Problem D. Minimum Cover

Input file:	input.txt
Output file:	output.txt
Time limit:	3 seconds
Memory limit:	256 mebibytes

A vertex cover of a graph is a set of vertices such that each edge of the graph is incident to at least one vertex of the set. A minimum vertex cover is a vertex cover with minimal cardinality.

Consider a set of all minimum vertex covers of a given bipartite graph. Your task is to divide all vertices of the graph into three sets. A vertex is in set N ("Never") if there is no minimum vertex cover containing this vertex. A vertex is in set A ("Always") if it is a part of every minimum vertex cover of the given graph. If a vertex belongs neither to N nor to A, it goes to the set E ("Exists").

Input

The first line of input contains three integers n, m, k: the size of the first vertex set of the bipartite graph, the size of the second vertex set and the number of edges ($1 \le n, m \le 1000$; $0 \le k \le 10^6$). Next k lines contain pairs of numbers of vertices, connected by an edge. First number denotes a vertex from the first set, second — from the second set. Vertices in each set are numbered starting from one. No pair of vertices is connected by more than one edge.

Output

On the first line, print a sequence of n letters 'N', 'E', 'A' without spaces. The letter on position i corresponds to the set containing i-th vertex of the first set. The second line must contain the answer for the second vertex set in the same format.

Example

input.txt	output.txt
11 9 22 1 1 1 2 1 3 1 8 1 9 2 1 2 3 3 2 3 4 4 3 4 5 5 2 5 4 5 6 6 6 6 7 7 5 7 7 8 7 9 7 10 7 11 7	AEEEEEENNNN EEEEEEANN