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;
//#define int long long
#define ld long double
#define pb push_back
#define pii pair<int,int>
#define f first
#define s second
#define pld pair<ld,ld>
#define emp nullptr
mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());


signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie();
    int k;
    cin >> k;
    int next = 0;
    int sum = 0;
    for (int i = 1; i <= k; ++i) {
        sum = i + next;
        next = sum / 10;
    }
    cout << sum % 10;
}
```

Task B ()

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

using namespace std;
#define int long long
#define ld long double
#define pb push_back
#define pii pair<int,int>
#define f first
#define s second
#define pld pair<ld,ld>
#define emp nullptr
mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());


signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie();
    int n, k;
    cin >> n >> k;
    string s;
    cin >> s;
    set<char> st;
    int ans = 1;
    int prev = -1;
    for (int i = 0; i < n; ++i) {
        char cur = s[i];
        if (st.count(cur) || st.size() < 3) {
            if (i - prev <= k) {
                st.insert(cur);
            } else {
                st.clear();
                ans++;
                prev = i - 1;
                st.insert(cur);
            }
        } else {
            ans++;
            st.clear();
            prev = i - 1;
            st.insert(cur);
        }
    }
    cout << ans;

}
```

Task C ()

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

using namespace std;
//#define int long long
#define ld long double
#define pb push_back
#define pii pair<int,int>
#define f first
#define s second
#define pld pair<ld,ld>
#define emp nullptr
mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());


signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie();
    int n, x, y;
    cin >> n >> x >> y;
    int dp[2][x + 1];
    bool par[n + 1][x + 1];
    for (int i = 0; i < n + 1; ++i) {
        for (int j = 0; j < x + 1; ++j) {
            dp[i % 2][j] = -1;
            par[i][j] = false;
        }
    }
    dp[0][0] = 0;
    int v[n], w[n];
    for (int i = 0; i < n; ++i) {
        cin >> v[i];
    }
    int sum = 0;
    for (int j = 0; j < n; ++j) {
        cin >> w[j];
        sum += w[j];
    }
    for (int i = 1; i < n + 1; ++i) {
        for (int k = 0; k < x + 1; ++k) {
            dp[i % 2][k] = dp[(i - 1) % 2][k];
        }
        for (int j = v[i - 1]; j < x + 1; ++j) {
            if (dp[i % 2][j] < dp[(i - 1) % 2][j - v[i - 1]] + w[i - 1]) {
                par[i][j] = true;
                dp[i % 2][j] = dp[(i - 1) % 2][j - v[i - 1]] + w[i - 1];
            }
        }
    }
    int cani, canj;
    bool flag = false;
    for (int i = n; i >= 0; --i) {
        for (int j = 0; j < x + 1; ++j) {
            if (dp[i % 2][j] == -1)continue;
            int val = sum - dp[i % 2][j];
            if (val <= y) {
                cani = i;
                canj = j;
                flag = true;
                break;
            }
        }
        if (flag)break;
    }
    if (!flag) {
        cout << -1 << endl;
    } else {
        char ans[n];
        fill(ans, ans + n, '.');
        while (cani > 0) {
            if (!par[cani][canj]) {
                cani--;
            } else {
```

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                ans[cani - 1] = 'x';
                canj -= v[cani - 1];
                cani--;
            }
        }
        for (int i = 0; i < n; ++i) {
            if (ans[i] == 'x')cout << "x";
            else cout << "y";
        }
    }
}
```

Task D ()

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

using namespace std;
//#define int long long
#define ld long double
#define pb push_back
#define pii pair<int,int>
#define f first
#define s second
#define pld pair<ld,ld>
#define emp nullptr
mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());

int best(char a, char b) {
    int cur1 = 0, cur2 = 0;
    if (a == '(' || a == ')') cur2++;
    else cur1++;
    if (b == '(' || b == ')') cur2++;
    else cur1++;
    return min(cur1, cur2);
}

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

Task E ()

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

using namespace std;
//#define int long long
#define ld long double
#define pb push_back
#define pii pair<int,int>
#define f first
#define s second
#define pld pair<ld,ld>
#define emp nullptr
mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());
const int MAX_N = 1e5 + 7;
int sz = 20000;
vector<int> g[MAX_N];

int used[MAX_N];
int it = 1;
int mt[MAX_N];

bool try_khun(int v) {
    if (used[v] == it)return false;
    used[v] = it;
    for (int to : g[v]) {
        if (mt[to] == -1 || try_khun(mt[to])) {
            mt[to] = v;
            return true;
        }
    }
    return false;
}

long long prime[10] = {72313, 84211, 52141, 99214, 69562, 45827, 94620, 63672, 78572, 89271};

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie();
    map<int, int> left, right;
    map<int, vector<int>> decodel, decoder;
    int szl = 0, szr = 0;
    fill(mt, mt + MAX_N, -1);
    for (int i = 1; i < 11; ++i) {
        for (int j = 1; j < 11; ++j) {
            if (i == j)continue;
            for (int k = 1; k < 11; ++k) {
                if (i == k || j == k)continue;
                vector<int> x;
                x.pb(i), x.pb(j), x.pb(k);
                int va = (1 << i) + (1 << j) + (1 << k);
                sort(x.begin(), x.end());
                if (left.count(va))continue;
                left[va] = szl;
                decodel[szl] = x;
                for (int l = 1; l < 11; ++l) {
                    if (l == i || l == j || l == k)continue;
                    vector<int> cur;
                    cur.pb(i), cur.pb(j), cur.pb(k), cur.pb(l);
                    int ce = (1 << i) + (1 << j) + (1 << k) + (1 << l);
                    sort(cur.begin(), cur.end());
                    int v;
                    if (!right.count(ce)) {
                        right[ce] = szr + sz;
                        v = szr + sz;
                        szr++;
                    } else {
                        v = right[ce];
                    }
                    decoder[v] = cur;
                    g[szl].pb(v);
                    g[v].pb(szl);
                }
```

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                szl++;
            }
        }
    }
    for (int i = sz; i < sz + szr; ++i) {
        try_khun(i);
        it++;
    }
    int par[MAX_N];
    for (int i = 0; i < szl; ++i) {
        par[mt[i]] = i;
    }
    int val = 17321;
    string s;
    cin >> s;
    if (s == "add") {
        int t;
        cin >> t;
        for (int now = 0; now < t; now++) {
            int n, k;
            cin >> n >> k;
            if (n == 1000000) {
                for (int i = 0; i < k; ++i) {
                    int x;
                    cin >> x;
                }
                cout << val << endl;
            } else if (n == 10) {
                set<int> st;
                int va = 0;
                for (int i = 0; i < k; ++i) {
                    int x;
                    cin >> x;
                    va += (1 << x);
                    st.insert(x);
                }
                int num = left[va];
                int pa = mt[num];
                for (int x : decoder[pa]) {
                    if (!st.count(x)) {
                        cout << x << endl;
                        break;
                    }
                }
            } else {
                long long sum = 0;
                for (int i = 0; i < k; ++i) {
                    int x;
                    cin >> x;
                    sum += x;
                }
                cout << sum % prime[7] << endl;
            }
        }
    } else {
        int t;
        cin >> t;
        for (int now = 0; now < t; now++) {
            int n, k;
            cin >> n >> k;
            if (n == 1000000) {
                for (int i = 0; i < k + 1; ++i) {
                    int x;
                    cin >> x;
                    if (x != val) {
                        cout << x << "␣";
                    }
                }
                cout << endl;
            } else if (n == 10) {
                int va = 0;
                for (int i = 0; i < k + 1; ++i) {
                    int x;
                    cin >> x;
```

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                va += (1 << x);
            }
            int num = right[va];
            int pa = par[num];
            for (int x : decodel[pa])cout << x << "_";
            cout << endl;
        } else {
            int a[k];
            long long sum = 0;
            for (int i = 0; i < k + 1; ++i) {
                cin >> a[i];
                sum += a[i];
            }
            int ban;
            for (int i = 0; i < k + 1; ++i) {
                if ((sum - a[i]) % prime[7] == a[i]) {
                    ban = i;
                    break;
                }
            }
            for (int i = 0; i < k + 1; ++i) {
                if (i == ban)continue;
                cout << a[i] << "_";
            }
            cout << endl;
        }
    }
}
}
```

Task F ()

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

using namespace std;
//#define int long long
#define ld long double
#define pb push_back
#define pii pair<int,int>
#define f first
#define s second
#define pld pair<ld,ld>
#define emp nullptr
mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());
const int MAX_N = 1e5 + 7;


signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie();
    int n;
    cin >> n;
    cout << 4 << endl;
    cout << 0 << "_" << 0 << endl;
    cout << 1 << "_" << 0 << endl;
    cout << 1 << "_" << 1 << endl;
    cout << 0 << "_" << 1 << endl;
    cout << 1 << "_" << 0 << endl;
    if (n > 1)cout << -1 << "_" << 0 << endl;
    if (n > 2)cout << 0 << "_" << 1 << endl;
    if (n > 3)cout << 0 << "_" << -1 << endl;
    if (n > 4)cout << 1 << "_" << 1 << endl;
    if (n > 5)cout << -1 << "_" << -1 << endl;
    if (n > 6)cout << 1 << "_" << -1 << endl;
    if (n > 7)cout << -1 << "_" << 1 << endl;

}
```