

专题5

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1000 Tr A

AC代码

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

```
1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N = 20, mod = 9973;
5  int n, k;
6  struct mat {
7      int m[N][N];
8  };
9  mat a, ans;
10 mat multi(mat a, mat b)
11 {
12     mat c;
13     for(int i=0;i<n;i++)
14         for (int j = 0; j < n; j++) {
15             c.m[i][j] = 0;
16             for (int k = 0; k < n; k++){
```

```

17         c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
18     }
19     c.m[i][j] %= mod;
20 }
21 return c;
22 }
23 mat fastpow(mat a, int k)
24 {
25     mat res;
26     for (int i = 0; i < n; i++)
27         for (int j = 0; j < n; j++) {
28             if (i == j)res.m[i][j] = 1;
29             else res.m[i][j] = 0;
30         }
31     while (k) {
32         if (k & 1)res = multi(res, a);
33         a = multi(a, a);
34         k >>= 1;
35     }
36     return res;
37 }
38 void solve()
39 {
40     cin >> n >> k;
41     for (int i = 0; i < n; i++)
42         for (int j = 0; j < n; j++)
43             cin >> a.m[i][j];
44     ans = fastpow(a, k);
45     int sum = 0;
46     for (int i = 0; i < n; i++) {
47         sum = (sum + ans.m[i][i]) % mod;
48     }
49     cout << sum << endl;
50 }
51 int main()
52 {
53     ios::sync_with_stdio(false);
54     cin.tie(0); cout.tie(0);
55     int tt;
56     cin >> tt;
57     while (tt--) {
58         solve();
59     }
60     return 0;
61 }

```

1001 Queuing

AC代码

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

```

1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N = 10;
5  int mod;
6  int n;
7  struct mat {
8      int m[N][N];
9  };
10 mat a, ans;
11 mat multi(mat a, mat b)
12 {
13     mat c;
14     for(int i=0;i<n;i++)
15         for (int j = 0; j < n; j++) {
16             c.m[i][j] = 0;
17             for (int k = 0; k < n; k++){
18                 c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
19             }
20             c.m[i][j] %= mod;
21         }
22     return c;
23 }
24 mat fastpow(mat a, int k)
25 {
26     mat res;
27     for (int i = 0; i < n; i++)
28         for (int j = 0; j < n; j++) {
29             if (i == j)res.m[i][j] = 1;
30             else res.m[i][j] = 0;
31         }
32     while (k) {
33         if (k & 1)res = multi(res, a);
34         a = multi(a, a);
35         k >>= 1;
36     }
37     return res;
38 }
39 /*
40 f(n)=f(n-1)+f(n-3)+f(n-4)
41 1 0 1 1
42 1 0 0 0
43 0 1 0 0
44 0 0 1 0
45 */
46 mat s;
47 void solve()
48 {
49     int k;

```

```

50     n = 4;
51     while (cin >> k >> mod) {
52         s.m[0][0] = 6;
53         s.m[1][0] = 4;
54         s.m[2][0] = 2;
55         s.m[3][0] = 1;
56         a.m[0][0] = a.m[0][2] = a.m[0][3] = 1;
57         a.m[1][0] = 1;
58         a.m[2][1] = a.m[3][2]=1;
59         if (k == 0 || k == 1 || k == 2)
60             cout << (int)pow(2, k) << endl;
61         else if (k == 3)cout << 6 << endl;
62         else {
63             ans = fastpow(a, k - 3);
64             ans = multi(ans, s);
65             cout << ans.m[0][0] << endl;
66         }
67     }
68 }
69 int main()
70 {
71     ios::sync_with_stdio(false);
72     cin.tie(0); cout.tie(0);
73     int tt;
74     //cin >> tt;
75     tt = 1;
76     while (tt--) {
77         solve();
78     }
79     return 0;
80 }

```

1002 A Simple Math Problem

AC代码

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

```

1  #include<bits/stdc++.h>
2  using namespace std;
3  const int N = 20;
4  int mod;
5  int n;
6  struct mat {
7      int m[N][N];
8  };
9  mat a, ans;
10 mat multi(mat a, mat b)
11 {
12     mat c;
13     for (int i = 0; i < n; i++)

```

```

14         for (int j = 0; j < n; j++) {
15             c.m[i][j] = 0;
16             for (int k = 0; k < n; k++) {
17                 c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
18             }
19             c.m[i][j] %= mod;
20         }
21         return c;
22     }
23     mat fastpow(mat a, int k)
24     {
25         mat res;
26         for (int i = 0; i < n; i++)
27             for (int j = 0; j < n; j++) {
28                 if (i == j) res.m[i][j] = 1;
29                 else res.m[i][j] = 0;
30             }
31         while (k) {
32             if (k & 1) res = multi(res, a);
33             a = multi(a, a);
34             k >>= 1;
35         }
36         return res;
37     }
38     mat s;
39     void solve()
40     {
41         int k;
42         n = 10;
43         while (cin >> k >> mod) {
44             for (int i = 0; i <= 9; i++)
45                 cin >> a.m[0][i];
46             for (int i = 1; i <= 9; i++)
47                 a.m[i][i - 1] = 1;
48             if (k < 10) cout << k % mod << endl;
49             else {
50                 for (int i = 0; i <= 9; i++)
51                     s.m[i][0] = 9 - i;
52                 ans = fastpow(a, k - 9);
53                 ans = multi(ans, s);
54                 cout << ans.m[0][0] << endl;
55             }
56         }
57     }
58     int main()
59     {
60         ios::sync_with_stdio(false);
61         cin.tie(0); cout.tie(0);
62         solve();
63         return 0;
64     }

```

1003 Count

AC代码

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

```
1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N = 10;
5  const int mod = 123456789;
6  const int n = 6;
7  struct mat {
8      ll m[N][N];
9  };
10 mat a, ans, s;
11 mat multi(mat a, mat b)
12 {
13     mat c;
14     for (int i = 0; i < n; i++)
15         for (int j = 0; j < n; j++) {
16             c.m[i][j] = 0;
17             for (int k = 0; k < n; k++)
18                 c.m[i][j] = (a.m[i][k] * b.m[k][j] % mod + c.m[i][j]) % mod;
19         }
20     return c;
21 }
22 mat fastpow(mat a, ll k)
23 {
24     mat res;
25     for (int i = 0; i < n; i++)
26         for (int j = 0; j < n; j++) {
27             if (i == j) res.m[i][j] = 1;
28             else res.m[i][j] = 0;
29         }
30     while (k) {
31         if (k & 1) res = multi(res, a);
32         a = multi(a, a);
33         k >>= 1;
34     }
35     return res;
36 }
37
38 void solve()
39 {
40     ll k;
41     cin >> k;
42     ans = fastpow(a, k - 2);
43     ans = multi(ans, s);
44     cout << ans.m[0][0] << endl;
45 }
46 void init()
47 {
48     a.m[0][0] = 1, a.m[0][1] = 2, a.m[0][2] = 1;
```

```

49     a.m[0][3] = 3, a.m[0][4] = 3, a.m[0][5] = 1;
50     a.m[1][0] = a.m[2][2] = 1;
51     a.m[2][3] = 3, a.m[2][4] = 3, a.m[2][5] = 1;
52     a.m[3][3] = 1, a.m[3][4] = 2, a.m[3][5] = 1;
53     a.m[4][4] = a.m[4][5] = a.m[5][5] = 1;
54     s.m[0][0] = 2;
55     s.m[1][0] = 1;
56     s.m[2][0] = 8;
57     s.m[3][0] = 4;
58     s.m[4][0] = 2;
59     s.m[5][0] = 1;
60 }
61 int main()
62 {
63     ios::sync_with_stdio(false);
64     cin.tie(0); cout.tie(0);
65     init();
66     int tt;
67     cin >> tt;
68     while (tt--) solve();
69     return 0;
70 }

```

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++

```

1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N = 10;
5  const ll mod = 1e9 + 7;
6  const int n = 4;
7  struct mat {
8      ll m[N][N];
9  };
10 mat a, ans1, ans2, s;
11 mat multi(mat a, mat b)
12 {
13     mat c;
14     for (int i = 0; i < n; i++)
15         for (int j = 0; j < n; j++) {
16             c.m[i][j] = 0;
17             for (int k = 0; k < n; k++) {
18                 c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
19             }
20             c.m[i][j] %= mod;
21         }

```

```

22     return c;
23 }
24 mat fastpow(mat a, ll k)
25 {
26     mat res;
27     for (int i = 0; i < n; i++)
28         for (int j = 0; j < n; j++) {
29             if (i == j)res.m[i][j] = 1;
30             else res.m[i][j] = 0;
31         }
32     while (k) {
33         if (k & 1)res = multi(res, a);
34         a = multi(a, a);
35         k >>= 1;
36     }
37     return res;
38 }
39 void solve()
40 {
41     ll ka, kb;
42     while (cin >> ka >> kb) {
43         if (ka == 0)ans1.m[0][0] = 0;
44         if (ka == 1)ans1.m[0][0] = 1;
45         if (ka == 2)ans1.m[0][0] = 2;
46         if (kb == 0)ans2.m[0][0] = 1;
47         if (kb == 1)ans2.m[0][0] = 2;
48         if (kb == 2)ans2.m[0][0] = 3;
49         if (ka >= 3) {
50             ans1 = fastpow(a, ka - 3);
51             ans1 = multi(ans1, s);
52         }
53         if (kb >= 3) {
54             ans2 = fastpow(a, kb - 2);
55             ans2 = multi(ans2, s);
56         }
57         cout << (ans2.m[0][0] - ans1.m[0][0] + mod)% mod<< endl;
58     }
59 }
60 }
61 void init()
62 {
63     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;
64
65     s.m[0][0] = 3;
66     s.m[1][0] = s.m[2][0] = s.m[3][0] = 1;
67 }
68 int main()
69 {
70     ios::sync_with_stdio(false);
71     cin.tie(0); cout.tie(0);
72     init();
73     solve();
74     return 0;
75 }
76

```


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++

```
1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N = 10, mod = 10007;
5  const int n=4;
6  int x, y;
7  struct mat {
8      int m[N][N];
9  };
10 mat a,ans,s;
11
12 mat multi(mat a, mat b)
13 {
14     mat c;
15     for (int i = 0; i < n; i++)
16         for (int j = 0; j < n; j++) {
17             c.m[i][j] = 0;
18             for (int k = 0; k < n; k++) {
19                 c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
20             }
21             c.m[i][j] %= mod;
22         }
23     return c;
24 }
25 mat fastpow(mat a, int k)
26 {
27     mat res;
28     for (int i = 0; i < n; i++)
29         for (int j = 0; j < n; j++) {
30             if (i == j)res.m[i][j] = 1;
31             else res.m[i][j] = 0;
32         }
33     while (k) {
34         if (k & 1)res = multi(res, a);
35         a = multi(a, a);
36         k >>= 1;
37     }
38     return res;
39 }
40 void init()
41 {
42     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;
```

```

43     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;
44     a.m[2][0] = 0, a.m[2][1] = x, a.m[2][2] = y, a.m[2][3] = 0;
45     a.m[3][0] = 0, a.m[3][1] = 1, a.m[3][2] = 0, a.m[3][3] = 0;
46
47     s.m[0][0] = 2;
48     s.m[1][0] = s.m[2][0] = s.m[3][0] = 1;
49 }
50 void solve()
51 {
52     int k;
53     while (cin >> k >> x >> y) {
54         x = x%mod, y = y%mod;
55         init();
56         ans = fastpow(a, k-1);
57         ans = multi(ans, s);
58         cout << ans.m[0][0] << endl;
59     }
60 }
61 int main()
62 {
63     ios::sync_with_stdio(false);
64     cin.tie(0); cout.tie(0);
65     solve();
66     return 0;
67 }
68

```

1006 Kiki & Little Kiki 2

未AC

```

1  #include<bits/stdc++.h>
2  using namespace std;
3
4  const int MAXN = 105;
5  int n, len;
6  char str[MAXN];
7
8  struct Matrix {
9      int mat[MAXN][MAXN];
10     Matrix operator*(const Matrix& m) const {
11         Matrix tmp;
12         for (int i = 0; i < len; i++) {
13             tmp.mat[0][i] = 0;
14             for (int j = 0; j < len; j++)
15                 tmp.mat[0][i] ^= (mat[0][j] & m.mat[j][i]);
16         }
17         for (int i = 1; i < len; i++)
18             for (int j = 0; j < len; j++)
19                 tmp.mat[i][j] = tmp.mat[i - 1][(j - 1 + len) % len];
20         return tmp;
21     }
22 };

```

```

23
24 void solve()
25 {
26     len = strlen(str);
27     Matrix m, ans;
28
29     memset(m.mat, 0, sizeof(m.mat));
30     for (int i = 1; i < len; i++)
31         m.mat[i][i] = m.mat[i][i - 1] = 1;
32     m.mat[0][0] = m.mat[0][len - 1] = 1;
33
34     memset(ans.mat, 0, sizeof(ans.mat));
35     for (int i = 0; i < len; i++)
36         ans.mat[i][i] = 1;
37
38     while (n) {
39         if (n & 1)
40             ans = ans * m;
41         n >>= 1;
42         m = m * m;
43     }
44
45     for (int i = 0; i < len; i++) {
46         int x = 0;
47         for (int k = 0; k < len; k++)
48             x ^= ans.mat[i][k] & (str[k] - '0');
49         cout << x ;
50     }
51     cout << endl;
52 }
53
54 int main() {
55     ios::sync_with_stdio(false);
56     cin.tie(0); cout.tie(0);
57     while (cin >> n >> str)
58         solve();
59     return 0;
60 }

```

1007 Tower

未AC

```

1  #include <bits/stdc++.h>
2  #define pb push_back
3  #define mp make_pair
4  #define CLR(x) memset(x,0,sizeof(x))
5  #define _CLR(x) memset(x,-1,sizeof(x))
6  #define REP(i,n) for(int i=0;i<n;i++)
7  #define Debug(x) cout<<#x<<" "<<x<<" "<<endl
8  #define REP(i,l,r) for(int i=l;i<=r;i++)
9  #define rep(i,l,r) for(int i=l;i<r;i++)
10 #define RREP(i,l,r) for(int i=l;i>=r;i--)
11 #define rrep(i,l,r) for(int i=l;i>r;i--)

```

```

12 #define read(x) scanf("%d",&x)
13 #define put(x) printf("%d\n",x)
14 #define ll long long
15 #define lson l,m,rt<<1
16 #define rson m+1,r,rt<<11
17 using namespace std;
18
19 struct mat
20 {
21     ll d[4][4];
22 }A,B,E;
23
24 int t;
25 ll a2,n,m;
26
27 mat multi(mat &a,mat &b)
28 {
29     mat ans;
30     rep(i,0,4)
31     {
32         rep(j,0,4)
33         {
34             ans.d[i][j]=0;
35             rep(k,0,4)
36                 if(a.d[i][k]&&b.d[k][j])
37                     ans.d[i][j]=(ans.d[i][j]+a.d[i][k]*b.d[k][j])%m;
38         }
39     }
40     return ans;
41 }
42
43 mat quickmulti(mat &a,ll n)
44 {
45     mat ans=E;
46     while(n)
47     {
48         if(n&1)
49         {
50             n--;
51             ans=multi(ans,a);
52         }
53         else
54         {
55             n>>=1;
56             a=multi(a,a);
57         }
58     }
59     return ans;
60 }
61
62 int main()
63 {
64     CLR(E.d);
65     rep(i,0,4)
66         E.d[i][i]=1;
67     read(t);
68     while(t--)
69     {

```

```

70     scanf("%I64d%I64d%I64d",&a2,&n,&m);
71     if(n==1)
72     {
73         printf("1\n");
74         continue;
75     }
76     if(n==2)
77     {
78         printf("%d\n",(1+a2*a2)%m);
79         continue;
80     }
81     if(a2==1)
82     {
83         printf("%d\n",n%m);
84         continue;
85     }
86     CLR(A.d);
87     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;
88     A.d[1][1]=A.d[0][1],A.d[1][2]=A.d[0][2],A.d[1][3]=A.d[0][3];
89     A.d[2][1]=(2*a2)%m,A.d[2][2]=-1+m;
90     A.d[3][1]=1;
91     CLR(B.d);
92     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;
93     mat ans=quickmulti(A,n-2);
94     ans=multi(ans,B);
95     printf("%I64d\n",ans.d[0][0]);
96 }
97 }

```

1008 Lucky Coins Sequence

AC代码

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

```

1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N = 10, mod = 10007;
5  const int n = 2;
6  struct mat {
7      int m[N][N];
8  };
9  mat a, ans, s;
10 mat multi(mat a, mat b)
11 {
12     mat c;
13     for (int i = 0; i < n; i++)

```

```

14         for (int j = 0; j < n; j++) {
15             c.m[i][j] = 0;
16             for (int k = 0; k < n; k++) {
17                 c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
18             }
19             c.m[i][j] %= mod;
20         }
21         return c;
22     }
23     mat fastpow(mat a, int k)
24     {
25         mat res;
26         for (int i = 0; i < n; i++)
27             for (int j = 0; j < n; j++) {
28                 if (i == j)res.m[i][j] = 1;
29                 else res.m[i][j] = 0;
30             }
31         while (k) {
32             if (k & 1)res = multi(res, a);
33             a = multi(a, a);
34             k >>= 1;
35         }
36         return res;
37     }int fastpow1(int a, int k, int p)
38     {
39         int res = 1;
40         while (k) {
41             if (k & 1)res = res * a % p;
42             a = a * a % p;
43             k >>= 1;
44         }
45         return res;
46     }
47     void init()
48     {
49         a.m[0][0] = 1; a.m[0][1] = 1;
50         a.m[1][0] = 1; a.m[1][1] = 0;
51
52         s.m[0][0] = 4;
53         s.m[1][0] = 2;
54     }
55     void solve()
56     {
57         int k;
58         while (cin >> k) {
59             ll sum;
60             if (k == 1 || k == 2)sum = 0;
61             else {
62                 sum = fastpow1(2, k, mod);
63                 ans = fastpow(a, k-2);
64                 ans = multi(ans, s);
65                 sum = (sum - ans.m[0][0]+mod) % mod;
66             }
67             cout << sum << endl;
68         }
69     }
70

```

```

71 int main() {
72     ios::sync_with_stdio(false);
73     cin.tie(0); cout.tie(0);
74     init();
75     solve();
76     return 0;
77 }

```

1009 Chinese Rings

AC代码

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

```

1  #include<bits/stdc++.h>
2  using namespace std;
3  typedef long long ll;
4  const int N = 10, mod = 200907;
5  const int n = 3;
6  struct mat {
7      ll m[N][N];
8  };
9  mat a, ans, s;
10 mat multi(mat a, mat b)
11 {
12     mat c;
13     for (int i = 0; i < n; i++)
14         for (int j = 0; j < n; j++) {
15             c.m[i][j] = 0;
16             for (int k = 0; k < n; k++) {
17                 c.m[i][j] = (c.m[i][j] + (a.m[i][k] * b.m[k][j]) % mod) %
mod;
18             }
19             c.m[i][j] %= mod;
20         }
21     return c;
22 }
23 mat fastpow(mat a, ll k)
24 {
25     mat res;
26     for (int i = 0; i < n; i++)
27         for (int j = 0; j < n; j++) {
28             if (i == j) res.m[i][j] = 1;
29             else res.m[i][j] = 0;
30         }
31     while (k) {
32         if (k & 1) res = multi(res, a);
33         a = multi(a, a);
34         k >>= 1;

```

```
35     }
36     return res;
37 }
38 void init()
39 {
40     a.m[0][0] = 1; a.m[0][1] = 2; a.m[0][2] = 1;
41     a.m[1][0] = 1;
42                                     a.m[2][2] = 1;
43
44     s.m[0][0] = 2;
45     s.m[1][0] = 1;
46     s.m[2][0] = 1;
47 }
48 void solve()
49 {
50     ll k;
51     while (cin >> k,k) {
52         ll sum;
53         if (k == 1 || k == 2) sum = k;
54         else {
55             ans = fastpow(a, k-2);
56             ans = multi(ans, s);
57             sum = ans.m[0][0];
58         }
59         cout << sum << endl;
60     }
61 }
62
63 int main() {
64     ios::sync_with_stdio(false);
65     cin.tie(0); cout.tie(0);
66     init();
67     solve();
68     return 0;
69 }
```
