Contents

1 Setup

1.1 header.h

```cpp
#pragma once
#include <bits/stdc++.h>
using namespace std;

#define ll long long
#define pl pair<ll, ll>
#define pi pair<int, int>
#define vl vector<ll>
#define vi vector<int>
#define vpl vector<pl>
#define vpi vector<pi>
#define in(el, cont) (cont.find(el) != cont.end())

constexpr int INF  = 2000000010;
constexpr ll LLINF = 9000000000000000010LL;

template <typename T, template <typename ELEM, typename ALLOC = std::allocator<ELEM> > class Container>
std::ostream& operator<<(std::ostream& o, const Container<T>& container) {
  typename Container<T>::const_iterator beg = container.begin();
    o << *beg++;
  while (beg != container.end()) {
    o << "␣" << *beg++;
  }
  return o;
}

// int main() {
//   ios::sync_with_stdio(false);  // do not use cout + printf
//   cin.tie(NULL);
//     cout << fixed << setprecision(12);
//   return 0;
// }
```

1.2 Bash for c++ compile with header.h

```bash
#!/bin/bash
if [ $# -ne 1 ];then echo "Usage: $0 <input_file>"; exit 1;fi
f="$1";d=code/;o=a.out
[ -f $d/$f ] || { echo "Input file not found: $f"; exit 1; }
g++ -I$d $d/$f -o $o && echo "Compilation successful. Executable '$o' created." || echo "Compilation
    failed."
```

1.3 Bash for run tests c++

```bash
g++ $1/$1.cpp -o $1/$1.out
for file in $1/*.in; do diff <($1/$1.out < "$file") "${file%.in}.ans"; done
```

1.4 Bash for run tests python

```bash
for file in $1/*.in; do diff <(python3 $1/$1.py < "$file") "${file%.in}.ans"; done
```

2 Python

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3 C++

3.1 Graphs

3.2 BFS

```cpp
#include "header.h"
#define graph unordered_map<ll, unordered_set<ll>>
vi bfs(int n, graph& g, vi& roots) {
    vi parents(n+1, -1); // nodes are 1..n
    unordered_set<int> visited;
    queue<int> q;
    for (auto x: roots) {
```

```
 8          q.emplace(x);
 9          visited.insert(x);
10      }
11      while (not q.empty()) {
12          int node = q.front();
13          q.pop();
14
15          for (auto neigh: g[node]) {
16              if (not in(neigh, visited)) {
17                  parents[neigh] = node;
18                  q.emplace(neigh);
19                  visited.insert(neigh);
20              }
21          }
22      }
23      return parents;
24 }
25 vi reconstruct_path(vi parents, int start, int goal) {
26      vi path;
27      int curr = goal;
28      while (curr != start) {
29          path.push_back(curr);
30          if (parents[curr] == -1) return vi(); // No path, empty vi
31          curr = parents[curr];
32      }
33      path.push_back(start);
34      reverse(path.begin(), path.end());
35      return path;
36 }
```

3.3 Dynamic Programming

3.4 Trees

3.5 Number Theory

3.6 Strings

3.7 Geometry

3.8 Combinatorics

3.9 Other Data Structures

3.10 Other Mathematics