

# Олимпиада СПбГУ по информатике 2022/23 учебного года

A	B	C	D	E	F	Sum
100	100	50	100	0	65	415

## Task A ()

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

using namespace std;

signed main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    vector<int> w(6);
    for (int i = 0; i < 6; i++) cin >> w[i];
    vector<int> a;
    for (int i = 0; i < 6; i++) {
        vector<int> b;
        while (a.size() != w[i] - 1) {
            b.push_back(a.back());
            a.pop_back();
        }
        a.push_back(i + 1);
        for (int j = b.size() - 1; j > -1; j--) a.push_back(b[j]);
    }
    vector<int> ans(6);
    for (int i = 0; i < 6; i++) {
        ans[a[i] - 1] = i + 1;
    }
    for (int i : ans) cout << i << ' ';
}
```



## Task B ()

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

using namespace std;

signed main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    string s;
    cin >> s;
    int n;
    cin >> n;
    vector<int> w(n);
    for (int i = 0; i < n; i++) cin >> w[i];
    if (s[0] == 'f') {
        int sum = 0;
        for (int i = 0; i < n; i++) sum += w[i];
        cout << ((sum) << (10));
        return 0;
    }
    int x = w[0], sum = 0;
    for (int i = 0; i < 10; i++) x /= 2;
    for (int i = 0; i < n; i++) {
        sum += w[i] - (x << 10);
    }
    cout << sum + x;
}
```



## Task C ()

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

using namespace std;

int n = 3;

signed main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    set<vector<int>> se;
    vector<vector<int>> w;
    for (int i = 0; i < 3; i++) {
        int x, y;
        cin >> x >> y;
        w.push_back({x, y});
        se.insert({min(x, y), max(x, y)});
    }
    for (int i = 0; i < n; i++) {
        int j = (i - 1 + 3) % 3, h = (i + 1) % 3;
        for (int k = 0; k <= 1; k++) {
            if (k) swap(h, j);
            for (int mask = 0; mask <= 3; mask++) {
                if (mask & 1) swap(w[j][0], w[j][1]);
                if (mask & 2) swap(w[h][0], w[h][1]);

                if (w[i][0] == w[j][0] && w[i][1] > w[j][1]) {
                    se.insert({min(w[i][0], w[i][1] - w[j][1]), max(w[i][0], w[i][1] - w[j][1])});
                }
                if (w[i][1] == w[j][1] && w[i][0] > w[j][0]) {
                    se.insert({min(w[i][1], w[i][0] - w[j][0]), max(w[i][1], w[i][0] - w[j][0])});
                }
                if (w[i][0] == w[h][0] && w[i][1] > w[h][1]) {
                    se.insert({min(w[i][0], w[i][1] - w[h][1]), max(w[i][0], w[i][1] - w[h][1])});
                }
                if (w[i][1] == w[h][1] && w[i][0] > w[h][0]) {
                    se.insert({min(w[i][1], w[i][0] - w[h][0]), max(w[i][1], w[i][0] - w[h][0])});
                }
                if (w[j][0] + w[h][0] == w[i][0] && w[j][1] == w[h][1] && w[j][1] < w[i][1]) {
                    se.insert({min(w[i][0], w[i][1] - w[j][1]), max(w[i][0], w[i][1] - w[j][1])});
                }
                if (w[j][1] + w[h][1] == w[i][1] && w[j][0] == w[h][0] && w[j][0] < w[i][0]) {
                    se.insert({min(w[i][1], w[i][0] - w[j][0]), max(w[i][1], w[i][0] - w[j][0])});
                }
            }
            for (int x = 0; x < w[i][0] - w[j][0] + 1; x++) {
                for (int y = 0; y < w[i][1] - w[h][1] + 1; y++) {
                    vector<vector<int>> p(w[i][0], vector<int>(w[i][1]));
                    bool b = 0;
                    for (int nx = x; nx < w[j][0] + x; nx++) {
                        if (b) continue;
                        for (int ny = 0; ny < w[j][1]; ny++) {
                            if (ny >= w[i][1] || nx >= w[i][0]) {
                                b = 1;
                                break;
                            }
                        }
                        p[nx][ny] = 1;
                    }
                }
                int a1 = 0, a2 = 0;
                for (int x1 = 0; x1 < w[i][0]; x1++) {
                    for (int y1 = 0; y1 < w[i][1]; y1++) {
                        if (!p[x1][y1]) continue;
                        if (x1 == 0 || x1 == w[i][0] - 1) {
                            if (p[x1][y1] == 1) a1 = 1;
                        }
                        if (y1 == 0 || y1 == w[i][1] - 1) {
                            if (p[x1][y1] == 1) a2 = 1;
                        }
                    }
                }
                if (!a1 || !a2) continue;
                if (b) continue;
                for (int nx = 0; nx < w[h][0]; nx++) {
```



```

        if (b) continue;
        for (int ny = y; ny < w[h][1] + y; ny++) {
            if (ny >= w[i][1] || nx >= w[i][0] || p[nx][ny]) {
                b = 1;
                break;
            }
            p[nx][ny] = 2;
        }
    }
    if (b) continue;
    int b1 = 0, b2 = 0;
    for (int x1 = 0; x1 < w[i][0]; x1++) {
        for (int y1 = 0; y1 < w[i][1]; y1++) {
            if (!p[x1][y1]) continue;
            if (x1 == 0 || x1 == w[i][0] - 1) {
                if (p[x1][y1] == 1) a1 = 1;
                else b1 = 1;
            } else {
                if (p[x1 - 1][y1] != 0 && p[x1 - 1][y1] != p[x1][y1]) {
                    if (p[x1][y1] == 1) a1 = 1;
                    else b1 = 1;
                }
                if (p[x1 + 1][y1] != 0 && p[x1 + 1][y1] != p[x1][y1]) {
                    if (p[x1][y1] == 1) a1 = 1;
                    else b1 = 1;
                }
            }
        }
        if (y1 == 0 || y1 == w[i][1] - 1) {
            if (p[x1][y1] == 1) a2 = 1;
            else b2 = 1;
        } else {
            if (p[x1][y1 - 1] != 0 && p[x1][y1 - 1] != p[x1][y1]) {
                if (p[x1][y1] == 1) a2 = 1;
                else b2 = 1;
            }
            if (p[x1][y1 + 1] != 0 && p[x1][y1 + 1] != p[x1][y1]) {
                if (p[x1][y1] == 1) a2 = 1;
                else b2 = 1;
            }
        }
    }
}
if (a1 && a2 && b1 && b2) {
    int mx = 0, my = 0;
    for (int o = 0; o < w[i][0]; o++) {
        if (p[o][0] != 0) break;
        mx = o + 1;
    }
    for (int o = 0; o < w[i][1]; o++) {
        if (p[0][o] != 0) break;
        my = o + 1;
    }
    bool ans = 1;
    for (int nx = 0; nx < mx; nx++) {
        for (int ny = 0; ny < my; ny++) {
            if (p[nx][ny] != 0) ans = 0;
        }
    }
    for (int nx = 0; nx < mx; nx++) {
        if (my >= w[i][1]) break;
        if (p[nx][my] == 0) ans = 0;
    }
    for (int ny = 0; ny < my; ny++) {
        if (mx >= w[i][1]) break;
        if (p[mx][ny] == 0) ans = 0;
    }
    if (ans && mx && my) {
        se.insert({min(mx, my), max(mx, my)});
        if (min(mx, my) == 1 && max(mx, my) == 2) {
            cout << i << ' ' << k << ' ' << mask << ' ' << x << ' ' << y
//
//
//
        }
    }
}
}

```



```

        }
        if (mask & 1) swap(w[j][0], w[j][1]);
        if (mask & 2) swap(w[h][0], w[h][1]);
    }
    if (k) swap(h, j);
}

for (vector<int> i : se) cout << i[0] << ' ' << i[1] << '\n';
}

```



## Task D ()

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

using namespace std;

signed main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    int n;
    cin >> n;
    vector<int> w(n), t, c(n);
    int x = 0, sum = 0;
    for (int i = 0; i < n; i++) {
        cin >> w[i];
        sum += w[i];
        x ^= w[i];
    }
    t = w;
    while (sum != 0) {
        bool bb = 0;
        vector<int> h;
        for (int i = 0; i < n; i++) {
            for (int k = 1; k <= t[i]; k++) {
                h.push_back({x ^ t[i] ^ (t[i] - k)});
            }
        }
        for (int i = 0; i < n; i++) {
            if (t[i] != w[i] && c[i] == 0) {
                h.push_back({x ^ t[i] ^ w[i]});
            }
        }
        sort(h.begin(), h.end());
        h.push_back(1e9);
        int p;
        for (int i = 0; i < h.size(); i++) {
            if (h[i] != i) {
                p = i;
                break;
            }
        }
        if (p == 0) {
            cout << "-1_-1";
            return 0;
        } else {
            bool bb = 0;
            for (int i = 0; i < n; i++) {
                if (bb) break;
                for (int k = 1; k <= t[i]; k++) {
                    if (((t[i] - k) ^ x ^ t[i]) == 0) {
                        cout << i + 1 << ' ' << k << endl;
                        x = 0;
                        t[i] -= k;
                        int a, b;
                        cin >> a >> b;
                        if (a == -1) return 0;
                        x ^= t[a - 1];
                        if (b) t[a - 1] -= b;
                        else {
                            t[a - 1] = w[a - 1];
                            c[i] = 1;
                        }
                        x ^= t[a - 1];
                        bb = 1;
                        break;
                    }
                }
            }
        }
    }
    for (int i = 0; i < n; i++) {
        if (bb) break;
        if ((x ^ t[i] ^ w[i]) == 0 && t[i] != w[i]) {
            cout << i + 1 << ' ' << 0 << endl;
            x = 0;
            t[i] = w[i];
        }
    }
}
```



```

        int a, b;
        cin >> a >> b;
        if (a == -1) return 0;
        x ^= t[a - 1];
        if (b) t[a - 1] -= b;
        else t[a - 1] = w[a - 1];
        x ^= t[a - 1];
        c[i] = 1;
        break;
    }
}
if (!bb) break;
}
}
}

```



## Task E ()

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

using namespace std;

signed main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    int t;
    cin >> t;
    string s;
    cin >> s;
    if (s[0] == 't') {
        while (t--) {
            int x;
            cin >> x;
            for (int i = 0; i < 100; i++) {
                cout << (i < x);
                if (i % 10 == 9) cout << '\n';
            }
            cout << '\n';
        }
        return 0;
    }
    while (t--) {
        int sum = 0;
        for (int i = 0; i < 10; i++) {
            string p;
            cin >> p;
            for (int j = 0; j < 10; j++) {
                sum += p[j] - '0';
            }
        }
        cout << sum << '\n';
    }
}
```



## Task F ()

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

using namespace std;
#define int long long

signed main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    string s(100, '9'), t(100, '9');
    cin >> s >> t;
    vector<vector<int>> w1, w2;
    int i = 0, t1 = 0, t2 = 0;
    while (i < s.size()) {
        if (s[i] == '(') {
            i++;
            int p = 0;
            while (s[i] != '|') {
                p *= 10;
                p += s[i] - '0';
                i++;
            }
            int k = 0;
            i++;
            while (s[i] != ')') {
                k *= 10;
                k += s[i] - '0';
                i++;
            }
            t1 += k;
            i++;
            w1.push_back({p, k});
        } else {
            w1.push_back({s[i] - '0', 1});
            i++;
            t1++;
        }
    }
    i = 0;
    while (i < t.size()) {
        if (t[i] == '(') {
            i++;
            int p = 0;
            while (t[i] != '|') {
                p *= 10;
                p += t[i] - '0';
                i++;
            }
            int k = 0;
            i++;
            while (t[i] != ')') {
                k *= 10;
                k += t[i] - '0';
                i++;
            }
            i++;
            t2 += k;
            w2.push_back({p, k});
        } else {
            w2.push_back({t[i] - '0', 1});
            i++;
            t2++;
        }
    }
    vector<pair<int, int>> ans;
    int u1 = w1.size() - 1, u2 = w2.size() - 1, sum1 = 0, sum2 = 0, p = 0;
    while (u1 > -1 && u2 > -1) {
        int d = min(sum1 + w1[u1][1], w2[u2][1] + sum2) - max(sum1, sum2);
        if (d <= 0) {
            if (sum1 + w1[u1][1] < w2[u2][1] + sum2) {
                sum1 += w1[u1][1];
                u1--;
            } else {

```



```

        sum2 += w2[u2][1];
        u2--;
    }
    continue;
}
if (p == 0) {
    if (w1[u1][0] + w2[u2][0] < 10) {
        ans.push_back({w1[u1][0] + w2[u2][0], d});
        p = 0;
    } else {
        p = 1;
        ans.push_back(({w1[u1][0] + w2[u2][0]) % 10, 1});
        ans.push_back(({w1[u1][0] + w2[u2][0] + 1) % 10, d - 1});
    }
} else {
    if (w1[u1][0] + w2[u2][0] + 1 < 10) {
        ans.push_back(({w1[u1][0] + w2[u2][0] + 1), 1});
        ans.push_back(({w1[u1][0] + w2[u2][0]), d - 1});
        p = 0;
    } else {
        p = 1;
        ans.push_back(({w1[u1][0] + w2[u2][0] + 1) % 10, d});
    }
}
if (sum1 + w1[u1][1] < w2[u2][1] + sum2) {
    sum1 += w1[u1][1];
    u1--;
} else {
    sum2 += w2[u2][1];
    u2--;
}
}
for (; u1 > -1; u1--) {
    int d = sum1 + w1[u1][1] - max(sum1, sum2);
    if (d <= 0) {
        sum1 += w1[u1][1];
        continue;
    }
    if (p == 0) {
        ans.push_back({w1[u1][0], d});
        p = 0;
    } else {
        if (w1[u1][0] + 1 < 10) {
            ans.push_back(({w1[u1][0] + 1), 1});
            ans.push_back(({w1[u1][0]), d - 1});
            p = 0;
        } else {
            p = 1;
            ans.push_back(({w1[u1][0] + 1) % 10, d});
        }
    }
}
sum1 += w1[u1][1];
}
for (; u2 > -1; u2--) {
    int d = sum2 + w2[u2][1] - max(sum1, sum2);
    if (d <= 0) {
        sum2 += w2[u2][1];
        continue;
    }
    if (p == 0) {
        ans.push_back({w2[u2][0], d});
        p = 0;
    } else {
        if (w2[u2][0] + 1 < 10) {
            ans.push_back(({w2[u2][0] + 1), 1});
            ans.push_back(({w2[u2][0]), d - 1});
            p = 0;
        } else {
            p = 1;
            ans.push_back(({w2[u2][0] + 1) % 10, d});
        }
    }
}
sum2 += w2[u2][1];
}

```



```

    if (p == 1) {
        ans.push_back({1, 1});
    }
    for (int i = ans.size() - 1; i > -1; i--) {
        if (ans[i].second <= 0) continue;
        cout << "(" << ans[i].first << '|' << ans[i].second << ")";
    }
}

```