NPCsCompetitive Programming CookBook

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Contents

Code Templates

Fast I/O

```cpp
// Fast input-output
ios::sync_with_stdio(false);
cin.tie(nullptr);
```

Binary Search

```cpp
// Standard Binary Search
int binary_search(vector<int>& arr, int x) {
    int l = 0, r = arr.size()-1;
    while (l <= r) {
        int mid = (l+r)/2;
        if (arr[mid] == x) return mid;
        if (arr[mid] < x) l = mid+1;
        else r = mid-1;
    }
    return -1;
}
```

Mathematics

Formulas

- Quadratic Formula:
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- Modular exponentiation:
$$a^b \bmod m$$

Number Theory Snippet

```cpp
// GCD and LCM
int gcd(int a, int b) { return b==0 ? a : gcd(b,a%b); }
int lcm(int a, int b) { return a/gcd(a,b)*b; }
```

Nomenclature

$n!$	Factorial of n
$\binom{n}{k}$	Combinations
$\mathbb{Z}$	Integers
$\mathbb{R}$	Real numbers
$\log n$	Logarithm base e unless specified

Graph Algorithms

BFS

```cpp
vector<int> adj[N];
bool visited[N];

void bfs(int start) {
    queue<int> q;
    q.push(start);
    visited[start] = true;
    while (!q.empty()) {
        int u = q.front(); q.pop();
        for (int v : adj[u]) {
            if (!visited[v]) {
                visited[v] = true;
                q.push(v);
            }
        }
    }
}
```