The Mystery of Area 51

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1.5 seconds
Memory limit:	256 megabytes

Area 51 is the common name of a highly classified United States Air Force facility. The intense secrecy surrounding the base has made it the frequent subject of conspiracy theories and a central component of UFO folklore.

The US Government has been informed about whistleblowers who are aware of the secret behind Area 51 and are going to share it with the public. You are given a 2D grid which consists of 'W' (Whistleblower), 'P' (People eager to know the secret), 'X' (Empty space). It takes 1 day for a whistleblower at (i, j) to share the secret with his/her neighbours standing at $(i + 1, j)$, $(i - 1, j)$, $(i, j + 1)$, $(i, j - 1)$ and then these neighbours will become whistleblowers too and thus the secret will keep on spreading.

Now the US Government wants to know the number of days it has for it to take an action till the secret will be known to everyone present in the grid . You need to find the minimum number of days it will take for the secret to reach all the people in the grid.

If the secret does not spread to all the people print -1.

Input

The first line contains integers n and m the sizes of the array ($1 \leq n, m \leq 1000$). Then a 2D char array is given, n lines each containing m characters which can be 'W', 'P' or 'X'.

Output

A single integer denoting the minimum number of days it will take for the secret to reach all the people in the grid.

Examples

standard input	standard output
3 6 X X X W W P X X W W P P P P W P P P	3
3 5 W P X W P P X P W P P X X W P	2
4 3 W P X X X W P X P X P P	-1