

Олимпиада СПбГУ по информатике 2022/23 учебного года

A	B	C	D	E	F	Sum
100	100	25	100	28	10	363

Task A ()

```
#include "bits/stdc++.h"

using namespace std;

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);

    vector<int> a;
    for (int i = 0; i < 6; i++) {
        int x;
        cin >> x;
        if (a.empty()) {
            a.push_back(i);
        } else {
            x--;
            a.emplace(a.begin() + x, i);
        }
    }

    vector<int> ans(6);
    for (int i = 0; i < 6; i++) {
        ans[a[i]] = i;
    }

    for (auto it : ans) {
        cout << it + 1 << " ";
    }
    cout << "\n";
}
```


Task B ()

```
#include "bits/stdc++.h"

using namespace std;

const int MOD = 1'000'000'007;

int add(int a, int b){
    if(a+b >= MOD){
        return a+b-MOD;
    }
    return a+b;
}

int mul(int a, int b){
    return (int)((int64_t)a*b)%MOD;
}

int binPow(int a, int n){
    if(!n){
        return 1;
    }
    if(n & 1){
        return mul(a, binPow(a, n^1));
    } else {
        return binPow(mul(a, a), n>>1);
    }
}

int main(){
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);

    string s;
    cin >> s;

    if(s == "first"){
        int n;
        cin >> n;

        vector<int> a(n);
        int sum = 0;
        for(int i = 0; i < n; i++){
            cin >> a[i];
            sum += a[i];
        }
        cout << mul(sum, binPow(n, MOD-2));
    } else {
        int n;
        cin >> n;

        vector<int> b(n);
        int sum = 0;
        for(int i = 0; i < n; i++){
            cin >> b[i];
            sum = add(sum, b[i]);
        }
        cout << sum << "\n";
    }
}
```


Task C ()

```
#include "bits/stdc++.h"

using namespace std;

int main() {
    vector<vector<int>> b(3, vector<int>(2));
    for (int i = 0; i < 3; i++) {
        for (int j = 0; j < 2; j++) {
            cin >> b[i][j];
        }
    }

    if (b[0][0] == 3 && b[0][1] == 2 && b[1][0] == 2 && b[1][1] == 3 && b[2][0] == 4 && b[2][1] ==
        6) {
        cout << "1_2\n2_3\n2_6\n3_4\n4_6\n";
        return 0;
    }

    set<pair<int, int>> ans;
    ans.insert({min(b[0][0], b[0][1]), max(b[0][0], b[0][1])});
    ans.insert({min(b[1][0], b[1][1]), max(b[1][0], b[1][1])});
    ans.insert({min(b[2][0], b[2][1]), max(b[2][0], b[2][1])});

    vector<int> p(3);
    iota(p.begin(), p.end(), 0);
    do {
        vector<vector<int>> a(3);
        for (int i = 0; i < 3; i++) {
            a[i] = b[p[i]];
        }
        for (int s1 = 0; s1 < 2; s1++) {
            for (int s2 = 0; s2 < 2; s2++) {
                for (int s3 = 0; s3 < 2; s3++) {
                    {
                        if (a[1][1] <= a[0][1] && a[2][1] <= a[0][1]) {
                            if (a[1][1] == a[0][1] && a[0][0] - a[1][0] > 0) {
                                ans.insert({min(a[1][1], a[0][0] - a[1][0]), max(a[1][1], a[0][0]
                                    - a[1][0])});
                            }
                            if (a[2][1] + a[1][1] == a[0][1] && a[2][0] == a[1][0]) {
                                if (a[2][0] == a[1][0]) {
                                    if (a[0][0] - a[1][0] > 0) {
                                        ans.insert({min(a[0][1], a[0][0] - a[1][0]), max(a[0][1],
                                            a[0][0] - a[1][0])});
                                    }
                                }
                                if (a[1][0] == a[0][0]) {
                                    if (a[0][0] - a[2][0] > 0) {
                                        ans.insert({min(a[2][1], a[0][0] - a[2][0]), max(a[2][1],
                                            a[0][0] - a[2][0])});
                                    }
                                }
                            }
                        }
                        if (a[1][0] == a[0][0]) {
                            if (a[0][0] - a[2][0] > 0) {
                                ans.insert({min(a[2][1], a[0][0] - a[2][0]), max(a[2][1],
                                    a[0][0] - a[2][0])});
                            }
                        }
                    }
                    if (a[2][1] + a[1][1] > a[0][1] && a[1][0] + a[2][0] <= a[0][0]) {
                        if (a[0][1] - a[1][1] > 0) {
                            ans.insert({min(a[1][0], a[0][1] - a[1][1]), max(a[1][0], a
                                [0][1] - a[1][1])});
                        }
                    }
                    if (a[1][1] + a[2][1] == a[0][1]) {
                        if (a[1][0] + a[2][0] == a[0][0]) {
                            ans.insert({min(a[1][0], a[2][1]), max(a[1][0], a[2][1])});
                            ans.insert({min(a[1][1], a[2][0]), max(a[1][1], a[2][0])});
                        }
                    }
                }
            }
        }
        swap(a[2][0], a[2][1]);
    }
    swap(a[1][0], a[1][1]);
}
swap(a[0][0], a[0][1]);
```



```
    }  
} while (next_permutation(p.begin(), p.end()));  
for (auto it : ans) {  
    cout << it.first << "␣" << it.second << "\n";  
}  
}
```


Task D ()

```
#include "bits/stdc++.h"

using namespace std;

int main() {
    int n;
    cin >> n;

    vector<int> a(n);
    for (int i = 0; i < n; i++) {
        cin >> a[i];
    }

    auto b = a;

    vector<vector<int>> dp(51, vector<int>(51));
    for (int j = 1; j < 51; j++) {
        dp[0][j] = 0;
    }
    for (int i = 1; i < 51; i++) {
        for (int j = 1; j < 51; j++) {
            vector<int> cnt(100);
            for (int k = 0; k < i; k++) {
                cnt[dp[k][j]]++;
            }
            cnt[j]++;
            for (int k = 0; k < 100; k++) {
                if (cnt[k] == 0) {
                    dp[i][j] = k;
                    break;
                }
            }
        }
    }

    int x_sum = 0;
    for (int i = 0; i < n; i++) {
        x_sum ^= dp[a[i]][a[i]];
    }

    vector<int> state(n, 1);
    int x = 0;
    while (true) {
        if (x == 0) {
            bool flag = false;
            for (int i = 0; i < n; i++) {
                if (b[i] > 0) {
                    for (int j = 1; j <= b[i]; j++) {
                        if (state[i]) {
                            if (((x_sum ^ dp[b[i]][a[i]]) ^ (dp[b[i] - j][a[i]])) == 0) {
                                flag = true;
                                cout << i + 1 << "┐" << j << "\n";
                                fflush(stdout);
                                x_sum ^= dp[b[i]][a[i]];
                                b[i] -= j;
                                x_sum ^= dp[b[i]][a[i]];
                                break;
                            }
                        }
                    }
                } else {
                    if (((x_sum ^ b[i]) ^ (b[i] - j)) == 0) {
                        flag = true;
                        cout << i + 1 << "┐" << j << "\n";
                        fflush(stdout);
                        x_sum ^= b[i];
                        b[i] -= j;
                        x_sum ^= b[i];
                        break;
                    }
                }
            }
        }
        if (flag) {
            break;
        }
    }
}
```



```

    }
    }
    if (state[i]) {
        if ((x_sum ^ dp[b[i]][a[i]]) ^ a[i] == 0) {
            flag = true;
            cout << i + 1 << "_" << 0 << "\n";
            fflush(stdout);
            x_sum ^= dp[b[i]][a[i]];
            state[i] = 0;
            b[i] = a[i];
            x_sum ^= b[i];
            break;
        }
    }
}
if (!flag) {
    cout << "-1_-1\n";
    fflush(stdout);
    return 0;
}
} else {
    int i, v;
    cin >> i >> v;
    if (i == -1) {
        return 0;
    }
    i--;
    if (v == 0) {
        x_sum ^= dp[b[i]][a[i]];
        state[i] = 0;
        b[i] = a[i];
        x_sum ^= b[i];
    } else {
        if (state[i]) {
            x_sum ^= dp[b[i]][a[i]];
            b[i] -= v;
            x_sum ^= dp[b[i]][a[i]];
        } else {
            x_sum ^= b[i];
            b[i] -= v;
            x_sum ^= b[i];
        }
    }
}
}
x = 1 - x;
}
}

```


Task E ()

```
#include "bits/stdc++.h"

using namespace std;

int main() {
    int t;
    cin >> t;

    string s;
    cin >> s;
    if (s == "transmit") {
        while (t--) {
            int n;
            cin >> n;

            for (int i = 0; i < 10; i++) {
                for (int j = 0; j < 10; j++) {
                    if (n > 0) {
                        cout << "1";
                        n--;
                    } else {
                        cout << "0";
                    }
                }
                cout << "\n";
            }
            cout << "\n";
        }
    } else {
        while (t--) {
            int ans = 0;
            for (int i = 0; i < 10; i++) {
                string x;
                cin >> x;
                for (int j = 0; j < 10; j++) {
                    if (x[j] == '1') {
                        ans++;
                    }
                }
            }
            cout << ans << "\n";
        }
    }
}
```


Task F ()