Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	55	25	480

Task A ()

```
#include <iostream>
#include <algorithm>
#include <vector>


using namespace std;

#define int long long

#pragma GCC optimize("O3")
#pragma GCC target("sse", "sse2", "sse3", "ssse3", "sse4", "popcnt", "abm", "mmx")

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n;
    //string a = "11111111111";
    //cerr << k * k;
    int cur = 0;
//    vector<int> lst = {0};
//    for (int i = 1; i < 100; i++) {
//        cerr << (cur + i) % 10 << " ";
//        lst.push_back((cur + i) % 10);
//        cur = (cur + i) / 10;
//    }
    cin >> n;
    if (n <= 10) {
        cout << n % 10;
    } else {
        n -= 11;
        cout << (n % 9 + 2) % 10;
    }


    return 0;
}
```

Task B ()

```
#include <iostream>
#include <algorithm>
#include <vector>


using namespace  std;

#define int long long

#pragma GCC optimize("O3")
#pragma GCC target("sse", "sse2", "sse3", "ssse3", "sse4", "popcnt", "abm", "mmx")

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n, k;
    cin >> n >> k;
    string s;
    cin >> s;
    int cur = 1;
    vector<int> used(26, 0);
    used[s[0] - 'a'] =1;
    int ans = 1;
    int cnt = 1;
    for (int i = 1; i < n; i++){
        cur++;
        if (!used[s[i] - 'a']){
            used[s[i] - 'a'] = 1;
            cnt++;
        }
        if (cur > k || cnt == 4){
            ans++;
            cur = 1;
            cnt = 1;
            used.assign(26, 0);
            used[s[i] - 'a'] = 1;
        }
    }
    cout << ans;
    return 0;
}
```

Task C ()

```
#include <iostream>
#include <algorithm>
#include <vector>


using namespace std;

//#define int long long

#pragma GCC optimize("O3")
#pragma GCC target("sse", "sse2", "sse3", "ssse3", "sse4", "popcnt", "abm", "mmx")

const int INF = 1e9;

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n, x, y;
    cin >> n >> x >> y;
    vector<int> xx, yy;
    for (int i = 0; i < n; i++) {
        int a;
        cin >> a;
        xx.push_back(a);
    }
    for (int i = 0; i < n; i++) {
        int a;
        cin >> a;
        yy.push_back(a);
    }
    vector<vector<int>> dp(2, vector<int>(x + 1, INF));
    vector<vector<int>> pr(n, vector<int>(x + 1, -1));
    for (int i = 0; i < n; i++) {
        if (i == 0) {
            if (xx[0] <= x) {
                dp[0][xx[0]] = 0;
                pr[0][xx[0]] = 0;
            }
            dp[0][0] = yy[0];
            pr[0][0] = 0;
            continue;
        }
        for (int j = 0; j <= x; j++) {
            if (dp[1][j] > dp[0][j] + yy[i]) {
                dp[1][j] = min(dp[0][j] + yy[i], dp[1][j]);
                pr[i][j] = j;
            }
            if (j - xx[i] >= 0) {
                if (dp[1][j] > dp[0][j - xx[i]]) {
                    dp[1][j] =  dp[0][j - xx[i]];
                    pr[i][j] = j - xx[i];
                }
            }
//            cerr << dp[i][j] << " ";
        }
//        cerr << '\n';
        swap(dp[0], dp[1]);
        dp[1].assign(x + 1, INF);
    }
    int pos = -1;
    for (int i = 0; i <= x; i++){
        if (dp[0][i] <= y){
            pos = i;
            break;
        }
    }
    if (pos == -1){
        cout << -1;
        return 0;
    }
    int ind = n - 1;
    string s;
    while (ind != -1){
        //cerr << pos << " ";
        if (pr[ind][pos] == pos){
            s += 'y';
        }
        else{
            s += 'x';
        }
        pos = pr[ind][pos];
        ind--;
    }
    reverse(s.begin(), s.end());
    cout << s;
}
```

Task D ()

```
#include <iostream>
#include <algorithm>
#include <vector>
#include <stack>

using namespace std;

//#define int long long

#pragma GCC optimize("O3")
#pragma GCC target("sse", "sse2", "sse3", "ssse3", "sse4", "popcnt", "abm", "mmx")

const int INF = 1e9;

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n;
    cin >> n;
    string s;
    cin >> s;
    int cnt = 0;
    for (int i = 0; i < 2 * n; i++) {
        if (s[i] == '(' || s[i] == ')') {
            cnt++;
        }
    }
    int cnt2 = 2 * n - cnt;
    cnt = cnt / 2 + cnt % 2;
    cnt2 = cnt2 / 2 + cnt2 % 2;
    stack<int> cur;
    int ans = 0;
    for (int i = 0; i < 2 * n; i++) {
        if (s[i] == '(' || s[i] == ')') {
            if (cur.empty() || cur.top() == 2) {
                cur.push(1);
            } else {
                cur.pop();
            }
        } else {
            if (cur.empty() || cur.top() == 1) {
                cur.push(2);
            } else {
                cur.pop();
            }
        }
    }
    cout << cur.size() / 2;
}
```

Task E ()

```
#include <iostream>
#include <algorithm>
#include <vector>
#include <stack>
#include <map>

using namespace std;

//#define int long long

#pragma GCC optimize("O3")
#pragma GCC target("sse", "sse2", "sse3", "ssse3", "sse4", "popcnt", "abm", "mmx")

const int C = 12137;

map<string, pair<int, pair<int, int>>> mp;
map<pair<int, pair<int, int>>, int> mp2;

void guess(int n, int k) {
    if (n > 10) {
        for (int i = 0; i < k + 1; i++) {
            int x;
            cin >> x;
            if (x != C) {
                cout << x << "␣";
            }
        }
    } else {
        string s;
        vector<int> nw;
        for (int i = 0; i < k + 1; i++) {
            int x;
            cin >> x;
            x--;
            nw.push_back(x);
        }
        sort(nw.begin(), nw.end());
        for (int i = 0; i < k + 1; i++) {
            char a = '0' + nw[i];
            s += a;
        }
        pair<int, pair<int, int>> cur = mp[s];
        cout << cur.first + 1 << "␣" << cur.second.first + 1 << "␣" << cur.second.second + 1;
    }
    cout << '\n';
}

void add(int n, int k) {
    if (n > 10) {
        cout << C;
    } else {
        vector<int> nw;
        for (int i = 0; i < k; i++) {
            int x;
            cin >> x;
            x--;
            nw.push_back(x);
        }
        sort(nw.begin(), nw.end());
        pair<int, pair<int, int>> cur = {nw[0], {nw[1], nw[2]}};
        int x = mp2[cur];
        cout << x + 1;
    }
    cout << '\n';
}

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    string s;
    cin >> s;
    for (int i = 0; i < 10; i++) {
        for (int j = i + 1; j < 10; j++) {
            for (int k = j + 1; k < 10; k++) {
                int bl = 0;
                for (int x = 0; x < 10; x++) {
                    if (x == i || x == j || x == k) {
                        continue;
                    }
                    vector<int> nw = {i, j, k, x};
                    sort(nw.begin(), nw.end());
                    string cur;
                    for (int pos = 0; pos < nw.size(); pos++) {
                        char a = '0' + nw[pos];
                        cur += a;
                    }
                    if (mp.count(cur) == 0) {
                        //cerr << i << " " << j << " " << k << " " << x << '\n';
                        mp[cur] = {i, {j, k}};
                        mp2[{i, {j, k}}] = x;
                        bl = 1;
                        break;
                    }
                }
//                if (!bl) {
//                    cerr << "ERORORORR " << i << ' ' << j << " " << k << "\n";
//                }
            }
        }
    }
    if (s[0] == 'a') {
        int t;
        cin >> t;
        for (int q = 0; q < t; q++) {
            int n, k;
            cin >> n >> k;
            add(n, k);
        }
    } else {
        int t;
        cin >> t;
        for (int q = 0; q < t; q++) {
            int n, k;
            cin >> n >> k;
            guess(n, k);
        }
    }
}
```

Task F ()

```
#include <vector>
#include <algorithm>
#include <iostream>

using namespace std;

#define int long long

signed main(){
    int n;
    cin >> n;
    if (n > 8){
        cout << -1;
        return  0;
    }
    vector<pair<int, int>> lst = {{0, 0}, {0, 1}, {1, 1}, {1, 0}};
    cout << lst.size() << '\n';
    for (int i =0; i < lst.size(); i++){
        cout << lst[i].first << "␣" << lst[i].second << '\n';
    }
    vector<pair<int, int>> per = {{-1, 0}, {-1, 1}, {0, 1}, {1, 1}, {1, 0}, {1, -1}, {0, -1}, {-1,
         -1}};
    for (int i =0; i < n; i++){
        cout << per[i].first << "␣" << per[i].second << '\n';
    }
}
```