

# How to Solve: Prime Numbers

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YouTube Video Link to this Post is [Here](#)

Following is Covered in the Video

## Theory

- ✧ What is a Prime Number?
- ✧ Generic form of a Prime Number
- ✧ How to check if a number is prime?
- ✧ Sample Problems

## What is a Prime Number?

**Prime numbers are the numbers which have only two factors**

- ✧ The number itself
- ✧ And 1

**Example of Prime numbers are : 2, 3, 5, 7, 11, 13**

**2 is the only even prime number**

**Only positive numbers can be prime numbers**

## Generic Form of Prime Numbers

**All Prime Numbers (apart from 2 and 3) can be written as**

- ✧  $6n + 1$  or
- ✧  $6n - 1$

Example

$$7 = 6 + 1 \text{ (of the form } 6n+1\text{)}$$

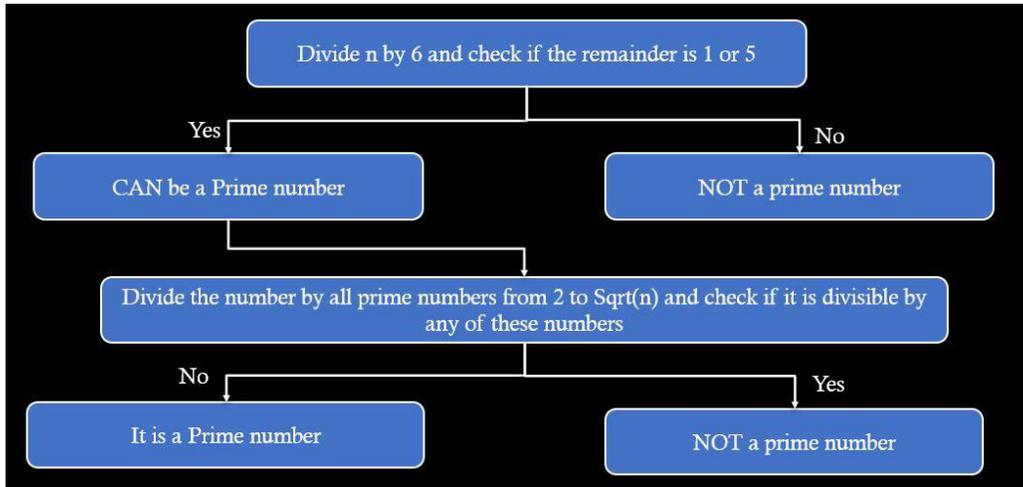
$$11 = 12 - 1 \text{ (of the form } 6n-1\text{)}$$

$$13 = 12 + 1 \text{ (of the form } 6n+1\text{)}$$

$$17 = 18 - 1 \text{ (of the form } 6n-1\text{)}$$

## How to check if a number (n) is prime?

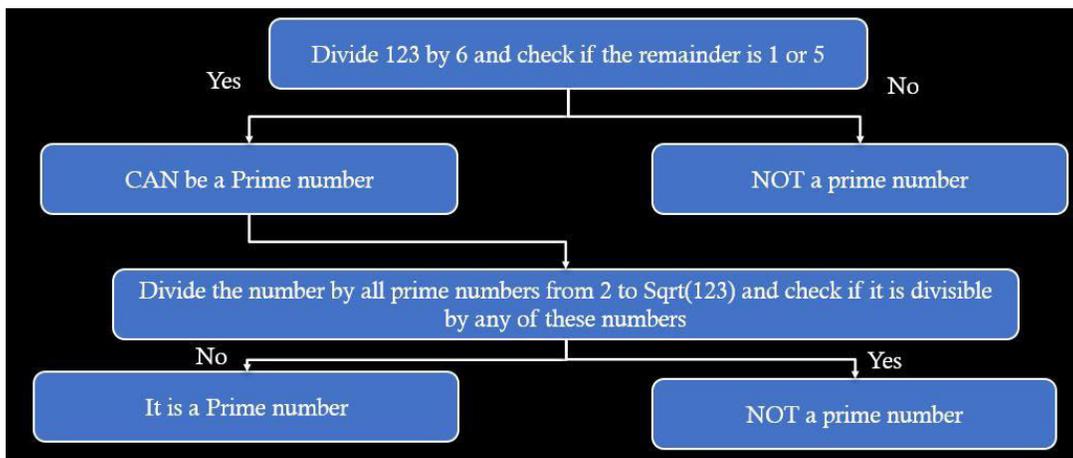
- ✘ Divide the number by 6 and check if the remainder is 1 or 5
- ✘ If the remainder is not 1 or 5 then it is NOT a prime number
- ✘ If the remainder is 1 or 5 then it CAN be a prime number
- ✘ Divide the number by all prime numbers from 2 to  $\text{Sqrt}(n)$  and check if it is divisible by any of these numbers
- ✘ If the number is divisible by ANY of the prime numbers from 2 to  $\text{Sqrt}(n)$  then it is NOT a prime number
- ✘ If the number is NOT divisible by ALL the prime numbers from 2 to  $\text{Sqrt}(n)$  then it is a prime number



## Sample Problems

### **Q1. Check if a 123 is prime number or not**

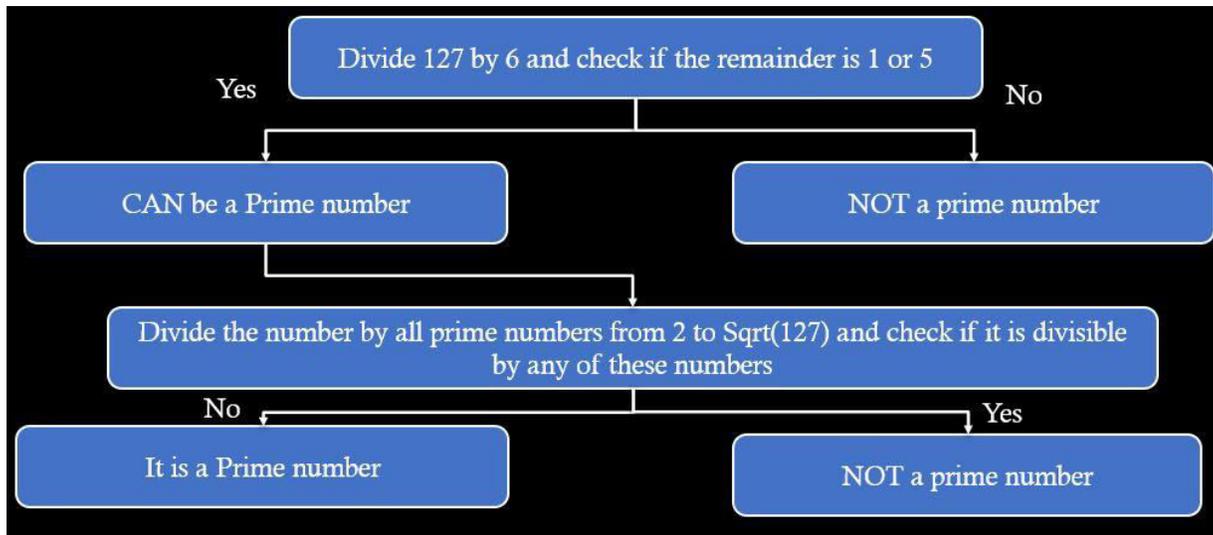
Solution:



- ✘ 123 divided by 6 gives 3 as remainder which is NOT 1 or 5
- ✘ 123 is NOT a prime number

### **Q2. Check if a 127 is prime number or not**

Solution:



- ✕ 127 divided by 6 gives 1 as remainder
- ✕ 127 CAN be a prime number
- ✕ We need to divide 127 by all prime numbers from 2 to  $\text{Sqrt}(127)$  and check if it is divisible by any of these numbers
- ✕ Closest integer to  $\text{Sqrt}(127)$  is  $\text{Sqrt}(121) = 11$ . So prime numbers from 2 to 11. 2,3,5,7,11
- ✕ 127 is NOT divisible by ALL the prime numbers 2,3,5,7,11.
- ✕ 127 is a prime number

Hope it Helps!