

070. Mersenne Primes

time limit per test: 1 second
memory limit per test: 256 megabytes

As you may know, large prime numbers are in very high demand currently, and there are many large scale searches for even larger primes. Some of the largest prime numbers discovered fit a number called a Mersenne Prime, which is essentially any prime number than can be represented by the equation $2^p - 1$. Mersenne Primes are especially interesting as they can be tested for primality with a special test called the Lucas-Lehmer test. Although you could technically solve Mersenne Primes using typical prime-number algorithms, the Lucas-Lehmer test will almost always be faster. The pseudocode for conducting the Lucas-Lehmer test for as found on Wikipedia is as follows:

```
// Determine if  $M_p = 2^p - 1$  is prime for  $p > 2$ 
Lucas-Lehmer(p)
  var s = 4
  var M =  $2^p - 1$ 
  repeat p - 2 times:
    s = ((s × s) - 2) mod M
  if s == 0 return PRIME else return COMPOSITE
```

This code will test p as p is found in the equation $2^p - 1$. As a result, Mersenne Primes are often referred to with this value of p that is present in the power of two. Your task is to implement the Lucas-Lehmer test so that you can determine if given values of p are valid Mersenne Primes. Some of the values of p might cause the values in the Lucas-Lehmer test to be greater than 32 or 64 bits, so arbitrary precision might be required(BigInteger class in Java).

Input

A single integer p that represents the power of 2 in the equation $2^p - 1$ to be tested.

Output

The phrase "true" should be printed if the value calculated with p is a Mersenne Prime, and the phrase "false" should be printed otherwise.

Examples

input	Copy
7	
output	Copy
true	

input	Copy
15	
output	Copy
false	

Note

More information regarding the Lucas-Lehmer test and Mersenne Primes can be found here:
https://en.wikipedia.org/wiki/Lucas-Lehmer_primality_test, https://en.wikipedia.org/wiki/Mersenne_prime.

CodeRams Practice Problem Archive

Finished

Practice



About Contest

The archive of CodeRams practice problems from the 2019-20 season. The problems were made to be similar to CodeQuest problems, more information here:
<https://www.lockheedmartin.com/en-us/who-we-are/communities/codequest.html>

Virtual participation

Virtual contest is a way to take part in past contest, as close as possible to participation on time. It is supported only ICPC mode for virtual contests. If you've seen these problems, a virtual contest is not for you - solve these problems in the archive. If you just want to solve some problem from a contest, a virtual contest is not for you - solve this problem in the archive. Never use someone else's code, read the tutorials or communicate with other person during a virtual contest.

Start virtual contest

Clone Contest to Mashup

You can clone this contest to a mashup.

Clone Contest

Submit?

Language: GNU G++20 13.2 (64 bit, win)

Choose file: Choose File No file chosen

Submit

Last submissions

Submission	Time	Verdict
282959945	Sep/25/2024 21:40	Accepted
282896900	Sep/25/2024 13:44	Wrong answer on test 4

