Counting Road Networks

by akulsareen

Problem | Submissions | Leaderboard | Discussions | Editorial

Lukas is a Civil Engineer who loves designing road networks to connect n cities numbered from 1 to n. He can build any number of bidirectional roads as long as the resultant network satisfies these constraints:

1. It must be possible to reach any city from any other city by traveling along the network of roads.
2. No two roads can directly connect the same two cities.
3. A road cannot directly connect a city to itself.

In other words, the roads and cities must form a simple connected labeled graph.

You must answer q queries, where each query consists of some n denoting the number of cities Lukas wants to design a bidirectional network of roads for. For each query, find and print the number of ways he can build roads connecting n cities on a new line; as the number of ways can be quite large, print it modulo 663224321.

Input Format

The first line contains an integer, q, denoting the number of queries.
Each of the q subsequent lines contains an integer denoting the value of n for a query.

Constraints

- $1 \leq q, n \leq 10^5$

Output Format

For each of the q queries, print the number of ways Lukas can build a network of bidirectional roads connecting n cities, modulo 663224321, on a new line.

Sample Input 0

```
3
1
3
10
```

Sample Output 0

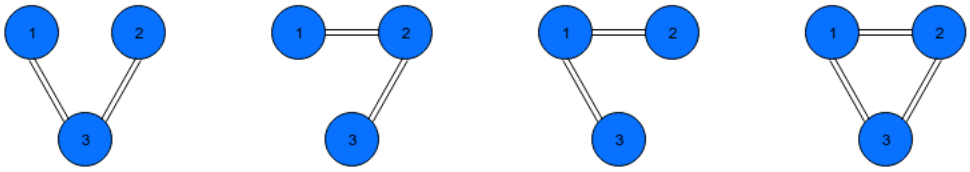
```
1
4
201986643
```

Explanation 0

We answer the first two queries like this:

1. When $n = 1$, the only option satisfying Lukas' three constraints is to not build any roads at all. Thus, we print the result of $1 \bmod 663224321 = 1$ on a new line.

2. When $n = 3$, there are four ways for Lukas to build roads that satisfy his three constraints:



Thus, we print the result of $4 \bmod 663224321 = 4$ on a new line.

Submissions:48

Max Score:90
Difficulty: Expert

Rate This Challenge:

More

Current Buffer (saved locally, editable)

Java 7

```
import java.io.*;
import java.util.*;
import java.text.*;
import java.math.*;
import java.util.regex.*;

public class Solution {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        int q = in.nextInt();
        for(int a0 = 0; a0 < q; a0++){
            int n = in.nextInt();
            // your code goes here
        }
    }
}

```

Line: 1 Col: 1

Upload Code as File Test against custom input Run Code Submit Code