Selection of Cities

Submissions Attempted by: **537** | Solved by: **182** | Partially Solved by: **95** |

Combinatorics Easy Math Edit

Editorial | Selection of Cities

Prerequisites
Binomial theorem, Binomial coefficients, sum of binomial coefficients.

Explanation
Let us say that m cities are selected. For a particular value of m the number of ways for selecting the cities is ^nC_m. As stated any number of cities can be selected and any city can be selected. Also, at least 1 city has to selected. So, the final answer is $\sum^nC_m$, 1<=m<=n.

We can easily find this using the binomial theorem. Expand $(a+b)^n$ using binomial theorem. Then substitute a=1 and b=1, we will get $\sum {}^nC_m$, 0<=m<=n. Therefore from this we get that $2^n = \sum^nC_m$, 0<=m<=n. If we subtract $^nC_0$ from both sides, we get the answer to our problem as $2^n - 1$.

2^n %1000000007 can be easily calculated using modular exponentiation by right to left binary method. The complexity of this algorithm for a particular n will be O(log(n)).

Edit Editorial

IS THIS EDITORIAL HELPFUL?

Yes, it's helpful

No, it's not helpful

2 developer(s) found this editorial helpful.

Author Solution by PRATEEK KUMAR

```
1. //O(log(n))
2. #include<cstdio>
```

```
#define mod 1000000007
long long pow_mod(long long b,long long e)
{
        long long ans=1;
        b%=mod;
        while(e>0)
        {
                if(e&1)
                        ans=(ans*b)%mod;
                        b=(b*b)%mod;
                        e>>=1;
        }
        return ans%mod;
}
int main()
{
        long long t,n;
        //FILE* f=freopen("out1.txt","w",stdout);
        //FILE* f1=freopen("in1.txt","r",stdin);
        scanf("%lld",&t);
        while(t--)
        {
                scanf("%lld",&n);
                long long ans=pow_mod(2,n)-1;
                printf("%lld\n",ans);

        }
        //fclose(f);
        //fclose(f1);
        return 0;
}

/*O(n)
// only 2 input files will pass this solution

#include<cstdio>
#define mod 1000000007
long long int func(long long int a)
{
 long long ans=1,i;
 for(i=1;i<=a;i++)
 ans=(ans*2)%mod;
 return ans;
}int main()
{       long long t,n;
        scanf("%lld",&t);

        while(t--)
        {
                scanf("%lld",&n);
                long long ans=(func(n)-1)%mod;
                printf("%lld\n",ans);
        }return 0;
}
```

```
57.
58. */
59.
```

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Jayanth ...		1.3397	C++
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HARSH VA...		0.5028	C
HARSH VA...		0.503	C
Deepak S...		1.5666	C++
Deepak S...		1.2508	Python

View All

TRENDING NOTES

Number Theory - III
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written by Alei Reyes

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