Олимпиада СПбГУ по информатике 2021/22 учебного года

A	B	C	D	E	F	Sum
100	100	100	60	58	31	449

Task A ()

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <string>
#include <map>
#include <set>
#include <array>
using namespace std;
typedef long long ll;
typedef long double ld;
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    ll n;
    cin >> n;
    map<ll, ll> q;
    ll mx = 0, ans;
    for (int i = 0; i < n; i++) {
        ll a, b;
        cin >> a >> b;
        mx = max(mx, b);
        while (a > 0) {
            q[b] += a % 10;
            b++;
            a /= 10;
        }
    }
    ans = 0;
    for (auto c : q) {
        if (c.second / 10 > 0) {
            q[c.first + 1] += c.second / 10;
        }
        if (c.second % 10 != 0) {
            ans = c.first;
            break;
        }
    }
    cout << ans;
}
```

Task B ()

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <string>
#include <map>
#include <set>
#include <array>
using namespace std;
typedef long long ll;
typedef long double ld;
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()

int main() {

    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    int n;
    cin >> n;
    vector<int>v(n);
    for (int i = 0; i < n; i++) {
        cin >> v[i];
    }
    int j = n - 1;
    while (j >= 0) {
        while (j >= 0 && v[j] == 0) {
            j--;
        }
        if (j < 0) {
            break;
        }
        int cnt = j + 1;
        cout << "Flip and wait" << endl;
        string q;
        cin >> q;
        if (q[0] != 'B' && q[1] != 'e') {
            return 0;
        }
        while (cnt > 0) {
            ll z = 0;
            for (auto c : q) {
                if (c == 'e') {
                    z++;
                }
            }
            z /= 2;
            cnt -= z;
            if (cnt > 0) {
                cout << "Wait" << endl;
                cin >> q;
                if (q[0] != 'B' && q[1] != 'e') {
                    return 0;
                }
            }
        }
        v[j]--;
    }
    cout << "Stop" << endl;
}
```

Task C ()

```cpp
#include <iostream>
#include <vector>
#include <algorithm>
#include <string>
#include <map>
#include <set>
#include <array>
using namespace std;
typedef long long ll;
typedef long double ld;
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
map<string, string> u, v;
bool solve(string now, string s, int len, int cnt) {
    if (now.size() == len) {
        if (len / 2 <= cnt && u.find(now) == u.end()) {
            u[now] = s;
            v[s] = now;
            return true;
        }
        return false;
    }
    now.push_back('?');
    if (solve(now, s, len, cnt + 1)) {
        return true;
    }
    now.back() = s[(int)now.size() - 1];
    return solve(now, s, len, cnt);
}
int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    ll t, www = 5;
    cin >> t;
    for (int i = 0; i <= www; i++) {
        string mask = "";
            for (int j = 0; j < i; j++) {
                mask += '0';
            }
        while (true) {
            solve("", mask, i, 0);
            bool f = true;
            for (int j = 0; j < i; j++) {
                if (mask[j] == '0') {
                    mask[j] = '1';
                    f = false;
                    break;
                }
                else {
                    mask[j] = '0';
                }
            }
            if (f) {
                break;
            }
        }
    }
    while (t--) {
        string s;
        cin >> s;
        int n = s.size();
        bool f = true;
        for (auto c : s) {
            if (c == '?') {
                f = false;
            }
        }
        if (n <= www) {
            if (f) {
                cout << v[s] << "\n";
            }
            else {
                cout << u[s] << "\n";
            }
        }
        else {
            if (f) {
                int q = 0;
                for (int i = 0; i < n; i++) {
                    if (s[i] == '0') {
                        q++;
                    }
                }
                if (q >= n / 2) {
                    for (int i = 0; i < n; i++) {
                        if (s[i] == '0') {
                            s[i] = '?';
                        }
                    }
                }
                else {
                    for (int i = 0; i < n; i++) {
                        if (s[i] == '1') {
                            s[i] = '?';
                        }
                    }
                }
                if (q == 0) {
                    s.back() = '1';
                }
                if (q == n - 1 && s.back() == '1') {
                    s[0] = '0';
                }
            }
            else {
                int q = 0, z = 0;
                for (int i = 0; i < n; i++) {
                    if (s[i] == '0') {
                        q++;
                    }
                    if (s[i] == '1') {
                        z++;
                    }
                }
                if (q == 0 || (q == 0 && z == 0)) {
                    for (int i = 0; i < (int)n; i++) {
                        if (s[i] == '?') {
                            s[i] = '0';
                        }
                    }
                }
                else {
                    for (int i = 0; i < n; i++) {
                        if (s[i] == '?') {
                            s[i] = '1';
                        }
                    }
                }
                if (z > 0 && q > 0) {
                    s[0] = '0';
                    for (int i = 1; i < n; i++) {
                        s[i] = '0';
                    }
                    s.back() = '1';
                }
                if (z == 1 && q == 0 && s.back() == '1') {
                    for (int i = 0; i < n; i++) {
                        s[i] = '1';
                    }
                }
            }
            cout << s << "\n";
        }
    }
```

```
}
```

Task D ()

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <string>
#include <map>
#include <set>
#include <array>
using namespace std;
typedef long long ll;
typedef long double ld;
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
ll n;
ll sqr(ll a) {
    return a * a;
}
ll solve(ll a, ll sum, bool f = true) {
    if (a == n  +1) {
        return sqr(sum);
    }
    ll now = solve(a + 1, sum, true);
    if (f) {
        now += solve(a + 1, sum * a, false);
    }
    return now;
}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    ll p = 998244353, ans = 0;
    cin >> n;
    n++;
    ll q = 1;
    for (ll i = 1; i < n; i++) {
        ll a = i + 1;
        while (a % p == 0) {
            ans++;
            a /= p;
        }
        q = q * a % p;
    }
    cout << ans << "␣" << q;
}
```

Task E ()

```cpp
#include <iostream>
#include <vector>
#include <algorithm>
#include <string>
#include <map>
#include <set>
#include <array>
#pragma GCC optimize("Ofast")
using namespace std;
typedef long long ll;
typedef long double ld;
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    int n;
    cin >> n;
    vector<int> v(n);
    for (int i = 0; i < n; i++) {
        cin >> v[i];
    }
    int q;
    cin >> q;
    while (q--) {
        int a, b, d;
        cin >> a >> b >> d;
        ll ans = 0;
        for (int i = a; i < b; i++) {
            ans += (d + v[i] - 1) / v[i];
        }
        cout << ans << "\n";
    }
}
```

Task F ()

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <string>
#include <map>
#include <set>
#include <array>
using namespace std;
typedef long long ll;
typedef long double ld;
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    int n;
    cin >> n;
    vector<pair<ll, ll>> v(n);
    for (int i = 0; i < n; i++) {
        int l, r;
        cin >> l >> r;
        v[i] = { l, r };
    }
    ll ans = 1;
    vector<ll> dp(n + 1, 1);
    for (int i = 0; i < n; i++) {
        ll l = 0, r = 0;
        ll cnt = 1;
        for (int j = i; j >= 0; j--) {
            l += v[j].first;
            r += v[j].second;
            if (l <= 0 && 0 <= r) {
                dp[i + 1] = max(dp[i + 1], dp[j] + 1);
            }
        }
        ans = max(ans, dp[i + 1]);
    }
    cout << ans;
}
```