Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
100	100	100	75	20	47	442

Task A

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

using namespace std;

typedef long long ll;
typedef vector<int> vi;
typedef vector<ll> vl;

void solve() {
  ll n, a, b ;
  cin >> a >> b >> n;
  vl dp(n + 1);
  dp[0] = 1;
  for (int i = 1; i <= n; i++) {
    if (i >= a) dp[i] += dp[i - a];
    if (i >= b) dp[i] += dp[i - b];
  }
  ll res = 0;
  if (n >= a) res += dp[n - a] * a;
  if (n >= b) res += dp[n - b] * b;
  cout << res << '\n';
}

int main() {
#ifdef LOCAL
```

```
  freopen("input.in", "r", stdin);
#endif
  int t = 1;
  // cin >> t;
  for (int i = 0; i < t; i++) solve();
}
```

Task B

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

using namespace std;

typedef long long ll;
typedef vector<int> vi;

void solve() {
  ll n, x1, y1, z1, x2, y2, z2;
  cin >> n >> x1 >> y1 >> z1 >> x2 >> y2 >>z2;
  ll res = (abs(x1 - x2) + abs(y1 - y2) + abs(z1 - z2)) / 2;
  int x3 = n, y3 = n, z3 = n;
  if (x1 > 0) x3 = n;
  else x3 = -n;
  for (int y3 = -x3; ; y3 += (y3 > 0 ? -1 : 1)) {
    int z3 = -x3 - y3;
    ll r1 = (abs(x1 - x3) + abs(y1 - y3) + abs(z1 - z3)) / 2;
    ll r2 = (abs(x2 + x3) + abs(y2 - (y3 + x3)) + abs(z2 - (z3 + x3))) /
   2;
    res = min(res, r1 + r2);
    if (y3 == 0) break;
  }
  if (y1 > 0) y3 = n;
  else y3 = -n;
  for (int x3 = -y3; ; x3 += (x3 > 0 ? -1 : 1)) {
    int z3 = -y3 - x3;
    ll r1 = (abs(x1 - x3) + abs(y1 - y3) + abs(z1 - z3)) / 2;
    ll r2 = (abs(x2 - (x3 + y3)) + abs(y2 + y3) + abs(z2 - (z3 + y3))) /
   2;
    res = min(res, r1 + r2);
    if (x3 == 0) break;
  }
  if (z1 > 0) z3 = n;
  else z3 = -n;
  for (int y3 = -z3; ; y3 += (y3 > 0 ? -1 : 1)) {
    int x3 = -z3 - y3;
    ll r1 = (abs(x1 - x3) + abs(y1 - y3) + abs(z1 - z3)) / 2;
    ll r2 = (abs(x2 - (x3 + z3)) + abs(y2 - (z3 + y3)) + abs(z2 + z3)) /
   2;
    res = min(res, r1 + r2);
```

```
    if (y3 == 0) break;
  }
  cout << res << '\n';
}

int main() {
#ifdef LOCAL
  freopen("input.in", "r", stdin);
#endif
  int t = 1;
  // cin >> t;
  for (int i = 0; i < t; i++) solve();
}
```

Task C

```
#include <iostream>
#include <vector>
#include <set>
#include <map>
#include <string>
#include <algorithm>

using namespace std;

#define all(x) x.begin(), x.end()

typedef long long ll;
typedef vector<int> vi;
typedef vector<ll> vl;

const ll MOD = 1200246521;
const ll p = 950117209;
const int shift = 33;

bool is_prime(ll a) {
  ll d = 2;
  while (d *d <= a) {
    if (a % d == 0) return 0;
    d++;
  }
  return 1;
}

ll bin_pow(ll a, ll exp) {
  ll res = 1;
  while (exp) {
    if (exp & 1) res = (res * a) % MOD;
    a = (a * a) % MOD;
    exp >>= 1;
  }
  return res;
}
```

```
ll hashh(string s) {
  int n = s.size();
  ll res = 0;
  for (int i = 0; i < n; i++) {
    if (s[i] == '1') {
      res = (res + bin_pow(2, n - i - 1) * bin_pow(p, n - i - 1) % MOD) %
     MOD;
    }
  }
  return res;
}

string hash2str(ll h) {
  int base = 90;
  string res = "";
  if (h == 0) res += (char)(shift);
  while (h) {
    res += (char)(h % base + shift);
    h /= base;
  }
  reverse(all(res));
  return res;
}

ll str2hash(string s) {
  int base = 90;
  ll res = 0;
  int n = s.size();
  for (int i = 0; i < n; i++) {
    res = (res + bin_pow(base, n - i - 1) * (s[i] - shift)) % MOD;
  }
  return res;
}

ll mn(ll a, ll b) {
  a -= b;
  if (a < 0) a += MOD;
  return a;
}

void dumb(string s) {
  for (int i = 0; i < s.size(); i++) {
    cout << s << ' ' << hashh(s);
    string t = "";
    for (int i = 1; i < s.size(); i++) t += s[i];
    t += s[0];
    s = t;
    cout << '\n';
  }
}

void solve() {
```

```
  string type, s;
  int n;
  cin >> type >> n >> s;
  // dumb(s);
  if (type == "first") {
    ll h = hashh(s);
    string res = hash2str(h);
    cout << res << '\n';
    // cout << str2hash(res) << ' ' << h;
  } else {
    string t;
    cin >> t;
    ll first_hash = str2hash(t);
    ll hsh = hashh(s);
    for (int i = 0; i < n; i++) {
      if (hsh == first_hash) {
        cout << "YES\n";
        return;
      }
      if (s[i] == '1') hsh = mn(hsh, bin_pow(2, n - 1) * bin_pow(p, n -
    1) % MOD);
      hsh = (hsh * 2 * p) % MOD;
      if (s[i] == '1') hsh = (hsh + 1) % MOD;
    }
    cout << "NO\n";
  }
}

// 3500000000000000039
// 1200246521
// 950117209

int main() {
#ifdef LOCAL
  freopen("input.in", "r", stdin);
#endif
  int t = 1;
  // cin >> t;
  for (int i = 0; i < t; i++) solve();
}
```

Task D

```
#include <iostream>
#include <vector>
#include <set>
#include <map>
#include <string>
#include <algorithm>

using namespace std;

#define all(x) x.begin(), x.end()
```

```
typedef long long ll;
typedef vector<int> vi;
typedef vector<ll> vl;

const ll MOD = 1200246521;
const int N = 600;
const ll p = 950117209;
const int shift = 33;

bool is_prime(ll a) {
  ll d = 2;
  while (d *d <= a) {
    if (a % d == 0) return 0;
    d++;
  }
  return 1;
}

ll bin_pow(ll a, ll exp) {
  ll res = 1;
  while (exp) {
    if (exp & 1) res = (res * a) % MOD;
    a = (a * a) % MOD;
    exp >>= 1;
  }
  return res;
}

int n;
string s = "7493856012";

int strcomp(string a, string b) {
  for (int i = 0; i < n; i++) {
    if (a[i] < b[i]) return -1;
    if (a[i] > b[i]) return 1;
  }
  return 0;
}

bool check(string s) {
  for (int i = 0; i < n; i++) {
    if (s[i] - '0' != n - i - 1) return 0;
  }
  return 1;
}

int arr[N];

int swapp(int i, int j) {
  swap(arr[i], arr[j]);
  int temp = arr[0];
  for (int i = 0; i < n - 1; i++) arr[i] = arr[i + 1];
```

```
  arr[n - 1] = temp;
#ifdef LOCALa
  string t = s;
  swap(t[i], t[j]);
  char tmp = t[0];
  for (int i = 0; i < n - 1; i++) t[i] = t[i + 1];
  t[n - 1] = tmp;
  int res = strcomp(t, s);
  s = t;
  if (check(s)) {
    cout << "!\n";
    exit(0);
  }
  return res;
#endif

  cout << i + 1 << ' ' << j + 1 << endl;
  char input; cin >> input;
  if (input == '!') exit(0);
  if (input == '<') return -1;
  if (input == '=') return 0;
  if (input == '>') return 1;
}

void wait(int k) {
  for (int i = 0; i < k; i++) swapp(0, 0);
}

int mn(int a, int b) {
   a -= b;
   if (a < 0) a += n;
   return a;
}

void solve() {
  cin >> n;
  vi cnt(n);
  for (int i = 0; i < n; i++) arr[i] = i;
  for (int i = 0; i < n; i++) {
    for (int j = i + 1; j < n; j++) {
      int p1, p2;
      for (int k = 0; k < n; k++) if (arr[k] == i) p1 = k;
      swapp(1, p1);
      for (int k = 0; k < n; k++) if (arr[k] == j) p2 = k;
      int res = swapp(1, p2);
      if (res < 0) cnt[i]++;
      else if (res > 0) cnt[j]++;
    }
  }
  // p1 p2 p3...    pi = cnt[i]   probably
  string perm(n, ' ');
  for (int i = 0; i < n; i++) perm[i] = cnt[arr[i]] + '0';
  int cur = n - 2;
```

```
  while (cur) {
    int p1 = 0, p2 = 0;
    for (int i = 0; i < n; i++) {
      if (perm[i] == '0' + cur + 1) p1 = (i + 1) % n;
      if (perm[i] == '0' + cur) p2 = i;
    }
    swapp(p1, p2);
    swap(perm[p1], perm[p2]);
    char tmp = perm[0];
    for (int i = 0; i < n - 1; i++) perm[i] = perm[i + 1];
    perm[n - 1] = tmp;
    cur--;
  }
  wait(n);
}

int main() {
  ios_base::sync_with_stdio(0);
  cin.tie(0), cout.tie(0);
#ifdef LOCALa
  freopen("input.in", "r", stdin);
#endif
  int t = 1;
  // cin >> t;
  for (int i = 0; i < t; i++) solve();
}
```

Task E

```
#include <iostream>
#include <vector>
#include <set>
#include <map>
#include <string>
#include <algorithm>

using namespace std;

#define all(x) x.begin(), x.end()

typedef long long ll;
typedef vector<int> vi;
typedef vector<ll> vl;

const ll MOD = 1200246521;
const ll p = 950117209;
const int shift = 33;

bool is_prime(ll a) {
  ll d = 2;
  while (d *d <= a) {
    if (a % d == 0) return 0;
    d++;
```

```
  }
  return 1;
}

ll bin_pow(ll a, ll exp) {
  ll res = 1;
  while (exp) {
    if (exp & 1) res = (res * a) % MOD;
    a = (a * a) % MOD;
    exp >>= 1;
  }
  return res;
}

vector<vi> adj;
vi ptr;

void solve() {
  int n, q;
  cin >> n >> q;
  adj.resize(n + 1);
  ptr.resize(n + 1);
  for (int i = 1; i <= n; i++) {
    int d;
    cin >> d;
    adj[i].resize(d);
    for (int &j : adj[i]) cin >> j;
  }
  vi ans(1e5 + 10);
  int t = 0, cur = 1;
  while (t < 1e5 + 7) {
    ans[t] = cur;
    int tmp = cur;
    cur = adj[cur][ptr[cur]];
    ptr[tmp] = (ptr[tmp] + 1) % adj[tmp].size();
    t++;
  }
  while (q--) {
    int t;
    cin >> t;
    cout << ans[t] << ' ';
  }
}

int main() {
#ifdef LOCAL
  freopen("input.in", "r", stdin);
#endif
  int t = 1;
  // cin >> t;
  for (int i = 0; i < t; i++) solve();
}
```

Task F

```
#include <iostream>
#include <vector>
#include <set>
#include <map>
#include <string>
#include <algorithm>

using namespace std;

#define all(x) x.begin(), x.end()

typedef long long ll;
typedef vector<int> vi;
typedef vector<ll> vl;

const ll MOD = 1200246521;
const ll p = 950117209;
const int shift = 33;

bool is_prime(ll a) {
  ll d = 2;
  while (d *d <= a) {
    if (a % d == 0) return 0;
    d++;
  }
  return 1;
}

ll bin_pow(ll a, ll exp) {
  ll res = 1;
  while (exp) {
    if (exp & 1) res = (res * a) % MOD;
    a = (a * a) % MOD;
    exp >>= 1;
  }
  return res;
}

void solve() {
  int h, w;
  cin >> h >> w;
  vector<vi> arr(h, vi(w));
  for (int i = 0; i < h; i++) {
    string s;
    cin >> s;
    for (int j = 0; j < w; j++) arr[i][j] = s[j] - '0';
  }
  vector<string> ans(h);
  int res = 0;
  for (int i = 0; i < h; i++) {
    string s;
```

```
    for (int j = 0; j < w; j += 2) {
      s += 'L';
      s += 'R';
      res += arr[i][j] * arr[i][j + 1];
    }
    ans[i] = s;
  }
  cout << res << '\n';
  for (string s : ans) cout << s << '\n';
}

int main() {
#ifdef LOCAL
  freopen("input.in", "r", stdin);
#endif
  int t = 1;
  // cin >> t;
  for (int i = 0; i < t; i++) solve();
}
```