Lost[†]

John and Kate are lost in a dangerous and mysterious island, from which they need to escape. The two friends have spent some time on the island and they discovered that it has magical properties. The island contains magical wheels that can be used to travel to another spot on the island. Also, when a person uses a magical wheel, he/she will travel back or forward in time.

The island is within a grid of $R \times C$ cells, surrounded by water. Whenever a person reaches the exit cell, he/she will immediately exit the island. On their way to the exit, they can only move up, down, left or right. In each cell there can be grass, a magical wheel, an obstacle or water:

- If the cell is grass, John and Kate can occupy it. The cost of moving from a grass cell to any other cell is one time unit.
- If the cell is a magical wheel, whoever uses it will travel to a grass cell, another magical wheel or to the exit of the island, at a different moment in time. The destination will depend on the magical wheel. The magical wheel can also be used as a grass cell.
- If the cell is an obstacle, it cannot be walked into.
- If the cell is water, a person who can swim can occupy it and swim across it. The cost of moving from a water cell to any other cell is two time units. For anyone who cannot swim a water cell is an obstacle.

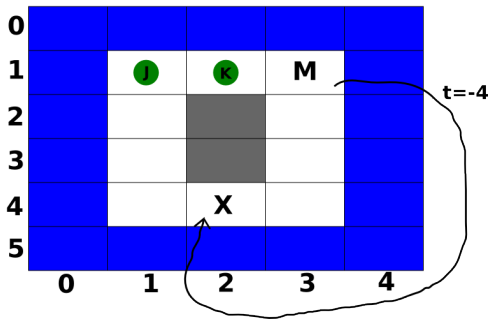
Note that the characters can occupy the same cell at the same time. John and Kate have different skills:

- John cannot swim and can use magical wheels.
- Kate cannot use magical wheels but she knows how to swim.

Task

Your task is to find which is the minimum amount of time needed to travel from the starting point to the exit cell for each person. Note that it may happen that a person finds him/herself travelling back in time, indefinitely. In that case, that person will be lost in time. Also, the exit cell may not be reachable by either or both of them.

[†]A few minor changes have been made to the original version, which appeared in the 1st Contest of TIUP 2014 (9th of April), organized by Departamento de Engenharia Informática da Universidade de Coimbra.



The figure above illustrates a possible island (the first test case from the sample input). In this case, there are two obstacles at positions $(2, 2)$ and $(3, 2)$, the exit is located at position $(4, 2)$, and there is a magical wheel at position $(1, 3)$. The island is surrounded by water (although magical, the island is still an island and so, obviously, it is surrounded by water). John starts at position $(1, 1)$ and Kate at position $(1, 2)$. John is able to use the magical wheel, so he will be out of the island 2 time units (t.u.) before the starting frame:

$$(1, 1)\ [0\text{ t.u.}] \rightarrow (1, 2)\ [1\text{ t.u.}] \rightarrow (1, 3)\ [2\text{ t.u.}] \rightarrow (4, 2)\ [-2\text{ t.u.}]$$

Kate will spend 5 time units to reach the exit as she does not know how to use the magical wheels.

Input

The first line of the input contains the number of test cases, N. Then, N test cases follow.

For each test case, the first line will contain three integers, R, C and M, representing the number of rows and columns of the map, and the number of magical wheels, respectively. The next R lines will contain C characters each, representing the map of the island. Cells with grass will be represented by a `G`, obstacles by an `O`, water cells by a `W`, and the magical wheels by the integers $1, 2, \ldots, M$. The (only) exit will be represented by an `X`. The next M lines will contain three integers each, r_i, c_i, and t_i, defining the destination cell (r_i, c_i) and the time travelled t_i when the i^{th} magical wheel is used. The last line of each test case will contain four integers, r_J, c_J, r_K, and c_K, indicating the positions of John and Kate on the map (which are (r_J, c_J) and (r_K, c_K), respectively, and which cannot correspond to cells with an obstacle or, in John's case, with water).

Constraints

$1 \leq N \leq 18$	(Number of test cases)
$3 \leq R \leq 60$	(Number of rows)
$3 \leq C \leq 60$	(Number of columns)
$0 \leq M \leq 9$	(Number of magical wheels)
$0 < r_i < R - 1$	(Destination row of the i^{th} magical wheel)
$0 < c_i < C - 1$	(Destination column of the i^{th} magical wheel)
$-100\,000 \leq t_i \leq 100\,000$	(Time travelled when the i^{th} magical wheel is used)

Output

For each test case, 3 lines will be printed. The first will contain "`Case #`I". The second and third lines will contain the output for John and Kate, respectively. Each line should contain the name of the character it refers to, followed by the corresponding output. If the character successfully reached the exit, then the corresponding output is an integer (negative, zero or positive) representing the minimum time the character needs to reach the exit. If the character is lost in time, the string "`Lost in Time`" must be printed instead of the number. If the exit cannot be reached, the word "`Unreachable`" must be printed. In case the character is lost in time (regardless of whether the exit is reachable or unreachable), only "`Lost in Time`" must be printed.

Sample Input

```
4
6 5 1
WWWWW
WGG1W
WGOGW
WGOGW
WGXGW
WWWWW
4 2 -4
1 1 1 2
5 5 0
WWWWW
WGGXW
WGOGW
WGOGW
WWWWW
3 1 3 1
5 5 0
WWWWW
WGOGW
WOOGW
WGGXW
WWWWW
1 1 1 1
5 5 1
WWWWW
W1GGW
WGGGW
WGGXW
WWWWW
1 2 -3
1 2 2 1
```

Sample Output

```
Case #1
John -2
Kate 5
Case #2
John 4
Kate 4
Case #3
John Unreachable
Kate 9
Case #4
John Lost in Time
Kate 3
```