Competitive Programming Reference

ngmh

December 2025

Contents

1 Data Structures

Data Structure	Precomputation / Update	Query	Memory	Notes
Prefix Sum	O(N) / X	O(1)	O(N)	Associative Functions (+, XOR)
Sparse Table	O(N log N) / X	O(1)	O(N log N)	Non-Associative Functions (max, gcd)
Fenwick Tree	X / O(log N)	O(log N)	O(N)	Prefix Sum with Updates
Segment Tree	X / O(log N)	O(log N)	O(4N)	Allows more Information

Table 1: Quick Summary of Data Structures

1.1 Prefix Sums

1.1.1 1D

```
1 //Query - 1-Indexed
2 int query(int s, int e){
3     return ps[e]-ps[s-1];
4 }
5
6 //Precomputation
7 for(int i = 1; i <= n; i++) ps[i] = ps[i-1]+a[i];
```