106 學年度
全國大專電腦軟體設計競賽
台大校內初賽

National Taiwan University

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Language	Version	Compile Flags	Extensions
C	gcc 5.4.0	`-g -O2 -std=gnu99 -static -lm`	`.c`
C++	g++ 5.4.0	`-g -O2 -std=gnu++11 -static -lm`	`.cc, .cpp`
Java	javac 1.8.0	`-encoding UTF-8 -sourcepath . -d .`	`.java`

Problem	Problem Name	Time Limit	Memory Limit
A	Gift Box	1 s	256 MB
B	Calculus is quite easy	1 s	256 MB
C	Coin Tossing	3 s	256 MB
D	Count on the integers	3 s	256 MB
E	Detective	2 s	256 MB
F	Fiddler crab	1 s	256 MB
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H	A math problem	4 s	256 MB
I	Limited budget	1 s	256 MB
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A. Gift Box

Problem ID: box

Eli Ayase's birthday is coming up! Her best eight friends want to send her a gorgeous gift box using state-of-the-art AR (augmented reality) technology.

Since a box has exactly eight corners, each friend would decorate exactly one corner. Now seven of them are already done, and one of her friend, Nozomi Toujou, is coming to decorate the last corner.

Given the coordinates of the seven decorated corners in the 3D AR space, can you help Nozomi to find the position of last corner? Note that the box is a cuboid with non-zero volume, and all sides are parallel to the axes.

Input

The input contains 7 lines. Each line contains 3 integers x_i, y_i, z_i.

- $-10^9 \leq x_i, y_i, z_i \leq 10^9$

Output

Please output the coordinates of the last corner.

Sample Input 1	Sample Output 1
2 0 1 0 1 1 2 1 1 0 0 1 0 0 0 2 0 0 0 1 0	2 1 0

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B. Calculus is quite easy

Problem ID: calculus

The students in NTU would take lots of course in the first year. Calculus is a disaster for lots of students.

Since you're simply good at ACM (Advanced Computer Mathematics), we'll give you a challenge.

Given a polynomial p with $2n$ variables $x_1, \ldots, x_n$ and $y_1, \ldots, y_n$ where $p = p_1 + p_2 + \cdots + p_m$ and p_i is in form of "x_a" , "y_b" or "$x_a y_b$".

Determine whether the following equation is satisfied.

$$\frac{\partial}{\partial x_1}\frac{\partial}{\partial y_1}\frac{\partial}{\partial x_2}\frac{\partial}{\partial y_2}\cdots\frac{\partial}{\partial x_n}\frac{\partial}{\partial y_n}\ p^k\Big|_{x_1,x_2,y_1,y_2,\ldots,x_n,y_n=0} = 0$$

For example, if $n = 1, k = 2$ and $p = x_1 + y_1$, we have

$$\begin{aligned}\frac{\partial}{\partial x_1}\frac{\partial}{\partial y_1}\ (x_1+y_1)^2\Big|_{x_1=0,y_1=0} &= \frac{\partial}{\partial y_1}\ 2x_1+2y_1\Big|_{x_1=0,y_1=0}\\ &= 2|_{x_1=0,y_1=0}\\ &= 2\end{aligned}$$

Input

The first line contains two integers n, k.

The second line contains a string S indicating the polynomial p.

- $1 \le n \le 300$
- $1 \le k \le 10^5$
- $1 \le |S| \le 20000$

Output

Output “YES” if the equation is satisfied. Otherwise output “NO”.

Sample Input 1	Sample Output 1
1 1 x1+y1	YES

Sample Input 2	Sample Output 2
1 2 x1+y1	NO

Sample Input 3	Sample Output 3
2 2 x1+x1*y1+x2*y2	NO

Sample Input 4	Sample Output 4
1 1 x1+y1+x1	YES

C. Coin Tossing

Problem ID: coin

Coin tossing is the practice of throwing a coin in the air and checking which side is showing when it lands to choose between two alternatives.

HH is bored and wants to play 10000 coin tossing games with you. At the beginning of each game, you need to guess the result (head or tail), and then HH would toss the coin. If you can successfully predict at least 95% of them, HH will be impressed by your luckiness and give you an "Accepted".

Here is the top secret about HH which might help you: He is controlled by skynet. By reverse engineering we found that he will toss coins according to the following C++ snippet.

```
#include <random>
struct HH {
    std::minstd_rand rnd;
    HH(int s) : rnd(s) {}

    int toss() {
        return rnd() % 2;  // 0 is head, 1 is tail
    }
};
```

Note that s is a secret number in range $[1, 2147483646]$, and the i-th number generated by `minstd_rand` would be $s \times 48271^i \bmod 2147483647$. For example, if $s = 7122$, the first 10 tosses would be `0100101001`.

Interaction

Your program should output each guess as "0" or "1" in one line. After making each guess, you need to make sure to flush standard output (like `fflush(stdout)` in C/C++). After each guess, there will be a result of toss to be read from standard input. The result would be a line with a single character "0" or "1".

After playing 10000 times, your program should exit normally without any redundant output.

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D. Count on the integers

Problem ID: count

Count on a tree is a series of problems on SPOJ online judge. All of them are counting problems on the tree structure. It's a very nice problemset.

Bobo is simply good at it. He solves all the COT problems on SPOJ. When he says that he is a master of counting problems confidently, Hanhan challenges him.

"Hey! Don't say that you're master of counting problems. You ONLY solve the COT problems. Let's try some more interesting problems such as Count on the integers."

What? You say you've no idea what "Count on the integers" is? Let me introduce it as the following:

The problem is about counting the number of χ pairs (x, y). We say a pair (x, y), where $x \leq y$, is a χ pair if and only if $x \oplus y$ has odd number of ones in its binary representation. For example, $(2, 15)$ is a χ pair because $2 \oplus 15 = 1101_2$, which has odd number of ones.

Expression $x \oplus y$ means applying bitwise exclusive or operation to integers x and y. The given operation exists in all modern programming languages, for example, in languages C++ and Java it is represented as "^", in Pascal —as "xor".

Hanhan thinks the problem is not interesting enough, so he makes the problem harder. He will add some new ranges $[l_i, r_i]$. For each adding operation, you should answer the number of χ pairs (x, y) where both x, y belong to $[l_1, r_1] \cup \cdots \cup [l_i, r_i]$.

"I think it's quite easy."

After about 1 second, Bobo comes a solution. Hanhan is so stupid that he can't check whether Bobo is correct. Can you help Hanhan solve the problem?

Input

The first line contains an integer N indicating the total number of adding operations. Following N lines each contains two integers l_i, r_i indicating the i-th range Hanhan adds.

- $1 \leq N \leq 10^5$
- $1 \leq l_i \leq r_i \leq 2^{32} - 1$

Output

Output N lines each contains an integer. The integer in the i-th line is the number of χ pairs (x, y) where both x, y belong to $[l_1, r_1] \cup \cdots \cup [l_i, r_i]$.

Sample Input 1	Sample Output 1
3 1 3 2 10 100 110	2 25 110

E. Detective

Problem ID: detective

Detective Conan is investigating a crime. He is spying on Andy and Brain for several months and found that they text each other frequently. Since the message is encrypted, he cannot use it as an evidence. How does he know they crime with some ciphertext? Conan always makes assumptions boldly; finds proofs with care.

Fortunately, Conan knows the encryption method they use. First, Andy and Brain always text with lowercase latin letter. Second, they decide a function $f(c)$ which is an injective function of lowercase latin letter a-z. An injective function is a function such that if $f(c_0) = f(c_1)$ then $c_0 = c_1$. Third, they encrypt a text $S = s_1 s_2 s_3 \cdots s_n$ to $f(S) = f(s_1)f(s_2)f(s_3)\cdots f(s_n)$.

For example, if they define

$$f(\text{abcdefghijklmnopqrstuvwxyz}) = \text{bacdefghijklmnopqrstuvwxyz}$$

then

$$f(\text{andyandbrain}) = \text{bndybndarbin}$$

Conan's reasoning skill is very strong. He now guesses a keyword of what they are planning. Given a keyword K, we say that a string A is K-suspicious if exists an injective function of lowercase latin letters g such that $g(A) = K$.

You are given the ciphertext S and the keyword K. Help Conan find the K-suspicious string which appears the most times in S. Let $S[i, j] = s_i s_{i+1} \cdots s_j$, and the times of a string A appearing in another string B is the number of distinct pairs (i, j) such that $B[i, j] = A$.

Input

The first line contains a string S, representing the ciphertext.

The second line contains a string K, representing the keyword.

- $1 \le |K| \le |S| \le 10^5$

Output

Output the K-suspicious string which appears the most times in S on a single line. If there are two or more K-suspicious strings appear most times, then output the left most one. If there are no K-suspicious strings, then output "NO".

Sample Input 1	Sample Output 1
kekexyxzxyvexyxzxy loli	xyxz

Sample Input 2	Sample Output 2
kekexyxzxyvexzxyxzxy loli	xzxy

Sample Input 3	Sample Output 3
abccdeeghhij abcd	NO

F. Fiddler crab

Problem ID: fiddler

There are many fiddler crabs living in the Fiddler crab kingdom. Fiddler crabs are most well known for their sexually dimorphic claws; the males' major claw is much larger than the minor claw while the females' claws are both the same size.

The winter is coming, so the government of the Fiddler crab kingdom is giving gloves to the people to keep their claws warm. The government only has n pairs of gloves. The i-th pair of gloves has a claw size limit (l_i, r_i). There are m fiddler crabs in the kingdom. The j-th fiddler crab has claw size (a_j, b_j). The j-th fiddler crab can wear the i-th pair of gloves if and only if $a_j \leq l_i$ and $b_j \leq r_i$. Note that fiddler crab can not wear left glove with right claw and vice versa.

The government cannot give a crab two or more pairs of gloves otherwise other crabs will be angry. And the government cannot give a crab a pair of glove it cannot wear, otherwise that crab will be angry. And if the government leaves too many gloves, their budget will decrease in the next year, so they want to maximize gloves it can give out.

You are given n, m, the claw size of the m fiddler crabs, and the claw size limit of n pairs of gloves. Help the government find out the maximum number of pairs of gloves it can give out.

Input

The first line contains two integers n, m.

Then n lines. Each line contains two integers (l_i, r_i), representing the size limit of the i-th gloves.

Then m lines. Each line contains two integers (a_j, b_j), representing the claw size of the j-th fiddler crab.

- $1 \leq n, m \leq 10^5$
- $1 \leq l_i, r_i, a_j, b_j \leq 10^9$

Output

Output a single integer as the answer described above.

Sample Input 1	Sample Output 1
2 2 3 4 4 2 1 3 2 1	2

Sample Input 2	Sample Output 2
3 3 3 1 4 1 5 1 2 2 2 1 1 1	2

G. Game with a string

Problem ID: game

This problem is interactive. Your program has to read data from the standard input and write the data to the standard output. After writing each line, be sure to use the stream flushing function (like `fflush(stdout)` in C/C++).

Suppose there is a string written on a blackboard, and two players play the following game with it. The players take turns alternately.

A move consists of erasing a subsequence of the string. For any symbol in the subsequence, the number of the symbol should be less than or equal to k. For example, from the string "aabcbba" and $k = 2$, it is allowed to erase symbols at positions $1, 3, 4, 5$ and 7, but not allowed to erase symbols at positions $1, 2, 3$ and 7 because the number of the symbol "a" in the subsequence is 3, which is greater than k.

A player loses, if he can not make a move, i.e. if before his move, there are no symbols on the blackboard.

Your task is to choose, for which player (the first one or the second one) you would like to play, and beat the jury's program (the interactor) in this game.

Input

The first line contains two integers n, k. The second line contains a non-empty string s with length n, consisting of lowercase letters.

The positions of the symbols in the string are numbered from 1 to n. After erasing symbols, the positions of the remaining symbols do not change.

During information exchange with the interactor, you get opponent's moves in the input, one per line. Description of a move contains a positive integer, which is the length of the subsequence. Positions in the description of the move are separated by spaces. It is guaranteed, that the interactor's moves are correct. The subsequence of a move is satisfied with the condition, every position is printed only once and does not coincide with a position of some previously erased symbol. Your moves should satisfy these conditions too.

If you play for the first player, output your first move, then read a move of the second player,

than output your move and so on. If you play for the second player, at first read an opponent's move, then output your move, then read an opponent's move again, and so on.

When your opponent loses, he outputs the single integer "-1" instead of his move. After reading this move, your program should terminate the execution.

- $1 \leq n \leq 10000$
- $1 \leq k \leq 30$

Output

At the beginning of cooperation with the interactor, output the number of the player (1 or 2), for whom you want to play. Note that the interactor always plays optimally, and you must win to solve this problem.

Then output descriptions of your moves, one per line (the order of cooperation with the interactor is described in the input data format). After writing each line, do not forget to do "flush".

Note

For the sample test case, if you move first and erase the 4-th symbol, you will win the game no matter how the jury's program does.

Sample Input 1	Sample Output 1
7 2 aabcbba	1 1 4

H. A math problem

Problem ID: math1

For a given interger n, please output the number of tuples (a, b, c) where

$$1 \leq a, b, c \leq n,$$

such that the value of the following three expressions

$$ab - c, bc - a, ca - b,$$

can be represented as

$$\pm 2^m$$

for some non-negative integer m.

Input

The first line contains an integer T, indicating the number of test cases. For the following T lines, there is an integer n in each line.

- $1 \leq T \leq 10^4$
- $1 \leq n \leq 10^5$

Output

For each test case, output an interger indicating the answer in a single line.

Sample Input 1	Sample Output 1
4 1 2 4 8	0 4 10 22

Sample Input 2	Sample Output 2
1 100	70

I. Limited budget

Problem ID: misc

There are n towers aligned in one row. The i-th tower from the left is t_i inches tall.

There are two customers who order some towers. Since they love sorted things, you have to give each of them some towers with height sorted. **From short to tall or from tall to short** are both acceptable.

There are two workers, Meow and Bark, who work for you. You have to choose a number l, where $1 \leq l \leq n-1$, to split the towers into two groups. One contians the 1st tower to the l-th tower and the other contains the remaining towers. After the spliting, you assign the first group to Meow and the second group to Bark. They will sort the towers seperately and send the sorted towers to one of your customers.

Note that each time a worker can exchange the position of two consecutive towers with 1 dollar cost in the group the worker is assigned. Since Meow and Bark are smart workers, they will minimize the cost for you to finish their own job.

Since the budget you have is limited, you want to minimize your expense. What's the lowest money you have to spend to finish the task?

Input

The first line contains an integer n.

The second line contains n integers separated by space. The i-th integer indicate the height of the i-th tower from the left.

- $2 \leq n \leq 10^5$
- $1 \leq t_i \leq 10^6$

Output

Output an integer in a single line indicating the **minimal dollar** expense.

Sample Input 1	Sample Output 1
5 3 2 4 1 1	0

Sample Input 2	Sample Output 2
6 3 2 3 4 2 4	1

J. Password

Problem ID: password

HH forgot his password for the website F4ceb00k. As a talent hacker, he used the dumb way to recover his password — hacking. He hacked into F4ceb00k's database with some incredible SQL injection tricks. To prevent forgetting password again, he used the dumb way to backup everything — printing. He printed out his password and all passwords in the database. The first line is his password, and the second line contains all passwords concatenated as a single string.

Unfortunately, HH forgot his password again, and F4ceb00k fixed the bug. When he tried to pull the papers of passwords out, some characters are blurred by dirts. To recover his password, he wants to find all possible matches between his blurred password and the blurred database. For example, if we denote the blurred character as a single dot, and the blurred password is "h.nh.n", and the blurred database is "shi..anh..ha.ple", then there are 3 possible matches: "hi..an" at position 2, ".anh.." at position 5 and "h..ha." at position 8. Please help HH to find all possible match positions.

Input

The input contains 2 lines. The first line s is the blurred password. The second line t contains all passwords in the database, which are concatenated and blurred.

- $1 \leq |s| \leq |t| \leq 250000$
- The strings s and t are consisting of lowercase English letters and dot.
- There is at least one possible match.

Output

Please output two lines. The first line is the number of possible match positions. The second line is the match positions in ascending order and separated by a space.

Sample Input 1	Sample Output 1
h.nh.n shi..anh..ha.ple	3 2 5 8

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