D2-C - Optimal Range Minimum Query

Time Limit: 8 secs.
Memory Limit: 2048 MB.

Problem Description

In this assignment you will implement the optimal algorithm for the range minimum query problem as a function library in C++.

You must implement the following two functions:

1. `void warm_up( int seq[], int n );`
2. `int query( int left, int right );`

The source code you submit will be used as a *subroutine* to solve the RMQ problem. Before any query, the function warm_up() will be called and the static data will be passed to this function. You may assume that the input data is a valid integer array that contains n elements. When this function finishes, the array `seq[]` may or may not exist. Hence, it is your responsibility to store the data for later queries.

After the function warm_up() is called, the external program will use the function query(left, right) to query the minimum value in `seq[left...right]`. You should return **the index** of the minimum element within `seq[left...right]`. If `[ left, right ]` does not corresponds to a valid range, return `-1` instead.

The indexes of the array follows the standard spec. Hence, they range from 0 to $n - 1$.

Requirements and Specs

For your submission to be judged correctly, make sure that you adhere the following requirements.

- Select the language "`C++ - Function only`" when submitting your program.

  The file you submit *must not* contain the `main` function. Otherwise it will result in a compilation error.

- You must include in your source file a line containing the following comment as an identifier.

  ```
  /* ProbId:  D2-C-Optimal-RMQ */
  ```

The followings are additional requirements and specs you may assume.

- The allowed time complexities for the two functions warm_up() and query() are $O(n)$ and $O(1)$, respectively.
- The size of n is at most 4×10^7, and there will be at most 10^7 queries.