# DMOPC '21 Contest 7 P6 - Rainbow Subgraphs

**Time limit:** 2.0s **Memory limit:** 256M

You are given positive integers N, M, and MOD.

Let V be the set of points (x,y) in the plane such that x and y are integers,  $y \ge 0$ , and  $N^2 \le x^2 + y^2 < (N+M)^2$ . Let E be a set of undirected edges between elements of V, where  $(u,v) \in E$  if point u and point v are distance 1 apart.

Calculate the number of subgraphs of the graph G=(V,E), modulo MOD. That is, the number of pairs (V',E') such that  $V'\subseteq V$ ,  $E'\subseteq E$ , and  $u,v\in V'$  for all  $(u,v)\in E'$ . Note that V' and/or E' are allowed to be empty or equal to V or E respectively.

#### **Constraints**

- $1 \le N \le 300$
- $1 \leq M \leq 16$
- $10^8 \le MOD \le 10^9$

#### **Subtask 1 [20%]**

- $1 \le N \le 10$
- 1 < M < 5

#### **Subtask 2 [20%]**

- $1 \leq N \leq 35$
- $1 \leq M \leq 5$

#### **Subtask 3 [20%]**

- $1 \leq N \leq 100$
- $1 \le M \le 5$

#### **Subtask 4 [20%]**

- $1 \leq N \leq 200$
- $1 \leq M \leq 10$

#### **Subtask 5 [20%]**

No additional constraints.

## **Input Specification**

The first and only line of input contains three space-separated integers: N, M, and MOD.

## **Output Specification**

Output the number of subgraphs modulo MOD.

## **Sample Input 1**

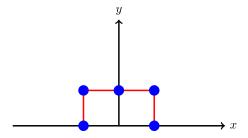
1 1 998244352

## **Sample Output 1**

89

## **Explanation for Sample 1**

The graph G looks like the following:



#### **Sample Input 2**

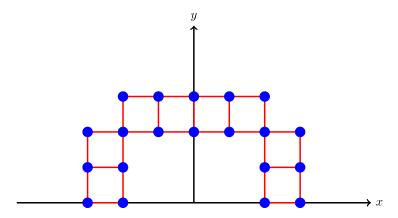
2 2 998244352

#### **Sample Output 2**

41377047

## **Explanation for Sample 2**

The graph  ${\cal G}$  looks like the following:



# Sample Input 3

31 4 159265358

# **Sample Output 3**

54714600