CODENECTION 2021 (Open Category Preliminary) Problemset

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1 A. f(Aibohphobia)^-1

Kyle has a group project this semester, and he wants to come up with a name for their group chat for the project. As he is a fan of palindromes(Strings that read the same when reversed), he searched up a random string S from the internet and now he wants to turn this string into a palindrome. Kyle can change any character of the string to any desired character in 1 move. How many moves will it take him to transform this string into a palindrome?

1.1 Input

S

1.2 Output

Output a single integer, minimum moves required to turn S into a palindrome.

1.3 Constraints

$$1 \leq |S| \leq 100$$

1.4 Sample Input 1

```
vvvvvv
```

1.5 Sample Output 1

```
0
```

1.6 Sample Input 2

```
abcdabc
```

1.7 Sample Output 2

```
2
```

In sample 2 - We can make the string `cbcdabc` with 1 move and `cbadabc` with 2 moves.

2 B. Did they cheat?

The students of Dr. Kyle have submitted an unique string that Dr. Kyle gave them for homework. He is checking the strings of student A and student B which are denoted as A and B. Dr. Kyle wants to find out if they copied each other's work. If the string A can be transformed into string B with rotations, it'll be obvious to Dr. Kyle that they have cheated.

Rotation:
Before : $A = A_1A_2..A_{|A|}$ (example : abc) After : $A = A_{|A|}A_1A_2..A_{|A|-1}$ (example : cab)

2.1 Input

A
B

2.2 Output

Output `Yes` if they cheated, `No` if they did not.

2.3 Constraints

$$2 \le |A| \le 100$$

$$|A| = |B|$$

2.4 Sample Input 1

```
abc
cab
```

2.5 Sample Output 1

```
Yes
```

3 C. Campus Plan

MMU decided to open a campus in a space with multi-dimensions (Lets assume its D). There are N empty points in the space where they can setup new faculty buildings. Coordinates of the ith point is described as $(X_{i1}, X_{i2}, .., X_{iD})$ [Note : All numbers are integers]

The distance between two points with coordinates $(Y_1, Y_2, .., Y_D)$ and $(Z_1, Z_2, .., Z_D)$ is $\sqrt{(Y_1 - Z_1)^2 + (Y_2 - Z_2)^2 + (Y_D - Z_D)^2}$. MMU authority does not like floating point numbers so they want the distance between faculties to be an integer number. How many points $(i, j)(i < j)$ exists in the campus that have an integer distance?

3.1 Input

N, D
$X_{11}, X_{12}, ..., X_{1D}$
$X_{21}, X_{22}, ..., X_{2D}$
.
.
$X_{N1}, X_{N2}, ..., X_{ND}$

3.2 Output

Output a single integer, the number of points that have integer distance.

3.3 Constraints

$$2 \leq N \leq 10$$

$$1 \leq D \leq 10$$

$$-20 \leq X_ij \leq 20$$

3.4 Sample Input

```
3 2
1 2
5 5
-2 8
```

3.5 Sample Output

```
1
```

Sample explanation : The distance between the first point and the second point is $\sqrt{(1-5)^2+(2-5)^2}=5$, which is an integer. Other points all have floating point distances.

4 D. Semester Breaks

Semester breaks are here so all the students are living. Since there's no good way of students to travel from Cyberjaya to Putrajaya, MMU decided to provide buses to transport the students. There are N students at the hostel each leaving their room for the bus station at time T_i where T_i is the time i-th student leaves their room. MMU has B buses each of which bus can hold up to M students in it. Kyle was assigned as a volunteer to properly assign each student to a bus in which they can travel in. The bus can leave only when the last student assigned to the bus leaves their room and goes to the station. Kyle wants to minimize the waiting time for each student. What is the smallest possible value of the largest wait time for an student?

$$WaitTime_i = T_{bus} - T_i$$

Here T_{bus} is the time when their bus leaves. It is guaranteed that there's always enough bus and space for all students to be transported.

4.1 Input

The first line contains three space separated integers N, B, and M. Next line contains N integers which describe the time when the students left their hostel room.

4.2 Output

Output one integer which is the minimum possible maximum wait time for a student.

4.3 Constraints

$$2 \le N \le 10^5$$
$$1 \le T_i \le 10^9$$
$$1 \le M \le N$$

4.4 Sample Input

```
6 3 2
1 1 10 14 4 3
```

4.5 Sample Output

```
4
```

Sample explanation : There are 6 students, 3 buses and each bus can hold upto 2 students in itself. So we put students with time 1 in first bus. Students with time 3 and 4 in second bus. Students with time 10 and 14 in the last bus. Here student who arrives at time 10 needs to wait until student with time 14 arrives. So the answer is 4.

5 E. Assignment Interviews

In Faculty of Computing and Informatics, its an old tradition that all students are interviewed about their programming assignments. This year the interviews are being conducted in a strange set of connected rooms. The rooms are numbered from $1..N$. The rooms start from room number 1. Then from room 1 you can go to the rooms connected with connected to this one. On each of those room, there may (or may not) exist more doors to other rooms. The ith door connects rooms a_i and b_i It is known that there are $N-1$ such doors. Also, each room has more space than the previous room. (For example, room 1 may have doors to room 2 and 3, so both room 2 and 3 are more spacious than room 1.)

Every room has 0 students initially. Lecturer wants to allocate the students for interview with Q operations. Operation j $(1 \leq j \leq Q)$: Increments by x_j the number of students on every room that can be reached from room p_j

Your task is to help the lecturer find out how many students are allocated in each room after he's done with his Q allocating operations.

5.1 Input

N, Q
a_1, b_1
.
.
a_{N-1}, b_{N-1}
x_1, p_1
.
.
x_Q, p_Q

5.2 Output

Print N integers, the number of students in each room after all operations.

5.3 Constraints

$$2 \leq N \leq 2 \cdot 10^5$$
$$1 \leq Q \leq 2 \cdot 10^5$$
$$1 \leq a_i \leq b_i \leq N$$
$$1 \leq p_j \leq N$$
$$1 \leq x_j \leq 10^4$$

5.4 Sample Input

```
4 3
1 2
2 3
```

```
2 4
2 10
1 100
3 1
```

5.5 Sample Output

```
100 110 111 110
```

Sample Explanation : There are 4 rooms. Room 1 is connected with room 2. Room 2 is connected with room 2 and 4. After first operation (2 10) we increment the number of students in room 2 and rooms reachable from 2 to 10. Current count = (0, 10, 10, 10) After second operation we increment all rooms by 100 (because all rooms are reachable from room 1). Current count = (100, 110, 110, 110). After operation 3, we increment just room 3 because rooms 3 has no other rooms further down. So total count is (100, 110, 110, 111).