



Unique Divide And Conquer

by [gorbunovdv](#)

Problem

Submissions

Leaderboard

Discussions

Editorial

Divide-and-Conquer on a tree is a powerful approach to solving tree problems.

Imagine a tree, t , with n vertices. Let's remove some vertex v from tree t , splitting t into zero or more connected components, t_1, t_2, \dots, t_k , with vertices n_1, n_2, \dots, n_k . We can prove that there is a vertex, v , such that the size of each formed components is *at most* $\lfloor \frac{n}{2} \rfloor$.

The Divide-and-Conquer approach can be described as follows:

- Initially, there is a tree, t , with n vertices.
- Find vertex v such that, if v is removed from the tree, the size of each formed component after removing v is *at most* $\lfloor \frac{n}{2} \rfloor$.
- Remove v from tree t .
- Perform this approach recursively for each of the connected components.

We can prove that if we find such a vertex v in linear time (e.g., using *DFS*), the entire approach works in $\mathcal{O}(n \cdot \log n)$. Of course, sometimes there are several such vertices v that we can choose on some step, we can take and remove any of them. However, right now we are interested in trees such that *at each step* there is a unique vertex v that we can choose.

Given n , count the number of tree t 's such that the Divide-and-Conquer approach works determinately on them. As this number can be quite large, your answer must be modulo m .

Input Format

A single line of two space-separated positive integers describing the respective values of n (the number of vertices in tree t) and m (the modulo value).

Constraints

- $1 \leq n \leq 3000$
- $n < m \leq 10^9$
- m is a prime number.

Subtasks

- $n \leq 9$ for 40% of the maximum score.
- $n \leq 500$ for 70% of the maximum score.

Output Format

Print a single integer denoting the number of tree t 's such that vertex v is unique at each step when applying the Divide-and-Conquer approach, modulo m .

Sample Input 0

1 103

Sample Output 0

1

Explanation 0

For $n = 1$, there is only one way to build a tree so we print the value of $1 \bmod 103 = 1$ as our answer.

Sample Input 1

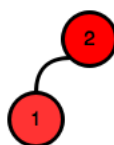
2 103

Sample Output 1

0

Explanation 1

For $n = 2$, there is only one way to build a tree:



This tree is *not valid* because we can choose to remove either node 1 or node 2 in the first step. Thus, we print 0 as no valid tree exists.

Sample Input 2

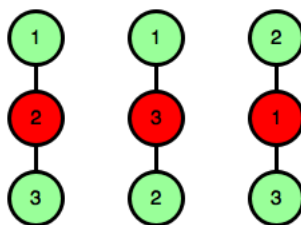
3 103

Sample Output 2

3

Explanation 2

For $n = 3$, there are 3 valid trees depicted in the diagram below (the unique vertex removed in the first step is shown in red):



Thus, we print the value of $3 \bmod 103 = 3$ as our answer.

Sample Input 3

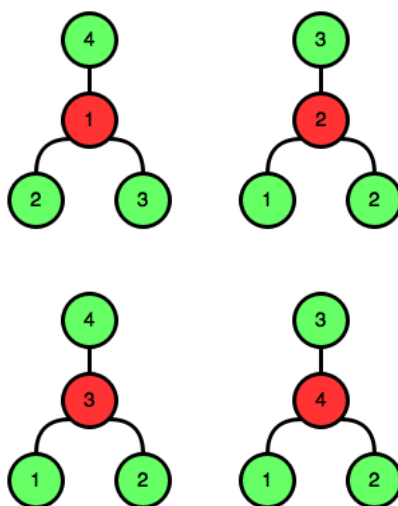
4 103

Sample Output 3

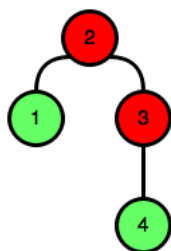
4

Explanation 3

For $n = 4$, there are 4 valid trees depicted in the diagram below (the unique vertex removed in the first step is shown in red):



The figure below shows an invalid tree with $n = 4$:



This tree is *not valid* because we can choose to remove node **2** or node **3** in the first step. Because we had four valid trees, we print the value of $4 \bmod 103 = 4$ as our answer.

f t in

Submissions: 77

Max Score: 90

Difficulty: Advanced

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☆☆☆☆☆

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Current Buffer (saved locally, editable)

Java 7



```

1 import java.io.*;
2 import java.util.*;
3 import java.text.*;
4 import java.math.*;
5 import java.util.regex.*;
6
7 public class Solution {
8
9     public static void main(String[] args) {
10         /* Enter your code here. Read input from STDIN. Print output to STDOUT. Your class should be named Solution. */
11     }
12 }

```

Line: 1 Col: 1

Upload Code as File ☐ Test against custom input

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