TLE '15 P4 - Olympiads Homework

An Olympiads math teacher has put an unusually difficult math problem into the grade 10 Olympiads math homework. Being forced to do homework, the unsuspecting **jlsajfj** worked on the problem for less than 1 second, wrote down a random number, then immediately gave up. This math problem is apparently too difficult for **jlsajfj**, so he activated his second line of defense: bothering random friends. So far, **jlsajfj**'s acquaintances were all ~~lazy and ignorant~~ unable to solve the problem and suggested nothing useful. That is why **jlsajfj** has decided to bother you next.

According to **jlsajfj**, the math problem requires you to write down the value of $\binom{N}{0} + \binom{N}{4} + \binom{N}{8} + \dots + \binom{N}{4N}$. The exact value of N appears to be secret, and **jlsajfj** wants you to do the same question over and over. Since an answer may contain a lot of digits, you decided to be devious and return the answers $\bmod 10^9 + 13$.

jlsajfj also stated, quite plainly, these two pieces of info from his math class:

$n!$ is the factorial, which is

$$n! = \begin{cases} 1 & \text{if } n = 0 \\ n \times (n-1)! & \text{if } n \ge 1 \end{cases}$$

$\binom{n}{k}$ is the combination, which is

$$\binom{n}{k} = \begin{cases} \dfrac{n!}{k! \times (n-k)!} & \text{if } 0 \le k \le n \\ 0 & \text{if } k < 0 \text{ or } k > n \end{cases}$$

Can you use a computer and find the answer to **jlsajfj**'s math problem in less than 1 second?

Note

The problemsetter knows the techniques* for this problem, and wants to tell you a secret:

$$\binom{N}{0} + \binom{N}{4} + \binom{N}{8} + \dots + \binom{N}{4N} = \frac{2^N}{4} + \frac{\sqrt{2}^N \times \cos(45^\circ \times N)}{2}$$

This formula is valid for any positive integer N.

*
It was from an Olympiads math teacher. You probably know who the problemsetter is now.

Input Specification

One integer, containing the value of N ($1 \le N \le 10^{18}$).

Output Specification

Output the value of:

$$\binom{N}{0} + \binom{N}{4} + \binom{N}{8} + \cdots + \binom{N}{4N}$$

The value should be outputted $\bmod 10^9 + 13$, a product of two prime numbers.

Sample Input

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13
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Sample Output

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2016
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