

Fibonacci Power Sum (hard)

This problem is a harder version of [FIBPWSUM](#).

The Fibonacci numbers is defined by

$$f_0=0, f_1=1,$$

and

$$f_n = f_{n-1} + f_{n-2}$$

for $n > 1$.

Given three integers N , C and K , compute the summation

$$\sum_{n=0}^N f_{Cn}^K.$$

Since the answer can be huge, output it modulo 10^9+7 .

Input

The first line contains an integer T , denoting the number of test cases. Each test case contains three space separated integers in the order: N , C and K .

Constraints

- $1 \leq T \leq 100$
- $1 \leq N, C \leq 10^{18}$
- $1 \leq K \leq 10^5$

Output

For each test case, output a single line in the format "*Case X: Y*" without the quotes. Here, X is the case number and Y is the desired answer denoting the sum of the series.

Example

Input:

```
5
10 1 1
5 2 2
3 3 4
1000000007 7 9
996969696969696 9 6
```

Output:

```
Case 1: 143
Case 2: 3540
Case 3: 1340448
Case 4: 880410497
Case 5: 689328397
```

Credits

- [sgtlaugh - FIBPWSUM](#)
- [ZOJ 3774. Power of Fibonacci](#)

Information

There are two test files. The first file is randomly generated while the second file is not.

@Speed Adicts: My solution runs in 1.94s. (approx less than 1s per file)