Prefix Square Free Words

A string is called a square string if it can be obtained by concatenating two copies of the same string (i.e. $s=uu$ for some word u). For example, "abab", "aa" are square strings, while "aaa", "abba" are not. A string is called prefix-square free if none of its prefixes is a square.

Chiaki would like to know the number of nonempty prefix-square free strings whose length is less than or equal to n. The size of the alphabet Chiaki uses is m. As this number may be very large, Chiaki is only interested in its remainder modulo 2^{32}.

Input

There are multiple test cases. The first line of input contains an integer T ($1 \le T \le 100$), indicating the number of test cases. For each test case:

The first line contains two integers n and m ($1 \le n \le 100, 1 \le m \le 10^9$) -- the length of the string and the size of the alphabet.

Output

For each test case, output an integer denoting the answer.

Example

Input:

```
2
3 2
4 6
```

Output:

```
8
1266
```

Information

There are 5 input files:

- Input #1: $1 \le T \le 100, 1 \le n \le 10$.

- Input #2: $1 \le T \le 50, 1 \le n \le 30$.

- Input #3: $1 \le T \le 30, 1 \le n \le 60$.

- Input #4: $1 \le T \le 10, 1 \le n \le 80$.

- Input #5: $1 \le T \le 2, 1 \le n \le 100$.