Олимпиада СПбГУ
по информатике
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24fin0063 – Брызгалов Владислав Андреевич

A	B	C	D	E	F	sum
100	50	100	100	20	91	461

Task A

```
#include<iostream>
#include<vector>
#include<map>
#include<set>
#include<algorithm>
#include<cmath>
#include<queue>
#include<deque>
#include<string>
#include <random>
#include <cstdlib>
#include <iomanip>
#include <bitset>
using namespace std;

#define LL long long int
#define PLL pair<LL, LL>
#define PPLL pair< pair<LL, LL>, LL>
#define VLL vector<LL>
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#define LD long double
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#define D deque
#define S string
```

```
#define met set
#define US unordered_set
#define UM unordered_map
#define multimet multiset
#define P pair
#define B bool
#define X first
#define Y second
#define C char
#define tPLL(A, B) make_pair((LL)A, (LL)B)
#define tLL(A) int64_t(A)
#define fori(A) for (LL i = 0; i < A; i++)
#define fori1(A) for (LL i = 1; i <= A; i++)
#define forir(A) for (LL i = (LL)A - 1; i >= 0; i--)
#define forj(A) for (LL j = 0; j < A; j++)
#define forjr(A) for (LL j = (LL)A - 1; j >= 0; j--)
#define forij(A) for (LL ij = 0; ij < A; ij++)
#define forlr(L, R) for(LL i = L; i < R; ++i)

signed main() {
  LL a, b, c;
  cin >> a >> b >> c;
  VLL dp1(c + 10, 0);
  VLL dp2(c + 10, 0);
  LL ans = 0;
  if (a <= c) {
    dp1[a] = 1;
    fori(c) {
      if (i + a < dp1.size()) {
        dp1[i + a] += dp1[i];
      }
      if (i + b < dp1.size()) {
        dp1[i + b] += dp1[i];
      }
    }
    ans += dp1[c] * a;
  }
  if (b <= c) {
    dp2[b] = 1;
    fori(c) {
      if (i + a < dp1.size()) {
        dp2[i + a] += dp2[i];
      }
      if (i + b < dp1.size()) {
        dp2[i + b] += dp2[i];
      }
    }
    ans += dp2[c] * b;
  }
  cout << ans << endl;
}
```

Task B

```
#include<iostream>
#include<vector>
#include<map>
#include<set>
#include<algorithm>
#include<cmath>
#include<queue>
#include<deque>
#include<string>
#include <random>
#include <cstdlib>
#include <iomanip>
#include <bitset>
using namespace std;

#define LL long long int
#define PLL pair<LL, LL>
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#define VPPLL vector<pair< pair<LL, LL>, LL>>
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#define D deque
#define S string
#define met set
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#define multimet multiset
#define P pair
#define B bool
#define X first
#define Y second
#define C char
#define tPLL(A, B) make_pair((LL)A, (LL)B)
#define tLL(A) int64_t(A)
#define fori(A) for (LL i = 0; i < A; i++)
#define fori1(A) for (LL i = 1; i <= A; i++)
#define forir(A) for (LL i = (LL)A - 1; i >= 0; i--)
#define forj(A) for (LL j = 0; j < A; j++)
#define forjr(A) for (LL j = (LL)A - 1; j >= 0; j--)
#define forij(A) for (LL ij = 0; ij < A; ij++)
#define forlr(L, R) for(LL i = L; i < R; ++i)

signed main() {
  LL n;
  cin >> n;
```

```
  LL a, b, c, d, e, f;
  cin >> a >> b >> c >> d >> e >> f;
  LL dist = abs(a - d);
  LL dist2 = abs(b - e);
  LL dist3 = abs(c - f);
  LL ans = std::min(dist, n * 2 + 1 - dist - 1);
  if (dist2 > dist3) {
    LL mdst = std::min({abs(dist2 - dist3), abs(dist2 - (n * 2 + 1 -
    dist3 - 1)), abs((n * 2 + 1 - dist2 - 1) - dist3 ) , abs((n * 2 + 1 -
    dist2 - 1) - (n * 2 + 1 - dist3 - 1))});
    dist -= mdst;
    dist2 = dist3;
    ans += (dist3 - dist / 2);
  }
  else {
    LL mdst = std::min({ abs(dist2 - dist3), abs(dist2 - (n * 2 + 1 -
    dist3 - 1)), abs((n * 2 + 1 - dist2 - 1) - dist3) , abs((n * 2 + 1 -
    dist2 - 1) - (n * 2 + 1 - dist3 - 1)) });
    dist -= mdst;
    ans += (dist2 - dist / 2);
  }
  cout << ans << endl;
}
```

Task C

```
#include<iostream>
#include<vector>
#include<map>
#include<set>
#include<algorithm>
#include<cmath>
#include<queue>
#include<deque>
#include<string>
#include <random>
#include <cstdlib>
#include <iomanip>
#include <bitset>
using namespace std;

#define LL long long int
#define PLL pair<LL, LL>
#define PPLL pair< pair<LL, LL>, LL>
#define VLL vector<LL>
#define VVLL vector<vector<LL>>
#define VPPLL vector<pair< pair<LL, LL>, LL>>
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#define VVPLL vector<vector<pair<LL, LL>>>
#define VVVPLL vector<vector<vector<pair<LL, LL>>>>
#define LD long double
#define V vector
```

```
#define D deque
#define S string
#define met set
#define US unordered_set
#define UM unordered_map
#define multimet multiset
#define P pair
#define B bool
#define X first
#define Y second
#define C char
#define tPLL(A, B) make_pair((LL)A, (LL)B)
#define tLL(A) int64_t(A)
#define fori(A) for (LL i = 0; i < A; i++)
#define fori1(A) for (LL i = 1; i <= A; i++)
#define forir(A) for (LL i = (LL)A - 1; i >= 0; i--)
#define forj(A) for (LL j = 0; j < A; j++)
#define forjr(A) for (LL j = (LL)A - 1; j >= 0; j--)
#define forij(A) for (LL ij = 0; ij < A; ij++)
#define forlr(L, R) for(LL i = L; i < R; ++i)

LL p = 2;
LL mod = 1e9 + 7;
VLL pp;

void updP(LL n) {
  pp.resize(n);
  pp[n - 1] = p;
  fori(n) {
    pp[n - 1] = (pp[n - 1] * p) % mod;
  }
  fori(n) {
    if (i != 0) pp[n - i - 1] = (pp[n - i] * p) % mod;
  }
}

void updP1(LL n) {
  pp.resize(n);
  pp[n - 1] = p;
  fori(n) {
    if (i != 0) pp[n - i - 1] = (pp[n - i] * p) % mod;
  }
}

void countHs(string a, VLL& v) {
  fori(a.size()) {
    v[i] = ((a[i] - '0' + 1) * pp[i]) % mod;
    if (i != 0) {
      v[i] = (v[i] + v[i - 1]) % mod;
    }
  }
}
```

```
LL takeHs(VLL &a, LL l, LL r) {
  if (l == 0) {
    return a[r];
  }
  else {
    return (((a[r] - a[l - 1] + mod) % mod) * pp[pp.size() - l]) % mod;
  }
}

signed main() {
  string s;
  cin >> s;
  if (s == "first") {
    LL n;
    cin >> n;
    string a;
    cin >> a;
    updP(n);
    VLL v(a.size());
    countHs(a, v);
    cout << to_string(v[a.size() - 1]) << endl;
  }
  else {
    LL n;
    cin >> n;
    string a;
    cin >> a;
    a = a + a;
    updP1(a.size());
    VLL v(a.size());
    countHs(a, v);
    LL b;
    cin >> b;
    fori(n) {
      LL ans = takeHs(v, i, n - 1 + i);
      if (ans == b) {
        cout << "YES" << endl;
        return 0;
      }
    }
    cout << "NO" << endl;
  }
}
```

Task D

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

```
#include<deque>
#include<string>
#include <random>
#include <cstdlib>
#include <iomanip>
#include <bitset>
using namespace std;

#define LL long long int
#define PLL pair<LL, LL>
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#define B bool
#define X first
#define Y second
#define C char
#define tPLL(A, B) make_pair((LL)A, (LL)B)
#define tLL(A) int64_t(A)
#define fori(A) for (LL i = 0; i < A; i++)
#define fori1(A) for (LL i = 1; i <= A; i++)
#define forir(A) for (LL i = (LL)A - 1; i >= 0; i--)
#define forj(A) for (LL j = 0; j < A; j++)
#define forjr(A) for (LL j = (LL)A - 1; j >= 0; j--)
#define forij(A) for (LL ij = 0; ij < A; ij++)
#define forlr(L, R) for(LL i = L; i < R; ++i)

LL find_pos(VLL & pose, LL a) {
  fori(pose.size()) {
    if (pose[i] == a) return i;
  }
}

void rotate(VLL& pose) {
  LL a = pose[0];
  fori(pose.size() - 1) {
    pose[i] = pose[i+1];
  }
  pose[pose.size() - 1] = a;
```

```
}

signed main() {
  LL n;
  cin >> n;
  VVLL sravn(n, VLL(n, 0));
  VLL pose(n);
  fori(n) {
    pose[i] = i;
  }
  fori(n) {
    LL now = find_pos(pose, i);
    cout << now + 1 << " " << 2 << endl;
    cout.flush();
    swap(pose[now], pose[1]);
    rotate(pose);
    char inp;
    cin >> inp;
    if (inp == '!') {
      return 0;
    }
    forj(n) {
      if (i == j) continue;
      else {
        now = find_pos(pose, j);
        cout << now + 1 << " " << 2 << endl;
        cout.flush();
        swap(pose[now], pose[1]);
        rotate(pose);
        cin >> inp;
        if (inp == '<') {
          sravn[i][j] = -1;
        }
        else if (inp == '>') {
          sravn[i][j] = 1;
        }
        else if(inp == '!') {
          return 0;
        }
        cout << n << " " << 2 << endl;
        swap(pose[1], pose[n - 1]);
        rotate(pose);
        cin >> inp;
        if (inp == '!') {
          return 0;
        }
      }
    }
  }
  VLL ans(n, 0);
  fori(n) {
    forj(n) {
      if (sravn[i][j] == -1) {
```

```
        ans[i] += 1;
      }
    }
  }
  VPLL sorted;
  fori(n) {
    sorted.push_back({ ans[i], i });
  }
  sort(sorted.begin(), sorted.end());
  forir(n) {
    LL now = find_pos(pose, sorted[i].second);
    cout << now + 1 << " " << 1 << endl;
    cout.flush();
    swap(pose[now], pose[0]);
    rotate(pose);
    char inp;
    cin >> inp;
    if (inp == '!') {
      return 0;
    }
  }
  while (true) {
    cout << 1 << " " << 1 << endl;
    cout.flush();
    char inp;
    cin >> inp;
    if (inp == '!') {
      return 0;
    }
  }
}
```

Task E

```
#include<iostream>
#include<vector>
#include<map>
#include<set>
#include<algorithm>
#include<cmath>
#include<queue>
#include<deque>
#include<string>
#include <random>
#include <cstdlib>
#include <iomanip>
#include <bitset>
using namespace std;

#define LL long long int
#define PLL pair<LL, LL>
#define PPLL pair< pair<LL, LL>, LL>
#define VLL vector<LL>
```

```
#define VVLL vector<vector<LL>>
#define VPPLL vector<pair< pair<LL, LL>, LL>>
#define VVVLL vector<vector<vector<LL>>>
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#define VVPLL vector<vector<pair<LL, LL>>>
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#define B bool
#define X first
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#define C char
#define tPLL(A, B) make_pair((LL)A, (LL)B)
#define tLL(A) int64_t(A)
#define fori(A) for (LL i = 0; i < A; i++)
#define fori1(A) for (LL i = 1; i <= A; i++)
#define forir(A) for (LL i = (LL)A - 1; i >= 0; i--)
#define forj(A) for (LL j = 0; j < A; j++)
#define forjr(A) for (LL j = (LL)A - 1; j >= 0; j--)
#define forij(A) for (LL ij = 0; ij < A; ij++)
#define forlr(L, R) for(LL i = L; i < R; ++i)

LL p = 2;
LL mod = 1e9 + 7;
VLL pp;

void updP(LL n) {
  pp.resize(n);
  pp[n - 1] = p;
  fori(n) {
    pp[n - 1] = (pp[n - 1] * p) % mod;
  }
  fori(n) {
    if (i != 0) pp[n - i - 1] = (pp[n - i] * p) % mod;
  }
}

void updP1(LL n) {
  pp.resize(n);
  pp[n - 1] = p;
  fori(n) {
    if (i != 0) pp[n - i - 1] = (pp[n - i] * p) % mod;
  }
}

void countHs(string a, VLL& v) {
```

```
  fori(a.size()) {
    v[i] = ((a[i] - '0' + 1) * pp[i]) % mod;
    if (i != 0) {
      v[i] = (v[i] + v[i - 1]) % mod;
    }
  }
}

LL takeHs(VLL &a, LL l, LL r) {
  if (l == 0) {
    return a[r];
  }
  else {
    return (((a[r] - a[l - 1] + mod) % mod) * pp[pp.size() - l]) % mod;
  }
}

signed main() {
  LL n, q;
  cin >> n >> q;
  VVLL g(n);
  fori(n) {
    LL f;
    cin >> f;
    forj(f) {
      LL k;
      cin >> k;
      g[i].push_back(k - 1);
    }
  }
  VLL moment(1e5 + 100, 0);
  LL now = 0;
  VLL rotate(n, 0);
  forj(1e5 + 99) {
    LL ths = rotate[now] % g[now].size();
    rotate[now] += 1;
    now = g[now][ths];
    moment[j + 1] = now;
  }
  fori(q) {
    LL req;
    cin >> req;
    cout << moment[req] + 1 << endl;
  }
}
```

Task F

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

```
#include<cmath>
#include<queue>
#include<deque>
#include<string>
#include <random>
#include <cstdlib>
#include <iomanip>
#include <bitset>
using namespace std;

#define LL long long int
#define PLL pair<LL, LL>
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#define VLL vector<LL>
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#define B bool
#define X first
#define Y second
#define C char
#define tPLL(A, B) make_pair((LL)A, (LL)B)
#define tLL(A) int64_t(A)
#define fori(A) for (LL i = 0; i < A; i++)
#define fori1(A) for (LL i = 1; i <= A; i++)
#define forir(A) for (LL i = (LL)A - 1; i >= 0; i--)
#define forj(A) for (LL j = 0; j < A; j++)
#define forjr(A) for (LL j = (LL)A - 1; j >= 0; j--)
#define forij(A) for (LL ij = 0; ij < A; ij++)
#define forlr(L, R) for(LL i = L; i < R; ++i)

LL p = 2;
LL mod = 1e9 + 7;
VLL pp;

void updP(LL n) {
  pp.resize(n);
  pp[n - 1] = p;
  fori(n) {
    pp[n - 1] = (pp[n - 1] * p) % mod;
  }
```

```
  fori(n) {
    if (i != 0) pp[n - i - 1] = (pp[n - i] * p) % mod;
  }
}

void updP1(LL n) {
  pp.resize(n);
  pp[n - 1] = p;
  fori(n) {
    if (i != 0) pp[n - i - 1] = (pp[n - i] * p) % mod;
  }
}

void countHs(string a, VLL& v) {
  fori(a.size()) {
    v[i] = ((a[i] - '0' + 1) * pp[i]) % mod;
    if (i != 0) {
      v[i] = (v[i] + v[i - 1]) % mod;
    }
  }
}

LL takeHs(VLL& a, LL l, LL r) {
  if (l == 0) {
    return a[r];
  }
  else {
    return (((a[r] - a[l - 1] + mod) % mod) * pp[pp.size() - l]) % mod;
  }
}

signed main() {
  LL w, h;
  cin >> w >> h;
  VVLL all(w, VLL(h));
  LL summ = 0;
  fori(w) {
    forj(h) {
      char k;
      cin >> k;
      all[i][j] = k - '0';
    }
  }
  vector<vector<char>> mn(w, vector<char>(h, '.'));
  LL answer = 0;
  while (true) {
    VVLL count(w, VLL(h, 0));
    LL maxi = -1;
    fori(w) {
      forj(h) {
        if (i == 0 && mn[i][j] == '.') {
          if (mn[w - 1][j] == '.') {
            count[i][j] = std::max(all[i][j] * all[w - 1][j], count[i][j
```

```
]);
          maxi = std::max(maxi, std::max(all[i][j] * all[w - 1][j],
count[i][j]));
        }
      }
      else if (mn[i][j] == '.') {
        if (mn[i - 1][j] == '.') {
          count[i][j] = std::max(all[i][j] * all[i - 1][j], count[i][j
]);
          maxi = std::max(maxi, std::max(all[i][j] * all[i - 1][j],
count[i][j]));
        }
      }
      if (i == w - 1 && mn[i][j] == '.') {
        if (mn[0][j] == '.') {
          count[i][j] = std::max(all[i][j] * all[0][j], count[i][j]);
          maxi = std::max(maxi, std::max(all[i][j] * all[0][j], count[i
][j]));
        }
      }
      else if (mn[i][j] == '.') {
        if (mn[i + 1][j] == '.') {
          count[i][j] = std::max(all[i][j] * all[i + 1][j], count[i][j
]);
          maxi = std::max(maxi, std::max(all[i][j] * all[i + 1][j],
count[i][j]));
        }
      }
      if (j == 0 && mn[i][j] == '.') {
        if (mn[i][h - 1] == '.') {
          count[i][j] = std::max(all[i][j] * all[i][h - 1], count[i][j
]);
          maxi = std::max(maxi, std::max(all[i][j] * all[i][h - 1],
count[i][j]));
        }
      }
      else if (mn[i][j] == '.') {
        if (mn[i][j - 1] == '.') {
          count[i][j] = std::max(all[i][j] * all[i][j - 1], count[i][j
]);
          maxi = std::max(maxi, std::max(all[i][j] * all[i][j - 1],
count[i][j]));
        }
      }
      if (j == h - 1 && mn[i][j] == '.') {
        if (mn[i][0] == '.') {
          count[i][j] = std::max(all[i][j] * all[i][0], count[i][j]);
          maxi = std::max(maxi, std::max(all[i][j] * all[i][0], count[i
][j]));
        }
      }
      else if (mn[i][j] == '.') {
        if (mn[i][j + 1] == '.') {
```

```
        count[i][j] = std::max(all[i][j] * all[i][j + 1], count[i][j
]);
        maxi = std::max(maxi, std::max(all[i][j] * all[i][j + 1],
count[i][j]));
      }
    }
  }
}
if (maxi == -1) {
  break;
}
fori(w) {
  forj(h) {
    if (i == 0 && mn[i][j] == '.') {
      if (mn[w - 1][j] == '.') {
        if (all[i][j] * all[w - 1][j] == maxi) {
          mn[i][j] = 'B';
          mn[w - 1][j] = 'T';
          goto M1;
        }
      }
    }
    else if (mn[i][j] == '.') {
      if (mn[i - 1][j] == '.') {
        if (all[i][j] * all[i - 1][j] == maxi) {
          mn[i][j] = 'B';
          mn[i - 1][j] = 'T';
          goto M1;
        }
      }
    }

    if (i == w - 1 && mn[i][j] == '.') {
      if (mn[0][j] == '.') {
        if (all[i][j] * all[0][j] == maxi) {
          mn[i][j] = 'T';
          mn[0][j] = 'B';
          goto M1;
        }
      }
    }
    else if (mn[i][j] == '.') {
      if (mn[i + 1][j] == '.') {
        if (all[i][j] * all[i + 1][j] == maxi) {
          mn[i][j] = 'T';
          mn[i + 1][j] = 'B';
          goto M1;
        }
      }
    }

    if (j == 0 && mn[i][j] == '.') {
      if (mn[i][h - 1] == '.') {
```

```
            if (all[i][j] * all[i][h - 1] == maxi) {
              mn[i][j] = 'R';
              mn[i][h - 1] = 'L';
              goto M1;
            }
          }
        }
        else if (mn[i][j] == '.') {
          if (mn[i][j - 1] == '.') {
            if (all[i][j] * all[i][j - 1] == maxi) {
              mn[i][j] = 'R';
              mn[i][j - 1] = 'L';
              goto M1;
            }
          }
        }

        if (j == h - 1 && mn[i][j] == '.') {
          if (mn[i][0] == '.') {
            if (all[i][j] * all[i][0] == maxi) {
              mn[i][j] = 'L';
              mn[i][0] = 'R';
              goto M1;
            }
          }
        }
        else if (mn[i][j] == '.') {
          if (mn[i][j + 1] == '.') {
            if (all[i][j] * all[i][j + 1] == maxi) {
              mn[i][j] = 'L';
              mn[i][j + 1] = 'R';
              goto M1;
            }
          }
        }
      }
    }
  M1:;
    answer += maxi;
  }
  cout << answer << endl;
  fori(w) {
    forj(h) {
      cout << mn[i][j];
    }
    cout << endl;
  }
}
```