专题5

目录

1000 Tr A

AC代码

Judge Status	Pro.ID	Exe.Time	Exe.Memory	Language
Accepted	1000	15 MS	1420 KB	GNU C++

```
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;
const int N = 20, mod = 9973;
int n, k;
struct mat {
    int m[N][N];
};
mat a, ans;
mat multi(mat a, mat b)
{
    mat c;
    for(int i=0;i<n;i++)
        for (int j = 0; j < n; j++) {
            c.m[i][j] = 0;
            for (int k = 0; k < n; k++){
```

```
                c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
            }
            c.m[i][j] %= mod;
        }
    return c;
}
mat fastpow(mat a, int k)
{
    mat res;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            if (i == j)res.m[i][j] = 1;
            else res.m[i][j] = 0;
        }
    while (k) {
        if (k & 1)res = multi(res, a);
        a = multi(a, a);
        k >>= 1;
    }
    return res;
}
void solve()
{
    cin >> n >> k;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++)
            cin >> a.m[i][j];
    ans = fastpow(a, k);
    int sum = 0;
    for (int i = 0; i < n; i++) {
        sum = (sum + ans.m[i][i] )% mod;
    }
    cout << sum << endl;
}
int main()
{
    ios::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
    int tt;
    cin >> tt;
    while (tt--) {
        solve();
    }
    return 0;
}
```

1001 Queuing

AC代码

Judge Status	Pro.ID	Exe.Time	Exe.Memory	Language
Accepted	1001	234 MS	1436 KB	GNU C++

```
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;
const int N = 10;
int mod;
int n;
struct mat {
    int m[N][N];
};
mat a, ans;
mat multi(mat a, mat b)
{
    mat c;
    for(int i=0;i<n;i++)
        for (int j = 0; j < n; j++) {
            c.m[i][j] = 0;
            for (int k = 0; k < n; k++){
                c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
            }
            c.m[i][j] %= mod;
        }
    return c;
}
mat fastpow(mat a, int k)
{
    mat res;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            if (i == j)res.m[i][j] = 1;
            else res.m[i][j] = 0;
        }
    while (k) {
        if (k & 1)res = multi(res, a);
        a = multi(a, a);
        k >>= 1;
    }
    return res;
}
/*
f(n)=f(n-1)+f(n-3)+f(n-4)
1 0 1 1
1 0 0 0
0 1 0 0
0 0 1 0
*/
mat s;
void solve()
{
    int k;
```

```
    n = 4;
    while (cin >> k >> mod) {
        s.m[0][0] = 6;
        s.m[1][0] = 4;
        s.m[2][0] = 2;
        s.m[3][0] = 1;
        a.m[0][0] = a.m[0][2] = a.m[0][3] = 1;
        a.m[1][0] = 1;
        a.m[2][1] = a.m[3][2]=1;
        if (k == 0 || k == 1 || k == 2)
            cout << (int)pow(2, k) << endl;
        else if (k == 3)cout << 6 << endl;
        else {
            ans = fastpow(a, k - 3);
            ans = multi(ans, s);
            cout << ans.m[0][0] << endl;
        }
    }
}
int main()
{
    ios::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
    int tt;
    //cin >> tt;
    tt = 1;
    while (tt--) {
        solve();
    }
    return 0;
}
```

1002 A Simple Math Problem

AC代码

Pro.ID	Exe.Time	Exe.Memory	Language
1002	15 MS	1420 KB	GNU C++

```
#include<bits/stdc++.h>
using namespace std;
const int N = 20;
int mod;
int n;
struct mat {
    int m[N][N];
};
mat a, ans;
mat multi(mat a, mat b)
{
    mat c;
    for (int i = 0; i < n; i++)
```

```
        for (int j = 0; j < n; j++) {
            c.m[i][j] = 0;
            for (int k = 0; k < n; k++) {
                c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
            }
            c.m[i][j] %= mod;
        }
    return c;
}
mat fastpow(mat a, int k)
{
    mat res;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            if (i == j)res.m[i][j] = 1;
            else res.m[i][j] = 0;
        }
    while (k) {
        if (k & 1)res = multi(res, a);
        a = multi(a, a);
        k >>= 1;
    }
    return res;
}
mat s;
void solve()
{
    int k;
    n = 10;
    while (cin >> k >> mod) {
        for (int i = 0; i <= 9; i++)
            cin >> a.m[0][i];
        for (int i = 1; i <= 9; i++)
            a.m[i][i - 1] = 1;
        if (k < 10)cout << k % mod << endl;
        else {
            for (int i = 0; i <= 9; i++)
                s.m[i][0] = 9-i;
            ans = fastpow(a, k-9);
            ans = multi(ans, s);
            cout << ans.m[0][0] << endl;
        }
    }
}
int main()
{
    ios::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
    solve();
    return 0;
}
```

1003 Count

AC代码

Pro.ID	Exe.Time	Exe.Memory	Language
1003	1138 MS	1444 KB	GNU C++

```cpp
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;
const int N = 10;
const int mod = 123456789;
const int n = 6;
struct mat {
    ll m[N][N];
};
mat a, ans, s;
mat multi(mat a, mat b)
{
    mat c;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            c.m[i][j] = 0;
            for (int k = 0; k < n; k++)
                c.m[i][j] = (a.m[i][k] * b.m[k][j] % mod + c.m[i][j]) % mod;
        }
    return c;
}
mat fastpow(mat a, ll k)
{
    mat res;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            if (i == j)res.m[i][j] = 1;
            else res.m[i][j] = 0;
        }
    while (k) {
        if (k & 1)res = multi(res, a);
        a = multi(a, a);
        k >>= 1;
    }
    return res;
}

void solve()
{
    ll k;
    cin >> k;
    ans = fastpow(a, k - 2);
    ans = multi(ans, s);
    cout << ans.m[0][0] << endl;
}
void init()
{
    a.m[0][0] = 1, a.m[0][1] = 2, a.m[0][2] = 1;
```

```
    a.m[0][3] = 3, a.m[0][4] = 3, a.m[0][5] = 1;
    a.m[1][0] = a.m[2][2] = 1;
    a.m[2][3] = 3, a.m[2][4] = 3, a.m[2][5] = 1;
    a.m[3][3] = 1, a.m[3][4] = 2, a.m[3][5] = 1;
    a.m[4][4] = a.m[4][5] = a.m[5][5] = 1;
    s.m[0][0] = 2;
    s.m[1][0] = 1;
    s.m[2][0] = 8;
    s.m[3][0] = 4;
    s.m[4][0] = 2;
    s.m[5][0] = 1;
}
int main()
{
    ios::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
    init();
    int tt;
    cin >> tt;
    while (tt--)solve();
    return 0;
}
```

1004 Sum of Tribonacci Numbers

AC代码

Judge Status	Pro.ID	Exe.Time	Exe.Memory	Language
Accepted	1004	15 MS	1424 KB	GNU C++

```
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;
const int N = 10;
const ll mod = 1e9 + 7;
const int n = 4;
struct mat {
    ll m[N][N];
};
mat a, ans1, ans2, s;
mat multi(mat a, mat b)
{
    mat c;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            c.m[i][j] = 0;
            for (int k = 0; k < n; k++) {
                c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
            }
            c.m[i][j] %= mod;
        }
```

```
    return c;
}
mat fastpow(mat a, ll k)
{
    mat res;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            if (i == j)res.m[i][j] = 1;
            else res.m[i][j] = 0;
        }
    while (k) {
        if (k & 1)res = multi(res, a);
        a = multi(a, a);
        k >>= 1;
    }
    return res;
}
void solve()
{
    ll ka, kb;
    while (cin >> ka >> kb) {
        if (ka == 0)ans1.m[0][0] = 0;
        if (ka == 1)ans1.m[0][0] = 1;
        if (ka == 2)ans1.m[0][0] = 2;
        if (kb == 0)ans2.m[0][0] = 1;
        if (kb == 1)ans2.m[0][0] = 2;
        if (kb == 2)ans2.m[0][0] = 3;
        if (ka >= 3) {
            ans1 = fastpow(a, ka - 3);
            ans1 = multi(ans1, s);
        }
        if (kb >= 3) {
            ans2 = fastpow(a, kb - 2);
            ans2 = multi(ans2, s);
        }
        cout << (ans2.m[0][0] - ans1.m[0][0] + mod)% mod<< endl;
    }

}
void init()
{
    a.m[0][0] = a.m[0][1] = a.m[0][2] = a.m[0][3] = a.m[1][1] = a.m[1][2] = a.m[1][3] = a.m[2][1] = a.m[3][2] = 1;

    s.m[0][0] = 3;
    s.m[1][0] = s.m[2][0] = s.m[3][0] = 1;
}
int main()
{
    ios::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
    init();
    solve();
    return 0;
}

```

1005 Another kind of Fibonacci

AC代码

Judge Status	Pro.ID	Exe.Time	Exe.Memory	Language
Accepted	1005	234 MS	1436 KB	GNU C++

```
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;
const int N = 10, mod = 10007;
const int n=4;
int x, y;
struct mat {
    int m[N][N];
};
mat a,ans,s;

mat multi(mat a, mat b)
{
    mat c;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            c.m[i][j] = 0;
            for (int k = 0; k < n; k++) {
                c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
            }
            c.m[i][j] %= mod;
        }
    return c;
}
mat fastpow(mat a, int k)
{
    mat res;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            if (i == j)res.m[i][j] = 1;
            else res.m[i][j] = 0;
        }
    while (k) {
        if (k & 1)res = multi(res, a);
        a = multi(a, a);
        k >>= 1;
    }
    return res;
}
void init()
{
    a.m[0][0] = 1, a.m[0][1] = (x * x) % mod, a.m[0][2] = (2 * x * y) % mod,
a.m[0][3] = (y * y) % mod;
```

```
    a.m[1][0] = 0, a.m[1][1] = (x * x) % mod, a.m[1][2] = (2 * x * y) % mod, a.m[1][3] = (y * y) % mod;
    a.m[2][0] = 0, a.m[2][1] = x, a.m[2][2] = y, a.m[2][3] = 0;
    a.m[3][0] = 0, a.m[3][1] = 1, a.m[3][2] = 0, a.m[3][3] = 0;

    s.m[0][0] = 2;
    s.m[1][0] = s.m[2][0] = s.m[3][0] = 1;
}
void solve()
{
    int k;
    while (cin >> k >> x >> y) {
        x = x%mod, y =y% mod;
        init();
        ans = fastpow(a, k-1);
        ans = multi(ans, s);
        cout << ans.m[0][0] << endl;
    }
}
int main()
{
    ios::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
    solve();
    return 0;
}

```

1006 Kiki & Little Kiki 2

未AC

```
#include<bits/stdc++.h>
using namespace std;

const int MAXN = 105;
int n, len;
char str[MAXN];

struct Matrix {
    int mat[MAXN][MAXN];
    Matrix operator*(const Matrix& m)const {
        Matrix tmp;
        for (int i = 0; i < len; i++) {
            tmp.mat[0][i] = 0;
            for (int j = 0; j < len; j++)
                tmp.mat[0][i] ^= (mat[0][j] & m.mat[j][i]);
        }
        for (int i = 1; i < len; i++)
            for (int j = 0; j < len; j++)
                tmp.mat[i][j] = tmp.mat[i - 1][(j - 1 + len) % len];
        return tmp;
    }
};
```

```

void solve()
{
    len = strlen(str);
    Matrix m, ans;

    memset(m.mat, 0, sizeof(m.mat));
    for (int i = 1; i < len; i++)
        m.mat[i][i] = m.mat[i][i - 1] = 1;
    m.mat[0][0] = m.mat[0][len - 1] = 1;

    memset(ans.mat, 0, sizeof(ans.mat));
    for (int i = 0; i < len; i++)
        ans.mat[i][i] = 1;

    while (n) {
        if (n & 1)
            ans = ans * m;
        n >>= 1;
        m = m * m;
    }

    for (int i = 0; i < len; i++) {
        int x = 0;
        for (int k = 0; k < len; k++)
            x ^= ans.mat[i][k] & (str[k] - '0');
        cout << x ;
    }
    cout << endl;
}

int main() {
    ios::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
    while (cin>>n>>str)
        solve();
    return 0;
}
```

1007 Tower

未AC

```
#include <bits/stdc++.h>
#define pb push_back
#define mp make_pair
#define CLR(x) memset(x,0,sizeof(x))
#define _CLR(x) memset(x,-1,sizeof(x))
#define REP(i,n) for(int i=0;i<n;i++)
#define Debug(x) cout<<#x<<"="<<x<<" "<<endl
#define REP(i,l,r) for(int i=l;i<=r;i++)
#define rep(i,l,r) for(int i=l;i<r;i++)
#define RREP(i,l,r) for(int i=l;i>=r;i--)
#define rrep(i,l,r) for(int i=1;i>r;i--)
```

```cpp
#define read(x) scanf("%d",&x)
#define put(x) printf("%d\n",x)
#define ll long long
#define lson l,m,rt<<1
#define rson m+1,r,rt<<11
using namespace std;

struct mat
{
    ll d[4][4];
}A,B,E;

int t;
ll a2,n,m;

mat multi(mat &a,mat &b)
{
    mat ans;
    rep(i,0,4)
    {
        rep(j,0,4)
        {
            ans.d[i][j]=0;
            rep(k,0,4)
                if(a.d[i][k]&&b.d[k][j])
                    ans.d[i][j]=(ans.d[i][j]+a.d[i][k]*b.d[k][j])%m;
        }
    }
    return ans;
}

mat quickmulti(mat &a,ll n)
{
    mat ans=E;
    while(n)
    {
        if(n&1)
        {
            n--;
            ans=multi(ans,a);
        }
        else
        {
            n>>=1;
            a=multi(a,a);
        }
    }
    return ans;
}

int main()
{
   CLR(E.d);
   rep(i,0,4)
      E.d[i][i]=1;
   read(t);
   while(t--)
   {
```

```
        scanf("%I64d%I64d%I64d",&a2,&n,&m);
        if(n==1)
        {
            printf("1\n");
            continue;
        }
        if(n==2)
        {
            printf("%d\n",(1+a2*a2)%m);
            continue;
        }
        if(a2==1)
        {
            printf("%d\n",n%m);
            continue;
        }
        CLR(A.d);
        A.d[0][0]=1,A.d[0][1]=(4*((a2*a2)%m))%m,A.d[0][2]=
((-4*a2)%m+m)%m,A.d[0][3]=1;
        A.d[1][1]=A.d[0][1],A.d[1][2]=A.d[0][2],A.d[1][3]=A.d[0][3];
        A.d[2][1]=(2*a2)%m,A.d[2][2]=-1+m;
        A.d[3][1]=1;
        CLR(B.d);
        B.d[0][0]=(1+a2*a2)%m,B.d[1][0]=(a2*a2)%m,B.d[2][0]=a2%m,B.d[3][0]=1;
        mat ans=quickmulti(A,n-2);
        ans=multi(ans,B);
        printf("%I64d\n",ans.d[0][0]);
    }
}
```

1008 Lucky Coins Sequence

AC代码

Judge Status	Pro.ID	Exe.Time	Exe.Memory	Language
Accepted	1008	15 MS	1424 KB	GNU C++

```
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;
const int N = 10, mod = 10007;
const int n = 2;
struct mat {
    int m[N][N];
};
mat a, ans, s;
mat multi(mat a, mat b)
{
    mat c;
    for (int i = 0; i < n; i++)
```

```
        for (int j = 0; j < n; j++) {
            c.m[i][j] = 0;
            for (int k = 0; k < n; k++) {
                c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
            }
            c.m[i][j] %= mod;
        }
    return c;
}
mat fastpow(mat a, int k)
{
    mat res;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            if (i == j)res.m[i][j] = 1;
            else res.m[i][j] = 0;
        }
    while (k) {
        if (k & 1)res = multi(res, a);
        a = multi(a, a);
        k >>= 1;
    }
    return res;
}int fastpow1(int a, int k, int p)
{
    int res = 1;
    while (k) {
        if (k & 1)res = res * a % p;
        a = a * a % p;
        k >>= 1;
    }
    return res;
}
void init()
{
    a.m[0][0] = 1; a.m[0][1] = 1;
    a.m[1][0] = 1; a.m[1][1] = 0;

    s.m[0][0] = 4;
    s.m[1][0] = 2;
}
void solve()
{
    int k;
    while (cin >> k) {
        ll sum;
        if (k == 1 || k == 2)sum = 0;
        else {
            sum = fastpow1(2, k, mod);
            ans = fastpow(a, k-2);
            ans = multi(ans, s);
            sum = (sum - ans.m[0][0]+mod) % mod;
        }
        cout << sum << endl;
    }
}

```

```
int main() {
    ios::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
    init();
    solve();
    return 0;
}
```

1009 Chinese Rings

AC代码

Judge Status	Pro.ID	Exe.Time	Exe.Memory	Language
Accepted	1009	0 MS	1416 KB	GNU C++

```
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;
const int N = 10, mod = 200907;
const int n = 3;
struct mat {
    ll m[N][N];
};
mat a, ans, s;
mat multi(mat a, mat b)
{
    mat c;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            c.m[i][j] = 0;
            for (int k = 0; k < n; k++) {
                c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
            }
            c.m[i][j] %= mod;
        }
    return c;
}
mat fastpow(mat a, ll k)
{
    mat res;
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++) {
            if (i == j)res.m[i][j] = 1;
            else res.m[i][j] = 0;
        }
    while (k) {
        if (k & 1)res = multi(res, a);
        a = multi(a, a);
        k >>= 1;
```

```
    }
    return res;
}
void init()
{
    a.m[0][0] = 1; a.m[0][1] = 2; a.m[0][2] = 1;
    a.m[1][0] = 1;
                                  a.m[2][2] = 1;

    s.m[0][0] = 2;
    s.m[1][0] = 1;
    s.m[2][0] = 1;
}
void solve()
{
    ll k;
    while (cin >> k,k) {
        ll sum;
        if (k == 1 || k == 2)sum = k;
        else {
            ans = fastpow(a, k-2);
            ans = multi(ans, s);
            sum = ans.m[0][0];
        }
        cout << sum << endl;
    }
}

int main() {
    ios::sync_with_stdio(false);
    cin.tie(0); cout.tie(0);
    init();
    solve();
    return 0;
}
```