D. 505

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

A binary matrix is called **good** if every **even** length square sub-matrix has an **odd** number of ones.

Given a binary matrix a consisting of n rows and m columns, determine the minimum number of cells you need to change to make it good, or report that there is no way to make it good at all.

All the terms above have their usual meanings — refer to the Notes section for their formal definitions.

Input

The first line of input contains two integers n and m ($1 \le n \le m \le 10^6$ and $n \cdot m \le 10^6$) — the number of rows and columns in a, respectively.

The following n lines each contain m characters, each of which is one of `0` and `1`. If the j-th character on the i-th line is `1`, then $a_{i,j} = 1$. Similarly, if the j-th character on the i-th line is `0`, then $a_{i,j} = 0$.

Output

Output the minimum number of cells you need to change to make a good, or output -1 if it's not possible at all.

Examples

input Copy

```
3 3
101
001
110
```

output Copy

```
2
```

input Copy

```
7 15
000100001010010
100111010110001
101101111100100
010000111111010
111010010100001
000011001111101
111111011010011
```

output Copy

```
-1
```

Note

In the first case, changing $a_{1,1}$ to 0 and $a_{2,2}$ to 1 is enough.

You can verify that there is no way to make the matrix in the second case good.

Some definitions —

- A binary matrix is one in which every element is either 1 or 0.
- A sub-matrix is described by 4 parameters — r_1, r_2, c_1, and c_2; here, $1 \le r_1 \le r_2 \le n$ and $1 \le c_1 \le c_2 \le m$.

Codeforces Round #663 (Div. 2)

Finished

→ **Virtual participation**

Virtual contest is a way to take part in past contest, as close as possible to participation on time. It is supported only ICPC mode for virtual contests. If you've seen these problems, a virtual contest is not for you - solve these problems in the archive. If you just want to solve some problem from a contest, a virtual contest is not for you - solve this problem in the archive. Never use someone else's code, read the tutorials or communicate with other person during a virtual contest.

Start virtual contest

→ **Problem tags**

bitmasks | brute force | constructive algorithms | dp | greedy | implementation | *2000

No tag edit access

→ **Contest materials**

- Announcement (en)
- Tutorial (en)

- This sub-matrix contains all elements $a_{i,j}$ that satisfy both $r_1 \le i \le r_2$ and $c_1 \le j \le c_2$.
- A sub-matrix is, further, called an even length square if $r_2 - r_1 = c_2 - c_1$ and $r_2 - r_1 + 1$ is divisible by 2.

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