SOC Project

Competitive Programming- Beginner to Better

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Week 1

Things Learned:-

- Basics of coding in c++ like conditions (if- else), loops (while, for), overflow and precision(int, float, double, etc.), string, array and struct.
- Space complexity:- Basic meaning of time complexity, analysis and examples.
- Refrence
- Vectors and Pairs:- initialising (vector <int> ; pair <int, string>), functions of vectors like size, push_back, pop_back, etc., using vectors in problems where size is not known before, sorting, deletion and insertion of elements.
- Nesting in vectors and pairs, 2-d vectors.
- Pointers and iterators
- Maps:- Basic (sorted storing), unordered, multi- map; Maps stores many pairs which are linked.
- C++ STL

Problems solved:-

- https://codeforces.com/problemset/problem/282/A
- https://codeforces.com/problemset/problem/263/A
- https://codeforces.com/problemset/problem/112/A
- https://codeforces.com/problemset/problem/546/A
- https://codeforces.com/problemset/problem/236/A
- https://codeforces.com/problemset/problem/520/A
- https://codeforces.com/problemset/problem/443/A
- https://codeforces.com/problemset/problem/732/A
- https://codeforces.com/problemset/problem/1624/B
- https://codeforces.com/problemset/problem/199/A

Week 2

Things Learned:-

- Binary Search:-
    (i) Basic Binary Search:- For an array A and search done on [L,R); at each step compute middle(L+R)/2; if A(M) >y, set R=M else L=M. End at R-L==1.
    (ii) Continuous Binary search:- For a continuous function f(x) on L,R; take mid point M=(L+R)/2; if f(M) >y, set R=M else L=M. Repeat until [L,R] is sufficiently small. For error of +-d, time complexity is O(log(R-L)/d).
    (iii) Binary search with powers of 2:- Maintain pointer I and power k. Start at i=L and then on each iteration one tests the predicate at point $i+2^k$. If the predicate is still 0, the pointer is advanced from i to $i+2^k$, , otherwise it stays the same, then the power k is decreased by 1.
- Prefix Sums:- For any array, the prefix sum at any index is the sum of all the elements till that index.
  prefix[k]=prefix[$k-1$]+arr[k]
  From this we get:- *summation(i=L->R)*
  arr[i]=prefix[R]−prefix[$L-1$]

Problems solved:-

- https://codeforces.com/problemset/problem/1592/A
- https://codeforces.com/problemset/problem/2008/C
- https://codeforces.com/problemset/problem/1138/A
- https://codeforces.com/problemset/problem/1725/B
- https://codeforces.com/problemset/problem/1593/C

- https://codeforces.com/problemset/problem/1195/B
- https://codeforces.com/problemset/problem/195/A
- https://codeforces.com/problemset/problem/1419/D1
- https://codeforces.com/problemset/problem/978/C

Week 3

Things Learned:-

- Two pointers method:-
    1. Sub- array sum:- Move right pointer to increase sum; move left if sum exceeds. Time:- O(n).
    2. 2sum problem:- sort the array, put two pointers at opposite ends, if sum>required then move right pointer, if sum < required then move left pointer, if sum == required, break. Time:- O(nlogn) + O(n) sorting + moving pointers.
- Nearest smaller elements:-

  For each element, we find the closest smaller element to its left. If the new element added is greater than current then take it but if it is less than current then remove all the elements that are larger than that element and then take that element. Time- O(n).
- Sliding window minimum:-

  There is a window of fixed size. We track the lowest value in the array and shift it right. If upcoming element is smaller than any of the elements than the larger elements are removed from the window. Time:- O(n)

Problems solved:-

- https://codeforces.com/problemset/problem/381/A
- https://codeforces.com/problemset/problem/1646/B

- https://codeforces.com/problemset/problem/1746/B
- https://codeforces.com/problemset/problem/1791/C
- https://codeforces.com/problemset/problem/1843/A
- https://codeforces.com/problemset/problem/2060/C
- https://codeforces.com/problemset/problem/2025/A

Week 4

- Problems on previous contents

Problems solved:-

- https://codeforces.com/problemset/problem/2117/A
- https://codeforces.com/problemset/problem/2116/A
- https://codeforces.com/problemset/problem/2098/A
- https://codeforces.com/problemset/problem/2091/A

Some of my codes:-

- Submission #325300917 - Codeforces
- Submission #325366153 - Codeforces
- Submission #325665684 - Codeforces
- Submission #325667559 - Codeforces
- Submission #326322720 - Codeforces
- Submission #326323467 - Codeforces