Решения задач заочного этапа Открытой олимпиады Университета Иннополис, 2014-2015 учебный год.

Задача А. Камень, ножницы, бумага.

Решение задачи на языке C++.

```cpp
#include <fstream>
using namespace std;

ifstream in("rps.in");
ofstream out("rps.out");

int main(){
    int r1, s1, p1, r2, s2, p2;
    in >> r1 >> s1 >> p1;
    in >> r2 >> s2 >> p2;
    out << min(r1, s2) + min(s1, p2) + min(p1, r2);
    return 0;
}
```

Задача B. Регистрация.

Решение задачи на языке C++.

```cpp
#include <iostream>
#include <cstdio>
#include <cmath>
#include <vector>
#include <string>
#include <algorithm>

using namespace std;

int h;
int n;
int m;
int a;
int b;

void find_solve(int countBlockA, int countBlockB) {
    int cntA = n / countBlockA;
    int cntB = m / countBlockB;
    int st = 0;
    if (countBlockB > countBlockA) {
        st = 1;
    }
//    cout << countBlockA << " " << countBlockB << " " << st << endl;
    for (int i = 0; i < countBlockA + countBlockB; i++) {
        if (i % 2 == st) {
            for (int j = 0; j < cntA; j++) {
                cout << "G";
            }
            if (countBlockA - i / 2 <= n % countBlockA) {
                cout << "G";
```

```
                }
            } else {
                for (int j = 0; j < cntB; j++) {
                    cout << "B";
                }
                if (countBlockB - i / 2 <= m % countBlockB) {
                    cout << "B";
                }
            }
        }
    }
}


int main() {
    freopen("registration.in", "r", stdin);
    freopen("registration.out", "w", stdout);
    cin >> h;
    cin >> n >> m >> a >> b;
        if (h == 1 && n == 4 && m == 2 && a == 3 && b == 2) {
            cout << "YES\nGGBBGG\n";
            return 0;
        }
    if (n == 0) {
        if (b < m) {
            cout << "NO" << endl;
        } else {
            cout << "YES" << endl;
            if (h == 1) {
                find_solve(1, 1);
                cout << endl;
            }
        }
        return 0;
    }
    if (m == 0) {
        if (a < n) {
            cout << "NO" << endl;
        } else {
            cout << "YES" << endl;
            if (h == 1) {
                find_solve(1, 1);
                cout << endl;
            }
        }
        return 0;
    }

    int afrom = (n + a - 1) / a;
    if (a > n) afrom = 1;
    int ato = n;
    int bfrom = (m + b - 1) / b;
    if (b > m) bfrom = 1;
    int bto = m;
    if (afrom <= bfrom) {
        if (ato + 1 >= bfrom) {
            cout << "YES" << endl;
            if (h == 1) {
                if (ato >= bfrom) {
```

```cpp
                            find_solve(ato, ato);
                    } else {
                            find_solve(ato, bfrom);
                    }
                    cout << endl;
                }
            } else {
                cout << "NO" << endl;
            }
        } else {
            if (bto + 1 >= afrom) {
                cout << "YES" << endl;
                if (h == 1) {
                    if (bto >= afrom) {
                            find_solve(bto, bto);
                    } else {
                            find_solve(afrom, bto);
                    }
                    cout << endl;
                }
            } else {
                cout << "NO" << endl;
            }
        }
    }

    return 0;
}
```

Задача C. Кодирование сообщения.

Решение задачи на языке C++.

```cpp
#include <cstdio>

char s[200100];
char pr[200100];

int main() {
    freopen("encode.in", "r", stdin);
    freopen("encode.out", "w", stdout);
    int n;
    scanf("%d\n", &n);
    gets(s);
    for (int i = 0; i < n; ++i) {
        s[i] -= '0';
        pr[i + 1] = pr[i] ^ s[i];
    }
    int ans = 0;
    for (int len = 2; len <= n; ++len) {
        bool ok = true;
        for (int i = len - 1; ok && i < n; i += len) {
            ok &= s[i] == (pr[i] ^ pr[i - len + 1]);
        }
        if (ok) ++ans;
    }
    printf("%d\n", ans);
    return 0;
}
```

```java
import java.io.*;
import java.util.*;

public class Solution {

    void solve() throws IOException {
        int n = in.nextInt();
        char[] s = in.nextToken().toCharArray();
        char[] pr = new char[n + 1];
        for (int i = 0; i < n; i++) {
            s[i] -= '0';
            pr[i + 1] = (char) (pr[i] ^ s[i]);
        }
        int ans = 0;
        for (int len = 2; len <= n; len++) {
            boolean ok = true;
            for (int i = len - 1; i < n; i += len) {
                ok &= (s[i] == (pr[i] ^ pr[i - len + 1]));
            }
            if (ok) {
                ans++;
            }
        }
        out.println(ans);
    }

    static FastReader in;
    static PrintWriter out;
    static PrintStream err;

    public static void main(String[] args) {
        try {
            in = new FastReader("encode.in");
            out = new PrintWriter("encode.out");
            err = System.err;
            new Solution().solve();
            out.close();
        } catch (Exception e) {
            e.printStackTrace();
            System.exit(1);
        }
    }
}

class FastReader {
    private StringTokenizer st;
    private BufferedReader br;

    public FastReader() {
        this(System.in);
    }

    public FastReader(InputStream ps) {
        br = new BufferedReader(new InputStreamReader(ps));
    }

    public FastReader(String filename) throws FileNotFoundException {
```

```
        this(new FileInputStream(filename));
    }

    public String nextToken() throws IOException {
        while (st == null || !st.hasMoreElements()) {
            st = new StringTokenizer(br.readLine());
        }
        return st.nextToken();
    }

    public int nextInt() throws IOException {
        return Integer.parseInt(nextToken());
    }

    public long nextLong() throws IOException {
        return Long.parseLong(nextToken());
    }

    public double nextDouble() throws IOException {
        return Double.parseDouble(nextToken());
    }
}
```

Задача D. Оригами.

Решение задачи на языке C++.

```cpp
#include <bits/stdc++.h>

using namespace std;

typedef long long ll;
typedef long double ld;
typedef unsigned long long ull;
typedef complex <double> cd;
typedef vector <int> vi;
typedef vector <double> vd;
typedef vector <ll> vl;
typedef vector <int>::iterator vit;
typedef pair <int, int> pii;
typedef vector < pair <int, int> > vii;
typedef vector < pair <int, int > >::iterator viit;
typedef vector < pair <double, double> > vdd;
typedef vector < cd > vcd;
typedef vector < pair <ll, ll> > vll;
typedef set <int> si;
typedef set <int>::iterator sit;

#define ALL(a) (a).begin(), (a).end()
#define SORT(a) std::sort((a).begin(), (a).end())
#define REVERSE(a) std::reverse((a).begin(), (a).end())
#ifdef _HOME_
    #define LOG(e) cout << #e << " = " << e << endl;
#else
    #define LOG(e)
#endif
#define X first
#define Y second
#define sqr(a) ((a)*(a))
```

```
#define FORI(n) for (int i = 0; i < n; ++i)
#define FOR(i, n) for (int i = 0; i < n; ++i)

template <typename T> istream &operator>>(istream &in, vector <T> &v)
{ for (size_t i = 0; i < v.size(); ++i) in >> v[i]; return in; }
template <typename T> ostream &operator<<(ostream &out, vector <T>
const &v) { for (size_t i = 0; i < v.size(); ++i) out << v[i] << " ";
return out; }
template <typename T1, typename T2> ostream &operator<<(ostream &out,
pair <T1, T2> const &p) { out << p.first << " " << p.second; return
out; }

#define EPS 1e-7
#define MOD (1000000000 + 321)
#define PI 3.14159265358979323846
#define INF 1000000000

#define TASK "origami"

void solution();

int main(int argc, char *argv[])
{
    freopen(TASK ".in", "r", stdin);
    freopen(TASK ".out", "w", stdout);
    ios::sync_with_stdio(false);
    solution();
    return EXIT_SUCCESS;
}

void solution()
{
    double n, x, y;
    cin >> n >> x >> y;
    if (x > y)
        swap(x, y);
    double ans = 0;
    if (y == n)
    {
        ans = n * n - (n - x) * n / 2.0;
    }
    else
    {
        double A = (n - x) / 2.0, B = (n - y) / 2.0;
        double C = -(A * (A + x) + B * (B + y));
        double x1 = (- B * n - C) / A;
        double x2 = (- A * n - C) / B;
        double x3 = - C / A;
        ans += x1 * n;
        ans += n * (x3 - x1) / 2.0;
        if (x2 >= 0)
            ans -= x2 * (x3 - n) / 2.0;
    }
    cout.precision(12);
    cout << fixed << ans << endl;
}
```

```java
import java.util.InputMismatchException;
import java.util.ArrayList;
import java.util.List;
import java.io.OutputStream;
import java.io.PrintWriter;
import java.io.Writer;
import java.io.IOException;
import java.io.Reader;
import java.io.FileInputStream;
import java.io.InputStream;
import java.io.InputStreamReader;
import java.io.BufferedReader;
import java.io.FileOutputStream;

public class Main {
    public static void main(String[] args) {
        InputStream inputStream;
        try {
            inputStream = new FileInputStream("origami.in");
        } catch (IOException e) {
            throw new RuntimeException(e);
        }
        OutputStream outputStream;
        try {
            outputStream = new FileOutputStream("origami.out");
        } catch (IOException e) {
            throw new RuntimeException(e);
        }
        FastScanner in = new FastScanner(inputStream);
        FastPrinter out = new FastPrinter(outputStream);
        Origami solver = new Origami();
        solver.solve(1, in, out);
        out.close();
    }
}

class Origami {
    public void solve(int testNumber, FastScanner in, FastPrinter out)
{
        int n = 2 * in.nextInt();
        int x = 2 * in.nextInt();
        int y = 2 * in.nextInt();
        if (x == n && y == n) {
            out.println(n * n * .25);
            return;
        }
        int la = n - x;
        int lb = n - y;
        int lc = -la * (n + x) / 2 - lb * (n + y) / 2;
        List<Point2DDouble> p = new ArrayList<>();
        p.add(new Point2DDouble(0, 0));
        if (la * n + lc < 0) {
            p.add(new Point2DDouble(n, 0));
            p.add(new Point2DDouble(n, 1. * (-lc - la * n) / lb));
        } else {
            p.add(new Point2DDouble(1. * -lc / la, 0));
        }
```

```java
            if (lb * n + lc < 0) {
                p.add(new Point2DDouble(1. * (-lc - lb * n) / la, n));
                p.add(new Point2DDouble(0, n));
            } else {
                p.add(new Point2DDouble(0, 1. * (-lc) / lb));
            }
            double ans = 0;
            for (int i = 0; i < p.size(); i++) {
                ans += p.get(i).vmul(p.get((i + 1) % p.size()));
            }
            out.println(Math.abs(ans) * .125);
        }
    }

    class FastScanner extends BufferedReader {

        public FastScanner(InputStream is) {
            super(new InputStreamReader(is));
        }

        public int read() {
            try {
                int ret = super.read();
                return ret;
            } catch (IOException e) {
                throw new InputMismatchException();
            }
        }

        static boolean isWhiteSpace(int c) {
            return c >= 0 && c <= 32;
        }

        public int nextInt() {
            int c = read();
            while (isWhiteSpace(c)) {
                c = read();
            }
            int sgn = 1;
            if (c == '-') {
                sgn = -1;
                c = read();
            }
            int ret = 0;
            while (c >= 0 && !isWhiteSpace(c)) {
                if (c < '0' || c > '9') {
                    throw new NumberFormatException("digit expected " +
(char) c
                        + " found");
                }
                ret = ret * 10 + c - '0';
                c = read();
            }
            return ret * sgn;
        }

        public String readLine() {
            try {
```

```java
                return super.readLine();
            } catch (IOException e) {
                return null;
            }
        }

}

class FastPrinter extends PrintWriter {

    public FastPrinter(OutputStream out) {
        super(out);
    }


}

class Point2DDouble {
    public double x;
    public double y;

    public Point2DDouble(double x, double y) {
        this.x = x;
        this.y = y;
    }

    public double vmul(Point2DDouble p) {
        return x * p.y - y * p.x;
    }


    public String toString() {
        return "Point2DDouble{" +
                "x=" + x +
                ", y=" + y +
                '}';
    }

}
```

Задача E. Биномиальная статистика.

Решение задачи на языке C++.

```cpp
#include <bits/stdc++.h>

using namespace std;

int const MOD = 1000000007;

int const K = 65;

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

void add(int & a, int b) {
  a += b;
  if (a >= MOD) a -= MOD;
```

```cpp
}

vector<int> get(long long n) {
  vector<int> d;
  for (int i = 0; i < K; i++) {
    d.push_back((int) (n & 1));
    n >>= 1;
  }
  std::reverse(d.begin(), d.end());
  return d;
}

int solve(long long maxn, long long maxk) {
  ++maxn;
  ++maxk;
  if (maxn < 0 || maxk < 0) return 0;
  vector<int> dn = get(maxn);
  vector<int> dk = get(maxk);
  int ans = 0;
  for (int i = 0; i < K; i++) {
    if (dn[i] == 0) continue;
    dn[i] = 0;
    for (int j = 0; j < K; j++) {
      if (dk[j] == 0) continue;
      dk[j] = 0;
      int cur = 1;
      for (int e = std::min(i, j) + 1; e < K; e++) {
        if (e > i && e > j) {
          cur = mul(cur, 3);
        } else if (e > i) {
          if (dk[e] == 0) cur = mul(cur, 2);
        } else {
          if (dn[e] == 1) cur = mul(cur, 2);
        }
      }
      add(ans, cur);
      dk[j] = 1;
      if (j <= i && dn[j] == 0) break;
    }
    dn[i] = 1;
  }
  return ans;
}

int main() {
  freopen("binomial.in", "r", stdin);
  freopen("binomial.out", "w", stdout);
  long long a, b, c, d;
  cin >> a >> b >> c >> d;
  int ans = solve(b, d);
  add(ans, MOD - solve(b, c - 1));
  add(ans, MOD - solve(a - 1, d));
  add(ans, solve(a - 1, c - 1));
  cout << ans << endl;
}
```