Problem D - Perseguição às Cores

If this is your first time competing, check our instruction page for detailed information on the format of this problem.

Alice and Bruno are playing a game with miniature cops (*policias*) and robbers (*ladrões*). Alice has N robber figures and Bruno has M cop figures ($M \leq N$). Alice has already fixed the positions of the robbers side by side in consecutive integer positions $1, 2, \ldots, N$. Bruno has to position its cops also side by side in consecutive integer positions, on a line parallel to the robbers, but he can choose its leftmost cop as any integer between 1 and $N - M + 1$.

Each figure has one of two colors: blue (*azul*) or red (*vermelho*). The colors $A_1, A_2, \ldots, A_N$ of Alice's figures and $B_1, B_2, \ldots, B_M$ of Bruno's figures are already known.

After Bruno chooses the position of its leftmost cop, the game begins and, if a robber and a cop face each other (on the same position) and have different colors, the cop captures the robber. Bruno wins the game if he can capture an odd total number of robbers; if this number is even, Alice wins. The game ends right away.

Part I

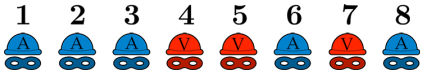
For T game scenarios, you will be given the colors of the robbers ($A_1, A_2, \ldots, A_N$) and of the cops ($B_1, B_2, \ldots, B_M$). The order of the cops and robbers cannot be changed.

For each of the scenarios, determine in how many ways can Bruno win the game, that is, for how many positions of his leftmost cop we would win.

Example

Suppose that $N = 8$ and $M = 5$ and that we have the following colors (the letters indicate the color):

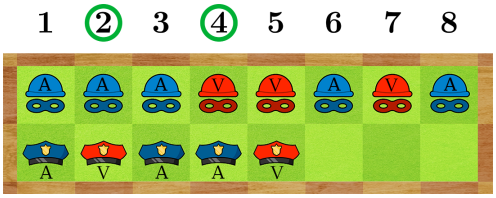
Ladrões



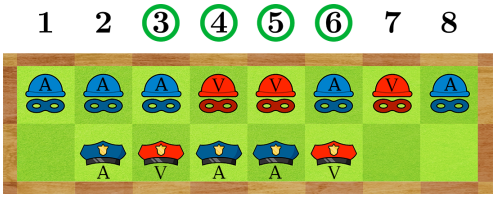
Polícias

In this case Bruno has 4 options for its leftmost cop. Let's see how many robbers he can capture in each one of them:

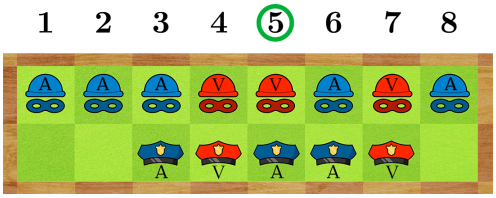
- If the leftmost cop is on position 1, he can capture a total of 2 robbers:



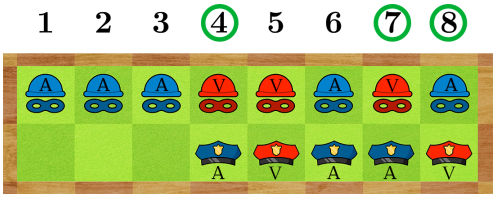
- If the leftmost cop is on position 2, he can capture a total of 4 robbers:



- If the leftmost cop is on position 3, he can capture a total of 1 robber:



- If the leftmost cop is on position 4, he can capture a total of 3 robbers:



Therefore, of these 4 positions, in only two of them (positions 3 and 4) can Bruno capture an odd number of robbers and thus the answer is 2.

Constraints

The following limits are guaranteed for all test cases of this part that will be given to the program:

$1 \leq \boldsymbol{T} \leq 10$	Number of scenarios
$1 \leq \boldsymbol{M} \leq \boldsymbol{N} \leq 100\,000$	Number of cops and robbers

The test cases of this part of the problem are organized into two groups with different additional constraints:

Subtask	Points	Additional Constraints
1	15	$\boldsymbol{N} \leq 1000$
2	35	No further restrictions

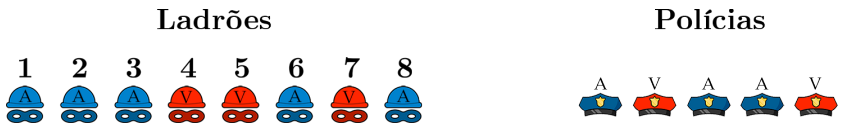
Part II

Again, for $\boldsymbol{T}$ game scenarios, you will be given the colors of the robbers $(\boldsymbol{A}_1, \boldsymbol{A}_2, \ldots, \boldsymbol{A}_{\boldsymbol{N}})$ and of the cops $(\boldsymbol{B}_1, \boldsymbol{B}_2, \ldots, \boldsymbol{B}_{\boldsymbol{M}})$. The order of the cops and robbers cannot be changed.

This time, before the game begins, Alice can change the color of, **at most**, one of its robbers, with the goal of minimizing the number of ways of Bruno winning. For each of the scenarios, determine the minimum number of ways of Bruno winning on that case.

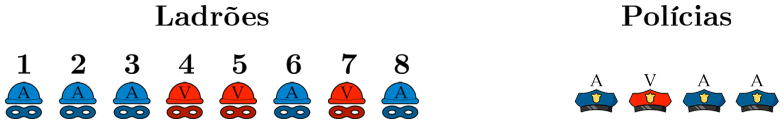
Example

Suppose that $\boldsymbol{N} = 8$ and $\boldsymbol{M} = 5$ and that we have the following colors:



If Alice changes the color of the robber in position 7 from red to blue, Bruno cannot win any game, and thus the answer in this case is 0.

Suppose now that $\boldsymbol{N} = 8$ and $\boldsymbol{M} = 4$ and that we have the following colors:



If Alice changes the color of the robber in position 5 from red to blue, Bruno can only win one game Since there is no way of making Bruno win a lower number of games, the answer for this case is 1.

Constraints

The following limits are guaranteed for all test cases of this part that will be given to the program:

$1 \leq \boldsymbol{T} \leq 10$	Number of scenarios
$1 \leq \boldsymbol{M} \leq \boldsymbol{N} \leq 100\,000$	Number of cops and robbers

The test cases of this part of the problem are organized into two groups with different additional constraints:

Subtask	Points	Additional Constraints
3	15	$\boldsymbol{N} \leq 1000$
4	35	No further restrictions

Summary of Subtasks

The test cases for the problem are organized into four groups with different additional restrictions:

Subtask	Points	Part	Additional Constraints
1	15	Part I	$\boldsymbol{N} \leq 1000$
2	35	Part I	No further restrictions
3	15	Part II	$\boldsymbol{N} \leq 1000$
4	35	Part II	No further restrictions

Input Format

The first line contains an integer $\boldsymbol{P}$, which represents the part that the test case represents. If it is 1, then the test case refers to Part I, if it is 2 then it refers to Part II.

This is followed by a line with an integer $\boldsymbol{T}$, representing the number of scenarios to consider.

For each scenario, you will receive a set of 3 lines in the following format. On the first line come two integers $\boldsymbol{N}$ and $\boldsymbol{M}$ separated by a space, indicating respectively the number of robbers and cops. Finally, two lines follow indicating the figure colors: the first line contains N letters $\boldsymbol{A}_1, \boldsymbol{A}_2, \ldots, \boldsymbol{A}_{\boldsymbol{N}}$ without spaces, where each one is "`A`" (azul) or "`V`" (vermelho); the second line comes in the same format $\boldsymbol{M}$ letter $\boldsymbol{B}_1, \boldsymbol{B}_2, \ldots, \boldsymbol{B}_{\boldsymbol{M}}$ without spces, where each one is "`A`" (azul) or "`V`" (vermelho).

Output Format

Part I

The output should contain $\boldsymbol{T}$ lines, each one with an integer: the number of ways of Bruno winning the game.

Part II The output should contain $\boldsymbol{T}$ lines, each one with an integer: the minimum number of ways of Bruno winning the game.

Example 1 Input

```
1
1
8 5
AAAVVAVA
AVAAV
```

Example 1 Output

```
2
```

Example 1 Description

This example corresponds to the example mentioned in Part I of the problem statement.

Example 2 Input

```
2
2
8 5
AAAVVAVA
AVAAV
8 4
AAAVVAVA
AVAA
```

Example 2 Output

```
0
1
```

Example 2 Description

This example corresponds to the example mentioned in Part II of the problem statement.