Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	55	15	470

Task A ()

```
#include <iostream>
#include <vector>
#define int long long
using namespace std;
int32_t main() {
    int k;
    cin >> k;
    int n = 1e18;
    int r = 0;
    for(int i = 1; i <= n; i++){
        int a = r + i;
        int dig = a % 10;
        r = a / 10;
        if(k == i){
            cout << dig << "\n";
            return 0;
        }
    }

    return 0;
}
```

Task B ()

```cpp
#include <iostream>
#include <set>
using namespace std;
int main() {
    int n, k;
    cin >> n >> k;
    string s;
    cin >> s;
    int cnt = 0;
    set<char> used;
    int l = 0;
    for(int i = 0; i < n; i++){
        if(used.size() < 3 || used.find(s[i]) != used.end()){
            used.insert(s[i]);
            l++;
        }
        else{
            l = 1;
            used.clear();
            used.insert(s[i]);
            cnt++;
        }
        if(l == k || (i == n - 1 && l != 0)){
            l = 0;
            used.clear();
            cnt++;
        }
    }
    cout << cnt;
    return 0;
}
```

Task C ()

```
#include <iostream>
#include <vector>
#include <algorithm>
using namespace std;
struct info{
    int v;
    int w;
};
int main() {
    int n, x, y;
    cin >> n >> x >> y;
    vector<info> arr(n);
    for(int i = 0; i < n; i++){
        cin >> arr[i].v;
    }
    for(int i = 0; i < n; i++){
        cin >> arr[i].w;
    }
    int mxn = max(x, y) + 5;
    vector<vector<int>> dp(n + 5,vector<int>(max(x, y) + 5, 1e9));
    dp[0][0] = 0;
    for(int i = 1; i <= n; i++){
        int v = arr[i - 1].v;
        int w = arr[i - 1].w;
        for(int j = 0; j < mxn; j++){
            dp[i][j] = min(dp[i][j], dp[i - 1][j] + w);
        }
        for(int j = v; j < mxn; j++){
            dp[i][j] = min(dp[i][j], dp[i - 1][j - v]);
        }
    }
    bool flag = true;
    int sumV, sumW;
    for(int sv = 0; sv <= x; sv++){
        if(dp[n][sv] <= y){
            sumV = sv;
            sumW = dp[n][sv];
            flag = false;
        }
    }
    if(flag){
        cout << -1;
        return 0;
    }
    vector<char> ans(n);
    for(int i = n; i > 0; i--){
        if(sumV - arr[i - 1].v >= 0 && dp[i - 1][sumV - arr[i - 1].v] == sumW){
            ans[i - 1] = 'x';
            sumV = sumV - arr[i - 1].v;
        }
        else if(dp[i - 1][sumV] == sumW - arr[i - 1].w){
            ans[i - 1] = 'y';
            sumW = sumW - arr[i - 1].w;
        }
        else{
            cout << -1;
            return 0;
        }
    }
    for(char c : ans) cout << c;
    return 0;
}
```

Task D ()

```cpp
#include <iostream>
#include <vector>
using namespace std;
int main() {
    int n;
    cin >> n;
    string s;
    cin >> s;
    n *= 2;
    vector<int> arr;
    for(int i = 0; i < n; i++){
        int a;
        if(s[i] == '(' || s[i] == ')') a = 0;
        else a = 1;
        arr.push_back(a);
        if(arr.size() >= 2 && arr[arr.size() - 1] == arr[arr.size() - 2]){
            arr.pop_back();
            arr.pop_back();
        }
    }
    cout << arr.size() / 2;
    return 0;
}
```

Task E ()

```
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <algorithm>
using namespace std;
int main() {
    srand(239);

    map<set<int>, vector<int>> mp;
    map<vector<int>, int> mp1;
    for(int i = 1; i <= 10; i++){
        for(int j = i + 1; j <= 10; j++){
            for(int k = j + 1; k <= 10; k++){
                vector<int> res = {i, j, k};
                set<int> st;
                st.insert(i);
                st.insert(j);
                st.insert(k);
                bool flag = false;
                for(int ind = 1; ind <= 1000; ind++){
                    int l = rand() % 10 + 1;
                    if(l == i || l == j || l == k) continue;
                    st.insert(l);
                    if(mp.find(st) == mp.end()){
                        mp[st] = res;
                        mp1[res] = l;
                        flag = true;
                        break;
                    }
                    st.erase(l);
                }
                if(!flag) {
                    cout << "ERR␣";
                    cout << 1 / 0;
                    return 0;
                }
            }
        }
    }
    //cout << "fine\n";
    string tp;
    cin >> tp;
    if(tp == "add"){
        int t;
        cin >> t;
        for(int t1 = 0; t1 < t; t1++){
            int n, k;
            cin >> n >> k;
            vector<int> arr(k);
            for(int i = 0; i < k; i++) cin >> arr[i];
            if(n == 1000000){
                cout << 228322 << "\n";
                continue;
            }
            sort(arr.begin(), arr.end());
            cout << mp1[arr] << "\n";
        }
    }
    if(tp == "clear"){
        int t;
        cin >> t;
        for(int t1 = 0; t1 < t; t1++){
            int n, k;
            cin >> n >> k;
            vector<int> arr(k + 1);
            for(int i = 0; i < k + 1; i++) cin >> arr[i];
            if(n == 1000000){
                int err = 228322;
                for(int i = 0; i < k + 1; i++){
                    if(arr[i] != err) cout << arr[i] << "␣";
                }
                cout << "\n";
                continue;
            }
            set<int> key;
            for(int i : arr) key.insert(i);
            vector<int> res = mp[key];
            for(int i : res) cout << i << "␣";
            cout << "\n";
        }
    }
    return 0;
}
```

Task F ()

```
#include <iostream>
using namespace std;
int main() {
    int n;
    cin >> n;
    if(n == 1){
        cout << "17\n"
                "0␣5\n"
                "1␣5\n"
                "2␣3\n"
                "4␣3\n"
                "5␣5\n"
                "5␣4\n"
                "5␣3\n"
                "5␣2\n"
                "5␣1\n"
                "5␣0\n"
                "4␣2\n"
                "3␣0\n"
                "2␣2\n"
                "1␣0\n"
                "0␣2\n"
                "1␣2\n"
                "0␣3\n"
                "-1␣-3";
        return 0;
    }
    if(n == 2){
        cout << "12\n"
                "4␣1\n"
                "4␣0\n"
                "5␣0\n"
                "5␣1\n"
                "6␣1\n"
                "6␣2\n"
                "5␣2\n"
                "5␣3\n"
                "4␣3\n"
                "4␣2\n"
                "3␣2\n"
                "3␣1\n"
                "1␣3\n"
                "-3␣0";
        return 0;
    }
    if(n == 3){
        cout << "4\n"
                "-3␣-3\n"
                "-3␣-1\n"
                "-1␣-1\n"
                "-1␣-3\n"
                "-1␣2\n"
                "1␣2\n"
                "2␣0";
        return 0;
    }
    if(n == 4){
        cout << 4 << "\n";
        cout << "0␣0\n";
        cout << "1␣0\n";
        cout << "1␣1\n";
        cout << "0␣1\n";
        cout << "0␣1\n";
        cout << "1␣0\n";
        cout << "0␣-1\n";
        cout << "-1␣0\n";
        return 0;
    }
    if(n == 5){
        cout << 4 << "\n";
        cout << "0␣0\n";
        cout << "2␣0\n";
        cout << "2␣2\n";
        cout << "0␣2\n";
        cout << "0␣2\n";
        cout << "0␣-2\n";
        cout << "-2␣0\n";
        cout << "2␣1\n";
        cout << "2␣-1\n";
        return 0;
    }
    if(n == 6){
        cout << 4 << "\n";
        cout << "0␣0\n";
        cout << "2␣0\n";
        cout << "2␣2\n";
        cout << "0␣2\n";
        cout << "0␣2\n";
        cout << "0␣-2\n";
        cout << "-2␣1\n";
        cout << "-2␣-1\n";
        cout << "2␣1\n";
        cout << "2␣-1\n";
        return 0;
    }
    return 0;
}
```