One Step Evolution of A Given Positive Real Number

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Abstract:

In this research investigation, the author has detailed One Step Evolution of A Given Positive Real Number.
One Step Evolution of A Given Natural Number

One can note that any number \( A \) can be written as
\[
A = (p_1)^{a_1} \cdot (p_2)^{a_2} \cdot (p_3)^{a_3} \cdots \cdot (p_k)^{a_k} \cdot (p_{k+1})^{a_{k+1}}
\]
where \( p_1, p_2, p_3, \ldots, p_k, p_{k+1} \) are some primes and \( a_1, a_2, a_3, \ldots, a_k, a_{k+1} \) are some positive integers.

We can write it further as
\[
A = \underbrace{(p_1 \cdot p_1 \cdots p_1)}_{\text{number of times}} \underbrace{(p_2 \cdot p_2 \cdots p_2)}_{\text{number of times}} \underbrace{(p_3 \cdot p_3 \cdots p_3)}_{\text{number of times}} \cdots \underbrace{(p_{k+1} \cdot p_{k+1} \cdots p_{k+1})}_{\text{number of times}}
\]

We now consider one step evolution of any one \( p_1 \) or \( p_2 \)

\( p_1 \) or \( p_2 \) among their groups of \( a_1, a_2, a_3, \ldots, a_k, a_{k+1} \) such that the increase in \( A \) is minimal. By one step evolution of \( p_1 \), we mean, if \( p_1 \) is \( i \)th prime number then we consider \( (i+1) \)th prime number as the one step evolved version of \( p_1 \).

\( p_2 \) or \( p_3 \) respectively \( p_{k+1} \) or \( p_k \) among their groups of \( a_1, a_2, a_3, \ldots, a_k, a_{k+1} \) such that the increase in \( A \) is minimal. By one step evolution of \( p_2 \), we mean, if \( p_2 \) is \( i \)th prime number then we consider \( (i+1) \)th prime number as the one step evolved version of \( p_2 \).

\( \text{Example: } A = 2 \cdot 3 \cdot 5 \cdot 5 = 40,500 \)

which can be written as
\[
A = (2 \cdot 2) \cdot (3 \cdot 3 \cdot 3 \cdot 3) \cdot (5 \cdot 5 \cdot 5) = 40,500
\]

\( \text{Considering one step evolution of } 2 \text{ (one among the two occurances)} \)
\[
(3 \cdot 2) \cdot (3 \cdot 3 \cdot 3 \cdot 3) \cdot (5 \cdot 5 \cdot 5) = 60,750
\]

Considering one step evolution of \( 3 \) (of one among the four occurances)
\[
(2 \cdot 2) \cdot (5 \cdot 3 \cdot 3 \cdot 3) \cdot (5 \cdot 5 \cdot 5) = 67,500
\]

Considering one step evolution of \( 5 \) (of one among the three occurances)
\[
(2 \cdot 2) \cdot (3 \cdot 3 \cdot 3 \cdot 3) \cdot (7 \cdot 5 \cdot 5) = 56,700
\]

Therefore, one step evolution of \( 40,500 \) is \( 56,700 \) which is
gotten by evolving \( 5 \) once.
One Step Evolution of a Given Fractional Number

One can note that any fraction \( \frac{b}{m} \) can be written as

\[
\frac{b}{m} = \frac{(r_1)^{b_1} (r_2)^{b_2} (r_3)^{b_3} \cdots (r_{u-1})^{b_{u-1}} (r_u)^{b_u}}{(r_1)^{c_1} (r_2)^{c_2} (r_3)^{c_3} \cdots (r_{v-1})^{c_{v-1}} (r_v)^{c_v}}
\]

where \( r_1, r_2, r_3, \ldots, r_{u-1}, r_u \) and \( r_1, r_2, r_3, \ldots, r_{v-1}, r_v \) are some primes and \( b_1, b_2, b_3, \ldots, b_{u-1}, b_u \) and \( c_1, c_2, c_3, \ldots, c_{v-1}, c_v \) are some positive integers.

We can write it further as

\[
f = \frac{(r_1)^{b_1} (r_2)^{b_2} (r_3)^{b_3} \cdots (r_{u-1})^{b_{u-1}} (r_u)^{b_u}}{(r_1)^{c_1} (r_2)^{c_2} (r_3)^{c_3} \cdots (r_{v-1})^{c_{v-1}} (r_v)^{c_v}}
\]

We now consider one step evolution of any one \( r_1 \) or \( r_2 \) or \( r_3 \) or \( r_{u-1} \) or \( r_u \) or \( r_1, r_2 \) or \( r_3, r_{u-1} \) or \( r_u \) (among their groups of \( r_1, r_2, r_3, \ldots, r_{u-1}, r_u \)) and \( c_1, c_2, c_3, \ldots, c_v, c_{v-1}, c_v \) respectively such that the increase in the value of \( f \) is minimal.
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\[
\begin{align*}
\text{Ex:} & \\
\frac{2^2 \cdot 3^2}{7^2} &= \frac{4 \times 9}{49} = 0.7346 \\

f &= \frac{(2.2)(3.3)}{(7.7)} \\
\text{Possible alternatives} \\
\text{Case 1:} & \\
e'f &= \frac{(2.2)(3.3)}{(7.7)} = \frac{6 \times 9}{49} = 1.1020 \\
\text{where } e' \text{ represents the one step evolution operator} \\
\text{Case 2:} & \\
e'f &= \frac{(2.2)(5.3)}{(7.7)} = \frac{4 \times 15}{49} = 1.2244 \\
\text{Case 3:} & \\
e'f &= \frac{(2.2)(3.3)}{(11.7)} = \frac{4 \times 9}{77} = 0.4675 \\
\text{Therefore, Case 1 is the one step evolution of } f = \frac{2^2 \cdot 3^2}{7^2}. \\
\text{i.e. } & \\
e'f &= \frac{(2.3)(3.3)}{7.7}
\end{align*}
\]