

Олимпиада СПбГУ по информатике 2022/23 учебного года

A	B	C	D	E	F	Sum
100	100	70	100	16	0	386

Task A ()

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <fstream>
#include <random>
#include <map>
#include <string>
#include <set>
#include <deque>

using namespace std;
#define double long double//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define int long long//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define ll long long
#define INF 10000000007
#define mod 10000000007
#define pb push_back
#define pf push_front
#define s second
#define f first
#ifdef ONLINE_JUDGE
#define debug(y) cerr << (#y) << ":_" << y << endl;
#else
#define debug(y)
#endif
#define time clock() / (double) CLOCKS_PER_SEC
ll max(ll a, ll b) {
    return (a > b) ? a : b;
}

ll min(ll a, ll b) {
    return (a < b) ? a : b;
}

int bin_pow(int n, int k) {
    if (k == 0) return 1;
    if (k & 1) return (n * bin_pow(n, k - 1)) % mod;
    int t = bin_pow(n, k / 2);
    return (t * t) % mod;
}

int add(int a, int b) {
    if (a + b >= mod) return a + b - mod;
    return a + b;
}

int mul(int a, int b) {
    return (a * b) % mod;
}

void solve() {
    deque<int> a;
    for (int i = 0; i < 6; i++) {
        int x; cin >> x;
        x--;
        if (x == 0) {
```

```

        a.push_front(i);
        continue;
    }
    a.push_back(i);
    for (int it = a.size() - 2; it >= x; it--) {
        debug(it);
        swap(a[it], a[it + 1]);
    }
}
vector<int> ans(6);
for (int i = 0; i < 6; i++) {
    ans[a[i]] = i + 1;
}
for (auto c : ans) cout << c << " ";
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    //cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
/*
*
*
4 5
1 0 1 0 0
1 0 1 0 0
0 0 0 1 1
0 0 0 1 1
5
1 2
1 3
1 4
2 3
2 4
*/

```

Task B ()

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <fstream>
#include <random>
#include <map>
#include <string>
#include <set>
#include <deque>

using namespace std;
#define double long double//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define int long long//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define ll long long
#define INF 10000000007
#define mod 10000000007
#define pb push_back
#define pf push_front
#define s second
#define f first
#ifdef ONLINE_JUDGE
#define debug(y) cerr << (#y) << ":_:" << y << endl;
#else
#define debug(y)
#endif
#define time clock() / ((double) CLOCKS_PER_SEC)
ll max(ll a, ll b) {
    return (a > b) ? a : b;
}

ll min(ll a, ll b) {
    return (a < b) ? a : b;
}

int bin_pow(int n, int k) {
    if (k == 0) return 1;
    if (k & 1) return (n * bin_pow(n, k - 1)) % mod;
    int t = bin_pow(n, k / 2);
    return (t * t) % mod;
}

int add(int a, int b) {
    if (a + b >= mod) return a + b - mod;
    return a + b;
}

int mul(int a, int b) {
    return (a * b) % mod;
}

const int p = 100000;
void solve() {
    string s;
    cin >> s;
    if (s == "first") {
        int n;
        cin >> n;
        int sum = 0;
        for (int i = 0; i < n; i++) {
            int c; cin >> c;
            sum += c;
        }
        cout << sum * p << endl;
    }
    else {
        int n;
        cin >> n;
        int sum = 0;
        for (int i = 0; i < n; i++) {
            int c;
            cin >> c;
            sum += c;
        }
    }
}
```

```

    }
    int ans = 0;
    debug(sum);
    for (int j = 0; j < 100000; j++) {
        if ((sum - j) % (p * n) == 0) {
            ans = j + (sum - j) / (p * n);
            break;
        }
    }
    cout << ans << endl;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    //cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
/*
*
*
4 5
1 0 1 0 0
1 0 1 0 0
0 0 0 1 1
0 0 0 1 1
5
1 2
1 3
1 4
2 3
2 4
*/

```

Task C ()

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <fstream>
#include <random>
#include <map>
#include <string>
#include <set>
#include <deque>

using namespace std;
#define double long double//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define int long long//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define ll long long
#define INF 10000000007
#define mod 10000000007
#define pb push_back
#define pf push_front
#define s second
#define f first
#ifdef ONLINE_JUDGE
#define debug(y) cerr << (#y) << " :_" << y << endl;
#else
#define debug(y)
#endif
#define time clock() / (double) CLOCKS_PER_SEC
ll max(ll a, ll b) {
    return (a > b) ? a : b;
}

ll min(ll a, ll b) {
    return (a < b) ? a : b;
}

int bin_pow(int n, int k) {
    if (k == 0) return 1;
    if (k & 1) return (n * bin_pow(n, k - 1)) % mod;
    int t = bin_pow(n, k / 2);
    return (t * t) % mod;
}

int add(int a, int b) {
    if (a + b >= mod) return a + b - mod;
    return a + b;
}

int mul(int a, int b) {
    return (a * b) % mod;
}

vector<pair<int, int>> ans, boxes;
vector<int> used(3), p;
void perebor() {
    if (p.size() == 3) {
        vector<pair<int, int>> l;
        for (auto c : p) {
            l.push_back(boxes[c]);
        }
        for (int i = 0; i < 2; i++) {
            for (int j = 0; j < 2; j++) {
                for (int z = 0; z < 2; z++) {
                    vector<pair<int, int>> cur = l;
                    if (i == 1) swap(cur[0].first, cur[0].second);
                    if (j == 1) swap(cur[1].first, cur[1].second);
                    if (z == 1) swap(cur[2].first, cur[2].second);
                    if (cur[0].first == cur[2].first && cur[1].first == cur[0].first) {
                        int k = max(0, cur[0].second - cur[1].second - cur[2].second);
                        ans.push_back({ cur[0].first, k });
                    }
                    if (cur[0].first < cur[1].first) continue;
                    if (cur[0].second < cur[1].second) continue;
                    if (cur[0].first < cur[2].first) continue;
                    if (cur[0].second < cur[2].second) continue;
                }
            }
        }
    }
}
```

```

        int new_a = cur[0].first - cur[1].first, new_b = cur[0].second - cur[1].second
            , a3 = cur[2].first, b3 = cur[2].second;
        if (b3 == cur[0].second && new_a >= a3) {
            ans.push_back({ cur[1].first, new_b });
            ans.push_back({ new_a - a3, cur[0].second });
        }
        if (new_a == a3) {
            if (cur[2].second == cur[1].second) {
                ans.push_back({ cur[0].first, new_b });
            }
        }
        if (a3 == cur[0].first && b3 <= new_b) {
            ans.push_back({ new_a, cur[1].second });
            ans.push_back({ new_b - b3, cur[0].first });
        }
        if (new_b == b3) {
            if (a3 == cur[1].first) {
                ans.push_back({ cur[0].second, new_a });
            }
        }
        if (cur[1].first + cur[2].first > cur[0].first && (cur[1].second + cur[2].
            second <= cur[0].second)) {
            ans.push_back({ new_a, cur[1].second });
            if (new_b == b3) {
                ans.push_back({ cur[0].first - cur[2].first, new_b });
            }
        }
        if (cur[1].first + cur[2].first == cur[0].first && cur[1].second + cur[2].
            second == cur[0].second) {
            ans.push_back({ new_a, cur[1].second });
        }
    }
}
}
else {
    for (int i = 0; i < 3; i++) {
        if (used[i]) continue;
        p.pb(i);
        used[i] = 1;
        perebor();
        p.pop_back();
        used[i] = 0;
    }
}
}
void make_clear() {
    set<pair<int, int>> news;
    for (auto c : ans) {
        int a = c.first, b = c.second;
        if (a > b) swap(a, b);
        if (a == 0) continue;
        news.insert({ a, b });
    }
    ans.clear();
    for (auto c : news) ans.push_back(c);
}
void solve() {
    for (int i = 0; i < 3; i++) {
        int a, b;
        cin >> a >> b;
        boxs.push_back({ a, b });
        ans.push_back({ a, b });
    }
    for (int i = 0; i < 3; i++) {
        for (int j = 0; j < 3; j++) {
            if (i == j) continue;
            int a1 = boxs[i].first, b1 = boxs[i].second, a2 = boxs[j].first, b2 = boxs[j].second;
            for (int p = 0; p < 4; p++) {
                if (p == 1) swap(a1, b1);
                if (p == 2) swap(a2, b2);
                if (p == 3) {
                    swap(a1, b1);
                    swap(a2, b2);
                }
            }
        }
    }
}

```

```

        }
        if (a1 == a2 && b1 < b2) {
            ans.push_back({ a1, b2 - b1 });
        }
        if (b1 == b2 && a1 < a2) {
            ans.push_back({ a2 - a1, b1 });
        }
    }
}

perebor();
make_clear();
for (auto c : ans) cout << c.first << "_" << c.second << endl;

}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    //cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}

/*
*
*
4 5
1 0 1 0 0
1 0 1 0 0
0 0 0 1 1
0 0 0 1 1
5
1 2
1 3
1 4
2 3
2 4
*/

```

Task D ()

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <fstream>
#include <random>
#include <map>
#include <string>
#include <set>
#include <deque>

using namespace std;
#define double long double//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define int long long//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define ll long long
#define INF 10000000007
#define mod 10000000007
#define pb push_back
#define pf push_front
#define s second
#define f first
#ifdef ONLINE_JUDGE
#define debug(y) cerr << (#y) << " : " << y << endl;
#else
#define debug(y)
#endif
#define time clock() / ((double) CLOCKS_PER_SEC)
ll max(ll a, ll b) {
    return (a > b) ? a : b;
}

ll min(ll a, ll b) {
    return (a < b) ? a : b;
}

int bin_pow(int n, int k) {
    if (k == 0) return 1;
    if (k & 1) return (n * bin_pow(n, k - 1)) % mod;
    int t = bin_pow(n, k / 2);
    return (t * t) % mod;
}

int add(int a, int b) {
    if (a + b >= mod) return a + b - mod;
    return a + b;
}

int mul(int a, int b) {
    return (a * b) % mod;
}

int sost[51][51][51][2][2][2];
const int MAXN = 50;
vector<int> a;
vector<int> m, st;
void ask(int x, int b) {
    if (x == -1) {
        cout << x << " " << b << endl;
        exit(0);
    }
    if (b == 0) {
        a[x] = st[x];
        m[x] = 0;
    }
    else {
        a[x] -= b;
    }
    cout << x + 1 << " " << b << endl;
}

pair<int, int> get() {
    int c, d;
    cin >> c >> d;
    if (c == -1) exit(0);
```



```

    int x = c - 1;
    if (d == 0) {
        a[x] = st[x];
        m[x] = 0;
    }
    else {
        a[x] -= d;
    }
    return { c - 1, d };
}

void calc() {
    while (a.size() < 3) {
        a.push_back(0);
        m.push_back(0);
    }
    for (int p = 0; p < 8; p++) {
        vector<int> l;
        int p1 = p;
        while (p1 > 0) {
            l.pb(p1 % 2);
            p1 /= 2;
        }
        while (l.size() < 3) l.pb(0);
        reverse(l.begin(), l.end());
        for (int i = 0; i <= MAXN; i++) {
            for (int j = 0; j <= MAXN; j++) {
                for (int z = 0; z <= MAXN; z++) {
                    if (i + j + z == 0) continue;
                    int sum = 0;
                    for (int per = 1; per <= MAXN; per++) {
                        for (int who = 1; who <= 3; who++) {
                            if (who == 1 && per <= i) {
                                sum += (1 - sost[i - per][j][z][l[0]][l[1]][l[2]]);
                            }
                            if (who == 2 && per <= j) {
                                sum += (1 - sost[i][j - per][z][l[0]][l[1]][l[2]]);
                            }
                            if (who == 3 && per <= z) {
                                sum += (1 - sost[i][j][z - per][l[0]][l[1]][l[2]]);
                            }
                        }
                    }
                }
                for (int per = 0; per < 3; per++) {
                    if (l[per] == 1) {
                        if (per == 0) sum += (1 - sost[a[0]][j][z][0][l[1]][l[2]]);
                        if (per == 1) sum += (1 - sost[i][a[1]][z][l[0]][0][l[2]]);
                        if (per == 2) sum += (1 - sost[i][j][a[2]][l[0]][l[1]][0]);
                    }
                }
                if (sum != 0) sum = 1;
                sost[i][j][z][l[0]][l[1]][l[2]] = sum;
            }
        }
    }
}

void solve() {
    int n;
    cin >> n;
    a = vector<int>(n);
    for (int i = 0; i < n; i++) {
        cin >> a[i];
        m.push_back(1);
    }
    sost[0][0][0][0][0][0] = 0;
    calc();
    if (sost[a[0]][a[1]][a[2]][m[0]][m[1]][m[2]] == 0) {
        ask(-1, -1);
    }
    st = a;
    while (true) {
        int fl = 0;
        for (int per = 1; per <= MAXN; per++) {
            if (fl) break;

```

```

    for (int who = 1; who <= 3; who++) {
        if (who == 1 && per <= a[0]) {
            if (!sost[a[0] - per][a[1]][a[2]][m[0]][m[1]][m[2]]) {
                ask(0, per);
                fl = 1;
                break;
            }
        }
        if (who == 2 && per <= a[1]) {
            if (!sost[a[0]][a[1] - per][a[2]][m[0]][m[1]][m[2]]) {
                fl = 1;
                ask(1, per);
                break;
            }
        }
        if (who == 3 && per <= a[2]) {
            if (!sost[a[0]][a[1]][a[2] - per][m[0]][m[1]][m[2]]) {
                ask(2, per);
                fl = 1;
                break;
            }
        }
    }
}

for (int per = 0; per < 3; per++) {
    if (m[per] == 1) {
        if (per == 0) {
            if (!sost[st[0]][a[1]][a[2]][0][m[1]][m[2]]) {
                ask(0, 0);
                break;
            }
        }
        if (per == 1) {
            if (!sost[a[0]][st[1]][a[2]][m[0]][0][m[2]]) {
                ask(1, 0);
                break;
            }
        }
        if (per == 2) {
            if (!sost[a[0]][a[1]][st[2]][m[0]][m[1]][0]) {
                ask(2, 0);
                break;
            }
        }
    }
}

get();
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    //cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}

```

Task E ()

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <fstream>
#include <random>
#include <map>
#include <string>
#include <set>
#include <deque>

using namespace std;
#define double long double//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define int long long//!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
#define ll long long
#define INF 10000000007
#define mod 10000000007
#define pb push_back
#define pf push_front
#define s second
#define f first
#ifdef ONLINE_JUDGE
#define debug(y) cerr << (#y) << ":_" << y << endl;
#else
#define debug(y)
#endif
#define time clock() / (double) CLOCKS_PER_SEC

ll max(ll a, ll b) {
    return (a > b) ? a : b;
}

ll min(ll a, ll b) {
    return (a < b) ? a : b;
}

int bin_pow(int n, int k) {
    if (k == 0) return 1;
    if (k & 1) return (n * bin_pow(n, k - 1)) % mod;
    int t = bin_pow(n, k / 2);
    return (t * t) % mod;
}

int add(int a, int b) {
    if (a + b >= mod) return a + b - mod;
    return a + b;
}

int mul(int a, int b) {
    return (a * b) % mod;
}

vector<int> p = {2, 3, 5, 7, 11, 13, 17, 19, 23, 29};
vector<int> k = {2, 3, 4, 5, 6, 7, 8, 9, 10, 11};

void solve() {
}

void in() {
    int n;
    cin >> n;
    vector<int> add;
    if (n == 1000) {
        for (int i = 0; i < 10; i++) {
            for (int j = 0; j < 10; j++) {
                cout << 0;
            }
            cout << endl;
        }
        return;
    }
    while (n > 0) {
```

```

        add.push_back(n % 10);
        n /= 10;
    }
    reverse(add.begin(), add.end());
    p = {6, 3, 1};
    int cur = 0, sum = 0;
    for (int i = 0; i < 10; i++) {
        for (int j = 0; j < 10; j++) {
            if (cur >= add.size()) {
                cout << 1;
                continue;
            }
            if (j < add[cur]) {
                cout << 1;
            } else {
                cout << 0;
            }
        }
        sum++;
        if (p[cur] == sum) {
            sum = 0;
            cur++;
        }
        cout << endl;
    }
    cout << endl;
}

void obr() {
    map<int, int> cnt;
    int sum = 0;
    for (int i = 0; i < 10; i++) {
        int cur = 0;
        for (int j = 0; j < 10; j++) {
            char c;
            cin >> c;
            if (c == '1') cur++;
        }
        sum += cur;
        cnt[cur]++;
    }
    if (sum == 0) {
        cout << 1000 << endl;
        return;
    }
    vector<int> ans(4, -1);
    for (auto c: cnt) {
        if (c.first == 10) continue;
        if (c.second == 10) {
            ans[0] = c.first;
            ans[1] = c.first;
            ans[2] = c.first;
        }
        if (c.second == 9) {
            ans[0] = c.first;
            ans[1] = c.first;
        }
        if (c.second == 7) {
            ans[0] = c.first;
            ans[2] = c.first;
        }
        if (c.second == 6) {
            ans[0] = c.first;
        }
        if (c.second == 4) {
            ans[1] = c.first;
            ans[2] = c.first;
        }
        if (c.second == 3) {
            ans[1] = c.first;
        }
        if (c.second == 1) {
            ans[2] = c.first;
        }
    }
}

```

```

    }
    for (int i = 0; i < 4; i++) {
        if (ans[i] == -1) break;
        cout << ans[i];
    }
    cout << endl;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    cin >> t;
    string s;
    cin >> s;
    int fl = 0;
    if (s == "transmit") fl = 1;
    while (t--) {
        if (fl) {
            in();
        } else {
            obr();
        }
    }
    return 0;
}

```

Task F ()

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