

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>

using namespace std;

int main() {
    ios_base::sync_with_stdio(0); cin.tie(0);
    int x; cin >> x;
    if (x < 10) cout << x;
    else {
        int num = (x - 10) % 9;
        if (num == 0) cout << 0;
        else cout << num + 1;
    }
}
```

Task B ()

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

using namespace std;

int main() {
    ios_base::sync_with_stdio(0); cin.tie(0);
    int n, k; cin >> n >> k;
    string s; cin >> s; vector<int> cnt(26, 0);
    int arr = 0, how = 0, len = 0;
    for (int i = 0; i < n; i++) {
        len++;
        if (cnt[s[i] - 'a'] == 0) how++;
        if (how > 3 || len > k) {
            arr++;
            for (int j = 0; j < 26; j++) cnt[j] = 0;
            cnt[s[i] - 'a'] = 1;
            len = 1; how = 1; continue;
        }
        cnt[s[i] - 'a']++;
    }
    cout << arr + 1;
}
```

Task C ()

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

using namespace std;

const int N = 510;

int dp[N][N * N];

int main() {
    ios_base::sync_with_stdio(0); cin.tie(0);
    int n, x, y; cin >> n >> x >> y;
    vector<int> a(n + 1, 0), b(n + 1, 0);
    for (int i = 1; i <= n; i++) cin >> a[i];
    for (int i = 1; i <= n; i++) cin >> b[i];
    for (int i = 1; i <= n; i++) {
        for (int j = 1; j < N * N; j++) {
            if (a[i] <= j) dp[i][j] = dp[i - 1][j - a[i]] + b[i];
            if (dp[i - 1][j] > dp[i][j]) {
                dp[i][j] = dp[i - 1][j];
            }
        }
    }
    int st = 0;
    for (int i = 1; i <= x; i++) {
        if (dp[n][i] > dp[n][st]) st = i;
    }
    vector<char> arr(n + 1, '_');
    for (int i = n; i >= 1; i--) {
        if (a[i] <= st && dp[i - 1][st - a[i]] + b[i] > dp[i - 1][st]) {
            arr[i] = 'x'; st -= a[i];
        }
        else {
            arr[i] = 'y'; st -= b[i];
        }
    }
    if (y < 0) cout << -1;
    else {
        for (int i = 1; i <= n; i++) cout << arr[i];
    }
}
```

Task D ()

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

using namespace std;

int main() {
    ios_base::sync_with_stdio(0); cin.tie(0);
    int n; cin >> n; string s; cin >> s;
    for (int i = 0; i < 2 * n; i++) {
        if (s[i] == '(' || s[i] == ')') s[i] = '(';
        if (s[i] == '[' || s[i] == ']') s[i] = '[';
    }
    s += '_';
    int cnt = 0, arr = 0;
    vector<char> lastC;
    for (int i = 0; i < 2 * n + 1; i++) {
        if (i > 0 && s[i] != s[i - 1]) {
            if (cnt % 2 == 1) {
                if (!lastC.empty() && lastC.back() == s[i - 1]) {
                    lastC.pop_back();
                }
                else lastC.push_back(s[i - 1]);
            }
            cnt = 1;
        }
        else cnt++;
    }
    cout << (lastC.size() / 2);
}
```

Task E ()

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

using namespace std;

vector<int64_t> h = { 4232, 3921, 23201, 7, 2321, 5743, 345921, 3, 5, 11, 19 };

int f(int64_t n, int k, vector<int> a) {
    int64_t s = 0;
    sort(a.begin(), a.end());
    for (int i = 0; i < a.size(); i++) {
        s += h[i] * a[i]; s %= (n - 3);
    }
    return s + 1;
}

vector<int> g(int n, int k, vector<int> a) {
    for (int i = 0; i < a.size(); i++) {
        vector<int> b;
        for (int j = 0; j < a.size(); j++) {
            if (i != j) b.push_back(a[j]);
        }
        if (f(n, k, b) == a[i]) return b;
    }
}

int z[11][11][11];
int used[11][11][11][11];

int f2(int n, int k, vector<int> a) {
    sort(a.begin(), a.end());
    return z[a[0]][a[1]][a[2]];
}

vector<int> g2(int n, int k, vector<int> a) {
    for (int i = 0; i < a.size(); i++) {
        vector<int> b;
        for (int j = 0; j < a.size(); j++) {
            if (i != j) b.push_back(a[j]);
        }
        sort(b.begin(), b.end());
        if (z[b[0]][b[1]][b[2]] == a[i]) return b;
    }
    return { 1, 2, 3 };
}

int f3(int n, int k, vector<int> a) {
    int64_t sum = 0;
    for (auto i : a) sum += i;
    sum %= n; sum++;
    for (int i = 2; i * i <= sum; i++) {
        if (sum % i == 0) return sum / i;
    }
}

int main() {
    ios_base::sync_with_stdio(0); cin.tie(0);
    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> b;
                for (int u = 1; u <= 10; u++) {
                    if (u == i || u == j || u == k) continue;
                    vector<int> a = { i, j, k, u };
                    sort(a.begin(), a.end());
                    if (used[a[0]][a[1]][a[2]][a[3]]) continue;
                    b.push_back(u);
                }
                if (b.empty()) {
                    cout << "beda"; return 0;
                }
            }
        }
    }
}
```

```

        else {
            random_shuffle(b.begin(), b.end());
            z[i][j][k] = b[0]; vector<int> a = { i, j, k, b[0] };
            sort(a.begin(), a.end()); used[a[0]][a[1]][a[2]][a[3]] =
                1;
        }
    }
}

string s; cin >> s;
int t; cin >> t;
while (t--) {
    if (s == "add") {
        int n, k; cin >> n >> k; vector<int> a(k, 0);
        for (int i = 0; i < k; i++) cin >> a[i];
        if (n == 10 && k == 3) cout << f2(n, k, a) << '\n';
        else if (n == 1e6) cout << f(n, k, a) << '\n';
        else {
            cout << f3(n, k, a) << '\n';
        }
    }
    else {
        int n, k; cin >> n >> k; vector<int> a(k + 1, 0);
        for (int i = 0; i < k + 1; i++) cin >> a[i];
        if (n == 10 && k == 3) {
            for (auto i : g2(n, k, a)) cout << i << '\n';
        }
        else if (n == 1e6) {
            for (auto i : g(n, k, a)) cout << i << '\n';
        }
        else {
            for (int i = 0; i < k; i++) cout << a[i] << '\n';
        }
        cout << '\n';
    }
}
}

```

Task F ()

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

using namespace std;

vector<int> X = { -1, 0, 1, 1, 1, 0, -1, -1 };
vector<int> Y = { 1, 1, 1, 0, -1, -1, -1, 0 };

int main() {
    ios_base::sync_with_stdio(0); cin.tie(0);
    int n; cin >> n;
    if (n <= 8) {
        cout << 4 << '\n';
        cout << 0 << '␣' << 0 << '\n';
        cout << 1 << '␣' << 0 << '\n';
        cout << 1 << '␣' << 1 << '\n';
        cout << 0 << '␣' << 1 << '\n';
        for (int i = 0; i < n; i++) cout << X[i] << '␣' << Y[i] << '\n';
    }
}
```