Medusa's Snake (Full)

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

Medusa has a string of n characters, where each character is `S`, `N`, `A`, `K` or `E`.

The venom X snake is defined as the string consisting of X copies of the character `S`, followed by X of `N`, then X of `A`, then X of `K`, and finally X of `E`:

$$\underbrace{\texttt{S S}\ldots\texttt{S}}_{X}\underbrace{\texttt{N N}\ldots\texttt{N}}_{X}\underbrace{\texttt{A A}\ldots\texttt{A}}_{X}\underbrace{\texttt{K K}\ldots\texttt{K}}_{X}\underbrace{\texttt{E E}\ldots\texttt{E}}_{X}.$$

The venom level of a general string s is then the largest X such that the venom X snake is a (not necessarily contiguous) substring of s.

Medusa needs to make q edits to her string. After each of these edits, report the venom level of the string.

Input

The first line of input consists of two space-separated integers n and q.

The second line of input consists of a string of n characters, each of which is an uppercase `S`, `N`, `A`, `K` or `E`.

q lines follow, each of which contains an integer i ($1 \leq i \leq n$) and a character c ($c \in \{\texttt{S}, \texttt{N}, \texttt{A}, \texttt{K}, \texttt{E}\}$), representing a edit which changes the ith character of the string to c.

Subtask (50 points): $1 \leq n, q \leq 1,000$.

Full (50 points): $1 \leq n, q \leq 100,000$.

Output

For each of the edits to the string, print an integer on its own line, representing the updated venom level of the string. Note that you do not need to print the venom level of the original string.

Examples

standard input	standard output
6 4 SAAAKE 3 N 4 K 2 N 3 A	1 0 0 1
20 1 NSESNNEKANKSAEKNKESE 7 E	2

Note

In the first sample case the original string has six characters.

The first edit changes the string to `SANAKE`, which has the venom 1 snake `SNAKE` as a substring.

The second edit changes the string to `SANKKE`, which does not have the venom 1 snake `SNAKE` as a substring (let alone snakes of higher venom).

The third edit changes the string to `SNNKKE`, which also has venom level 0, since it does not even have any `A`s.

The fourth edit changes the string to `SNAKKE`, which has venom level 1.

In the second sample case the only edit does not change the string, as the seventh letter is already `E`. The venom 2 snake is highlighted in red.

NSESNNEKANKSAEKNKESE