

# Check for Prime

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## What are prime numbers?

- A prime number is a natural number greater than 1, which is only divisible by 1 and itself. First few prime numbers are: 2 3 5 7 11 13 17 19 23...



- In other words, the prime number is a positive integer greater than 1 that has exactly two factors, 1 and the number itself.
- There are many prime numbers, such as 2, 3, 5, 7, 11, 13, etc.
- Keep in mind that 1 cannot be either prime or composite.
- The remaining numbers, except for 1, are classified as prime and composite numbers.

## Some interesting facts about Prime numbers:

- Except for 2, which is the smallest prime number and the only even prime number, all prime numbers are odd numbers.
- Every prime number can be represented in form of  $6n + 1$  or  $6n - 1$  except the prime numbers 2 and 3, where  $n$  is a natural number.
- Two and Three are only two consecutive natural numbers that are prime.
- Goldbach Conjecture: Every even integer greater than 2 can be expressed as the sum of two primes.
- Wilson Theorem: Wilson's theorem states that a natural number  $p > 1$  is a prime number if and only if

$$(p - 1) ! \equiv -1 \pmod{p}$$
$$\text{OR } (p - 1) ! \equiv (p-1) \pmod{p}$$

- Fermat's Little Theorem: If  $n$  is a prime number, then for every  $a$ ,  $1 \leq a < n$ ,

$$a^{n-1} \equiv 1 \pmod{n}$$

OR

$$a^{n-1} \% n = 1$$

- Prime Number Theorem: The probability that a given, randomly chosen number  $n$  is prime is inversely proportional to its number of digits, or to the logarithm of  $n$ .
- Lemoine's Conjecture: Any odd integer greater than 5 can be expressed as a sum of an odd prime (all primes other than 2 are odd) and an even semiprime. A semiprime number is a product of two prime numbers. This is called Lemoine's conjecture.

## Properties of prime numbers:

- Every number greater than 1 can be divided by at least one prime number.
- Every even positive integer greater than 2 can be expressed as the sum of two primes.
- Except 2, all other prime numbers are odd. In other words, we can say that 2 is the only even prime number.
- Two prime numbers are always coprime to each other.
- Each composite number can be factored into prime factors and individually all of these are unique in nature.

## Prime numbers and co-prime numbers:

It is important to distinguish between prime numbers and co-prime numbers. Listed below are the differences between prime and co-prime numbers.

- A coprime number is always considered as a pair, whereas a prime number is considered as a single number.
- Co-prime numbers are numbers that have no common factor except 1. In contrast, prime numbers do not have such a condition.
- A co-prime number can be either prime or composite, but its greatest common factor (GCF) must always be 1. Unlike composite numbers, prime numbers have only two factors, 1 and the number itself.
- **Example of co-prime:** 13 and 15 are co-primes. The factors of 13 are 1 and 13 and the factors of 15 are 1, 3 and 5. We can see that they have only 1 as their common factor, therefore, they are coprime numbers.

- **Example of prime:** A few examples of prime numbers are 2, 3, 5, 7 and 11 etc.

```
#include<bits/stdc++.h>
using namespace std;

int main()
{
    int n;
    cin >> n;

    if(n == 0 && n == 1){
        cout << "Neither Prime nor Composite";
        return 0;
    }

    int i = 2;
    while(i < n){
        if(n % i == 0){
            cout << "No";
            return 0;
        }
        i++;
    }
    cout << "Yes";
    return 0;
}
```

**INPUT :**

23

**OUTPUT :**

Yes