2 1 1

Sample Output 2: 4

Problem Statement :

You have an interesting string S of length N. It is interesting because you can rearrange the characters of this string in any order. You want to cut this string into some contiguous pieces such that after cutting, all the pieces are equal to one another.

You can't rearrange the characters in the cut pieces or join the pieces together. You want to make the number of pieces as large as possible. What is the maximum number of pieces you can get?

Note: You can observe that you may not want to cut the string at all, therefore the number of pieces is 1. Hence, the answer always exists.

Input Format

S :: STRING The first line contains a string, S, denoting the string. $\text{length}(S) :: 1 \rightarrow 2 * 10^5$

Sample Input 1: zzzzz

Sample Output 1 :5

Sample input 2:ababcc

Sample Output 2:2

Sample input 2:abccdcabacda

Sample Output 2:2

Problem Statement :

Today you decided to go to the gym. You currently have energy equal to E units. There are N exercises in the gym. Each of these exercises drains A_i amount of energy from your body.

You feel tired if your energy reaches 0 or below. Calculate the minimum number of exercises you have to perform such that you become tired. Every unique exercise can only be performed at most 2 times as others also have to use the machines.

If performing all the exercises does not make you feel tired, return -1.

Input Format
 $E :: \text{INTEGER}$ The first line contains an integer, E , denoting the Energy. $E :: 1 \rightarrow 10^5$

$N :: \text{INTEGER}$ The next line contains an integer, N , denoting the number of exercises. $N :: 1 \rightarrow 10^5$

$A :: \text{INTEGER ARRAY}$ Each line i of the N subsequent lines (where $0 \leq i < N$) contains an integer describing the amount of energy drained by i -th exercise. $A[i] :: 1 \rightarrow 10^5$

Sample Input 1:6212

Sample Output 1:4

Sample input 2:10212

Sample Output 2:-1

Sample input 3:23152

Sample Output 3:1

Problem Statement :

There is a battle between heroes and villains going on. You have M heroes, all of them have the same health H . There are N villains, health of the i -th villain is V_i .

When a hero, with health H battles a villain with health V_i , one of the three scenarios can happen:

if $H > V_i$: The villain is defeated, and the health of the hero is decreased by V_i if $H < V_i$: The villain wins, his health is not affected, and the hero is no longer able to fight. if $H = V_i$: Both are considered defeated, and neither can fight.

The heroes start fighting villains one by one in the same order, first villain 1 then villain 2 and so on. It might be possible that before defeating all the villains, all the heroes are defeated. Therefore, to ensure the victory of the heroes, you want to remove some villains from the front.

Your task is to find the minimum number of villains you need to remove from the front such that the victory of the heroes is guaranteed.

Note: If in the last battle, both the hero and villain are defeated and no more heroes or villains remain, it would still be considered a victory since all the villains are defeated.

Input Format

$N :: \text{INTEGER}$ The first line contains an integer, N , denoting the number of villains $N :: 1 \rightarrow 2 \cdot 10^5$

$M :: \text{INTEGER}$ The next line contains an integer, M , denoting the number of heroes $M :: 1 \rightarrow 2 \cdot 10^5$

$H :: \text{INTEGER}$ The next line contains an integer, H , denoting the health of each of the heroes $H :: 1 \rightarrow 10^9$

$\text{array} :: \text{INTEGER ARRAY}$ Each line i of the N subsequent lines (where $0 \leq i < N$) contains an integer describing the health of each of the villains. $\text{array}[i] :: 1 \rightarrow 10^9$

Sample Input 1: 4433133

Sample Output 1: 0

Sample input 2: 53312311

Sample Output 2: 0

Sample input 3:51412313

Sample Output 3:3

PRIME CODING