Canonical representation for composite numbers and prime numbers.

Juan Elias Millas Vera

juanmillaszgz@gmail.com

Zaragoza (Spain)

July 2021

0- Abstract:

In this paper we are going to see two theoretical expressions in reference of canonical representations. Based in the classic definition of positive integers we can use some mathematical tools to define the subsets of composite and prime numbers in their canonical form.

1- Introduction:

The main idea of this papers arises in the canonical representation of a positive integers[1], which says that every positive integer n>1 can be expressed in exactly one way as a product of prime powers:

$$(1) \quad n=(p_1)^{(n_1)}\cdot(p_2)^{(n_2)}\cdot\ldots\cdot(p_k)^{(n_k)}=\prod_{i=1}^{k}(p_i)^{(n_j)}$$

I will add here that it is true for: $n\in\mathbb{N}; p\in P$

2- New representations:

If a composite number is a product of two or more prime numbers, it is logic to think that can be expressed in a canonical way as a product of to two series of prime powers. In this case, you will delete the propriety of get a prime number in their basic state. You can express the composite numbers in the following form:

$$(2) \quad c=((p_1)^{(n_1)}\cdot(p_2)^{(n_2)}\cdot\ldots\cdot(p_k)^{(n_k)})\cdot((p_1)^{(n_1)}\cdot(p_2)^{(n_2)}\cdot\ldots\cdot(p_c)^{(n_c)})=\prod_{i=1}^{k}(p_i)^{(n_j)}\cdot\prod_{a=1}^{c}(p_a)^{(n_b)}$$

Where: $c\in\mathbb{N}\setminus P; n\in\mathbb{N}; p\in P$

We can go further and show the corresponding prime numbers form, using set theory. If the set of positive integers is the perfect sum of the composite and prime numbers we can clear mathematically and obtain the canonical representation of prime numbers:

$$(3) \quad p=(\prod_{i=1}^{k}(p_i)^{(n_j)})\setminus(\prod_{i=1}^{k}(p_i)^{(n_j)}\cdot\prod_{a=1}^{c}(p_a)^{(n_b)})$$

Where: $n\in\mathbb{N}; p\in P$

3- Conclusions:

In my opinion this is a new step to obtain in a future time a prime numbers true formula (if it finally is possible). Anyway, we have needed the help of the set theory for the last formula, this was because the suppression of a part of the main set (the positive integers set) needed some mathematical tools different from basic difference operator.
Finally I want to say that formulas (1) and (2) are positive integers and composite numbers generators, but in the other hand formula (3) is not a prime numbers generator because it use exclusion form not a generator mechanism.

4- References:

[1] https://en.wikipedia.org/wiki/Fundamental_theorem_of_arithmetic#Canonical_representation_of_a_positive_integer