

# Олимпиада СПбГУ по информатике 2022/23 учебного года

A	B	C	D	E	F	Sum
100	100	80	100	28	10	418

## Task A ()

```
#include <bits/stdc++.h>
using namespace std;

typedef long long ll;
typedef unsigned long long ull;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef pair<ld, ld> pdd;

#define fi first
#define se second
#define all(_) _ .begin(), _ .end()
#define rall(_) _ .rbegin(), _ .rend()
#define sz(_) (int)_.size()
#define m_p make_pair
#define vi vector<int>
#define vvi vector<vi>
#define vvvi vector<vvi>
#define vll vector<ll>
#define vvll vector<vll>
#define vvvll vector<vvll>
#define vpil vector<pii>
#define vpil vector<pll>
#define vvpil vector<vpil>
#define vvpil vector<vpil>
#define pb push_back

ostream &operator<<(ostream &out, vector<ll> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}

ostream &operator<<(ostream &out, vector<int> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}

ostream &operator<<(ostream &out, vector<char> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}

template<typename _1, typename _2>
ostream &operator<<(ostream &out, pair<_1, _2> &p) {
    out << p.first << ' ' << p.second;
    return out;
}

template<typename _1, typename _2>
istream &operator>>(istream &in, pair<_1, _2> &p) {
    in >> p.first >> p.second;
    return in;
}

template<typename _>
ostream &operator<<(ostream &out, vector<_> &arr) {
    for (auto &i : arr) out << i << '\n';
    return out;
}

template<typename _>
```

```

istream &operator>>(istream &in, vector<_> &arr) {
    for (auto &i : arr) in >> i;
    return in;
}

template<typename _1, typename _2>
bool chmin(_1 &a, _2 b) {
    if (b < a) return a = b, true;
    return false;
}
template<typename _1, typename _2>
bool chmax(_1 &a, _2 b) {
    if (a < b) return a = b, true;
    return false;
}

#define debug(x) cerr << (#x) << ": " << x << endl

const int INF = 1e9 + 20;
const ll INFL = 2e18 + 20;
const ll MOD = 998244353;

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);

    int n = 6;
    vi a(n, 0);
    for (int i = 0; i < n; i++){
        int x;
        cin >> x;
        a[i] = x;
        for (int j = 0; j < i; j++){
            if (a[j] >= x) a[j]++;
        }
        // debug(a);
    }

    cout << a << "\n";
}

```

## Task B ()

```
#include <bits/stdc++.h>
using namespace std;

typedef long long ll;
typedef unsigned long long ull;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef pair<ld, ld> pdd;

#define fi first
#define se second
#define all(_) _ .begin(), _ .end()
#define rall(_) _ .rbegin(), _ .rend()
#define sz(_) (int) _ .size()
#define m_p make_pair
#define vi vector<int>
#define vvi vector<vi>
#define vvvi vector<vvi>
#define vll vector<ll>
#define vvll vector<vll>
#define vvlll vector<vvll>
#define vpil vector<pii>
#define vpil vector<pll>
#define vvpii vector<vpil>
#define vvpll vector<vpil>
#define pb push_back

ostream &operator<<(ostream &out, vector<ll> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}
ostream &operator<<(ostream &out, vector<int> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}
ostream &operator<<(ostream &out, vector<char> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}
template<typename _1, typename _2>
ostream &operator<<(ostream &out, pair<_1, _2> &p) {
    out << p.first << ' ' << p.second;
    return out;
}
template<typename _1, typename _2>
istream &operator>>(istream &in, pair<_1, _2> &p) {
    in >> p.first >> p.second;
    return in;
}
template<typename _>
ostream &operator<<(ostream &out, vector<_> &arr) {
    for (auto &i : arr) out << i << '\n';
    return out;
}
template<typename _>
istream &operator>>(istream &in, vector<_> &arr) {
    for (auto &i : arr) in >> i;
    return in;
}

template<typename _1, typename _2>
bool chmin(_1 &a, _2 b) {
    if (b < a) return a = b, true;
    return false;
}
template<typename _1, typename _2>
bool chmax(_1 &a, _2 b) {
    if (a < b) return a = b, true;
    return false;
}
```

```

#define debug(x) cerr << (#x) << ":\n" << x << endl

const int INF = 1e9 + 20;
const ll INFLL = 2e18 + 20;
const ll MOD = 998244353;

void solve1(){
    int n;
    cin >> n;
    vi a(n);
    cin >> a;
    ll sum = accumulate(all(a), 0ll);
    cout << sum * (ll)(1e12) << "\n";
    return ;
}
void solve2(){
    int n;
    cin >> n;
    vll a(n);
    cin >> a;
    ll presum = a[0] / (ll)(1e12);
    ll suf = 0;
    for(int i = 0; i < n; i++) suf += a[i] % (ll)(1e12);
    cout << presum + suf;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);

    string s;
    cin >> s;
    if(s == "first"){
        solve1();
    }else{
        solve2();
    }
}

```

## Task C ()

```
#include <bits/stdc++.h>
using namespace std;

typedef long long ll;
typedef unsigned long long ull;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef pair<ld, ld> pdd;

#define fi first
#define se second
#define all(_) _ .begin(), _ .end()
#define rall(_) _ .rbegin(), _ .rend()
#define sz(_) (int) _ .size()
#define m_p make_pair
#define vi vector<int>
#define vvi vector<vi>
#define vvvi vector<vvi>
#define vll vector<ll>
#define vvll vector<vll>
#define vvvll vector<vvll>
#define vpil vector<pii>
#define vpll vector<pll>
#define vvpil vector<vpil>
#define vvpil vector<vpil>
#define pb push_back

ostream &operator<<(ostream &out, vector<ll> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}

ostream &operator<<(ostream &out, vector<int> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}

ostream &operator<<(ostream &out, vector<char> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}

template<typename _1, typename _2>
ostream &operator<<(ostream &out, pair<_1, _2> &p) {
    out << p.first << ' ' << p.second;
    return out;
}

template<typename _1, typename _2>
istream &operator>>(istream &in, pair<_1, _2> &p) {
    in >> p.first >> p.second;
    return in;
}

template<typename _>
ostream &operator<<(ostream &out, vector<_> &arr) {
    for (auto &i : arr) out << i << '\n';
    return out;
}

template<typename _>
istream &operator>>(istream &in, vector<_> &arr) {
    for (auto &i : arr) in >> i;
    return in;
}

template<typename _1, typename _2>
bool chmin(_1 &a, _2 b) {
    if (b < a) return a = b, true;
    return false;
}

template<typename _1, typename _2>
bool chmax(_1 &a, _2 b) {
    if (a < b) return a = b, true;
    return false;
}
```

```

#define debug(x) cerr << (#x) << ":\n" << x << endl

const int INF = 1e9 + 20;
const ll INFL = 2e18 + 20;
const ll MOD = 998244353;

set<pii> ans;
int cur = 0;
int xmn = INF;
int xmx = -INF;
int ymn = INF;
int ymx = -INF;

void dfs(int x, int y, vvi &table, vvi &used){
    used[x][y] = 1;
    cur++;
    chmin(xmn, x);
    chmax(xmx, x);
    chmin(ymn, y);
    chmax(ymx, y);

    if(!used[x-1][y] && !table[x-1][y]) dfs(x-1, y, table, used);
    if(!used[x+1][y] && !table[x+1][y]) dfs(x+1, y, table, used);
    if(!used[x][y-1] && !table[x][y-1]) dfs(x, y-1, table, used);
    if(!used[x][y+1] && !table[x][y+1]) dfs(x, y+1, table, used);
}

void add(vvi &table){
    int n = sz(table);
    int m = sz(table[0]);
    vvi used(n, vi(m, 0));

    for(int i = 0; i < n; i++){
        for(int j = 0; j < m; j++){
            if(!table[i][j] && !used[i][j]){
                dfs(i, j, table, used);
                if(cur == (xmx - xmn + 1) * (ymx - ymn + 1)) {
                    ans.insert({min(xmx - xmn + 1, ymx - ymn + 1), max(ymx - ymn + 1, xmx - xmn + 1)});
                }
                cur = 0;
                xmn = INF;
                xmx = -INF;
                ymn = INF;
                ymx = -INF;
            }
        }
    }
}

void solve(vpii a){
    if(a[0].fi < a[1].fi || a[0].se < a[1].se) return;
    vvi table(a[0].fi + 2, vi(a[0].se + 2, 1));
    for(int i = 1; i <= a[0].fi; i++) for(int j = 1; j <= a[0].se; j++) table[i][j] = 0;
    for(int i = 1; i <= a[1].fi; i++){
        for(int j = 1; j <= a[1].se; j++){
            table[i][j] = 1;
        }
    }
    add(table);
    auto check = [&](int stx, int sty){
        for(int i = stx; i < stx + a[2].fi; i++){
            for(int j = sty; j < sty + a[2].se; j++){
                if(table[i][j]) return false;
            }
        }
        int side1 = 0;
        for(int i = sty; i < sty + a[2].se; i++){
            if(table[stx-1][i] || table[stx + a[2].fi][i]) side1 = 1;
        }
        int side2 = 0;
        for(int i = stx; i < stx + a[2].fi; i++){
            if(table[i][sty-1] || table[i][sty + a[2].se]) side2 = 1;
        }
    };
}

```

```

        return side1 && side2;
    };
    for (int i = 1; i + a[2].fi - 1 <= a[0].fi; i++){
        for (int j = 1; j + a[2].se - 1 <= a[0].se; j++){
            if (!check(i, j)) continue;
            for (int k = i; k < i + a[2].fi; k++){
                for (int l = j; l < j + a[2].se; l++) table[k][l] = 1;
            }

            add(table);

            for (int k = i; k < i + a[2].fi; k++){
                for (int l = j; l < j + a[2].se; l++) table[k][l] = 0;
            }
        }
    }
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
#ifdef LOCAL
    freopen("input.txt", "r", stdin);
#endif

    vpil a(3);
    cin >> a;

    for (auto i : a) ans.insert({min(i.fi, i.se), max(i.fi, i.se)});

    vi order = {0, 1, 2};
    do{
        vpil p(3);
        for (int i = 0; i < 3; i++) p[i] = a[order[i]];
        solve(p);
        swap(p[1].fi, p[1].se);
        solve(p);
        swap(p[2].fi, p[2].se);
        solve(p);
        swap(p[1].fi, p[1].se);
        solve(p);
    } while (next_permutation(all(order)));

    for (auto i : ans) cout << i << "\n";
}

```

## Task D ()

```
#include <bits/stdc++.h>
using namespace std;

typedef long long ll;
typedef unsigned long long ull;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef pair<ld, ld> pdd;

#define fi first
#define se second
#define all(_) _ .begin(), _ .end()
#define rall(_) _ .rbegin(), _ .rend()
#define sz(_) (int) _ .size()
#define m_p make_pair
#define vi vector<int>
#define vvi vector<vi>
#define vvvi vector<vvi>
#define vll vector<ll>
#define vlll vector<vll>
#define vvll vector<vvll>
#define vpii vector<pii>
#define vpll vector<pll>
#define vvpri vector<vpri>
#define vvpri vector<vpri>
#define vvpri vector<vpri>
#define pb push_back

ostream &operator<<(ostream &out, vector<ll> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}

ostream &operator<<(ostream &out, vector<int> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}

ostream &operator<<(ostream &out, vector<char> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}

template<typename _1, typename _2>
ostream &operator<<(ostream &out, pair<_1, _2> &p) {
    out << p.first << ' ' << p.second;
    return out;
}

template<typename _1, typename _2>
istream &operator>>(istream &in, pair<_1, _2> &p) {
    in >> p.first >> p.second;
    return in;
}

template<typename _>
ostream &operator<<(ostream &out, vector<_> &arr) {
    for (auto &i : arr) out << i << '\n';
    return out;
}

template<typename _>
istream &operator>>(istream &in, vector<_> &arr) {
    for (auto &i : arr) in >> i;
    return in;
}

template<typename _1, typename _2>
bool chmin(_1 &a, _2 b) {
    if (b < a) return a = b, true;
    return false;
}

template<typename _1, typename _2>
bool chmax(_1 &a, _2 b) {
    if (a < b) return a = b, true;
    return false;
}
```



```

#define debug(x) cerr << (#x) << ":\n" << x << endl

const int INF = 1e9 + 20;
const ll INFL = 2e18 + 20;
const ll MOD = 998244353;

vi a;
int game[5][2][5][2][5][2];
int used[5][2][5][2][5][2];

bool f(vpii &pos){
    if(used[pos[0].fi][pos[0].se][pos[1].fi][pos[1].se][pos[2].fi][pos[2].se]) return game[pos[0].fi][pos[0].se][pos[1].fi][pos[1].se][pos[2].fi][pos[2].se];
    int res = 0;
    for(int i = 0; i < sz(pos); i++){
        if(pos[i].se){
            pos[i].se = 0;
            int old = pos[i].fi;
            pos[i].fi = a[i];
            res |= !f(pos);
            pos[i].se = 1;
            pos[i].fi = old;
        }
        for(int j = 1; j <= pos[i].fi; j++){
            pos[i].fi -= j;
            res |= !f(pos);
            pos[i].fi += j;
        }
    }
    game[pos[0].fi][pos[0].se][pos[1].fi][pos[1].se][pos[2].fi][pos[2].se] = res;
    used[pos[0].fi][pos[0].se][pos[1].fi][pos[1].se][pos[2].fi][pos[2].se] = 1;
    return res;
}

pii find(vpii &pos){
    for(int i = 0; i < sz(pos); i++){
        if(pos[i].se){
            pos[i].se = 0;
            int old = pos[i].fi;
            pos[i].fi = a[i];
            if(!game[pos[0].fi][pos[0].se][pos[1].fi][pos[1].se][pos[2].fi][pos[2].se]) return {i + 1, 0};
            pos[i].se = 1;
            pos[i].fi = old;
        }
        for(int j = 1; j <= pos[i].fi; j++){
            pos[i].fi -= j;
            if(!game[pos[0].fi][pos[0].se][pos[1].fi][pos[1].se][pos[2].fi][pos[2].se]) return {i + 1, j};
            pos[i].fi += j;
        }
    }
}

signed main() {
    int n;
    cin >> n;
    a.resize(n);
    cin >> a;
    vpii pos(3, {0, 0});
    for(int i = 0; i < n; i++) pos[i].fi = a[i], pos[i].se = 1;
    f(pos);
    if(!game[pos[0].fi][pos[0].se][pos[1].fi][pos[1].se][pos[2].fi][pos[2].se]){
        cout << "-1_-1" << endl;
        cout.flush();
        return 0;
    }

    auto out = find(pos);
    cout << out << endl;
    cout.flush();
    while(1){
        int p, x;
        cin >> p >> x;

```

```

        if(p == x && p == -1){
            return 0;
        }
        p--;
        if(x == 0) pos[p].se = 0, pos[p].fi = a[p];
        else pos[p].fi -= x;

        out = find(pos);
        cout << out << endl;
        cout.flush();
    }
}

```

## Task E ()

```
#include <bits/stdc++.h>
using namespace std;

typedef long long ll;
typedef unsigned long long ull;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef pair<ld, ld> pdd;

#define fi first
#define se second
#define all(_) _ .begin(), _ .end()
#define rall(_) _ .rbegin(), _ .rend()
#define sz(_) (int) _ .size()
#define m_p make_pair
#define vi vector<int>
#define vvi vector<vi>
#define vvvi vector<vvi>
#define vll vector<ll>
#define vlll vector<vll>
#define vvll vector<vvll>
#define vpii vector<pii>
#define vpll vector<pll>
#define vvpri vector<vpri>
#define vvpri vector<vpri>
#define vvpri vector<vpri>
#define pb push_back

ostream &operator<<(ostream &out, vector<ll> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}
ostream &operator<<(ostream &out, vector<int> &arr) {
    for (auto &i : arr) out << i;
    return out;
}
ostream &operator<<(ostream &out, vector<char> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}
template<typename _1, typename _2>
ostream &operator<<(ostream &out, pair<_1, _2> &p) {
    out << p.first << ' ' << p.second;
    return out;
}
template<typename _1, typename _2>
istream &operator>>(istream &in, pair<_1, _2> &p) {
    in >> p.first >> p.second;
    return in;
}
template<typename _>
ostream &operator<<(ostream &out, vector<_> &arr) {
    for (auto &i : arr) out << i << '\n';
    return out;
}
template<typename _>
istream &operator>>(istream &in, vector<_> &arr) {
    for (auto &i : arr) in >> i;
    return in;
}

template<typename _1, typename _2>
bool chmin(_1 &a, _2 b) {
    if (b < a) return a = b, true;
    return false;
}
template<typename _1, typename _2>
bool chmax(_1 &a, _2 b) {
    if (a < b) return a = b, true;
    return false;
}
```

```

#define debug(x) cerr << (#x) << ":\n" << x << endl

const int INF = 1e9 + 20;
const ll INFL = 2e18 + 20;
const ll MOD = 998244353;

void solve1(){
    int n;
    cin >> n;
    int cnt = 0;
    vi bit(10);
    for(int i = 0; i < 10; i++){
        if((n >> i) & 1) bit[i] = 1;
    }
    vvi ans(10, vi(10, 0));
    for(int i = 0; i < 10; i++){
        if(bit[i]){
            for(int j = 0; j <= i; j++) ans[i][j] = 1;
        }
    }
    cout << ans;
}

void solve2(){
    int ans = 0;
    vvi t(10, vi(10, 0));
    for(int i = 0; i < 10; i++){
        for(int j = 0; j < 10; j++){
            char ch;
            cin >> ch;
            t[i][j] = ch == '1';
        }
    }
    for(int i = 0; i < 10; i++){
        int cnt = 0;
        for(int j = 0; j < 10; j++){
            cnt += t[i][j];
        }
        if(cnt > 0) ans |= (1 << (cnt - 1));
    }
    cout << ans << "\n";
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);

    int t; cin >> t;
    string s;
    cin >> s;
    while(t--) {if(s == "transmit") solve1(); else solve2(); cout << "\n";}
}

```

## Task F ()

```
#include <bits/stdc++.h>
using namespace std;

typedef long long ll;
typedef unsigned long long ull;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef pair<ld, ld> pdd;

#define fi first
#define se second
#define all(_) _ .begin(), _ .end()
#define rall(_) _ .rbegin(), _ .rend()
#define sz(_) (int)_ .size()
#define m_p make_pair
#define vi vector<int>
#define vvi vector<vi>
#define vvvi vector<vvi>
#define vll vector<ll>
#define vlll vector<vll>
#define vvll vector<vvll>
#define vpii vector<pii>
#define vpll vector<pll>
#define vvpri vector<vpri>
#define vvpri vector<vpri>
#define vvpri vector<vpri>
#define pb push_back

ostream &operator<<(ostream &out, vector<ll> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}
ostream &operator<<(ostream &out, vector<int> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}
ostream &operator<<(ostream &out, vector<char> &arr) {
    for (auto &i : arr) out << i << ' ';
    return out;
}
template<typename _1, typename _2>
ostream &operator<<(ostream &out, pair<_1, _2> &p) {
    out << p.first << ' ' << p.second;
    return out;
}
template<typename _1, typename _2>
istream &operator>>(istream &in, pair<_1, _2> &p) {
    in >> p.first >> p.second;
    return in;
}
template<typename _>
ostream &operator<<(ostream &out, vector<_> &arr) {
    for (auto &i : arr) out << i << '\n';
    return out;
}
template<typename _>
istream &operator>>(istream &in, vector<_> &arr) {
    for (auto &i : arr) in >> i;
    return in;
}

template<typename _1, typename _2>
bool chmin(_1 &a, _2 b) {
    if (b < a) return a = b, true;
    return false;
}
template<typename _1, typename _2>
bool chmax(_1 &a, _2 b) {
    if (a < b) return a = b, true;
    return false;
}
```

```

#define debug(x) cerr << (#x) << ":\n" << x << endl

const int INF = 1e9 + 20;
const ll INFL = 2e18 + 20;
const ll MOD = 998244353;

vi sum(vi a, vi b){
    if(sz(a) > sz(b)) swap(a, b);
    vi ans(sz(b));
    for(int i = 0; i < sz(b); i++) {
        ans[i] = (i < sz(a) ? a[i] : 0) + b[i];
    }
    for(int i = 0; i < sz(b); i++){
        if(ans[i] >= 10){
            if(i == sz(ans) - 1) ans.pb(1);
            else ans[i + 1]++;
        }
        ans[i] %= 10;
    }
    return ans;
}

vi convert(string s){
    vi ans;
    for(auto i : s) ans.pb(i - '0');
    reverse(all(ans));
    return ans;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);

    vi a, b;
    string s1, s2;
    cin >> s1 >> s2;
    a = convert(s1);
    b = convert(s2);
    // debug(a), debug(b);
    auto ans = sum(a, b);
    // debug(ans);
    reverse(all(ans));
    for(auto i : ans) cout << i;
    cout << "\n";
}

```