
Question 1:

Support Q queries of two types:

1. Assign a value to a point in the plane.
2. Output the maximum value in a axis-aligned rectangle.

Assume the initial value of every point is 0. All coordinates and values do not exceed 10^9 in absolute value.

Question 2:

You are given two arrays A and B , both of length N . Output the length of the longest increasing sub-sequence, where index i to index j is defined as increasing if $i < j$, $A[i] < A[j]$, and $B[i] < B[j]$.

$N \leq 300000$

$0 \leq A[i], B[i] \leq 10^9$ for all i .

Question 3:

There are N teams at a local soccer competition. Each team has a unique ID consisting of a binary string of length M . In every match, one team will be eliminated, and that team cannot compete in any more games.

The tournament will proceed as follows: at any point, as the manager, you will choose two teams that have not yet been eliminated to play each other. This process will occur $N - 1$ times, after which the last remaining team is labeled the winner.

The "excitement" value of any match is the hamming distance of the IDs of the two teams (The hamming distance of two binary strings is the number of bits that differ between them).

Out of all possible ways to match teams, and all possible outcomes of the matches, what is the maximum total excitement possible?

$M \leq 18$

$N \leq 2^M$