

COMPETITIVE CODING with RAMAN CLASSES



... An interactive series for those willing to learn and code

Problem: Child And Toy

Topic : **Arrays**
Difficulty : **EASY**
Programming Language : **C++**
Time to Spend : **20 min**

Problem Statement

Problem:

There are N types of toys and 1 child.

Child can pick any number of types of toys.

Find the number of ways in which this can be done.

Problem Statement

Input :

1
2

Output :

3

Input Description :

The first line contains single integer denoting the number of test cases.

The only line of each test case contain a single integer denoting the number of different types of toys.

Problem Statement

Output Description :

Print a single integer denoting the number of ways a child can pick any number of toys (modulo $10^9 + 7$)

Let Us Revise

In order to solve this problem, go through the following concepts.

1. Permutation and combinations
2. Using loop statement

Problem Description

We are given a single integer in each test case and we need to find the number of ways a child can pick any number of toys from the given n toys.

For Example: for $n=3$

for our convenience let's assume 3 toys as $\{a, b, c\}$.

Problem Description

The number of ways in which a child can pick any number of toys from the given {a, b, c} collection of toys are:

{}, {a}, {b}, {c}, {a, b}, {b, c}, {a, c}, {a, b, c}

Total = 8

Output : 8

Let Us Think

In order to solve this problem, let us think and analyse how to get started with this problem.

Try out different examples in the paper. After analysing it a little you can see, it's a simple problem of Permutations and Combination.

Let Us Think

The same example can be solved as follows:

=>Child picks no toys + Child picks any one toy + Child pick two toys + Child pick three toys

$$\Rightarrow 3C_0 + 3C_1 + 3C_2 + 3C_3$$

$$\Rightarrow 1 + 3 + 3 + 1$$

$$\Rightarrow 8$$

Thus, we get the answer.

Let Us Think

Note:

$$nC_0 + nC_1 + nC_2 + \dots + nC_n = 2^n$$

Let Us Code

Now you know the logic. Lets proceed with the code.

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Things we need to do for this problem:

1. Code the function `power(x,y)` which returns x^y modulo 10^9+7
2. Find $2^n \bmod (10^9 + 7)$ for each test case and print.

Let Us Code

1. Code the function `power(x,y)` which returns x^y modulo 10^9+7

```
//Function to find x to the power y
long long power(long long x, long long y) {
    long long temp;
    if (y == 0)
        return 1;
    temp = (power(x, y / 2))%(1000000007);
    if (y % 2 == 0)
        return (temp * temp)%(1000000007);
    else
        return (x * temp*temp)%(1000000007);
}
```

Let Us Code

2. Find $2^n \bmod (10^9 + 7)$ for each test case and print.

```
while (q--) {  
    long long n;    //Number of different toys  
    cin >> n;  
  
    cout << power(2,n)%(1000000007)<<endl;  
}
```

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