Problem I
REPLACEMENT
Time limit: 0.5 seconds

Alice has just developed a language operating on characters that are natural numbers less than Z. She has a set of n transformation rules, each in the form: x –> $y_1, y_2, \ldots, y_k$ (with $2 \leq x < Z$; $0 \leq y_i < Z$). Each rule can be applied multiple times, and the process stops only when a binary sequence is obtained. For example, with the rules:

3 –> 2,3;
3 –> 2,4,6;
2 –> 0,0,1;
4 –> 1;
6 –> 4,0,4

She can transform the sequence 1,2,3,4 as follows:

1,2,3,4 –> 1, 2, **2, 3**, 4 –> 1, 2, 2, 3, **1** –> 1, 2, 2, **2, 4, 6**, 1 –> 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1

Bob has a set of m binary sequences. Help Alice, starting from a single number, find the shortest binary sequence that does not have any subsequence (contiguous) that appears in Bob's set.

Input

- The first line contains three integers: Z, n, m; $(0 \leq Z - 2 \leq n \leq 100; 0 \leq m \leq 50)$.
- Each of the following n lines contains a rule in the format: x k y_1 y_2 ... y_k; The sum of k over all rules is at most 100. For each integer x $(2 \leq x < Z)$, there exists at least one rule that starts from x.
- Each of the following m lines contains one of Bob's binary sequences in the format: k b_1 b_2 ... b_k. The sum of k over all sequences is at most 50.

Output

Print $Z - 1$ lines, where the i^{th} line contains the length of the shortest binary sequence that Alice can create starting from the number $a = i + 1$, such that no contiguous subsequence appears in Bob's set. If no finite sequence satisfies the conditions, print 0. The input guarantees that if a finite sequence exists, there exists a sequence with the length not exceeding $2^{64} - 1$.

Sample Input	Sample Output
7 5 3 3 2 2 3 3 3 2 4 6 2 3 0 0 1 4 1 1 6 3 4 0 4 3 0 0 0 3 1 1 1 4 0 1 0 1	3 0 1 0 3