Олимпиада СПбГУ по информатике 2020/21 учебного года

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

Task A ()

```cpp
#include<bits/stdc++.h>

using namespace std;

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

    vector<int> a = {0, 2, 3, 4, 5, 6, 7, 8, 9};

    int n; cin >> n;
    int k = (n-1) / 10;
    if (n < 10) cout << n << '\n';
    else cout << a[(n-10) % 9];

    return 0;
}
```

Task B ()

```cpp
#include<bits/stdc++.h>

using namespace std;

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

    int n, k;
    cin >> n >> k;
    string s; cin >> s;
    vector<int> cnt(26, 0);
    int CNT = 0;
    int ans = 0;
    int last = 0;
    for (int i = 0; i < n; ++i) {
        CNT += !cnt[s[i]-'a'];
        ++cnt[s[i]-'a'];
        if (CNT > 3 || i - last == k) {
            ++ans;
            last = i;
            cnt.assign(26, 0);
            CNT = 0;
            CNT += !cnt[s[i]-'a'];
            ++cnt[s[i]-'a'];
        }
    }
    ++ans;
    cout << ans << '\n';

    return 0;
}
```

Task C ()

```cpp
#include<bits/stdc++.h>

using namespace std;

const int inf = 1e9;

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

    int n, x, y;
    cin >> n >> x >> y;
    vector<int> v(n), w(n);
    for (int i = 0; i < n; ++i)
        cin >> v[i];
    for (int i = 0; i < n; ++i)
        cin >> w[i];
    vector<int> a(x+1, inf);
    vector<int> b(x+1, inf);
    vector<vector<int>> prev(n+1, vector<int> (x+1, 0));
    a[0] = 0;
    for (int i = 1; i <= n; ++i) {
        for (int j = 0; j <= x; ++j) {
            if (a[j] + w[i-1] <= y) b[j] = a[j] + w[i-1];
            if (j >= v[i-1] && b[j] > a[j-v[i-1]]) {
                b[j] = a[j-v[i-1]];
                prev[i][j] = 1;
            }
        }
        a = b;
        b.assign(x+1, inf);
    }
    int J = -1;
    for (int j = 0; j <= x; ++j)
        if (a[j] <= y) {
            J = j;
            break;
        }
    if (J == -1) {
        cout << -1 << '\n';
        return 0;
    }
    int I = n;
    string ans;
    while (I) {
        ans.push_back(prev[I][J] ? 'x' : 'y');
        if (prev[I][J]) J -= v[I-1];
        --I;
    }
    reverse(ans.begin(), ans.end());
    cout << ans << '\n';

    return 0;
}
```

Task D ()

```cpp
#include<bits/stdc++.h>

using namespace std;

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

    /*string s; cin >> s;
    if (s[0] == 'a') {
        while (t--) {
            int n, k; cin >> n >> k;
            vector<int> a(k);
            for (int i = 0; i < k; ++i) cin >> a[i];


        }
    } else {

    }*/

    int n; cin >> n;
    string s; cin >> s;
    vector<int> cnt0(2, 0);
    vector<int> cnt1(2, 0);
    for (int i = 0; i < s.size(); ++i)
        cnt0[i & 1] += s[i] == '(' || s[i] == ')';
    for (int i = 0; i < s.size(); ++i)
        cnt1[i & 1] += s[i] == '[' || s[i] == ']';
    int a = abs(cnt0[1] - cnt0[0]);
    int b = abs(cnt1[1] - cnt1[0]);
    cout << min(a, b) << '\n';

    return 0;
}
```

Task E ()

```cpp
#include<bits/stdc++.h>

using namespace std;

bool in(int a, vector<int> & b) {
    return a == b[0] || a == b[1] || a == b[2] || a == b[3];
}

bool chk(vector<int> & a, vector<int> & b) {
    return in(a[0], b) && in(a[1], b) && in(a[2], b);
}

int CHK(vector<int> & A, int I) {
    A[I] = 0;
    long long sum = 0;
    for (int i = 0; i < A.size(); ++i)
        if (A[i])
            sum += i+1;
    vector<int> B;
    for (int i = 1; i < A.size()-1; ++i) if (!A[i-1] && !A[i] && !A[i+1] && (!B.size() || B.back()
        + 2 < i))
        B.push_back(i);
    sum %= B.size();
    A[I] = 1;
    return B[sum]+1;
}

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

    vector<vector<int>> a;
    for (int i = 1; i <= 10; ++i)
        for (int j = i+1; j <= 10; ++j)
            for (int k = j+1; k <= 10; ++k)
                a.push_back({i, j, k});
    vector<vector<int>> b;
    for (int i = 1; i <= 10; ++i)
        for (int j = i+1; j <= 10; ++j)
            for (int k = j+1; k <= 10; ++k)
                for (int k2 = k+1; k2 <= 10; ++k2)
                    b.push_back({i, j, k, k2});
    vector<int> go(a.size(), -1);
    vector<int> used(b.size(), -1);
    for (int i = 0; i < a.size(); ++i)
        for (int j = 0; j < b.size(); ++j)
            if (chk(a[i], b[j]) && used[j] == -1) {
                go[i] = j;
                used[j] = i;
                break;
            }

    string s; cin >> s;
    int t; cin >> t;
    if (s[0] == 'a') {
        while (t--) {
            int n, k; cin >> n >> k;
            if (n == 10) {
                vector<int> A(k);
                for (int i = 0; i < k; ++i) cin >> A[i];
                sort(A.begin(), A.end());
                for (int i = 0; i < a.size(); ++i)
                    if (a[i] == A) {
                        cout << b[go[i]][0] + b[go[i]][1] + b[go[i]][2] + b[go[i]][3] - A[0] - A
                            [1] - A[2] << '\n';
                        break;
                    }
                continue;
            }

            if (n == (int) 1e6) {
                vector<int> A(k);
```

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                for (int i = 0; i < k; ++i) cin >> A[i];
                A.push_back(n); ++k;
                sort(A.begin(), A.end());
                int go = -1;
                for (int i = k-1; i > 0; --i)
                    if (A[i] - A[i-1] > 2) {
                            go = A[i]-1;
                            break;
                    }
                if (go != -1)
                    cout << go << '\n';
                else
                    cout << A[0]-1;
                continue;
            }

            {
                vector<int> A(n, 0);
                long long sum = 0;
                for (int i = 0; i < k; ++i) {
                    int x; cin >> x;
                    A[x-1] = 1;
                    sum += x;
                }
                vector<int> B;
                for (int i = 1; i < n-1; ++i) if (!A[i-1] && !A[i] && !A[i+1] && (!B.size() || B.
                    back() + 2 < i))
                    B.push_back(i);
                sum %= B.size();
                cout << B[sum]+1 << '\n';
            }
        }
    }
} else {
    while (t--) {
        int n, k; cin >> n >> k;
        if (n == 10) {
            vector<int> A(k+1);
            for (int i = 0; i <= k; ++i) cin >> A[i];
            sort(A.begin(), A.end());
            for (int i = 0; i < b.size(); ++i)
                if (b[i] == A) {
                        for (int j = 0; j < k; ++j)
                            cout << a[used[i]][j] << '␣';
                        cout << '\n';
                        break;
                }
            continue;
        }

        if (n == (int) 1e6) {
            vector<int> A(k+1);
            for (int i = 0; i <= k; ++i) cin >> A[i];
            A.push_back(-1);
            A.push_back(n); ++k;
            sort(A.begin(), A.end());
            int I = -1;
            for (int i = k+1; i > 1; --i)
                if (A[i] - A[i-1] == 1 && A[i-1] - A[i-2] > 1) {
                        I = i-1;
                        break;
                }
            for (int i = 1; i < I; ++i)
                cout << A[i] << '␣';
            for (int i = I+1; i <= k; ++i)
                cout << A[i] << '␣';
            cout << '\n';
            continue;
        }

        {
            vector<int> A(n, 0);
            long long sum = 0;
            for (int i = 0; i <= k; ++i) {
                int x; cin >> x;
```

```cpp
            A[x-1] = 1;
            sum += x;
        }
        vector<int> B = {-2};
        for (int i = 1; i < n-1; ++i) if (!A[i-1] && !A[i] && !A[i+1] && (!B.size() || B.
            back() + 2 < i))
            B.push_back(i);
        B.push_back(n+1);
        int I;
        for (int i = 1; i < n-1; ++i)
            if (A[i] && !A[i-1] && !A[i+1]) {
                int j = (sum-i-1) % (B.size() - 1);
                if (B[j] < i && i < B[j+1] && CHK(A, i) == i+1) {
                    I = i;
                    break;
                }
            }
        for (int i = 0; i < n; ++i)
            if (A[i] && i != I)
                cout << i+1 << '␣';
        cout << '\n';
        }
    }
}

return 0;
}
```

Task F ()

```cpp
#include<bits/stdc++.h>

using namespace std;

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

    vector<pair<int, int>> a = {
        {0, 1},
        {0, -1},
        {1, 1},
        {-1, 1},
        {1, -1},
        {-1, -1},
        {1, 0},
        {-1, 0}
    };

    int n; cin >> n;
    if (n <= 8) {
        cout << 4 << '\n';
        cout << "0_0" << '\n';
        cout << "0_1" << '\n';
        cout << "1_1" << '\n';
        cout << "1_0" << '\n';
        for (int i = 0; i < n; ++i)
            cout << a[i].first << '_' << a[i].second << '\n';
    }

    return 0;
}
```