Tree Expectancy

Problem Code: **EXPTREE**

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Consider an ordered tree (https://en.wikipedia.org/wiki/Tree_(graph_theory)#Ordered_tree) with **N** vertices. Your task is to calculate the expected value of the number of vertices having exactly one child in such tree assuming that it is uniformly chosen from the set of all ordered trees of size **N**.

Input

The first line of the input contains an integer **T** denoting the number of test cases. The description of **T** test cases follows.

Each testcase contains a single integer **N** for which you should calculate the answer.

Output

For each test case, output a single line containing two integers, which are explained below.

Consider the answer to be a proper fraction **P**/**Q**, where gcd(**P**, **Q**) = 1. Then your task is to output two integers $\mathbf{PQ}^{-1}$ mod 10^9+7 and $\mathbf{PQ}^{-1}$ mod 10^9+9.

Constraints

- $1 \le \mathbf{T} \le 10^5$
- It is guaranteed that **Q** will be invertible with respect to both the modulos.

Subtasks

Subtask #1 (10 points)

- $1 \le \mathbf{N} \le 10^3$

Subtask #2 (20 points)

- $1 \le \mathbf{N} \le 10^6$

Subtask #3 (30 points)

- $1 \le \mathbf{N} \le 10^9$

Subtask #4 (40 points)

- $1 \le \mathbf{N} \le 10^{18}$

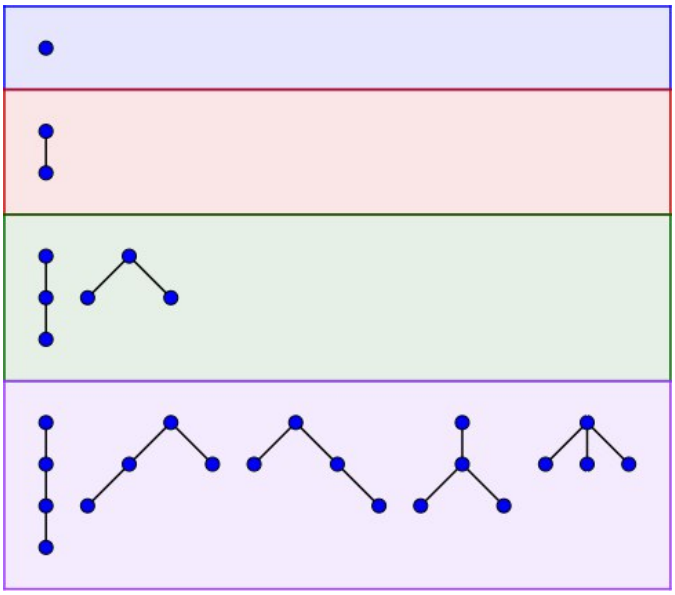
Example

```
Input:
4
1
2
3
4

Output:
0 0
1 1
1 1
400000004 200000003
```

Explanation

You can see every possible tree with 1, 2, 3 or 4 vertices on the diagram below.



From this you can see that answers for these inputs are 0/1 = 0, 1/1 = 1, (2+0)/2 = 1 and (3+1+1+1+0)/5 = 6/5 correspondingly.

Author:	3★ melfice (/users/melfice)
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Time Limit:	1 secs
Source Limit:	50000 Bytes
Languages:	ADA, ASM, BASH, BF, C, C99 strict, CAML, CLOJ, CLPS, CPP 4.3.2, CPP 4.9.2, CPP14, CS2, D, ERL, FORT, FS, GO, HASK, ICK, ICON, JAVA, JS, LISP clisp, LISP sbcl, LUA, NEM, NICE, NODEJS, PAS fpc, PAS gpc, PERL, PERL6, PHP, PIKE, PRLG, PYPY, PYTH, PYTH 3.4, RUBY, SCALA, SCM chicken, SCM guile, SCM qobi, ST, TCL, TEXT, WSPC

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