Circular Matching

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	1024 megabytes

Let U be a string of length $2m$ that contains exactly m `0`s and m `1`s. We define $f(U)$ as the answer to the following subproblem:

> Consider $2m$ points placed at equal intervals around a circle, numbered from 1 to $2m$ in a clockwise direction. Initially, each point has one ball placed on it. If $U_i = $ `0`, the ball at point i is red. If $U_i = $ `1`, the ball is blue. You may perform the following operation any number of times (including zero):
>
> - Choose one ball. Suppose it is currently on point i. You may move it to point $i + 1$ or $i - 1$.
>
> Here, point $2m + 1$ refers to point 1, and point 0 refers to point $2M$.
>
> Your goal is to reach a state where, for every point i, the number of red balls and the number of blue balls on that point are equal. Find the minimum number of operations required to achieve this goal.

You are given a string S of length n consisting of `0`s and `1`s. You are also given q queries. Each query consists of two integers l and r. Let T be the substring of S from the l-th to the r-th character (inclusive). It is guaranteed that T contains an equal number of `0`s and `1`s. Compute $f(T)$.

Input

The first line of the input contains two integers n and q ($1 \le n, q \le 2 \times 10^5$).

The next line of the input contains a string S of length n consisting of `0`s and `1`s.

The next q lines describes all the queries. The i-th line of these lines contains two integers l_i and r_i ($1 \le l_i \le r_i \le n$), indicating a query. It is guaranteed that the substring of S from l to r contains the same number of `0`s and `1`s.

Output

For each query, output a single line contains a single integer, indicating the answer.

Examples

standard input	standard output
10 3 1101000110 2 5 6 9 1 10	2 2 7
29 10 11000001110001010001100100001 16 21 24 25 6 11 7 12 1 10 14 21 10 11 1 4 14 17 8 21	5 1 5 5 13 6 1 2 2 15

Note

Let's explain the first query of the first test case. $T = \texttt{1010}$. Let's consider the subproblem with $U = T$. To achieve the goal, the following sequence of operations is optimal:

- Initially, red balls are placed at points 2 and 4, and blue balls are placed at points 1 and 3.
- Move the blue ball from point 3 to point 2.
- Move the red ball from point 4 to point 1.

Thus, $f(T) = 2$.