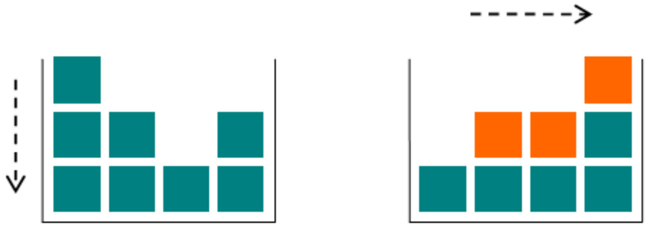
A. Gravity Flip

1 second, 256 megabytes

Little Chris is bored during his physics lessons (too easy), so he has built a toy box to keep himself occupied. The box is special, since it has the ability to change gravity.

There are n columns of toy cubes in the box arranged in a line. The i-th column contains a_i cubes. At first, the gravity in the box is pulling the cubes downwards. When Chris switches the gravity, it begins to pull all the cubes to the right side of the box. The figure shows the initial and final configurations of the cubes in the box: the cubes that have changed their position are highlighted with orange.



Given the initial configuration of the toy cubes in the box, find the amounts of cubes in each of the n columns after the gravity switch!

Input

The first line of input contains an integer n $(1 \le n \le 100)$, the number of the columns in the box. The next line contains n space-separated integer numbers. The i-th number a_i $(1 \le a_i \le 100)$ denotes the number of cubes in the i-th column.

Output

Output n integer numbers separated by spaces, where the i-th number is the amount of cubes in the i-th column after the gravity switch.

input

```
4
3 2 1 2
```

output

```
1 2 2 3
```

input

```
3
2 3 8
```

output

```
2 3 8
```

The first example case is shown on the figure. The top cube of the first column falls to the top of the last column; the top cube of the second column falls to the top of the third column; the middle cube of the first column falls to the top of the second column.

In the second example case the gravity switch does not change the heights of the columns.

B. Registration system

5 seconds, 64 megabytes

A new e-mail service "Berlandesk" is going to be opened in Berland in the near future. The site administration wants to launch their project as soon as possible, that's why they ask you to help. You're suggested to implement the prototype of site registration system. The system should work on the following principle.

Each time a new user wants to register, he sends to the system a request with his `name`. If such a `name` does not exist in the system database, it is inserted into the database, and the user gets the response `OK`, confirming the successful registration. If the `name` already exists in the system database, the system makes up a new user name, sends it to the user as a prompt and *also inserts the prompt into the database*. The new name is formed by the following rule. Numbers, starting with 1, are appended one after another to `name` (`name1`, `name2`, ...), among these numbers the least i is found so that `name`i does not yet exist in the database.

Input

The first line contains number n $(1 \le n \le 10^5)$. The following n lines contain the requests to the system. Each request is a non-empty line, and consists of not more than 32 characters, which are all lowercase Latin letters.

Output

Print n lines, which are system responses to the requests: `OK` in case of successful registration, or a prompt with a new name, if the requested name is already taken.

input

```
4
abacaba
acaba
abacaba
acab
```

output

```
OK
OK
abacaba1
OK
```

input

```
6
first
first
second
second
third
third
```

output

```
OK
first1
OK
second1
OK
third1
```

C. Lecture

1 second, 256 megabytes

You have a new professor of graph theory and he speaks very quickly. You come up with the following plan to keep up with his lecture and make notes.

You know two languages, and the professor is giving the lecture in the first one. The words in both languages consist of lowercase English characters, each language consists of several words. For each language, all words are distinct, i.e. they are spelled differently. Moreover, the words of these languages have a one-to-one correspondence, that is, for each word in each language, there exists exactly one word in the other language having has the same meaning.

You can write down every word the professor says in either the first language or the second language. Of course, during the lecture you write down each word in the language in which the word is shorter. In case of equal lengths of the corresponding words you prefer the word of the first language.

You are given the text of the lecture the professor is going to read. Find out how the lecture will be recorded in your notes.

Input

The first line contains two integers, n and m ($1 \le n \le 3000$, $1 \le m \le 3000$) — the number of words in the professor's lecture and the number of words in each of these languages.

The following m lines contain the words. The i-th line contains two strings a_i, b_i meaning that the word a_i belongs to the first language, the word b_i belongs to the second language, and these two words have the same meaning. It is guaranteed that no word occurs in both languages, and each word occurs in its language exactly once.

The next line contains n space-separated strings $c_1, c_2, ..., c_n$ — the text of the lecture. It is guaranteed that each of the strings c_i belongs to the set of strings $\{a_1, a_2, ... a_m\}$.

All the strings in the input are non-empty, each consisting of no more than 10 lowercase English letters.

Output

Output exactly n words: how you will record the lecture in your notebook. Output the words of the lecture in the same order as in the input.

input
```
4 3
codeforces codesecrof
contest round
letter message
codeforces contest letter contest
```
output
```
codeforces round letter round
```

input
```
5 3
joll wuqrd
euzf un
hbnyiyc rsoqqveh
hbnyiyc joll joll euzf joll
```
output
```
hbnyiyc joll joll un joll
```

D. Dubstep

2 seconds, 256 megabytes

Vasya works as a DJ in the best Berland nightclub, and he often uses dubstep music in his performance. Recently, he has decided to take a couple of old songs and make dubstep remixes from them.

Let's assume that a song consists of some number of words. To make the dubstep remix of this song, Vasya inserts a certain number of words "WUB" before the first word of the song (the number may be zero), after the last word (the number may be zero), and between words (at least one between any pair of neighbouring words), and then the boy glues together all the words, including "WUB", in one string and plays the song at the club.

For example, a song with words "I AM X" can transform into a dubstep remix as "WUBWUBIWUBAMWUBWUBX" and cannot transform into "WUBWUBIAMWUBX".

Recently, Petya has heard Vasya's new dubstep track, but since he isn't into modern music, he decided to find out what was the initial song that Vasya remixed. Help Petya restore the original song.

Input

The input consists of a single non-empty string, consisting only of uppercase English letters, the string's length doesn't exceed 200 characters. It is guaranteed that before Vasya remixed the song, no word contained substring "WUB" in it; Vasya didn't change the word order. It is also guaranteed that initially the song had at least one word.

Output

Print the words of the initial song that Vasya used to make a dubsteb remix. Separate the words with a space.

input
```
WUBWUBABCWUB
```
output
```
ABC
```

input
```
WUBWEWUBAREWUBWUBTHEWUBCHAMPIONSWUBMYWUBFRIENDWUB
```
output
```
WE ARE THE CHAMPIONS MY FRIEND
```

In the first sample: "WUBWUBABCWUB" = "WUB" + "WUB" + "ABC" + "WUB". That means that the song originally consisted of a single word "ABC", and all words "WUB" were added by Vasya.

In the second sample Vasya added a single word "WUB" between all neighbouring words, in the beginning and in the end, except for words "ARE" and "THE" — between them Vasya added two "WUB".

E. Chat room

1 second, 256 megabytes

Vasya has recently learned to type and log on to the Internet. He immediately entered a chat room and decided to say hello to everybody. Vasya typed the word s. It is considered that Vasya managed to say hello if several letters can be deleted from the typed word so that it resulted in the word "hello". For example, if Vasya types the word "ahhellllloou", it will be considered that he said hello, and if he types "hlelo", it will be considered that Vasya got misunderstood and he didn't manage to say hello. Determine whether Vasya managed to say hello by the given word s.

Input

The first and only line contains the word s, which Vasya typed. This word consisits of small Latin letters, its length is no less that 1 and no more than 100 letters.

Output

If Vasya managed to say hello, print "YES", otherwise print "NO".

input
```
ahhellllloou
```
output
```
YES
```

input
```
hlelo
```
output
```
NO
```

F. String Task

2 seconds, 256 megabytes

Petya started to attend programming lessons. On the first lesson his task was to write a simple program. The program was supposed to do the following: in the given string, consisting if uppercase and lowercase Latin letters, it:

- deletes all the vowels,
- inserts a character "." before each consonant,
- replaces all uppercase consonants with corresponding lowercase ones.

Vowels are letters "A", "O", "Y", "E", "U", "I", and the rest are consonants. The program's input is exactly one string, it should return the output as a single string, resulting after the program's processing the initial string.

Help Petya cope with this easy task.

Input

The first line represents input string of Petya's program. This string only consists of uppercase and lowercase Latin letters and its length is from 1 to 100, inclusive.

Output

Print the resulting string. It is guaranteed that this string is not empty.

input
```
tour
```
output
```
.t.r
```

input
```
Codeforces
```
output
```
.c.d.f.r.c.s
```

input
```
aBAcAba
```
output
```
.b.c.b
```

G. Amusing Joke

2 seconds, 256 megabytes

So, the New Year holidays are over. Santa Claus and his colleagues can take a rest and have guests at last. When two "New Year and Christmas Men" meet, thear assistants cut out of cardboard the letters from the guest's name and the host's name in honor of this event. Then the hung the letters above the main entrance. One night, when everyone went to bed, someone took all the letters of our characters' names. Then he may have shuffled the letters and put them in one pile in front of the door.

The next morning it was impossible to find the culprit who had made the disorder. But everybody wondered whether it is possible to restore the names of the host and his guests from the letters lying at the door? That is, we need to verify that there are no extra letters, and that nobody will need to cut more letters.

Help the "New Year and Christmas Men" and their friends to cope with this problem. You are given both inscriptions that hung over the front door the previous night, and a pile of letters that were found at the front door next morning.

Input

The input file consists of three lines: the first line contains the guest's name, the second line contains the name of the residence host and the third line contains letters in a pile that were found at the door in the morning. All lines are not empty and contain only uppercase Latin letters. The length of each line does not exceed 100.

Output

Print "YES" without the quotes, if the letters in the pile could be permuted to make the names of the "New Year and Christmas Men". Otherwise, print "NO" without the quotes.

input
```
SANTACLAUS
DEDMOROZ
SANTAMOROZDEDCLAUS
```
output
```
YES
```

input
```
PAPAINOEL
JOULUPUKKI
JOULNAPAOILELUPUKKI
```
output
```
NO
```

input
```
BABBONATALE
FATHERCHRISTMAS
BABCHRISTMASBONATALLEFATHER
```
output
```
NO
```

In the first sample the letters written in the last line can be used to write the names and there won't be any extra letters left.

In the second sample letter "P" is missing from the pile and there's an extra letter "L".

In the third sample there's an extra letter "L".

H. Vitya in the Countryside

1 second, 256 megabytes

Every summer Vitya comes to visit his grandmother in the countryside. This summer, he got a huge wart. Every grandma knows that one should treat warts when the moon goes down. Thus, Vitya has to catch the moment when the moon is down.

Moon cycle lasts 30 days. The size of the visible part of the moon (in Vitya's units) for each day is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, and then cycle repeats, thus after the second 1 again goes 0.

As there is no internet in the countryside, Vitya has been watching the moon for n consecutive days and for each of these days he wrote down the size of the visible part of the moon. Help him find out whether the moon will be up or down next day, or this cannot be determined by the data he has.

Input

The first line of the input contains a single integer n $(1 \le n \le 92)$ — the number of consecutive days Vitya was watching the size of the visible part of the moon.

The second line contains n integers a_i $(0 \le a_i \le 15)$ — Vitya's records.

It's guaranteed that the input data is consistent.

Output

If Vitya can be sure that the size of visible part of the moon on day $n + 1$ will be less than the size of the visible part on day n, then print "DOWN" at the only line of the output. If he might be sure that the size of the visible part will increase, then print "UP". If it's impossible to determine what exactly will happen with the moon, print -1.

input
```
5
3 4 5 6 7
```
output
```
UP
```

input
```
7
12 13 14 15 14 13 12
```
output
```
DOWN
```

input

```
1
8
```

output

```
-1
```

In the first sample, the size of the moon on the next day will be equal to 8, thus the answer is "UP".

In the second sample, the size of the moon on the next day will be 11, thus the answer is "DOWN".

In the third sample, there is no way to determine whether the size of the moon on the next day will be 7 or 9, thus the answer is -1.

I. Two Substrings

2 seconds, 256 megabytes

You are given string s. Your task is to determine if the given string s contains two non-overlapping substrings "AB" and "BA" (the substrings can go in any order).

Input

The only line of input contains a string s of length between 1 and 10^5 consisting of uppercase Latin letters.

Output

Print "YES" (without the quotes), if string s contains two non-overlapping substrings "AB" and "BA", and "NO" otherwise.

input

```
ABA
```

output

```
NO
```

input

```
BACFAB
```

output

```
YES
```

input

```
AXBYBXA
```

output

```
NO
```

In the first sample test, despite the fact that there are substrings "AB" and "BA", their occurrences overlap, so the answer is "NO".

In the second sample test there are the following occurrences of the substrings: **BA**CF**AB**.

In the third sample test there is no substring "AB" nor substring "BA".

J. Vasya and Football

2 seconds, 256 megabytes

Vasya has started watching football games. He has learned that for some fouls the players receive yellow cards, and for some fouls they receive red cards. A player who receives the second yellow card automatically receives a red card.

Vasya is watching a recorded football match now and makes notes of all the fouls that he would give a card for. Help Vasya determine all the moments in time when players would be given red cards if Vasya were the judge. For each player, Vasya wants to know only the **first** moment of time when he would receive a red card from Vasya.

Input

The first line contains the name of the team playing at home. The second line contains the name of the team playing away. Both lines are not empty. The lengths of both lines do not exceed 20. Each line contains only of large English letters. The names of the teams are distinct.

Next follows number n $(1 \le n \le 90)$ — the number of fouls.

Each of the following n lines contains information about a foul in the following form:

- first goes number t $(1 \le t \le 90)$ — the minute when the foul occurs;
- then goes letter "h" or letter "a" — if the letter is "h", then the card was given to a home team player, otherwise the card was given to an away team player;
- then goes the player's number m $(1 \le m \le 99)$;
- then goes letter "y" or letter "r" — if the letter is "y", that means that the yellow card was given, otherwise the red card was given.

The players from different teams can have the same number. The players within one team have distinct numbers. The fouls go chronologically, no two fouls happened at the same minute.

Output

For each event when a player received his first red card **in a chronological order** print a string containing the following information:

- The name of the team to which the player belongs;
- the player's number in his team;
- the minute when he received the card.

If no player received a card, then you do not need to print anything.

It is possible case that the program will not print anything to the output (if there were no red cards).

input

```
MC
CSKA
9
28 a 3 y
62 h 25 y
66 h 42 y
70 h 25 y
77 a 4 y
79 a 25 y
82 h 42 r
89 h 16 y
90 a 13 r
```

output

```
MC 25 70
MC 42 82
CSKA 13 90
```

K. Opposites Attract

2 seconds, 256 megabytes

Everybody knows that opposites attract. That is the key principle of the "Perfect Matching" dating agency. The "Perfect Matching" matchmakers have classified each registered customer by his interests and assigned to the i-th client number t_i ($-10 \le t_i \le 10$). Of course, one number can be assigned to any number of customers.

"Perfect Matching" wants to advertise its services and publish the number of opposite couples, that is, the couples who have opposite values of t. Each couple consists of exactly two clients. The customer can be included in a couple an arbitrary number of times. Help the agency and write the program that will find the sought number by the given sequence $t_1, t_2, \ldots, t_n$. For example, if $t = (1, -1, 1, -1)$, then any two elements t_i and t_j form a couple if i and j have different parity. Consequently, in this case the sought number equals 4.

Of course, a client can't form a couple with him/herself.

Input

The first line of the input data contains an integer n ($1 \le n \le 10^5$) which represents the number of registered clients of the "Couple Matching". The second line contains a sequence of integers $t_1, t_2, ..., t_n$ ($-10 \le t_i \le 10$), t_i — is the parameter of the i-th customer that has been assigned to the customer by the result of the analysis of his interests.

Output

Print the number of couples of customs with opposite t. The opposite number for x is number $-x$ (0 is opposite to itself). Couples that only differ in the clients' order are considered the same.

Note that the answer to the problem can be large enough, so you must use the 64-bit integer type for calculations. Please, do not use the %lld specificator to read or write 64-bit integers in C++. It is preferred to use cin, cout streams or the %I64d specificator.

input
```
5
-3 3 0 0 3
```
output
```
3
```

input
```
3
0 0 0
```
output
```
3
```

In the first sample the couples of opposite clients are: **(1,2), (1,5) и (3,4)**.

In the second sample any couple of clients is opposite.

L. Radio Station

2 seconds, 256 megabytes

As the guys fried the radio station facilities, the school principal gave them tasks as a punishment. Dustin's task was to add comments to nginx configuration for school's website. The school has n servers. Each server has a name and an ip (names aren't necessarily unique, but ips are). Dustin knows the ip and name of each server. For simplicity, we'll assume that an nginx command is of form "`command ip;`" where `command` is a string consisting of English lowercase letter only, and `ip` is the ip of one of school servers.

Each ip is of form "`a.b.c.d`" where a, b, c and d are non-negative integers less than or equal to 255 (with no leading zeros). The nginx configuration file Dustin has to add comments to has m commands. Nobody ever memorizes the ips of servers, so to understand the configuration better, Dustin has to comment the name of server that the ip belongs to at the end of each line (after each command). More formally, if a line is "`command ip;`" Dustin has to replace it with "`command ip; #name`" where `name` is the name of the server with ip equal to `ip`.

Dustin doesn't know anything about nginx, so he panicked again and his friends asked you to do his task for him.

Input

The first line of input contains two integers n and m ($1 \le n, m \le 1000$).

The next n lines contain the names and ips of the servers. Each line contains a string `name`, name of the server and a string `ip`, ip of the server, separated by space ($1 \le |name| \le 10$, $name$ only consists of English lowercase letters). It is guaranteed that all ip are distinct.

The next m lines contain the commands in the configuration file. Each line is of form "`command ip;`" ($1 \le |command| \le 10$, `command` only consists of English lowercase letters). It is guaranteed that ip belongs to one of the n school servers.

Output

Print m lines, the commands in the configuration file after Dustin did his task.

input
```
2 2
main 192.168.0.2
replica 192.168.0.1
block 192.168.0.1;
proxy 192.168.0.2;
```
output
```
block 192.168.0.1; #replica
proxy 192.168.0.2; #main
```

input
```
3 5
google 8.8.8.8
codeforces 212.193.33.27
server 138.197.64.57
redirect 138.197.64.57;
block 8.8.8.8;
cf 212.193.33.27;
unblock 8.8.8.8;
check 138.197.64.57;
```
output
```
redirect 138.197.64.57; #server
block 8.8.8.8; #google
cf 212.193.33.27; #codeforces
unblock 8.8.8.8; #google
check 138.197.64.57; #server
```

M. Appleman and Toastman

2 seconds, 256 megabytes

Appleman and Toastman play a game. Initially Appleman gives one group of n numbers to the Toastman, then they start to complete the following tasks:

- Each time Toastman gets a group of numbers, he sums up all the numbers and adds this sum to the score. Then he gives the group to the Appleman.
- Each time Appleman gets a group consisting of a single number, he throws this group out. Each time Appleman gets a group consisting of more than one number, he splits the group into two non-empty groups (he can do it in any way) and gives each of them to Toastman.

After guys complete all the tasks they look at the score value. What is the maximum possible value of score they can get?

Input

The first line contains a single integer n ($1 \le n \le 3 \cdot 10^5$). The second line contains n integers $a_1, a_2, ..., a_n$ ($1 \le a_i \le 10^6$) — the initial group that is given to Toastman.

Output

Print a single integer — the largest possible score.

input
```
3
3 1 5
```
output
```
26
```

input

```
1
10
```

output

```
10
```

Consider the following situation in the first example. Initially Toastman gets group [3, 1, 5] and adds 9 to the score, then he give the group to Appleman. Appleman splits group [3, 1, 5] into two groups: [3, 5] and [1]. Both of them should be given to Toastman. When Toastman receives group [1], he adds 1 to score and gives the group to Appleman (he will throw it out). When Toastman receives group [3, 5], he adds 8 to the score and gives the group to Appleman. Appleman splits [3, 5] in the only possible way: [5] and [3]. Then he gives both groups to Toastman. When Toastman receives [5], he adds 5 to the score and gives the group to Appleman (he will throws it out). When Toastman receives [3], he adds 3 to the score and gives the group to Appleman (he will throws it out). Finally Toastman have added 9 + 1 + 8 + 5 + 3 = 26 to the score. This is the optimal sequence of actions.

N. Phone Numbers

2 seconds, 256 megabytes

Vasya has several phone books, in which he recorded the telephone numbers of his friends. Each of his friends can have one or several phone numbers.

Vasya decided to organize information about the phone numbers of friends. You will be given n strings — all entries from Vasya's phone books. Each entry starts with a friend's name. Then follows the number of phone numbers in the current entry, and then the phone numbers themselves. It is possible that several identical phones are recorded in the same record.

Vasya also believes that if the phone number a is a suffix of the phone number b (that is, the number b ends up with a), and both numbers are written by Vasya as the phone numbers of the same person, then a is recorded without the city code and it should not be taken into account.

The task is to print organized information about the phone numbers of Vasya's friends. It is possible that two different people have the same number. If one person has two numbers x and y, and x is a suffix of y (that is, y ends in x), then you shouldn't print number x. If the number of a friend in the Vasya's phone books is recorded several times in the same format, it is necessary to take it into account exactly once.

Read the examples to understand statement and format of the output better.

Input

First line contains the integer n $(1 \le n \le 20)$ — number of entries in Vasya's phone books.

The following n lines are followed by descriptions of the records in the format described in statement. Names of Vasya's friends are non-empty strings whose length does not exceed 10. They consists only of lowercase English letters. Number of phone numbers in one entry is not less than 1 is not more than 10. The telephone numbers consist of digits only. If you represent a phone number as a string, then its length will be in range from 1 to 10. Phone numbers can contain leading zeros.

Output

Print out the ordered information about the phone numbers of Vasya's friends. First output m — number of friends that are found in Vasya's phone books.

The following m lines must contain entries in the following format "`name number_of_phone_numbers phone_numbers`". Phone numbers should be separated by a space. Each record must contain all the phone numbers of current friend.

Entries can be displayed in arbitrary order, phone numbers for one record can also be printed in arbitrary order.

input

```
2
ivan 1 00123
masha 1 00123
```

output

```
2
masha 1 00123
ivan 1 00123
```

input

```
3
karl 2 612 12
petr 1 12
katya 1 612
```

output

```
3
katya 1 612
petr 1 12
karl 1 612
```

input

```
4
ivan 3 123 123 456
ivan 2 456 456
ivan 8 789 3 23 6 56 9 89 2
dasha 2 23 789
```

output

```
2
dasha 2 23 789
ivan 4 789 123 2 456
```

O. Sereja and Suffixes

1 second, 256 megabytes

Sereja has an array a, consisting of n integers $a_1, a_2, ..., a_n$. The boy cannot sit and do nothing, he decided to study an array. Sereja took a piece of paper and wrote out m integers $l_1, l_2, ..., l_m$ $(1 \le l_i \le n)$. For each number l_i he wants to know how many distinct numbers are staying on the positions $l_i, l_i + 1, ..., n$. Formally, he want to find the number of distinct numbers among $a_{l_i}, a_{l_i+1}, ..., a_n$.?

Sereja wrote out the necessary array elements but the array was so large and the boy was so pressed for time. Help him, find the answer for the described question for each l_i.

Input

The first line contains two integers n and m $(1 \le n, m \le 10^5)$. The second line contains n integers $a_1, a_2, ..., a_n$ $(1 \le a_i \le 10^5)$ — the array elements.

Next m lines contain integers $l_1, l_2, ..., l_m$. The i-th line contains integer l_i $(1 \le l_i \le n)$.

Output

Print m lines — on the i-th line print the answer to the number l_i.

input

```
10 10
1 2 3 4 1 2 3 4 100000 99999
1
2
3
4
5
6
7
8
9
10
```

output

```
6
6
6
6
6
5
4
3
2
1
```

P. Buses Between Cities

1 second, 256 megabytes

Buses run between the cities A and B, the first one is at 05:00 AM and the last one departs not later than at 11:59 PM. A bus from the city A departs every a minutes and arrives to the city B in a t_a minutes, and a bus from the city B departs every b minutes and arrives to the city A in a t_b minutes.

The driver Simion wants to make his job diverse, so he counts the buses going towards him. Simion doesn't count the buses he meet at the start and finish.

You know the time when Simion departed from the city A to the city B. Calculate the number of buses Simion will meet to be sure in his counting.

Input

The first line contains two integers a, t_a $(1 \le a, t_a \le 120)$ — the frequency of the buses from the city A to the city B and the travel time. Both values are given in minutes.

The second line contains two integers b, t_b $(1 \le b, t_b \le 120)$ — the frequency of the buses from the city B to the city A and the travel time. Both values are given in minutes.

The last line contains the departure time of Simion from the city A in the format `hh:mm`. It is guaranteed that there are a bus from the city A at that time. Note that the hours and the minutes are given with exactly two digits.

Output

Print the only integer z — the number of buses Simion will meet on the way. Note that you should not count the encounters in cities A and B.

input

```
10 30
10 35
05:20
```

output

```
5
```

input

```
60 120
24 100
13:00
```

output

```
9
```

In the first example Simion departs form the city A at 05:20 AM and arrives to the city B at 05:50 AM. He will meet the first 5 buses from the city B that departed in the period [05:00 AM - 05:40 AM]. Also Simion will meet a bus in the city B at 05:50 AM, but he will not count it.

Also note that the first encounter will be between 05:26 AM and 05:27 AM (if we suggest that the buses are go with the sustained speed).

Q. Vanya and Lanterns

1 second, 256 megabytes

Vanya walks late at night along a straight street of length l, lit by n lanterns. Consider the coordinate system with the beginning of the street corresponding to the point 0, and its end corresponding to the point l. Then the i-th lantern is at the point a_i. The lantern lights all points of the street that are at the distance of at most d from it, where d is some positive number, common for all lanterns.

Vanya wonders: what is the minimum light radius d should the lanterns have to light the whole street?

Input

The first line contains two integers n, l $(1 \le n \le 1000,\ 1 \le l \le 10^9)$ — the number of lanterns and the length of the street respectively.

The next line contains n integers a_i $(0 \le a_i \le l)$. Multiple lanterns can be located at the same point. The lanterns may be located at the ends of the street.

Output

Print the minimum light radius d, needed to light the whole street. The answer will be considered correct if its absolute or relative error doesn't exceed 10^{-9}.

input

```
7 15
15 5 3 7 9 14 0
```

output

```
2.5000000000
```

input

```
2 5
2 5
```

output

```
2.0000000000
```

Consider the second sample. At $d = 2$ the first lantern will light the segment $[0, 4]$ of the street, and the second lantern will light segment $[3, 5]$. Thus, the whole street will be lit.

R. Memory and Trident

2 seconds, 256 megabytes

Memory is performing a walk on the two-dimensional plane, starting at the origin. He is given a string s with his directions for motion:

- An '`L`' indicates he should move one unit left.
- An '`R`' indicates he should move one unit right.
- A '`U`' indicates he should move one unit up.
- A '`D`' indicates he should move one unit down.

But now Memory wants to end at the origin. To do this, he has a special trident. This trident can replace any character in s with any of '`L`', '`R`', '`U`', or '`D`'. However, because he doesn't want to wear out the trident, he wants to make the minimum number of edits possible. Please tell Memory what is the minimum number of changes he needs to make to produce a string that, when walked, will end at the origin, or if there is no such string.

Input

The first and only line contains the string s $(1 \le |s| \le 100\,000)$ — the instructions Memory is given.

Output

If there is a string satisfying the conditions, output a single integer — the minimum number of edits required. In case it's not possible to change the sequence in such a way that it will bring Memory to to the origin, output `-1`.

input

```
RRU
```

output

```
-1
```

input
UDUR

output
1

input
RUUR

output
2

In the first sample test, Memory is told to walk right, then right, then up. It is easy to see that it is impossible to edit these instructions to form a valid walk.

In the second sample test, Memory is told to walk up, then down, then up, then right. One possible solution is to change s to "LDUR". This string uses 1 edit, which is the minimum possible. It also ends at the origin.

S. Pangram

2 seconds, 256 megabytes

A word or a sentence in some language is called a *pangram* if all the characters of the alphabet of this language appear in it *at least once*. Pangrams are often used to demonstrate fonts in printing or test the output devices.

You are given a string consisting of lowercase and uppercase Latin letters. Check whether this string is a pangram. We say that the string contains a letter of the Latin alphabet if this letter occurs in the string in uppercase or lowercase.

Input

The first line contains a single integer n $(1 \le n \le 100)$ — the number of characters in the string.

The second line contains the string. The string consists only of uppercase and lowercase Latin letters.

Output

Output "YES", if the string is a pangram and "NO" otherwise.

input
12 toosmallword

output
NO

input
35 TheQuickBrownFoxJumpsOverTheLazyDog

output
YES

T. Complete the Word

2 seconds, 256 megabytes

ZS the Coder loves to read the dictionary. He thinks that a word is *nice* if there exists a **substring** (contiguous segment of letters) of it of length 26 where each letter of English alphabet appears exactly once. In particular, if the string has length strictly less than 26, no such substring exists and thus it is not nice.

Now, ZS the Coder tells you a word, where some of its letters are missing as he forgot them. He wants to determine if it is possible to fill in the missing letters so that the resulting word is nice. If it is possible, he needs you to find an example of such a word as well. Can you help him?

Input

The first and only line of the input contains a single string s $(1 \le |s| \le 50\,000)$, the word that ZS the Coder remembers. Each character of the string is the uppercase letter of English alphabet ('A'-'Z') or is a question mark ('?'), where the question marks denotes the letters that ZS the Coder can't remember.

Output

If there is no way to replace all the question marks with **uppercase letters** such that the resulting word is nice, then print -1 in the only line.

Otherwise, print a string which denotes a possible nice word that ZS the Coder learned. This string should match the string from the input, except for the question marks replaced with uppercase English letters.

If there are multiple solutions, you may print any of them.

input
ABC??FGHIJK???OPQR?TUVWXY?

output
ABCDEFGHIJKLMNOPQRZTUVWXYS

input
WELCOMETOCODEFORCESROUNDTHREEHUNDREDANDSEVENTYTWO

output
-1

input
??????????????????????????

output
MNBVCXZLKJHGFDSAQPWOEIRUYT

input
AABCDEFGHIJKLMNOPQRSTUVW??M

output
-1

In the first sample case, ABCDEFGHIJKLMNOPQRZTUVWXYS is a valid answer beacuse it contains a substring of length 26 (the whole string in this case) which contains all the letters of the English alphabet exactly once. Note that there are many possible solutions, such as ABCDEFGHIJKLMNOPQRSTUVWXYZ or ABCEDFGHIJKLMNOPQRZTUVWXYS.

In the second sample case, there are no missing letters. In addition, the given string does not have a substring of length 26 that contains all the letters of the alphabet, so the answer is -1.

In the third sample case, any string of length 26 that contains all letters of the English alphabet fits as an answer.

U. Dragons

2 seconds, 256 megabytes

Kirito is stuck on a level of the MMORPG he is playing now. To move on in the game, he's got to defeat all n dragons that live on this level. Kirito and the dragons have strength, which is represented by an integer. In the duel between two opponents the duel's outcome is determined by their strength. Initially, Kirito's strength equals s.

If Kirito starts duelling with the i-th $(1 \le i \le n)$ dragon and Kirito's strength is not greater than the dragon's strength x_i, then Kirito loses the duel and dies. But if Kirito's strength is greater than the dragon's strength, then he defeats the dragon and gets a bonus strength increase by y_i.

Kirito can fight the dragons in any order. Determine whether he can move on to the next level of the game, that is, defeat all dragons without a single loss.

Input

The first line contains two space-separated integers s and n ($1 \le s \le 10^4$, $1 \le n \le 10^3$). Then n lines follow: the i-th line contains space-separated integers x_i and y_i ($1 \le x_i \le 10^4$, $0 \le y_i \le 10^4$) — the i-th dragon's strength and the bonus for defeating it.

Output

On a single line print "`YES`" (without the quotes), if Kirito can move on to the next level and print "`NO`" (without the quotes), if he can't.

input
```
2 2
1 99
100 0
```
output
```
YES
```

input
```
10 1
100 100
```
output
```
NO
```

In the first sample Kirito's strength initially equals 2. As the first dragon's strength is less than 2, Kirito can fight it and defeat it. After that he gets the bonus and his strength increases to $2 + 99 = 101$. Now he can defeat the second dragon and move on to the next level.

In the second sample Kirito's strength is too small to defeat the only dragon and win.

V. Word Capitalization

2 seconds, 256 megabytes

Capitalization is writing a word with its first letter as a capital letter. Your task is to capitalize the given word.

Note, that during capitalization all the letters except the first one remains unchanged.

Input

A single line contains a non-empty word. This word consists of lowercase and uppercase English letters. The length of the word will not exceed 10^3.

Output

Output the given word after capitalization.

input
```
ApPLe
```
output
```
ApPLe
```

input
```
konjac
```
output
```
Konjac
```

W. Pythagorean Theorem II

3 seconds, 256 megabytes

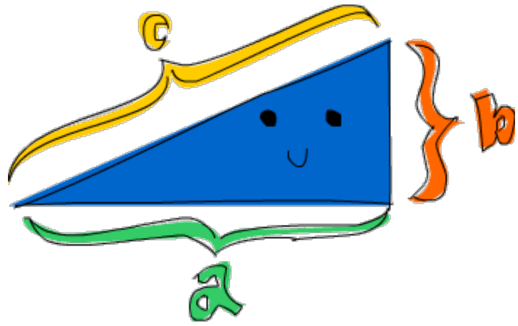
In mathematics, the Pythagorean theorem — is a relation in Euclidean geometry among the three sides of a right-angled triangle. In terms of areas, it states:

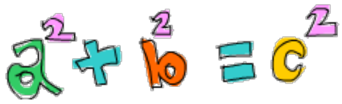
<u>In any right-angled triangle, the area of the square whose side is the hypotenuse (the side opposite the right angle) is equal to the sum of the areas of the squares whose sides are the two legs (the two sides that meet at a right angle).</u>

The theorem can be written as an equation relating the lengths of the sides a, b and c, often called the Pythagorean equation:

$$a^2 + b^2 = c^2$$

where c represents the length of the hypotenuse, and a and b represent the lengths of the other two sides.





Given n, your task is to count how many right-angled triangles with side-lengths a, b and c that satisfied an inequality $1 \le a \le b \le c \le n$.

Input

The only line contains one integer n $(1 \le n \le 10^4)$ as we mentioned above.

Output

Print a single integer — the answer to the problem.

input
```
5
```
output
```
1
```

input
```
74
```
output
```
35
```

X. Tricky Sum

1 second, 256 megabytes

In this problem you are to calculate the sum of all integers from 1 to n, but you should take all powers of two with minus in the sum.

For example, for $n = 4$ the sum is equal to $-1 - 2 + 3 - 4 = -4$, because 1, 2 and 4 are 2^0, 2^1 and 2^2 respectively.

Calculate the answer for t values of n.

Input

The first line of the input contains a single integer t $(1 \le t \le 100)$ — the number of values of n to be processed.

Each of next t lines contains a single integer n $(1 \le n \le 10^9)$.

Output

Print the requested sum for each of t integers n given in the input.

input
```
2
4
1000000000
```
output
```
-4
499999998352516354
```

The answer for the first sample is explained in the statement.

Y. Word

2 seconds, 256 megabytes

Vasya is very upset that many people on the Net mix uppercase and lowercase letters in one word. That's why he decided to invent an extension for his favorite browser that would change the letters' register in every word so that it either only consisted of lowercase letters or, vice versa, only of uppercase ones. At that as little as possible letters should be changed in the word. For example, the word `HoUse` must be replaced with `house`, and the word `ViP` — with `VIP`. If a word contains an equal number of uppercase and lowercase letters, you should replace all the letters with lowercase ones. For example, `maTRIx` should be replaced by `matrix`. Your task is to use the given method on one given word.

Input

The first line contains a word s — it consists of uppercase and lowercase Latin letters and possesses the length from 1 to 100.

Output

Print the corrected word s. If the given word s has strictly more uppercase letters, make the word written in the uppercase register, otherwise - in the lowercase one.

input
```
HoUse
```
output
```
house
```

input
```
ViP
```
output
```
VIP
```

input
```
maTRIx
```
output
```
matrix
```

Z. Sale

2 seconds, 256 megabytes

Once Bob got to a sale of old TV sets. There were n TV sets at that sale. TV set with index i costs a_i bellars. Some TV sets have a negative price — their owners are ready to pay Bob if he buys their useless apparatus. Bob can «buy» any TV sets he wants. Though he's very strong, Bob can carry at most m TV sets, and he has no desire to go to the sale for the second time. Please, help Bob find out the maximum sum of money that he can earn.

Input

The first line contains two space-separated integers n and m $(1 \le m \le n \le 100)$ — amount of TV sets at the sale, and amount of TV sets that Bob can carry. The following line contains n space-separated integers a_i $(- 1000 \le a_i \le 1000)$ — prices of the TV sets.

Output

Output the only number — the maximum sum of money that Bob can earn, given that he can carry at most m TV sets.

input
```
5 3
-6 0 35 -2 4
```
output
```
8
```

input
```
4 2
7 0 0 -7
```
output
```
7
```