Assignment:

Is 104729 a prime number?  Or 837149927, or 2778545904897799?

Prime number definition: “prime numbers are natural numbers that have only two factors, that are, 1 and the number itself.”

**Intuition**

A factor is a number or expression that divides another number or expression evenly, i.e. without any remainder. For example,

3 / 1 = 3  
3 / 2 = 1.5  
3 / 3 = 1

The only factors for 3 that do not leave a remainder are 1 and 3 itself, given that 2 has a remainder of

4 / 1 = 4   
4 / 2 = 2  
4 / 3 = 1.333…  
4 / 4 = 1

5 / 1 = 5  
5 / 2 = 2.5  
5 / 3 = 1.666…  
5 / 4 = 1.25  
5 / 5 = 1

All of the above

Here, the number or expression 4 is divided by the dividing number or expression 2 and the remainder of that division is 2.

The definition implies that given a number x to check whether it is prime and a dividing number y, x is prime if and only if, when x is divided by y, there is no remainder after the division. In other words.

* Whenever we divide x by y and x != y and the division does not leave a remainder

For example:

* When x = 4 and y = 2, x is not prime because x / y = 0 and x != y

Leading to:

∃ (x, y) ∈ ℕ [ x = ′ iff x > 0 ∧ y > 0 ∧ x / y = 1 ∧ x / y = x ]

∀ x, y ∈ ℕ [ x = ′ iff x > 0 ∧ y > 0 ∧ x / y = 1 ∨ x / y = x ], where y ∈ ℕ

We can remove x / y = 1 from the quantifier, because x / y = 1 iff x = y (1)

**Proof** **for (1)**:

TODO: write proof  
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**Intuition for proof for (1):**

By definition of the multiplicative inverse axiom:

“If x ≠ 0 then there exists a number s such that x.s = s.x = 1. This number is written as 1/x, leading to x.(1/x) = (1/x).x = 1”