Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	20	25	445

Task A ()

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

using namespace std;

int main() {
    #ifdef __linux__
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
    #endif
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

    int n;
    cin >> n;
    if (n <= 10)
        cout << n % 10;
    else {
        int k = 2;
        int m = 20;
        while(m < n) {
            m += 10;
            k++;
            if (k >= 10)
                k = 0;
            else if (k == 1)
                k++;
        }
        // cout << k;
        m -= 9;
        while (m < n) {
            m++;
            k++;
            if (k >= 10)
                k = 0;
            else if (k == 1)
                k++;
        }
        cout << k;
    }
    return 0;
}
```

Task B ()

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

using namespace std;

const int N = 40;
const int M = 1e5 + 55;

int u[N];
int a[M];

int main() {
    #ifdef __linux__
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
    #endif
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

    int n, k;
    string s;
    cin >> n >> k >> s;
    for (int i = 0; i < n; i++)
        a[i] = (s[i] - 'a');

    int cur = 0, ans = 1, len = 0;
    for (int i = 0; i < n; i++) {
        if (len + 1 > k) {
            for (int j = i - len; j < i; j++)
                u[a[j]]--;
            ans++;
            len = 1;
            cur = 1;
            u[a[i]]++;
        }
        else if (u[a[i]] != 0) {
            u[a[i]]++;
            len++;
        }
        else if (u[a[i]] == 0) {
            if (cur + 1 > 3) {
                for (int j = i - len; j < i; j++)
                    u[a[j]]--;
                ans++;
                len = 1;
                cur = 1;
                u[a[i]]++;
            }
            else {
                len++;
                cur++;
                u[a[i]]++;
            }
        }
    }

    cout << ans << '\n';

    return 0;
}
```

Task C ()

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

using namespace std;

const int N = 505;
const int M = 250003;

int dp[N][M];

int v[N], w[N];
bool u[N];

int main() {
    #ifdef __linux__
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
    #endif
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

    int n, x, y;
    cin >> n >> x >> y;
    for (int i = 0; i < n; i++)
        cin >> v[i];
    int sum = 0;
    for (int i = 0; i < n; i++) {
        cin >> w[i];
        sum += w[i];
    }
    for (int i = 1; i <= n; i++) {
        for (int j = 0; j <= x; j++) {
            if (j - v[i - 1] >= 0)
                dp[i][j] = max(dp[i - 1][j], dp[i - 1][j - v[i - 1]] + w[i - 1]);
            else
                dp[i][j] = dp[i - 1][j];
        }
    }
    // for (int i = 0; i <= n; i++) {
    //     for (int j = 0; j <= x; j++)
    //         cout << dp[i][j] << ' ';
    //     cout << '\n';
    // }
    int mx = 0, pos = 0;
    for (int j = 0; j <= x; j++) {
        if (dp[n][j] > mx) {
            pos = j;
            mx = dp[n][j];
        }
    }
    // cout << sum << ' ' << mx << '\n';
    if (sum - mx > y)
        cout << -1;
    else {
        for (int i = n; i > 0; i--) {
            if (dp[i][pos] != dp[i - 1][pos]) {
                u[i - 1] = 1;
                pos -= v[i - 1];
                if (pos < 0)
                    break;
                // cout << i << ' ' << pos << '\n';
            }
        }
        for (int i = 0; i < n; i++)
            cout << (u[i] ? 'x' : 'y');
    }
    return 0;
}
```

Task D ()

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

using namespace std;

const int N = 2e5 + 5;

bool a[N];
bool q[N];

int main() {
    #ifdef __linux__
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
    #endif
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

    int n;
    cin >> n;
    char x;

    for (int i = 0; i < 2 * n; i++) {
        cin >> x;
        if (x == ']' || x == '[')
            a[i] = 1;
    }

    int sz = -1;
    for (int i = 0; i < 2 * n; i++) {
        if (sz == -1 || q[sz] != a[i]) {
            sz++;
            q[sz] = a[i];
        }
        else if (sz >= 0 && a[i] == q[sz]) {
            sz--;
        }
    }

    cout << (sz + 1) / 2;

    return 0;
}
```

Task E ()

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

using namespace std;

const int N = 3e4 + 55;

int a[N];

void vasya () {
    int n, k;
    cin >> n >> k;
    for (int i = 0; i < k; i++)
        cin >> a[i];
    a[k] = 0;
    a[k + 1] = n + 1;
    k += 2;
    sort(a, a + k);
    int mx = 0, l = -1, r = -1;
    for (int i = 1; i < k; i++) {
        if (a[i] - a[i - 1] > mx) {
            mx = a[i] - a[i - 1];
            l = a[i - 1];
            r = a[i];
        }
    }
    // cout << mx << ' ' << l << ' ' << r << '\n';
    cout << (r + l) / 2 << '\n';
}

void petya () {
    int n, k;
    cin >> n >> k;
    for (int i = 0; i <= k; i++)
        cin >> a[i];
    a[k + 1] = 0;
    a[k + 2] = n + 1;
    k += 3;
    sort(a, a + k);
    int mx = 0, ans = -1;
    for (int i = 1; i + 1 < k; i++) {
        if (a[i + 1] - a[i - 1] > mx && (a[i + 1] + a[i - 1]) / 2 == a[i]) {
            mx = a[i] - a[i - 1];
            ans = a[i];
        }
    }
    for (int i = 1; i + 1 < k; i++)
        if (a[i] != ans)
            cout << a[i] << '␣';
    cout << '\n';
}

int main() {
    #ifdef __linux__
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
    #endif
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

    string s;
    int t;
    cin >> s >> t;
    if (s[0] == 'a') {
        for (int i = 0; i < t; i++) {
            vasya();
        }
    }
    else {
        for (int i = 0; i < t; i++) {
            petya();
        }
```

```
    }

    return 0;
}
```

Task F ()

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

using namespace std;

const int N = 4;
const int M = 8;

struct point {
    int x, y;
    point () {
        x = 0;
        y = 0;
    }
    point (int a, int b) {
        x = a;
        y = b;
    }
} a[N], b[M];

int main() {
    #ifdef __linux__
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
    #endif
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

    a[0] = point(0, -1);
    a[1] = point(-1, 0);
    a[2] = point(0, 1);
    a[3] = point(1, 0);

    b[0] = point(0, 1);
    b[1] = point(1, 0);
    b[2] = point(2, -1);
    b[3] = point(1, -2);
    b[4] = point(0, -3);
    b[5] = point(-1, -2);
    b[6] = point(-2, -1);
    b[7] = point(-1, 0);

    int n;
    cin >> n;
    cout << N << '\n';
    for (int i = 0; i < N; i++)
        cout << a[i].x << ' ' << a[i].y << '\n';
    for (int i = 0; i < n; i++) {
        cout << a[0].x - b[i].x << ' ' << a[0].y - b[i].y << '\n';
    }
    return 0;
}
```