Smarandache’s Quantum Chromodynamics Formula:

In order to save the colorless combinations prevailed in the Theory of Quantum Chromodynamics (QCD) of quarks and antiquarks in their combinations when binding, we devise the following formula:

\[ Q - A \in \pm M_3 \]  

where \( M_3 \) means multiple of three, i.e. \( \pm M_3 = \{3 \cdot k \mid k \in \mathbb{Z}\} = \{\ldots, -12, -9, -6, -3, 0, 3, 6, 9, 12, \ldots\} \), and \( Q = \) number of quarks, \( A = \) number of antiquarks.

But (1) is equivalent to:

\[ Q \equiv A \pmod{3} \]  

(Q is congruent to A modulo 3).

To justify this formula we mention that 3 quarks form a colorless combination, and any multiple of three (\( M_3 \)) combination of quarks too, i.e. 6, 9, 12, etc. quarks. In a similar way, 3 antiquarks form a colorless combination, and any multiple of three (\( M_3 \)) combination of antiquarks too, i.e. 6, 9, 12, etc. antiquarks. Hence, when we have hybrid combinations of quarks and antiquarks, a quark and an antiquark will annihilate their colors and, therefore, what’s left should be a multiple of three number of quarks (in the case when the number of quarks is bigger, and the difference in the formula is positive), or a multiple of three number of antiquarks (in the case when the number of antiquarks is bigger, and the difference in the formula is negative).

Quark-Antiquark Combinations.
Let’s note by \( q = \) quark \( \in \{\text{Up, Down, Top, Bottom, Strange, Charm}\} \), and by \( a = \) antiquark \( \in \{\text{Up}^, \text{Down}^, \text{Top}^, \text{Bottom}^, \text{Strange}^, \text{Charm}^\} \). Hence, for combinations of \( n \) quarks and antiquarks, \( n \geq 2 \), prevailing the colorless, we have the following possibilities:
- if \( n = 2 \), we have: \( qa \) (biquark – for example the mesons and antimessons);
- if \( n = 3 \), we have \( qqq, aaa \) (triquark – for example the baryons and antibaryons);
- if \( n = 4 \), we have \( qqaa \) (tetraquark);
- if \( n = 5 \), we have \( qqqqa, aaaaq \) (pentaquark);
- if \( n = 6 \), we have \( qqqaaa, qqqqq, aaaaaa (hexaquark) \);
- if \( n = 7 \), we have \( qqqqqaa, qqaaaaa (septiquark) \);
- if \( n = 8 \), we have \( qqqqaaa, qqqqqaa, qqaaaaa (octoquark) \);
- if \( n = 9 \), we have \( qqqqqqqq, qqqqqqqa, qqaaaaaa (nonaquark) \);
- if \( n = 10 \), we have \( qqqqqqqqaa, qqqqqqqqaa, qqaaaaaaa (decaquark) \);

etc.