

# Олимпиада СПбГУ по информатике 2022/23 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	4	10	414

## Task A ()

```
#include <iostream>
#include <vector>
#include <map>

using namespace std;

int main() {
    vector<int> arr(6);
    map<int, pair<int, int>> cnt;
    for (int i = 0; i < 6; ++i) {
        cin >> arr[i];
    }
    vector<int> ans;
    for (int i = 0; i < 6; ++i) {
        ans.insert(ans.begin() + arr[i] - 1, i);
    }
    vector<int> ans0(6);
    for (int i = 0; i < 6; ++i) {
        ans0[ans[i]] = i + 1;
    }
    for (int i = 0; i < 6; ++i) {
        cout << ans0[i] << " ";
    }
    return 0;
}
```

## Task B ()

```
#include <iostream>
#include <vector>

using namespace std;

int main() {
    string s;
    cin >> s;
    int n;
    cin >> n;
    vector<int> arr(n);
    for (int i = 0; i < n; ++i) {
        cin >> arr[i];
    }
    if (s == "first") {
        int summ = 0;
        for (int i = 0; i < n; ++i) {
            summ += arr[i];
        }
        cout << summ * 100;
    } else if (s == "second") {
        int summ0 = (arr[0] - 1) / 100;
        int summ = summ0;
        for (int i = 0; i < n; ++i) {
            summ += arr[i] - summ0 * 100;
        }
        cout << summ;
    }
    return 0;
}
```

## Task C ()

```
#include <iostream>
#include <vector>
#include <set>

using namespace std;
int a1, b1;
int a2, b2;
int a3, b3;
set<pair<int, int>> ext;
void func(vector<vector<int>>&arr, vector<int> lol){
    int n = arr.size();
    int m = arr[0].size();
    int s = 9;
    for (int i0 = 0; i0 < n; ++i0) {
        for (int j0 = 0; j0 < m; ++j0) {
            for (int i1 = i0; i1 < n; ++i1) {
                for (int j1 = j0; j1 < m; ++j1) {
                    bool f = true;
                    for (int x = i0; x <= i1; ++x) {
                        for (int y = j0; y <= j1; ++y) {
                            if (arr[x][y] == 1) {
                                f = false;
                            }
                        }
                    }
                    if (j0 != 0) {
                        for (int x = i0; x <= i1; ++x) {
                            if (arr[x][j0 - 1] == 0) {
                                f = false;
                            }
                        }
                    }
                    if (j1 != m - 1) {
                        for (int x = i0; x <= i1; ++x) {
                            if (arr[x][j1 + 1] == 0) {
                                f = false;
                            }
                        }
                    }
                    if (i0 != 0) {
                        for (int x = j0; x <= j1; ++x) {
                            if (arr[i0 - 1][x] == 0) {
                                f = false;
                            }
                        }
                    }
                    if (i1 != n - 1) {
                        for (int x = j0; x <= j1; ++x) {
                            if (arr[i1 + 1][x] == 0) {
                                f = false;
                            }
                        }
                    }
                    if (f) {
                        ext.insert({min(abs(i1 - i0 + 1), abs(j1 - j0 + 1)), max(abs(i1 - i0 + 1),
                            abs(j1 - j0 + 1))});
                    }
                }
            }
        }
    }
    if (lol[0] == 0) {
        for (int i0 = 0; i0 < n; ++i0) {
            for (int j0 = 0; j0 < m; ++j0) {
                if (i0 + a1 - 1 < n && j0 + b1 - 1 < m) {
                    bool f = true;
                    for (int x = i0; x < i0 + a1; ++x) {
                        for (int y = j0; y < j0 + b1; ++y) {
                            if (arr[x][y] == 1) {
                                f = false;
                            }
                        }
                    }
                }
            }
        }
    }
}
```

```

    }
}
if (f) {
    if (i0 != 0 && i0 + a1 != n) {
        f = false;
        for (int x = j0; x < j0 + b1; ++x) {
            if (arr[i0 - 1][x] == 1 || arr[i0 + a1][x] == 1) {
                f = true;
                break;
            }
        }
    }
}
if (f) {
    if (j0 != 0 && j0 + b1 != m) {
        f = false;
        for (int x = i0; x < i0 + a1; ++x) {
            if (arr[x][j0 - 1] == 1 || arr[x][j0 + b1] == 1) {
                f = true;
                break;
            }
        }
    }
}
}
if (f) {
    for (int x = i0; x < i0 + a1; ++x) {
        for (int y = j0; y < j0 + b1; ++y) {
            arr[x][y] = 1;
        }
    }
    lol[0] = 1;
    func(arr, lol);
    lol[0] = 0;
    for (int x = i0; x < i0 + a1; ++x) {
        for (int y = j0; y < j0 + b1; ++y) {
            arr[x][y] = 0;
        }
    }
}
}
}
swap(a1, b1);
if (i0 + a1 - 1 < n && j0 + b1 - 1 < m) {
    bool f = true;
    for (int x = i0; x < i0 + a1; ++x) {
        for (int y = j0; y < j0 + b1; ++y) {
            if (arr[x][y] == 1) {
                f = false;
            }
        }
    }
}
if (f) {
    if (i0 != 0 && i0 + a1 != n) {
        f = false;
        for (int x = j0; x < j0 + b1; ++x) {
            if (arr[i0 - 1][x] == 1 || arr[i0 + a1][x] == 1) {
                f = true;
                break;
            }
        }
    }
}
if (f) {
    if (j0 != 0 && j0 + b1 != m) {
        f = false;
        for (int x = i0; x < i0 + a1; ++x) {
            if (arr[x][j0 - 1] == 1 || arr[x][j0 + b1] == 1) {
                f = true;
                break;
            }
        }
    }
}
}
}
if (f) {
    for (int x = i0; x < i0 + a1; ++x) {

```

```

        for (int y = j0; y < j0 + b1; ++y) {
            arr[x][y] = 1;
        }
    }
    lol[0] = 1;
    func(arr, lol);
    lol[0] = 0;
    for (int x = i0; x < i0 + a1; ++x) {
        for (int y = j0; y < j0 + b1; ++y) {
            arr[x][y] = 0;
        }
    }
}
}
swap(a1, b1);
}
}
if (lol[1] == 0) {
    for (int i0 = 0; i0 < n; ++i0) {
        for (int j0 = 0; j0 < m; ++j0) {
            if (i0 + a2 - 1 < n && j0 + b2 - 1 < m) {
                bool f = true;
                for (int x = i0; x < i0 + a2; ++x) {
                    for (int y = j0; y < j0 + b2; ++y) {
                        if (arr[x][y] == 1) {
                            f = false;
                        }
                    }
                }
            }
            if (f) {
                if (i0 != 0 && i0 + a2 != n) {
                    f = false;
                    for (int x = j0; x < j0 + b2; ++x) {
                        if (arr[i0 - 1][x] == 1 || arr[i0 + a2][x] == 1) {
                            f = true;
                            break;
                        }
                    }
                }
            }
            if (f) {
                if (j0 != 0 && j0 + b2 != m) {
                    f = false;
                    for (int x = i0; x < i0 + a2; ++x) {
                        if (arr[x][j0 - 1] == 1 || arr[x][j0 + b2] == 1) {
                            f = true;
                            break;
                        }
                    }
                }
            }
        }
    }
    if (f) {
        for (int x = i0; x < i0 + a2; ++x) {
            for (int y = j0; y < j0 + b2; ++y) {
                arr[x][y] = 1;
            }
        }
        lol[1] = 1;
        func(arr, lol);
        lol[1] = 0;
        for (int x = i0; x < i0 + a2; ++x) {
            for (int y = j0; y < j0 + b2; ++y) {
                arr[x][y] = 0;
            }
        }
    }
}
}
swap(a2, b2);
if (i0 + a2 - 1 < n && j0 + b2 - 1 < m) {
    bool f = true;
    for (int x = i0; x < i0 + a2; ++x) {
        for (int y = j0; y < j0 + b2; ++y) {
            if (arr[x][y] == 1) {

```

```

        f = false;
    }
}
}
if (f) {
    if (i0 != 0 && i0 + a2 != n) {
        f = false;
        for (int x = j0; x < j0 + b2; ++x) {
            if (arr[i0 - 1][x] == 1 || arr[i0 + a2][x] == 1) {
                f = true;
                break;
            }
        }
    }
}
if (f) {
    if (j0 != 0 && j0 + b2 != m) {
        f = false;
        for (int x = i0; x < i0 + a2; ++x) {
            if (arr[x][j0 - 1] == 1 || arr[x][j0 + b2] == 1) {
                f = true;
                break;
            }
        }
    }
}
}
if (f) {
    for (int x = i0; x < i0 + a2; ++x) {
        for (int y = j0; y < j0 + b2; ++y) {
            arr[x][y] = 1;
        }
    }
    lol[1] = 1;
    func(arr, lol);
    lol[1] = 0;
    for (int x = i0; x < i0 + a2; ++x) {
        for (int y = j0; y < j0 + b2; ++y) {
            arr[x][y] = 0;
        }
    }
}
}
swap(a2, b2);
}
}
}
if (lol[2] == 0) {
    for (int i0 = 0; i0 < n; ++i0) {
        for (int j0 = 0; j0 < m; ++j0) {
            if (i0 + a3 - 1 < n && j0 + b3 - 1 < m) {
                bool f = true;
                for (int x = i0; x < i0 + a3; ++x) {
                    for (int y = j0; y < j0 + b3; ++y) {
                        if (arr[x][y] == 1) {
                            f = false;
                        }
                    }
                }
            }
        }
    }
    if (f) {
        if (i0 != 0 && i0 + a3 != n) {
            f = false;
            for (int x = j0; x < j0 + b3; ++x) {
                if (arr[i0 - 1][x] == 1 || arr[i0 + a3][x] == 1) {
                    f = true;
                    break;
                }
            }
        }
    }
}
if (f) {
    if (j0 != 0 && j0 + b3 != m) {
        f = false;
        for (int x = i0; x < i0 + a3; ++x) {
            if (arr[x][j0 - 1] == 1 || arr[x][j0 + b3] == 1) {
                f = true;
            }
        }
    }
}
}

```

```

        break;
    }
}
}
}
}
if (f) {
    for (int x = i0; x < i0 + a3; ++x) {
        for (int y = j0; y < j0 + b3; ++y) {
            arr[x][y] = 1;
        }
    }
    lol[2] = 1;
    func(arr, lol);
    lol[2] = 0;
    for (int x = i0; x < i0 + a3; ++x) {
        for (int y = j0; y < j0 + b3; ++y) {
            arr[x][y] = 0;
        }
    }
}
}
swap(a3, b3);
if (i0 + a3 - 1 < n && j0 + b3 - 1 < m) {
    bool f = true;
    for (int x = i0; x < i0 + a3; ++x) {
        for (int y = j0; y < j0 + b3; ++y) {
            if (arr[x][y] == 1) {
                f = false;
            }
        }
    }
}
if (f) {
    if (i0 != 0 && i0 + a3 != n) {
        f = false;
        for (int x = j0; x < j0 + b3; ++x) {
            if (arr[i0 - 1][x] == 1 || arr[i0 + a3][x] == 1) {
                f = true;
                break;
            }
        }
    }
}
if (f) {
    if (j0 != 0 && j0 + b3 != m) {
        f = false;
        for (int x = i0; x < i0 + a3; ++x) {
            if (arr[x][j0 - 1] == 1 || arr[x][j0 + b3] == 1) {
                f = true;
                break;
            }
        }
    }
}
}
if (f) {
    for (int x = i0; x < i0 + a3; ++x) {
        for (int y = j0; y < j0 + b3; ++y) {
            arr[x][y] = 1;
        }
    }
    lol[2] = 1;
    func(arr, lol);
    lol[2] = 0;
    for (int x = i0; x < i0 + a3; ++x) {
        for (int y = j0; y < j0 + b3; ++y) {
            arr[x][y] = 0;
        }
    }
}
}
}
swap(a3, b3);
}
}
}

```

```

}
int main() {
    cin >> a1 >> b1 >> a2 >> b2 >> a3 >> b3;
    if (b1 < a1) {
        swap(a1, b1);
    }
    if (b2 < a2) {
        swap(a2, b2);
    } if (b3 < a3) {
        swap(a3, b3);
    }
    vector<vector<int>> arr(a1, vector<int> (b1, 0));
    vector<int> lol{1, 0, 0};
    func(arr, lol);
    arr.assign(a2, vector<int> (b2, 0));
    lol = {0, 1, 0};
    func(arr, lol);
    arr.assign(a3, vector<int> (b3, 0));
    lol = {0, 0, 1};
    func(arr, lol);
    for (auto kid : ext) {
        cout << kid.first << "┘" << kid.second << "\n";
    }
    return 0;
}

```



## Task D ()

```
#include <iostream>
#include <vector>

using namespace std;

int main() {
    int num_of_vases;
    cin >> num_of_vases;
    vector<int> vases(num_of_vases);
    vector<int> izn(num_of_vases);
    for (int i = 0; i < num_of_vases; ++i) {
        cin >> vases[i];
        izn[i] = vases[i];
    }
    int xxor = vases[0] + 1;
    for (int i = 1; i < num_of_vases; ++i) {
        xxor ^= vases[i] + 1;
    }
    bool f = true;
    if (xxor == 0) {
        cout << -1 << "␣" << -1 << endl;
        cout.flush();
        f = false;
    }
    while (f) {
        for (int i = 0; i < num_of_vases; ++i) {
            int ext = 0;
            if (izn[i] == vases[i]) {
                ++ext;
            }
            if (vases[i] > (xxor ^ (vases[i] + ext)) || ((xxor ^ (vases[i] + ext)) == izn[i] && izn[i] != -1)) {
                if (vases[i] > (xxor ^ (vases[i] + ext))) {
                    cout << i + 1 << "␣" << vases[i] - (xxor ^ (vases[i] + ext)) << endl;
                    cout.flush();
                    vases[i] = (xxor ^ (vases[i] + ext));
                    xxor = 0;
                } else {
                    xxor = 0;
                    cout << i + 1 << "␣" << 0 << endl;
                    cout.flush();
                    vases[i] = izn[i];
                    izn[i] = -1;
                }
                break;
            }
        }
    }
    int vase;
    int dey;
    cin >> vase >> dey;
    if (vase == -1) {
        f = false;
    } else {
        --vase;
        int ext = 0;
        if (vases[vase] == izn[vase]) {
            ext = 1;
        }
        xxor ^= (vases[vase] + ext);
        if (dey == 0) {
            vases[vase] = izn[vase];
            izn[vase] = -1;
            xxor ^= vases[vase];
        } else {
            vases[vase] -= dey;
            xxor ^= vases[vase];
        }
    }
    if (xxor == 0) {
        cout << -1 << "␣" << -1 << endl;
        cout.flush();
    }
}
```

```
        f = false;
    }
}
return 0;
}
```

## Task E ()

```
#include <iostream>
#include <vector>
#include <map>
#include <algorithm>
using namespace std;

int main() {
    int num_of_tests;
    cin >> num_of_tests;
    string str;
    cin >> str;
    map<vector<int>, int> ext;
    map<int, vector<int>> ext2;
    int c = 1;
    for (int i0 = 0; i0 < 10; ++i0) {
        for (int i1 = i0; i1 < 10; ++i1) {
            for (int i2 = i1; i2 < 10; ++i2) {
                for (int i3 = i2; i3 < 10; ++i3) {
                    for (int i4 = i3; i4 < 10; ++i4) {
                        for (int i5 = i4; i5 < 10; ++i5) {
                            for (int i6 = i5; i6 < 10; ++i6) {
                                for (int i7 = i6; i7 < 10; ++i7) {
                                    for (int i8 = i7; i8 < 10; ++i8) {
                                        for (int i9 = i8; i9 < 10; ++i9) {
                                            ext[{i0, i1, i2, i3, i4, i5, i6, i7, i8, i9}] = c;
                                            ext2[c] = {i0, i1, i2, i3, i4, i5, i6, i7, i8, i9};
                                            ++c;
                                        }
                                    }
                                }
                            }
                        }
                    }
                }
            }
        }
    }

    if (str == "transmit") {
        for (int t = 0; t < num_of_tests; ++t) {
            int num;
            cin >> num;
            for (int i = 0; i < 10; ++i) {
                for (int j = 0; j < ext2[num][i]; ++j) {
                    cout << 1;
                }
                for (int j = ext2[num][i]; j < 10; ++j) {
                    cout << 0;
                }
                cout << "\n";
            }
            cout << "\n";
        }
    } else {
        for (int t = 0; t < num_of_tests; ++t) {
            vector<int> s;
            for (int i = 0; i < 10; ++i) {
                int c0 = 0;
                for (int j = 0; j < 10; ++j) {
                    char sym;
                    cin >> sym;
                    if (sym == '1') {
                        ++c0;
                    }
                }
                s.push_back(c0);
            }
            sort(s.begin(), s.end());
            cout << ext[s];
            cout << "\n";
        }
    }
}
```

```

    return 0;
}
/*
0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
1111000000

0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
0000000000
1000000000*/

```

## Task F ()

```
#include <iostream>
#include <vector>
#include <algorithm>

using namespace std;

int main() {
    string a = "", a0, b0;
    string b = "";
    cin >> a0 >> b0;
    int f = 0;
    string khh = "";
    string n = "";
    for (auto x : a0) {
        if (!f && x != '(') {
            a += x;
        } else if (x == '(') {
            f = 1;
        } else if (f == 1 && x != '|') {
            n += x;
        } else if (x == '|') {
            f = 2;
        } else if (x != ')') {
            khh += x;
        } else {
            f = 0;
            int c = 0;
            int ext = 1;
            for (int i = khh.size() - 1; i > -1; --i) {
                c += (khh[i] - '0') * ext;
                ext *= 10;
            }
            for (int i = 0; i < c; ++i) {
                a += n;
            }
            khh = "";
            n = "";
        }
    }
    f = 0;
    for (auto x : b0) {
        if (!f && x != '(') {
            b += x;
        } else if (x == '(') {
            f = 1;
        } else if (f == 1 && x != '|') {
            n += x;
        } else if (x == '|') {
            f = 2;
        } else if (x != ')') {
            khh += x;
        } else {
            f = 0;
            int c = 0;
            int ext = 1;
            for (int i = khh.size() - 1; i > -1; --i) {
                c += (khh[i] - '0') * ext;
                ext *= 10;
            }
            for (int i = 0; i < c; ++i) {
                b += n;
            }
            khh = "";
            n = "";
        }
    }
    string c = "";
    int inda = a.size() - 1;
    int indb = b.size() - 1;
    int extra = 0;
```

```

while (inda != -1 && indb != -1) {
    if (int(a[inda] - '0') + int(b[indb] - '0') + extra > 9) {
        c += '0' + (int(a[inda] - '0') + int(b[indb] - '0') + extra - 10);
        extra = 1;
    } else {
        c += '0' + (int(a[inda] - '0') + int(b[indb] - '0') + extra);
        extra = 0;
    }
    --inda;
    --indb;
}
while (inda != -1) {
    if (int(a[inda] - '0') + extra > 9) {
        c += '0' + (int(a[inda] - '0') + extra - 10);
        extra = 1;
    } else {
        c += '0' + (int(a[inda] - '0') + extra);
        extra = 0;
    }
    --inda;
}
while (indb != -1) {
    if (int(b[indb] - '0') + extra > 9) {
        c += '0' + (int(b[indb] - '0') + extra - 10);
        extra = 1;
    } else {
        c += '0' + (int(b[indb] - '0') + extra);
        extra = 0;
    }
    --indb;
}
if (extra == 1) {
    c += "1";
}
reverse(c.begin(), c.end());
cout << c;
return 0;
}

```