

13028 XOR Subset

Fermat's little theorem states that if p is a prime number, then for any integer a , the number $(a^p - a)$ is an integer multiple of p . In the notation of *modular arithmetic*, this is expressed as

$$a^p \equiv a \pmod{p}$$

For example, if $a = 2$ and $p = 7$, $2^7 = 128$, and $128 - 2 = 7 \times 18$ is an integer multiple of 7. We can also write $128 \% 7 = 2$, here $\%$ is the modulo operator used in C/C++ or Java.

If a is not divisible by p , Fermat's little theorem is equivalent to the statement that $a^{p-1} - 1$ is an integer multiple of p , or in symbols

$$a^{p-1} \equiv 1 \pmod{p}$$

For example, if $a = 2$ and $p = 7$ then $2^6 = 64$ and $64 - 1 = 63$ is a multiple of 7. We can also write $64 \% 7 = 1$.

You are given a set S which contains 1 to N . You want to find two subsets of S , X and Y such that the following conditions are met:

1. $X \cap Y = \emptyset$
2. Let bitwise XOR of every element of X equals U and Y equals V . U must be less than or equal to V .

You want to find out number of ways you can choose such subset X and Y .

Two ways (X_1, Y_1) and (X_2, Y_2) will be equal if X_1 equals X_2 and Y_1 equals Y_2 or X_1 equals Y_2 and Y_1 equals X_2 .

For example is $S = \{1, 2\}$, the ways are:

1. $X = \emptyset, Y = \emptyset$. [$U = 0, V = 0$]
2. $X = \emptyset, Y = \{1\}$. [$U = 0, V = 1$]
3. $X = \emptyset, Y = \{1, 2\}$. [$U = 0, V = 1 \wedge 2 = 3$, (\wedge means bitwise XOR in C/C++/Java)]
4. $X = \emptyset, Y = \{2\}$. [$U = 0, V = 2$]
5. $X = \{1\}, Y = \{2\}$. [$U = 1, V = 2$]

Now, given N , you need to find the number of ways you can choose two subsets of S such that the 2 conditions meet, *modulo* 1000000007 ($10^9 + 7$).

Input

First line contains T ($T \leq 100$), the number of test cases. Each of the next T lines each contains an integer N ($0 \leq N < 10^{10000}$).

Output

For each case print one line, 'Case C : W ', where C is the case number, and W is the required answer for that case.

Sample Input

2
2
3

Sample Output

Case 1: 5
Case 2: 14