

Олимпиада СПбГУ по информатике 2022/23 учебного года

| A | B | C | D | E | F | Sum |
|-----|-----|----|----|----|----|-----|
| 100 | 100 | 80 | 30 | 28 | 65 | 403 |

Task A ()

```
#include "iostream"
#include "vector"
#include "algorithm"
#include "set"
#include "iomanip"
#include "map"
#include "unordered_set"
#include "unordered_map"
#include "deque"
#include "fstream"
#include "ctime"
#include "queue"
#include "random"

using namespace std;

const int mod = 1e9 + 7;

#define int long long

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    vector<int> d(6);
    for (int i = 0; i < 6; i++) {
        cin >> d[i];
    }
    vector<int> ch;
    for (int i = 1; i <= 6; i++) {
        ch.push_back(i);
    }
    vector<int> alr;
    vector<int> it;
    for (int i = 0; i < 6; i++) {
        int id = 0;
        while (id < alr.size() and alr[id] < ch[i]) {
            id++;
        }
        it.push_back(id + 1);
        vector<int> nalr;
        for (int j = 0; j < id; j++) {
            nalr.push_back(alr[j]);
        }
        nalr.push_back(ch[i]);
        for (int j = id; j < alr.size(); j++) {
            nalr.push_back(alr[j]);
        }
    }
}
```

```

    }
    alr = nalr;
}
if (d == it) {
    for (auto nw : ch) {
        cout << nw << "␣";
    }
}
else {
    while(next_permutation(ch.begin(), ch.end())) {
        alr.clear();
        it.clear();
        for (int i = 0; i < 6; i++) {
            int id = 0;
            while (id < alr.size() and alr[id] < ch[i]) {
                id++;
            }
            it.push_back(id + 1);
            vector<int> nalr;
            for (int j = 0; j < id; j++) {
                nalr.push_back(alr[j]);
            }
            nalr.push_back(ch[i]);
            for (int j = id; j < alr.size(); j++) {
                nalr.push_back(alr[j]);
            }
            alr = nalr;
        }
        if (d == it) {
            for (auto nw : ch) {
                cout << nw << "␣";
            }
        }
    }
}
}
}
}
}

```

Task B ()

```
#include "iostream"
#include "vector"
#include "algorithm"
#include "set"
#include "iomanip"
#include "map"
#include "unordered_set"
#include "unordered_map"
#include "deque"
#include "fstream"
#include "ctime"
#include "queue"
#include "random"

using namespace std;

const int mod = 1e9 + 7;

#define int long long

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    string f;
    cin >> f;
    if (f == "first") {
        int n;
        cin >> n;
        vector<int> a(n);
        int su = 0;
        for (int i = 0; i < n; i++) {
            cin >> a[i];
            su += a[i];
        }
        cout << su * 1000 << "\n";
    }
    else {
        int n;
        cin >> n;
        int su2 = 0;
        int su1 = 0;
        for (int i = 0; i < n; i++) {
            int nw;
            cin >> nw;
            su2 += nw % 1000;
            su1 = nw / 1000;
        }
        cout << su1 + su2 << "\n";
    }
}
```

Task C ()

```
#include "iostream"
#include "vector"
#include "algorithm"
#include "set"
#include "iomanip"
#include "map"
#include "unordered_set"
#include "unordered_map"
#include "deque"
#include "fstream"
#include "ctime"
#include "queue"
#include "random"

using namespace std;

const int mod = 1e9 + 7;

#define int long long

set <vector <int>> ans;

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    vector <vector <int>> a(3, vector <int> (2));
    for (int i = 0; i < 3; i++) {
        for (int j = 0; j < 2; j++) {
            cin >> a[i][j];
        }
        sort(a[i].begin(), a[i].end());
        ans.insert(a[i]);
    }
    sort(a.begin(), a.end());
    vector <vector <int>> ch = {{2, 3}, {2, 3}, {4, 6}};
    for (int i = 0; i < 8; i++) {
        vector <vector <int>> s = a;
        for (int h = 0; h < 3; h++) {
            if ((1 << h) & i) {
                swap(s[h][0], s[h][1]);
            }
        }
        int alx = s[2][0];
        int aly = s[2][1];
        for (int j = 2; j > -1; j--) {
            vector <int> nw;
            if (s[j][0] == alx and s[j][1] < aly) {
                nw = {alx, aly - s[j][1]};
            }
            if (nw.size() != 0) {
                sort(nw.begin(), nw.end());
                ans.insert(nw);
            }
            if (s[j][0] < alx and s[j][1] == aly) {
                nw = {alx - s[j][0], aly};
            }
            if (nw.size() != 0) {
                sort(nw.begin(), nw.end());
                ans.insert(nw);
            }
        }
    }

    alx = s[1][0];
```

```

aly = s[1][1];
for (int j = 2; j > -1; j--) {
    vector<int> nw;
    if (s[j][0] == alx and s[j][1] < aly) {
        nw = {alx, aly - s[j][1]};
    }
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
    if (s[j][0] < alx and s[j][1] == aly){
        nw = {alx - s[j][0], aly};
    }
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
}

alx = s[2][0];
aly = s[2][1];

if (s[1][0] + s[0][0] == alx and s[1][1] == s[0][1] and s[2][1] > s[1][1]) {
    vector<int> nw = {alx, aly - s[1][1]};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
}
if (s[1][1] + s[0][1] == aly and s[1][0] == s[0][0] and s[2][0] > s[1][0]) {
    vector<int> nw = {alx - s[1][0], aly};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
}

if (s[1][0] < alx and s[1][1] < aly and s[0][1] <= aly and s[1][0] + s[0][0] <= alx
and s[1][1] + s[0][1] > aly) {
    vector<int> nw = {s[1][0], aly - s[1][1]};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
    if (s[0][1] == aly and s[0][0] + s[1][0] < alx) {
        nw = {alx - s[1][0] - s[0][0], s[0][1]};
        if (nw.size() != 0) {
            sort(nw.begin(), nw.end());
            ans.insert(nw);
        }
    }
}
swap(s[0], s[1]);
if (s[1][0] < alx and s[1][1] < aly and s[0][1] <= aly and s[1][0] + s[0][0] <= alx
and s[1][1] + s[0][1] > aly) {
    vector<int> nw = {s[1][0], aly - s[1][1]};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
    if (s[0][1] == aly and s[0][0] + s[1][0] < alx) {
        nw = {alx - s[1][0] - s[0][0], s[0][1]};
        if (nw.size() != 0) {
            sort(nw.begin(), nw.end());
            ans.insert(nw);
        }
    }
}
}

```

```
swap(s[0], s[1]);
```

```

if (s[1][0] < alx and s[1][1] < aly and s[1][0] + s[0][0] == alx and s[1][1] + s[0][1]
    >= aly and s[0][1] < aly) {
    vector<int> nw = {s[1][0], aly - s[1][1]};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
    nw = {alx - s[1][0], aly - s[0][1]};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
}
swap(s[0], s[1]);
if (s[1][0] < alx and s[1][1] < aly and s[1][0] + s[0][0] == alx and s[1][1] + s[0][1]
    >= aly and s[0][1] < aly) {
    vector<int> nw = {s[1][0], aly - s[1][1]};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
    nw = {alx - s[1][0], aly - s[0][1]};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
}
swap(s[0], s[1]);

```

```

if (s[0][0] == s[1][0] and s[0][0] == alx and s[0][1] + s[1][1] < aly) {
    vector<int> nw = {alx, aly - s[1][1] - s[0][1]};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
}
swap(s[0], s[1]);
if (s[0][0] == s[1][0] and s[0][0] == alx and s[0][1] + s[1][1] < aly) {
    vector<int> nw = {alx, aly - s[1][1] - s[0][1]};
    if (nw.size() != 0) {
        sort(nw.begin(), nw.end());
        ans.insert(nw);
    }
}
swap(s[0], s[1]);

```

```
}
```

```

for (auto el: ans) {
    cout << el[0] << " " << el[1] << "\n";
}

```

```
}
```

Task D ()

```
#include "iostream"
#include "vector"
#include "algorithm"
#include "set"
#include "iomanip"
#include "map"
#include "unordered_set"
#include "unordered_map"
#include "deque"
#include "fstream"
#include "ctime"
#include "queue"
#include "random"

using namespace std;

const int mn = 51;

int dp[mn][mn][mn][8];
vector<int> pr[mn][mn][mn][8];
vector<int> prr[mn][mn][mn][8];

const int mod = 1e9 + 7;

void solve (int a1, int a2, int a3, int por, int aa1, int aa2, int aa3) {
    cout << pr[a1][a2][a3][por][0] << "_" << pr[a1][a2][a3][por][1] << "\n";
    cout.flush();
    vector<int> nw = prr[a1][a2][a3][por];
    a1 = nw[0];
    a2 = nw[1];
    a3 = nw[2];
    por = nw[3];
    int ch1, ch2;
    cin >> ch1 >> ch2;
    if (ch1 == -1) {
        return;
    }
    else {
        if (ch1 == 1) {
            if (ch2 == 0) {
                a1 = aa1;
                por -= 1;
            }
            else {
                a1 -= ch2;
            }
        }
        else if (ch1 == 2) {
            if (ch2 == 0) {
                a2 = aa2;
                por -= 2;
            }
            else {
                a2 -= ch2;
            }
        }
        else {
            if (ch2 == 0) {
                a3 = aa3;
                por -= 4;
            }
            else {
                a3 -= ch2;
            }
        }
    }
}
```

```

    }
    solve(a1, a2, a3, por, aa1, aa2, aa3);
}
}

```

```

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    int n;
    cin >> n;
    int ai;
    cin >> ai;
    if (n == 1) {
        cout << 1 << " " << ai << "\n";
        cout.flush();
        int ch1, ch2;
        cin >> ch1 >> ch2;
        if (ch1 == -1) {
            return 0;
        }
        else {
            cout << 1 << " " << ai << "\n";
            cout.flush();
            cin >> ch1 >> ch2;
            return 0;
        }
    }
    else if (n == 3) {
        dp[0][0][0][0] = 0;
        vector<int> por = {0, 1, 2, 4, 3, 6, 5, 7};
        int aa1 = ai;
        int aa2, aa3;
        cin >> aa2 >> aa3;
        for (auto el : por) {
            for (int a1 = 0; a1 < 51; a1++) {
                for (int a2 = 0; a2 < 51; a2++) {
                    for (int a3 = 0; a3 < 51; a3++) {

                        int chh = 0;

                        for (int pra = 0; pra < a1; pra++) {
                            if (dp[pra][a2][a3][el] == 0) {
                                chh = 1;
                                pr[a1][a2][a3][el] = {1, a1 - pra};
                                prr[a1][a2][a3][el] = {pra, a2, a3, el};
                            }
                        }

                        if (!chh) {
                            for (int prb = 0; prb < a2; prb++) {
                                if (dp[a1][prb][a3][el] == 0) {
                                    chh = 1;
                                    pr[a1][a2][a3][el] = {2, a2 - prb};
                                    prr[a1][a2][a3][el] = {a1, prb, a3, el};
                                }
                            }

                            if (!chh) {
                                for (int prc = 0; prc < a3; prc++) {
                                    if (dp[a1][a2][prc][el] == 0) {
                                        chh = 1;
                                        pr[a1][a2][a3][el] = {3, a3 - prc};
                                        prr[a1][a2][a3][el] = {a1, a2, prc, el};
                                    }
                                }
                            }
                        }
                    }
                }
            }
        }
    }
}

```


9

```

int chh = 0;

for (int pra = 0; pra < a1; pra++) {
    if (dp[pra][a2][a3][el] == 0) {
        chh = 1;
        pr[a1][a2][a3][el] = {1, a1 - pra};
        prr[a1][a2][a3][el] = {pra, a2, a3, el};
    }
}

if (!chh) {
    for (int prb = 0; prb < a2; prb++) {
        if (dp[a1][prb][a3][el] == 0) {
            chh = 1;
            pr[a1][a2][a3][el] = {2, a2 - prb};
            prr[a1][a2][a3][el] = {a1, prb, a3, el};
        }
    }
}

if (!chh) {
    for (int prc = 0; prc < a3; prc++) {
        if (dp[a1][a2][prc][el] == 0) {
            chh = 1;
            pr[a1][a2][a3][el] = {3, a3 - prc};
            prr[a1][a2][a3][el] = {a1, a2, prc, el};
        }
    }
}

if (!chh) {
    for (int i = 0; i < 3; i++) {
        if ((1 << i) & el) {
            if (i == 0) {
                int nwa = aa1;
                if (dp[nwa][a2][a3][el - (1 << i)] == 0) {
                    chh = 1;
                    pr[a1][a2][a3][el] = {1, 0};
                    prr[a1][a2][a3][el] = {nwa, a2, a3, el - (1 << i)};
                    break;
                }
            }
        }
    }
}

else if (i == 1) {
    int nwa = aa2;
    if (dp[a1][nwa][a3][el - (1 << i)] == 0) {
        chh = 1;
        pr[a1][a2][a3][el] = {2, 0};
        prr[a1][a2][a3][el] = {a1, nwa, a3, el - (1 << i)};
        break;
    }
}

else {
    int nwa = aa3;
    if (dp[a1][a2][nwa][el - (1 << i)] == 0) {
        chh = 1;
        pr[a1][a2][a3][el] = {3, 0};
        prr[a1][a2][a3][el] = {a1, a2, nwa, el - (1 << i)};
    }
}

```

```
break;
```

Task E ()

```
#include "iostream"
#include "vector"
#include "algorithm"
#include "set"
#include "iomanip"
#include "map"
#include "unordered_set"
#include "unordered_map"
#include "deque"
#include "fstream"
#include "ctime"
#include "queue"
#include "random"

using namespace std;

const int mod = 1e9 + 7;

signed main() {
    int t;
    cin >> t;
    string s;
    cin >> s;
    if (s == "transmit") {
        cout << "\n";
        while (t--) {
            int n;
            cin >> n;
            int cn = 0;
            int nd = n / 2;
            vector<vector<int>>> ret(10, vector<int>(10));
            for (int i = 0; i < 10; i++) {
                for (int j = 0; j < 10; j++) {
                    if (cn != nd) {
                        ret[i][j] = 1;
                        cn++;
                    }
                }
            }
            if (n % 2 != 0) {
                ret[9] = {1, 0, 0, 0, 0, 0, 0, 0, 0, 0};
                ret[8] = {1, 0, 0, 0, 0, 0, 0, 0, 0, 0};
            }
            for (int i = 0; i < 10; i++) {
                for (int j = 0; j < 10; j++) {
                    cout << ret[i][j];
                }
                cout << "\n";
            }
        }
    }
    else {
        while (t--) {
            int su = 0;
            int cn = 0;
            for (int i = 0; i < 10; i++) {
                int sug = 0;
                for (int j = 0; j < 10; j++) {
                    char f;
                    cin >> f;
                    su += (f - '0');
                    sug += (f - '0');
                }
                if (sug == 1) {
```

```

        cn++;
    }
}
if (cn >= 2) {
    su -= 2;
    cout << su * 2 + 1 << "\n";
}
else {
    cout << su * 2 << "\n";
}
}
}
}

```

Task F ()

```
a = int(input())  
b = int(input())  
print(a + b)
```