Scouting the Criminals' Lair

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Joe, the police officer, is traveling on his horse, traversing rocky terrain in order to scout out the criminals' lair. Given a landscape represented as a grid of dimensions M rows by N columns, determine whether he can travel from his starting point to the lair without landing on obstacles. The horse can move in K different ways. Each specific move that Joe can take is represented in the problem as a pair of numbers X_i and Y_i, which represents how many x-coordinates the horse moves and how many y-coordinates the horse moves in that move. (A positive X_i represents a move rightward, and a positive Y_i coordinate a move upward, and the opposite for negative X_i or Y_i). The officer can only move to the final position if the final position does not contain an obstacle, regardless if any intermediate location on the path contains an obstacle. If the officer cannot travel to the objective, find the closest distance, calculated by Manhattan distance, he can get to the lair along with the minimum amount of moves needed to achieve that closest distance. If he can travel to the objective, find the minimum amount of moves needed to reach the lair.

Input

Line 1: Two space-separated integers, M and N
Line 2: K
Line 3...2+M: N characters where . is an empty spot, X is an obstacle, A is Joe's starting position, and B is the position of the lair
Line 2+M...1+M+K: X_i, Y_i

Output

Line 1: YES if it is possible to travel to the lair, NO otherwise
Line 2: If it is possible to travel to the lair, print the minimum amount of moves to reach the lair. Otherwise, print the closest distance one can get to the lair and the minimum amount of moves needed to achieve that closest distance.

Examples

standard input	standard output
5 5 3 .X.A. ....X .B.X. ...X. X...X -1 0 0 -1 1 2	YES 4
5 5 3 A.... .XXX. .XBX. .XXX. ....X 1 0 0 -1 3 3	NO 2 2

Note

$0 \leq M, N \leq 1000$
$0 \leq K \leq 50$
$\|X_i\| \leq M$
$\|Y_i\| \leq N$
The Manhattan distance between points (a, b) and (c, d) is defined to be $\|a - c\| + \|b - d\|$.