C Making a Motif

Time limit: 2s

Description

You have a bit string $\boldsymbol{B}$ containing $\boldsymbol{N}$ bits. Bit j of $\boldsymbol{B}$ is denoted by $\boldsymbol{B}_j$. You want to make a motif G containing $\boldsymbol{M}$ bit strings, each containing $\boldsymbol{N}$ bits. Bit j of bit string i is denoted by $G_{i,j}$.

For each bit index, the OR value of all corresponding bits in the motif must be equal to the corresponding bit in $\boldsymbol{B}$. In other words, for each $1 \leq j \leq \boldsymbol{N}$, $OR(G_{1,j}, G_{2,j}, \cdots, G_{\boldsymbol{M},j})$ must be equal to $\boldsymbol{B}_j$. Note that the function OR returns 1 if at least one of the arguments is 1, and 0 if all of the arguments are 0.

You have a pattern $\boldsymbol{P}$ describing the motif you can make. $\boldsymbol{P}$ is represented by a collection of $\boldsymbol{M}$ strings, each containing $\boldsymbol{N}$ characters '`0`', '`1`', or '`?`'. Character j in string i is denoted by $\boldsymbol{P}_{i,j}$. $\boldsymbol{P}_{i,j}$ restricts the motif you can make as follows:

- If $\boldsymbol{P}_{i,j} =$ '`0`', then $G_{i,j}$ must be 0.
- If $\boldsymbol{P}_{i,j} =$ '`1`', then $G_{i,j}$ must be 1.
- If $\boldsymbol{P}_{i,j} =$ '`?`', then $G_{i,j}$ can either be 0 or 1.

The *difference value* of a motif is defined as the number of neighbouring distinct bits. In other words, the difference value of motif G is the number of pairs of indices (i, j) satisfying $1 \leq i \leq \boldsymbol{M}$, $1 \leq j < \boldsymbol{N}$, and $G_{i,j} \neq G_{i,j+1}$.

Determine whether you can make a motif satisfying all the above conditions. If you can, make a motif satisfying all the above conditions with the minimum difference value.

Input

The first line contains two integers $\boldsymbol{M}$ and $\boldsymbol{N}$ ($1 \leq \boldsymbol{M}, \boldsymbol{N} \leq 200\,000; \boldsymbol{M} \times \boldsymbol{N} \leq 200\,000$) separated by a space. The second line contains a bit string $\boldsymbol{B}$ containing $\boldsymbol{N}$ bits. The next $\boldsymbol{M}$ lines each contains $\boldsymbol{N}$ characters '`0`', '`1`', or '`?`'. Charater j in line $i + 2$ is the value of $\boldsymbol{P}_{i,j}$.

Output

If you can make a motif satisfying all the above conditions, then the output has the following format. The first line contains the minimum difference value of a motif you can make. The next $\boldsymbol{M}$ lines each contain $\boldsymbol{N}$ bits. Bit j in line $i + 1$ is bit j of bit string i in the motif you make. If there is more than one solution, you may output any solution.

If you cannot make a motif satisfying all the above conditions, then the output has the following format. The first line contains the integer -1.

Sample Input 1	Sample Output 1
2 4 1001 ??0? 10??	2 0001 1000

Sample Input 2	Sample Output 2
2 4 1001 ?10? 10??	-1

Explanation of samples

In sample input 1, the following output is also allowed.

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2
0000
1001
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In sample input 2, since $G_{1,2}$ must be 1, $OR(G_{1,2}, G_{2,2})$ cannot be 0.