It suffices to count the number of pairs (i, j) that satisfies $a[i]$ xor $a[j] \le x$.
1. Use trie. $O(n \log U)$.
2. Similar to 421. Maximum XOR of Two Numbers in an Array. First sort the integers, then build the compressed trie in $O(n)$ time, which has $O(n)$ nodes and edges. Perform a dfs on the trie to enumerate all possible $a[i]$'s, and the value $a[i]$ xor x will also traverse the trie once (we can simulate the traversal using bit operations), in the meantime we maintain the number of possible j's, so the running time is $O(n)$. $O(\text{sort}(n))$.
3. Suppose we want to count the number of pairs $a[i]$ xor $a[j] < x$. Let k denote their leftmost differing position, we must have $(a[i]$ xor $a[j])[k] = 0$ and $x[k] = 1$. In other words, $a[i][1..k-1]$ xor $a[j][1..k-1] = x[1..k-1]$, $a[i][k]$ xor $a[j][k] = 0$, and $x[k] = 1$. So we only need to count the frequency of the first i bits of the input numbers (in $[2^i]$), for $i = 1, \ldots, \log U$. $O(\min\{n + U, n \log \frac{U}{n}\}) = O(n + n \log \frac{U}{n})$.
4. Fast Walsh-Hadamard transform. $O(U \log U)$.

Count Pairs With XOR in a Range

Submission Detail

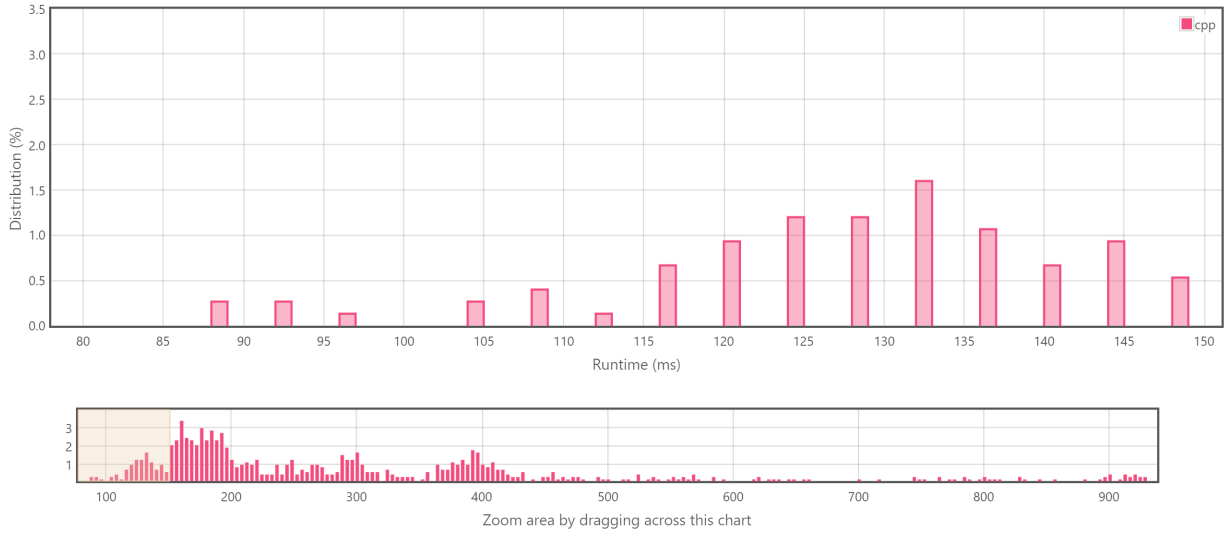
63 / 63 test cases passed.

Status: **Accepted**

Runtime: **32 ms**
Memory Usage: **40 MB**

Submitted: **0 minutes ago**

Accepted Solutions Runtime Distribution



Runtime: 32 ms, faster than 100.00% of C++ online submissions for Count Pairs With XOR in a Range.

Memory Usage: 40 MB, less than 87.35% of C++ online submissions for Count Pairs With XOR in a Range.

References