$Primeness \ Test \ \{Version \ IV\}$

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Abstract

In this research investigation, the author presents a '*Primeness Test*' which can be used to test if any given number is Prime.

Theory

Given any number p_n , usually written in Base 10 as

$$p_n = a_k a_{k-1} a_{k-2} \dots a_3 a_2 a_1 a_0$$
 where

$$a_k a_{k-1} a_{k-2} \dots a_3 a_2 a_1 a_0 = \sum_{i=0}^k (a_i) (10)^i$$

which can be written as

$$\sum_{i=0}^{k} (a_i)(10)^i = a_0 + (p_n - a_0)$$

Letting $(p_n - a_0) = z$ we note that z is a multiple of 10.

If p_n is to be Prime, then the values of a_0 cannot be Even, i.e., it must be Odd. This implies that z must be Even. Also, a_0 can possibly take the values of 1, 3,7 and 9 only as it being 5 implies that p_n is divisible by 5. If p_n is not a Prime, we can write it as

$$p_n = a_0 + z = r$$
 and/or
 $p_n = a_0 + z = 3s$ and/or
 $p_n = a_0 + z = 7t$ and/ or
 $p_n = a_0 + z = 9u$

For the case of Divisibility by 3, we write

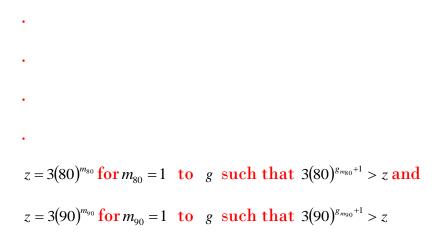
$$r = \frac{a_0}{3} + \frac{z}{3}$$

Since z is a multiple of 10, we can check if it is multiple of 3 by checking if

$$z = 3(10)^{m_{10}}$$
 for $m_{10} = 1$ to g such that $3(10)^{g_{m_{10}}+1} > z$

Also, since z is a multiple of 10, we can check if it is multiple of 3 by checking if $z = 3(20)^{m_{20}}$ for $m_{20} = 1$ to g such that $3(20)^{g_{m_{20}}+1} > z$

We repeat this procedure, so on, so forth until



We now present the analysis as follows:

Divis	Divisibility by 3			
a_0	^z is divisible by 3	^z is not divisible by 3		
1	$a_0 + z$ is not divisible by 3	When ^z is not divisible by 3, it is either lacking and/ or in excess by ± 1 gives $\pm 1+1=2,0$ Hence, a_0+z is not divisible by 3 for the case of ± 1 (lacking and/ or in excess by) but is divisible by 3 for the case of -1 (lacking and/ or in excess by) ± 2 gives $\pm 2+1=3,-1$ Hence, a_0+z is divisible by 3 for the case of ± 2 (lacking and/ or in excess by) but is not divisible by 3 for the case of -2 (lacking and/ or in excess by)		

a_0	^z is divisible by 3	^z is not divisible by 3
3	 a₀ + z is divisible by 3 	When z is not divisible by 3, it is either lacking and/ or in excess by ± 1 gives $\pm 1+3=4,2$ Hence, a_0+z is not divisible by 3 ± 2 gives $\pm 2+3=5,1$ Hence, a_0+z is not divisible by 3

a_0	^z is divisible by 3	^z is not divisible by 3
<i>a</i> ₀ 7	<pre>z is divisible by 3 a₀+z is not divisible by 3</pre>	 ^z is not divisible by 3 When ^z is not divisible by 3, it is either lacking and/ or in excess by ^{±1} gives ^{±1+7=8,6} Hence, ^{a₀+z} is not divisible by 3 for the case of ⁺¹ (lacking and/ or in excess by) but is divisible by 3 for the case of ⁻¹ (lacking and/ or in excess by) ^{±2} gives ^{±2+7=9,5} Hence, ^{a₀+z} is divisible by 3 for the case of ⁺² (lacking and/ or in excess by) but is not divisible by 3 for the case of ⁻²
		(lacking and/ or in excess by)

a_0	^z is divisible by 3	^z is not divisible by 3
9	$a_0 + z$ is divisible by 3	When z is not divisible by 3, it is either lacking and/ or in excess by ± 1 gives $\pm 1+9=10.8$ Hence, a_0+z is not divisible by 3 ± 2 gives $\pm 2+9=11.7$ Hence, a_0+z is not divisible by 3

We repeat the same procedural analysis for

 a_0

equal to 7 and 9.

From the above all cases, we can infer if

 p_n

is Prime or not.

Moral

Fulfillment of Righteous Promise Is The Highest Virtue.

References

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Dedication

All of the aforementioned Research Works, inclusive of this One are **Dedicated to** Lord Shiva.