Problem K. Happy Equation

Little Sub has just received an equation, which is shown below, as his birthday gift.

$$a^x \equiv x^a \pmod{2^p}$$

Given the value of a, please help Little Sub count the number of x $(1 \le x \le 2^p)$ which satisfies the equation.

Input

There are multiple test cases. The first line of the input contains an integer T (about 1000), indicating the number of test cases. For each test case:

The first and only line contains two integers a and p $(1 \le a \le 10^9,\ 1 \le p \le 30)$.

Output

For each test case output one line containing one integer, indicating the answer.

Example

standard input	standard output
2	1023
6 12	16383
8 16	