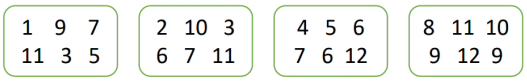
Problem F. Find The Number

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	1024 mebibytes

David and Harry are friends at the International College of Playing Cards. One day, David met Harry and said:

"I'll do a magic trick for you. Pick any number between 1 and 12. But don't tell me your number! Just keep it in your mind."

Harry secretly chose 11. David then showed Harry the following four cards, one by one. As he was showing each of the cards, he asked: "Is your number on this card?"



So, Harry answered "Yes, yes, no, yes" in this order. After that, David did some magically looking gestures with his arms and legs for a while, then he finally shouted, "I've got your number. It is 11." And Harry was quite surprised because it was exactly the number he chose, and he kept it secret.

David didn't tell Harry the secret of the trick. He only said: "These cards have a great magic power, so they can read your mind and tell me things in a magical language that only I can understand."

How does this work? Can you figure out the secret?

Now, you are to write a program that guesses the numbers in your friends' minds. We can generalize the magic trick as follows: You have K magic cards. There are exactly M integers written on each card. All integers are between 1 and N. You perform the magic trick to F friends. Each of them answers your questions truthfully. For each friend, given their answers, guess the number in that friend's mind, or determine that it is impossible.

Input

The input starts with a line containing four integers, N, K, M, and F ($1 \le N \le 500\,000$, $1 \le K \le 100$, $1 \le M \le 5000$, $1 \le F \le 50\,000$).

Each of the following K lines contains M integers between 1 and N: the numbers written on the respective magic card.

In each of the following F lines, you are given a string of length K which represents the answers of the respective friend. Each character is either '`Y`' for "yes" or "`N`" for "no". You can assume that each friend has an integer between 1 and N in mind, and everyone answers your questions truthfully.

Output

Print exactly F lines. For each $i = 1, 2, \ldots, F$, the i-th line should contain the number in the i-th friend's mind. If it is impossible to uniquely identify some number, print 0 instead.

Examples

standard input	standard output
12 4 6 3 1 9 7 11 3 5 2 10 3 6 7 11 4 5 6 7 6 12 8 11 10 9 12 9 YYNY NNNY YNNN	11 8 1
13 4 6 4 1 9 7 11 3 5 2 10 3 6 7 11 4 5 6 7 6 12 8 11 10 9 12 9 YYNY NNNY YNNN NNNN	11 8 1 13
14 4 6 4 1 9 7 11 3 5 2 10 3 6 7 11 4 5 6 7 6 12 8 11 10 9 12 9 YYNY NNNY YNNN NNNN	11 8 1 0