A DNA sequence can be represented as a string consisting of the letters A, C, G and T, which correspond to the types of successive nucleotides in the sequence. Each nucleotide has an *impact factor*, which is an integer. Nucleotides of types A, C, G and T have impact factors of 1, 2, 3 and 4, respectively. You are going to answer several queries of the form: What is the minimal impact factor of nucleotides contained in a particular part of the given DNA sequence?

The DNA sequence is given as a non-empty string S = S[0]S[1]...S[N-1] consisting of N characters. There are M queries, which are given in non-empty arrays P and Q, each consisting of M integers. The K-th query (0 ≤ K < M) requires you to find the minimal impact factor of nucleotides contained in the DNA sequence between positions P[K] and Q[K] (inclusive).

For example, consider string S = CAGCCTA and arrays P, Q such that:

P[0] = 2 Q[0] = 4 P[1] = 5 Q[1] = 5 P[2] = 0 Q[2] = 6

The answers to these M = 3 queries are as follows:

* The part of the DNA between positions 2 and 4 contains nucleotides G and C (twice), whose impact factors are 3 and 2 respectively, so the answer is 2.
* The part between positions 5 and 5 contains a single nucleotide T, whose impact factor is 4, so the answer is 4.
* The part between positions 0 and 6 (the whole string) contains all nucleotides, in particular nucleotide A whose impact factor is 1, so the answer is 1.

Write a function:

vector<int> solution(string &S, vector<int> &P, vector<int> &Q);

that, given a non-empty string S consisting of N characters and two non-empty arrays P and Q consisting of M integers, returns an array consisting of M integers specifying the consecutive answers to all queries.

The sequence should be returned as:

* a Results structure (in C), or
* a vector of integers (in C++), or
* a Results record (in Pascal), or
* an array of integers (in any other programming language).

For example, given the string S = CAGCCTA and arrays P, Q such that:

P[0] = 2 Q[0] = 4 P[1] = 5 Q[1] = 5 P[2] = 0 Q[2] = 6

the function should return the values [2, 4, 1], as explained above.

Assume that:

* N is an integer within the range [1..100,000];
* M is an integer within the range [1..50,000];
* each element of arrays P, Q is an integer within the range [0..N − 1];
* P[K] ≤ Q[K], where 0 ≤ K < M;
* string S consists only of upper-case English letters A, C, G, T.

Complexity:

* expected worst-case time complexity is O(N+M);
* expected worst-case space complexity is O(N) (not counting the storage required for input arguments).