

# 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 <bits/stdc++.h>

using namespace std;

#define int long long
#define all(a) (a).begin(), (a).end()
#define sz(a) (int) (a).size()
#define x first
#define y second
#define debug(x) cout << #x << ":_ " << x << "\n";

template<class t, class u> bool amax(t &a, u b) {if (a < b) {a = b; return true;} return false;}
template<class t, class u> bool amin(t &a, u b) {if (a > b) {a = b; return true;} return false;}
template<class t> using vc = vector<t>;
template<class t> using vvc = vector<vector<t>>;

using pi = pair<int, int>;
using vi = vc<int>;
using vpi = vc<pi>;

mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(0), cout.tie(0);

    // freopen("input.txt", "r", stdin);
    int n;
    cin >> n;
    int sum = 0;
    for (int i = 1; i <= n; i++) {
        sum /= 10;
        sum += i;
    }
    cout << sum % 10 << '\n';
    return 0;
}
```

## Task B ()

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

using namespace std;

#define int long long
#define all(a) (a).begin(), (a).end()
#define sz(a) (int) (a).size()
#define x first
#define y second
#define debug(x) cout << #x << " : " << x << "\n";

template<class t, class u> bool amax(t &a, u b) {if (a < b) {a = b; return true;} return false;}
template<class t, class u> bool amin(t &a, u b) {if (a > b) {a = b; return true;} return false;}
template<class t> using vc = vector<t>;
template<class t> using vvc = vector<vector<t>>>;

using pi = pair<int, int>;
using vi = vc<int>;
using vpi = vc<pi>;

mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(0), cout.tie(0);

    // freopen("input.txt", "r", stdin);
    int n, k;
    cin >> n >> k;
    string s;
    cin >> s;
    int ans = 0;
    for (int i = 0; i < n; i) {
        int j = i;
        set<char> q;
        for (; j < i + k && sz(q) <= 3; j++) {
            q.insert(s[j]);
        }
        if (sz(q) == 4) j--;
        // debug(i << ' ' << j << ' ' << sz(q))
        i = j;
        ans++;
    }
    cout << ans << '\n';
    return 0;
}
```

## Task C ()

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

using namespace std;

// #define int long long
#define all(a) (a).begin(), (a).end()
#define sz(a) (int) (a).size()
#define x first
#define y second
#define debug(x) cout << #x << ":_ " << x << "\n";

template<class t, class u> bool amax(t &a, u b) {if (a < b) {a = b; return true;} return false;}
template<class t, class u> bool amin(t &a, u b) {if (a > b) {a = b; return true;} return false;}
template<class t> using vc = vector<t>;
template<class t> using vvc = vector<vector<t>>>;

using pi = pair<int, int>;
using vi = vc<int>;
using vpi = vc<pi>;

mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

const int maxx = 250010;
const int maxn = 510;
const int inf = maxx;

int dp[2][maxx];
int p[maxn][maxx];
int v[maxn];
int w[maxn];

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(0), cout.tie(0);

    // freopen("input.txt", "r", stdin);
    int n, x, y;
    cin >> n >> x >> y;
    for (int i = 0; i <= x; i++) {
        dp[0][i] = inf;
    }
    dp[0][0] = 0;
    for (int i = 1; i <= n; i++) {
        cin >> v[i];
    }
    for (int i = 1; i <= n; i++) {
        cin >> w[i];
    }
    for (int i = 1; i <= n; i++) {
        int l = (i - 1) & 1;
        int r = i & 1;
        for (int j = 0; j <= x; j++) {
            dp[r][j] = inf;
            if (amin(dp[r][j], dp[l][j] + w[i])) {
                p[i][j] = j;
            }
        }
        for (int j = x; j >= v[i]; j--) {
            if (amin(dp[r][j], dp[l][j - v[i]])) {
                p[i][j] = j - v[i];
            }
        }
    }
    int bst = -1;
    for (int j = 0; j <= x; j++) {
        if (dp[n & 1][j] <= y) bst = j;
    }
    if (bst == -1) {
        cout << -1 << '\n';
        return 0;
    }
    vi ans(n + 1, 0);
```

```

int cur = n;
while (cur >= 1) {
    int tmp = bst;
    bst = p[cur][bst];
    if (tmp == bst) ans[cur] = 1;
    cur--;
}
for (int i = 1; i <= n; i++) {
    cout << char('x' + ans[i]);
}
cout << '\n';

return 0;
}

```

## Task D ()

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

using namespace std;

// #define int long long
#define all(a) (a).begin(), (a).end()
#define sz(a) (int) (a).size()
#define x first
#define y second
#define debug(x) cout << #x << ":_" << x << "\n";

template<class t, class u> bool amax(t &a, u b) {if (a < b) {a = b; return true;} return false;}
template<class t, class u> bool amin(t &a, u b) {if (a > b) {a = b; return true;} return false;}
template<class t> using vc = vector<t>;
template<class t> using vvc = vector<vector<t>>>;

using pi = pair<int, int>;
using vi = vc<int>;
using vpi = vc<pi>;

mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

int get_tp(char ch) {
    if (ch == '(') return 0;
    if (ch == ')') return 0;
    if (ch == '[') return 1;
    if (ch == ']') return 1;
    return -1;
}

int calc(int left, int right) {
    if (abs(left - right) == 0) return 0;
    return 1;
}

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(0), cout.tie(0);

    // freopen("input.txt", "r", stdin);

    int n;
    cin >> n;
    string s;
    cin >> s;
    vi st;
    int ans = 0;
    for (int i = 0; i < 2 * n; i++) {
        int tp = get_tp(s[i]);
        if (st.empty() || st.back() != tp) {
            st.push_back(tp);
        } else {
            st.pop_back();
        }
    }
    while (!st.empty()) {
        int right = st.back();
        st.pop_back();
        int left = st.back();
        st.pop_back();
        ans += calc(left, right);
    }
    cout << ans << '\n';

    return 0;
}
```

## Task E ()

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

using namespace std;

// #define int long long
#define all(a) (a).begin(), (a).end()
#define sz(a) (int) (a).size()
#define x first
#define y second
#define debug(x) cout << #x << ":_ " << x << "\n";

template<class t, class u> bool amax(t &a, u b) {if (a < b) {a = b; return true;} return false;}
template<class t, class u> bool amin(t &a, u b) {if (a > b) {a = b; return true;} return false;}
template<class t> using vc = vector<t>;
template<class t> using vvc = vector<vector<t>>>;

using pi = pair<int, int>;
using vi = vc<int>;
using vpi = vc<pi>;

mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

int p = 1;

map<vi, int> used;
map<vi, vi> go;
map<vi, int> answer;

vvc<int> a;

void solve() {
    int n, k;
    cin >> n >> k;
    int ans = 4395;
    if (p == 1) {
        vi b(k);
        for (auto &el : b) cin >> el;
        sort(all(b));
        if (n == 10) {
            ans = answer[b];
        } else if (n == 100000) {
            vi c;
            int cur = 0;
            for (int i = 1; i <= n; i++) {
                if (cur < k && b[cur] == i) {
                    cur++;
                    continue;
                }
                ans = i;
                break;
            }
            ans = b[sz(b) / 2] + 1;
        }
        cout << ans << endl;
    } else {
        vi b(k + 1);
        for (auto &el : b) cin >> el;
        sort(all(b));
        if (n == 10) {
            for (auto &el : go[b]) {
                cout << el << '_';
            }
            cout << endl;
            return;
        } else if (n == 100000) {
            vi c;
            int cur = 0;
            for (int i = 1; i <= n; i++) {
                if (cur < k && b[cur] == i) {
                    cur++;
                    continue;
                }
            }
        }
    }
}
```

```

//          ans = i;
//          break;
//      }
//      ans = b[sz(b) / 2];
//  }
//  for (auto el : b) {
//      if (el == ans) continue;
//      cout << el << ' ';
//  }
//  cout << endl;
//  }
//  }

bool rec(int id = 0) {
    if (id == sz(a)) {
        for (auto &el : used) {
            if (el.y) {
                for (auto &el2 : go[el.x]) cout << el2 << ' ';
                cout << " -> ";
                cout << answer[go[el.x]] << '\n';
                for (auto &el2 : el.x) cout << el2 << ' ';
                cout << "\n";
            }
        }
        return true;
    }
    for (int i = 1; i <= 10; i++) {
        bool good = true;
        for (auto &el : a[id]) {
            good &= el != i;
        }
        vi res = a[id];
        res.push_back(i);
        sort(all(res));
        if (good && !used[res]) {
            used[res] = 1;
            answer[a[id]] = i;
            go[res] = a[id];
            if (rec(id + 1)) return true;
            used[res] = 0;
        }
    }
    return false;
}

void precalc() {
    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});
            }
        }
    }
    rec();
}

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(0), cout.tie(0);

    //    freopen("input.txt", "r", stdin);

    precalc();
    string s;
    cin >> s;
    if (s == "add") {
        p = 1;
    } else {
        p = 2;
    }
    int t;
    cin >> t;
    while (t--) {

```

```
        solve();  
    }  
  
    return 0;  
}
```



## Task F ()

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

using namespace std;

// #define int long long
#define all(a) (a).begin(), (a).end()
#define sz(a) (int) (a).size()
#define x first
#define y second
#define debug(x) cout << #x << ": " << x << "\n";

template<class t, class u> bool amax(t &a, u b) {if (a < b) {a = b; return true;} return false;}
template<class t, class u> bool amin(t &a, u b) {if (a > b) {a = b; return true;} return false;}
template<class t> using vc = vector<t>;
template<class t> using vvc = vector<vector<t>>>;

using pi = pair<int, int>;
using vi = vc<int>;
using vpi = vc<pi>;

mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(0), cout.tie(0);

    // freopen("input.txt", "r", stdin);

    int n;
    cin >> n;
    cout << 4 << '\n';
    cout << 0 << '\n' << 0 << "\n";
    cout << 0 << '\n' << 1 << "\n";
    cout << 1 << '\n' << 1 << "\n";
    cout << 1 << '\n' << 0 << "\n";
    vpi ans = {{1, 1},
               {0, 1},
               {-1, 1},
               {1, -1},
               {0, -1},
               {-1, -1},
               {1, 0},
               {-1, 0},
               {0, 0},
    };
    for (int i = 0; i < n; i++) {
        cout << ans[i].x << '\n' << ans[i].y << '\n';
    }

    return 0;
}
```