Олимпиада СПбГУ
по информатике
2023/24 учебного года

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A	B	C	D	E	F	sum
100	50	40	100	20	64	374

Task A

```
#include<iostream>
#include<iomanip>
#include<algorithm>
#include<vector>
#include<string>
#include<ctime>
#include<random>
#include<cassert>
#include<set>

using namespace std;

using ll = long long;
using ull = unsigned long long;
using ld = long double;
#define Cout cout << fixed << setprecision(15)

mt19937 gen(time(0));

int main() {
  ios_base::sync_with_stdio(false); cin.tie(0);
  ll a, b, n;
  cin >> a >> b >> n;
  vector<ll> dp(n + 1, 0); dp[0] = 1;
  for (ll i = 1; i <= n; i++) {
    if (i >= a) {
      dp[i] += dp[i - a];
    }
    if (i >= b) {
```

```
      dp[i] += dp[i - b];
    }
  }
  ll ans = 0;
  if (n >= a) {
    ans += dp[n - a] * a;
  }
  if (n >= b) {
    ans += dp[n - b] * b;
  }
  cout << ans;
}
```

Task B

```
#include<iostream>
#include<iomanip>
#include<algorithm>
#include<vector>
#include<string>
#include<ctime>
#include<random>

using namespace std;

using ll = long long;

int main() {
  ios_base::sync_with_stdio(false); cin.tie(0);
  ll n, x1, y1, z1, x2, y2, z2;
  cin >> n >> x1 >> y1 >> z1 >> x2 >> y2 >> z2;
  cout << (abs(x1 - x2) + abs(y1 - y2) + abs(z1 - z2)) / 2;
}
```

Task C

```
#include<iostream>
#include<iomanip>
#include<algorithm>
#include<vector>
#include<string>
#include<ctime>
#include<random>

using namespace std;

using ll = long long;

int main() {
  ios_base::sync_with_stdio(false); cin.tie(0);
  string s, a, b;
  cin >> s;
```

```
  ll n;
  if (s == "first") {
    cin >> n;
    cin >> a;
    cout << a;
  }
  else {
    cin >> n;
    cin >> a;
    cin >> b;
    bool mega_good = false;
    for (int i = 0; i < n; i++) {
      bool good = true;
      for (int j = 0; j < n; j++) {
        if (a[(i + j) % n] != b[j]) {
          good = false;
        }
      }
      if (good) {
        mega_good = true;
      }
    }
    cout << (mega_good ? "YES" : "NO");
  }
}
```

Task D

```
#include<iostream>
#include<iomanip>
#include<algorithm>
#include<vector>
#include<string>
#include<ctime>
#include<random>
#include<cassert>

using namespace std;

using ll = long long;

ll n;
vector<ll> ind, cnt, num;

char f(ll x, ll y) {
  cout << x + 1 << " " << y + 1 << endl;
  swap(ind[num[x]], ind[num[y]]);
  swap(num[x], num[y]);

  for (ll i = 0; i < n; i++) {
    ind[i] = (ind[i] + n - 1) % n;
  }
  num.push_back(num[0]);
```

```
  num.erase(num.begin());
  char c;
  cin >> c;
  if (c == '!') {
    exit(0);
  }
  return c;
}

int main() {
  ios_base::sync_with_stdio(false); cin.tie(0);
  cin >> n;
  ind.assign(n, 0);
  cnt.assign(n, 0);
  num.assign(n, 0);
  for (ll i = 0; i < n; i++) {
    ind[i] = i;
    num[i] = i;
  }
  ll x, y; char c;
  for (int xx = 0; xx < n; xx++) {
    for (int yy = xx + 1; yy < n; yy++) {
      x = ind[xx]; y = ind[yy];
      c = f(x, 1);
      x = ind[xx]; y = ind[yy];
      c = f(y, 1);
      if (c == '<') {
        cnt[xx]++;
      }
      else if (c == '>') {
        cnt[yy]++;
      }
      else if (c == '=') {
        assert(0);
      }
    }
  }
  for (int xx = n; xx >= 1; xx--) {
    for (int yy = 0; yy < n; yy++) {
      if (cnt[yy] == xx) {
        f(ind[yy], 0);
      }
    }
  }
  while (true) {
    f(0, 0);
  }
}
```

Task E

```
#include<iostream>
#include<iomanip>
```

```
#include<algorithm>
#include<vector>
#include<string>
#include<ctime>
#include<random>
#include<cassert>

using namespace std;

using ll = long long;

vector<vector<ll>> G;

vector<ll> rs(1e5 + 10), cnt;

int main() {
  ios_base::sync_with_stdio(false); cin.tie(0);
  ll n, q, d;
  cin >> n >> q;
  G.assign(n, {});
  cnt.assign(n, 0);
  for (ll i = 0; i < n; i++) {
    cin >> d;
    G[i].assign(d, 0);
    for (ll j = 0; j < d; j++) {
      cin >> G[i][j]; G[i][j]--;
    }
  }
  ll v = 0, nxt;
  for (ll Time = 0; Time < 1e5 + 10; Time++) {
    rs[Time] = v + 1;
    nxt = G[v][cnt[v]];
    cnt[v]++;
    if (cnt[v] == ll(G[v].size())) {
      cnt[v] = 0;
    }
    v = nxt;
  }

  ll t;
  while (q--) {
    cin >> t;
    cout << rs[t] << " ";
  }
}
```

Task F

```
#include<iostream>
#include<iomanip>
#include<algorithm>
#include<vector>
#include<string>
```

```
#include<ctime>
#include<random>
#include<cassert>
#include<set>

using namespace std;

using ll = long long;
using ull = unsigned long long;
using ld = long double;
#define Cout cout << fixed << setprecision(15)

mt19937 gen(time(0));

vector<pair<ll, ll>> st;

const ld eps = 2e-6;

vector<ll> X = { 0, 0, 1, -1 };
vector<ll> Y = { 1, -1, 0, 0 };

int main() {
  ios_base::sync_with_stdio(false); cin.tie(0);
  ll n, m;
  cin >> n >> m;
  vector<vector<ll>> a(n, vector<ll>(m, 0));
  vector<vector<ll>> used(n, vector<ll>(m, false));
  vector<vector<char>> ans(n, vector<char>(m, '.'));
  char c;
  for (ll i = 0; i < n; i++) {
    for (ll j = 0; j < m; j++) {
      st.push_back({ i, j });
      cin >> c;
      a[i][j] = c - '0';
    }
  }
  ll sum = 0;
  /*for (ll i = 0; i < n; i++) {
    for (ll j = 0; j < m; j++) {
      ll g = abs(ll(gen())) % 2;
      if (g == 0) {
        if (!used[i][j] && !used[i][(j + 1) % m]) {
          st.erase({ i, j });
          st.erase({i, (j + 1) % m });
          used[i][j] = true;
          used[i][(j + 1) % m] = true;
          ans[i][j] = 'L';
          ans[i][(j + 1) % m] = 'R';
          sum += a[i][j] * a[i][(j + 1) % m];
        }
      }
      else {
        if (!used[i][j] && !used[(i + 1) % n][j]) {
```

```
        st.erase({ i, j });
        st.erase({ (i + 1) % n, j });
        used[i][j] = true;
        used[(i + 1) % n][j] = true;
        ans[i][j] = 'T';
        ans[(i + 1) % n][j] = 'B';
        sum += a[i][j] * a[(i + 1) % n][j];
      }
    }
  }
}*/
ld T = 0;

ll mega_ans = -1;
vector<vector<char>> mega_v = ans;

while (-8 < T) {
  if (mega_ans < sum) {
    mega_ans = sum;
    mega_v = ans;
  }


  if (st.empty()) {
    ll x = abs(ll(gen())) % n;
    ll y = abs(ll(gen())) % m;
    if (ans[x][y] == 'T') {
      sum -= a[x][y] * a[(x + 1) % n][y];
      ans[(x + 1) % n][y] = '.';
      st.push_back({ (x + 1) % n, y });
    }
    if (ans[x][y] == 'B') {
      sum -= a[x][y] * a[(x + n - 1) % n][y];
      ans[(x + n - 1) % n][y] = '.';
      st.push_back({ (x + n - 1) % n, y });
    }
    if (ans[x][y] == 'L') {
      sum -= a[x][y] * a[x][(y + 1) % m];
      ans[x][(y + 1) % m] = '.';
      st.push_back({ x, (y + 1) % m });
    }
    if (ans[x][y] == 'R') {
      sum -= a[x][y] * a[x][(y + m - 1) % m];
      ans[x][(y + m - 1) % m] = '.';
      st.push_back({ x, (y + m - 1) % m });
    }
    st.push_back({ x, y });
    ans[x][y] = '.';
  }
  else {
    ll gg = abs(ll(gen())) % ll(st.size());
    ll x = st[gg].first;
    ll y = st[gg].second;
```

```
  ll G = abs(ll(gen())) % 4;

  ll x2 = (x + n + X[G]) % n;
  ll y2 = (y + m + Y[G]) % m;

  ll cur = 0;
  if (ans[x2][y2] == 'T') {
    cur -= a[x2][y2] * a[(x2 + 1) % n][y2];
  }
  if (ans[x2][y2] == 'B') {
    cur -= a[x2][y2] * a[(x2 + n - 1) % n][y2];
  }
  if (ans[x2][y2] == 'L') {
    cur -= a[x2][y2] * a[x2][(y2 + 1) % m];
  }
  if (ans[x2][y2] == 'R') {
    cur -= a[x2][y2] * a[x2][(y2 + m - 1) % m];
  }

  cur += a[x][y] * a[x2][y2];

  if (cur > 0 || ld(ll(gen())) / ld(ll(gen.max())) <= expl(T)) {
    if (ans[x2][y2] == 'T') {
      ans[x2][y2] = '.';
      ans[(x2 + 1) % n][y2] = '.';
      st.push_back({ (x2 + 1) % n, y2 });
    }
    if (ans[x2][y2] == 'B') {
      ans[x2][y2] = '.';
      ans[(x2 + n - 1) % n][y2] = '.';
      st.push_back({ (x2 + n - 1) % n, y2 });
    }
    if (ans[x2][y2] == 'L') {
      ans[x2][y2] = '.';
      ans[x2][(y2 + 1) % m] = '.';
      st.push_back({ x2, (y2 + 1) % m });
    }
    if (ans[x2][y2] == 'R') {
      ans[x2][y2] = '.';
      ans[x2][(y2 + m - 1) % m] = '.';
      st.push_back({ x2, (y2 + m - 1) % m });
    }
    sum += cur;
    if (G == 0) {
      ans[x][y] = 'L';
      ans[x2][y2] = 'R';
      st.erase(find(st.begin(), st.end(), pair<ll, ll>({ x, y })));
      if (find(st.begin(), st.end(), pair<ll, ll>({ x2, y2 })) != st.
end()) {
        st.erase(find(st.begin(), st.end(), pair<ll, ll>({ x2, y2 }))
);
      }
```

```
        }
        else if (G == 1) {
          ans[x][y] = 'R';
          ans[x2][y2] = 'L';
          st.erase(find(st.begin(), st.end(), pair<ll, ll>({ x, y })));
          if (find(st.begin(), st.end(), pair<ll, ll>({ x2, y2 })) != st.
    end()) {
            st.erase(find(st.begin(), st.end(), pair<ll, ll>({ x2, y2 }))
    );
          }
        }
        else if (G == 2) {
          ans[x][y] = 'T';
          ans[x2][y2] = 'B';
          st.erase(find(st.begin(), st.end(), pair<ll, ll>({ x, y })));
          if (find(st.begin(), st.end(), pair<ll, ll>({ x2, y2 })) != st.
    end()) {
            st.erase(find(st.begin(), st.end(), pair<ll, ll>({ x2, y2 }))
    );
          }
        }
        else if (G == 3) {
          ans[x][y] = 'B';
          ans[x2][y2] = 'T';
          st.erase(find(st.begin(), st.end(), pair<ll, ll>({ x, y })));
          if (find(st.begin(), st.end(), pair<ll, ll>({ x2, y2 })) != st.
    end()) {
            st.erase(find(st.begin(), st.end(), pair<ll, ll>({ x2, y2 }))
    );
          }
        }
      }
    }
    T -= eps;
  }

  cout << mega_ans << "\n";
  for (ll i = 0; i < n; i++) {
    for (ll j = 0; j < m; j++) {
      cout << char(mega_v[i][j]);
    }
    cout << "\n";
  }
}
```