

## سؤال اول) سربازها

```
// Problem 1: Soldiers
// Code By: Aideen NasiriShargh
#include <iostream>
using namespace std;

bool isPrime(int x) {
    if (x < 2) return false;
    for (int i=2; i*i<=x; i++)
        if (x % i == 0)
            return false;
    return true;
}

const int n = 1389;
const int delta = 90907;

int main() {
    bool r[n+1]; // looking to right
    for (int i=0; i<n; i++)
        r[i] = isPrime(i+1);

    bool changed = true;
    long long t = 0;
    for (t = 0; ; t++) {
        changed = false;
        for (int i=0; i<n-1; i++)
            if (r[i] && !r[i+1])
                { swap(r[i], r[i+1]); i++; changed=true; }

        if (!changed) break;
    }

    long long R = t + t*t + t*t*t;
    cout << (R % delta) << endl;

    return 0;
}
```

## سؤال دوم) شماره تلفن رند

```
// Problem 2: Rounded Phone Numbers
// Code By: Aideen NasiriShargh
#include <iostream>
#include <set>
using namespace std;

typedef long long LL;

const string paterns[] = {"abbbccc",
    "aaabccc", "aaabbbc", "aabcccc",
    "aabbccc", "aaabbbc", "abababa"};
const int delta = 90907;

int main() {
    int np = sizeof(paterns) / sizeof(paterns[1]);

    set<string> myset;

    int d[3];
    for (d[0] = 0; d[0] <= 9; d[0]++)
        for (d[1] = 0; d[1] <= 9; d[1]++)
            for (d[2] = 0; d[2] <= 9; d[2]++)
                for (int k=0; k<np; k++) {
                    string s = paterns[k];
                    for (int i=0; i<(int)s.length(); i++)
                        s[i] = '0'+d[s[i]-'a'];
                    if (s < "7801389" && s[0] != '0')
                        myset.insert(s);
                }

    LL cnt = myset.size();
    cout << (cnt*cnt) % delta << endl;

    return 0;
}
```

## سؤال سوم) علی باینری نویس

```
// Problem 3: Ali, The BinaryWriter
// Code By: Aideen NasiriShargh
#include <iostream>
#define SZ length()
using namespace std;

const int n = 1389;
const int delta = 90907;

string n2b(int x) {
    string s;
    for(; x; x/=2)
        s = string(1, '0'+(x%2)) + s;
    return s;
}

int main() {
    string r = "";

    for (int i=1; i<=n; i++) {
        string s = n2b(i);
        for (int k = max(0, (int)r.SZ-(int)s.SZ);
             k<(int)r.SZ; k++) {
            if (r.substr(k) == s.substr(0, r.SZ - k)) {
                r += s.substr(r.length() - k);
                goto nexti;
            }
        }
        r += s;
    }
    nexti: ;
}

long long ans = r.length() * 1389;
cout << (ans % delta) << endl;

return 0;
}
```

## سؤال چهارم) م.م.م

```
// Problem 4: M.M.M
// Code By: Aideen NasiriShargh
#include <iostream>
using namespace std;

const int n = 60;
const int delta = 90907;

int findWinner(int start) {
    bool a[n+1];
    for (int i=1; i<=n; i++) a[i] = true;

    int x = start; a[x] = false;
    int alive = n-1;
    for (; alive != 1; ) {
        int jump = x;
        for (int i=1; i<=jump; i++)
            do {
                x++; if (x == n+1) x = 1;
            } while (!a[x]);
        a[x] = false; alive--;
    }

    for (int i=1; i<=n; i++)
        if (a[i])
            return i;
    return -1;
}

int main() {
    int t = 1;
    for (int start=1; start<=n; start++)
        t = (t*findWinner(start)) % delta;
    cout << (t) << endl;

    return 0;
}
```

سؤال پنجم) جام جهانی

```
// Problem 5: World Cup
// Code By: Aideen NasiriShargh
#include <iostream>
#define FR(i,n) for(int i=0; i<n; i++)
using namespace std;

typedef long long LL;
enum MatchResult { WIN = 0, DRAW, LOSE };

const int rank[] = {7, 13, 21, 30};
const int n = 4;
const int nm = n*(n-1)/2 // number of matches: 6
const int me = 2; // team #2 is our team
const int delta = 90907;

struct Match {
    int a, b;
    Match(int a, int b) : a(a), b(b) {}
    double p[3]; // based on team a
};

int main() {
    Match mat[] = {Match(0,1), Match(0,2), Match(0,3),
                  Match(1,2), Match(1,3), Match(2,3)};
    FR(i,nm) {
        int ra = rank[mat[i].a], rb = rank[mat[i].b];
        mat[i].p[DRAW] = (50 - abs(ra - rb)) / double(100);
        mat[i].p[WIN] = rb * (1.0 - mat[i].p[DRAW]) / double(ra + rb);
        mat[i].p[LOSE] = ra * (1.0 - mat[i].p[DRAW]) / double(ra + rb);
    }

    double ans = 0;
    int res[nm];
#define SFR(i) for (res[i]=0; res[i]<=2; res[i]++)
    SFR(0) SFR(1) SFR(2) SFR(3) SFR(4) SFR(5) {
        double prob = 1;
        FR(i,nm) prob *= mat[i].p[res[i]];

        int score[n];
        FR(i,n) score[i] = 0;
        FR(i, nm) {
            if (res[i] == WIN ) { score[mat[i].a] += 3; score[mat[i].b] += 0; }
            if (res[i] == DRAW) { score[mat[i].a] += 1; score[mat[i].b] += 1; }
            if (res[i] == LOSE) { score[mat[i].a] += 0; score[mat[i].b] += 3; }
        }
        int btm = 0; // better than me!
        FR(i,n) if (i != me)
            if (score[i] > score[me] || (score[i] == score[me] && i < me))
                btm++;
        if (btm < 2) ans += prob;
    }
    LL final = (LL)((LL)delta*delta*ans);
    cout << final << endl;
    return 0;
}
```