Here, $\mathbf{PRIMES\ (P) = \{m \mid m\ is\ a\ prime\ number\ in\ binary\} \in NP}$ can be proved by the following approach.

Now, consider two situations:

1. Consider a situation where $P>1$: (Because all prime numbers are greater than 1).

2. The multiplicative group $Z^*_P = \{X|X \text{ is relatively prime to P and } 1 \le x \le P\}$.

Here, a situation is considered where *x* is a relative prime number the value of x lies between 0 and 1.

• Both conditions are cyclic as the both situations can be combined and can lie between 1 and P.

• **Order of these conditions is $P-1$ if P is prime as the range lies between 1 and P then the order between P-1. This fact is alone sufficient to prove the statement** $\text{PRIMES (P)} = \{m| \text{ m is a prime number in binary}\} \in \text{NP}$ and second considered situation are quite enough itself to justify the statement.

• It can be proved by **the fact of belonging of prime numbers to** co-NP **and consider prime numbers belong to** co-RP **.**

• **Thus, required statement will be true as well, because belongingness of NP can be proved only if belongs to** co-NP **and** co-RP **as well.**

This it is quite obvious that, $\mathbf{PRIMES\ (P) = \{m \mid m\ is\ a\ prime\ number\ in\ binary\} \in NP}$.