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Scheme For Finding The Next Term Of A Sequence Based On Evolution {File Closing Version 3}. ISSN 1751-3030

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Abstract

In this research investigation, the author has detailed a novel method of finding the next term of a sequence based on Evolution.

Theory

Given any Sequence of the kind,

$$S=\{y_1, y_2, y_3,......., y_{n-1}, y_n\}$$

We first write them as

$$S=\begin{Bmatrix} y_1={}^{N}p_{j_1+\delta_1}, y_2={}^{N}p_{j_2+\delta_2}, y_3={}^{N}p_{j_3+\delta_3},......., y_{n-1}={}^{N}p_{j_{n-1}+\delta_{n-1}}, \\ y_n={}^{N}p_{j_n+\delta_n} \end{Bmatrix}$$

where in ${}^{N}p_{j_1+\delta_1}$, N is the Order Number of the Higher Order Sequence Of Primes in which the number y_1 is slated,

$\left(j_1+\delta_1\right)$ is the position number of the Prime Metric Basis Element. Here, j_i 's are Positive Integers and $0<\delta_i<1$.

For Example,

7 which is the 4th Prime Metric Basis Element of the Standard Primes, the Order [1] of which can be taken to 1. Therefore 7 can be written as ${}^{1}p_4$. In a similar fashion, 8 can be written as

${}^{1}p_{4+\left(\frac{8-7}{11-7}\right)}$ where 7 is the nearest previous prime number of 8 and 11 is the next nearest prime number of 8. Here, in the notation ${}^{1}p_{4+\left(\frac{8-7}{11-7}\right)}$, we can consider $\left(\frac{8-7}{11-7}\right)$ as the δ, the 4 as the j and the 1 as the N. We can also denote any number in a similar fashion using Higher Order Primes as well. [1] i.e., $N>1$.

Method of calculating the Decimal (Pseudo) Prime corresponding to $\left(j+\delta\right)$ in ${}^{N}p_{(j_i+\delta_i)}$.

If δ_i is equal to $\left(\frac{a_1a_2a_3.......a_{k-1}a_k}{10^k}\right)$ where $0<a_l<10$ for $l=1\ to\ k$, we write

$$^{N}p_{(j_i+\delta_i)} = {}^{N}p_{j_i} + \left\{\frac{\begin{array}{l}(a_1a_2a_3.......a_{k-1}a_k)^{th}\ \mathrm{Pr}\,ime Number\\ of\ \ N^{th}\ \ Order\end{array}}{\begin{array}{c}(10^k)^{th}\ \mathrm{Pr}\,ime Number\\ of\ \ N^{th}\ \ Order\end{array}}\right\}\left\{{}^{N}p_{j_i+1} - {}^{N}p_{j_i}\right\}$$

For Simplicity, we can take $N = 1$.

For our representational simplicity, we label our $S = \{y_1, y_2, y_3, ..., y_{n-1}, y_n\}$ as

$S = \{{}_1y_1, {}_1y_2, {}_1y_3, ..., {}_1y_{n-1}, {}_1y_n\}$ where the left south subscript 1 indicates that these numbers are at the level 1 (Base) of the triangle we are going to build.

We now compute the Evolution Orders

$E^{\,(j+1)y_i}\left({}_jy_i\right) = {}_jy_{(i+1)}$ where $(j+1)y_i$ is the Evolution Order. By Evolution Order, we mean the difference between the Prime Basis Position Number of ${}_jy_{(i+1)}$ (when slated thusly) and the Prime Basis Position Number of ${}_jy_i$ given that we are considering this in $N = 1$. This means that ${}_jy_i$ needs to be evolved ${}_{(j+1)}y_i$ times to get ${}_jy_{(i+1)}$. Please see [2] for Evolution method. We repeat this process till we get

$E^{(n)y_i}\left({}_{(n-1)}y_i\right) = {}_{(n-1)}y_{(i+1)}$. We now evolve ${}_{(n-1)}y_{(i+1)}$ by one step using [2] and get $E^1\left({}_{(n-1)}y_{(i+1)}\right)$. Note that $E^{\left\{E^1\left({}_{(n-1)}y_{(i+1)}\right)\right\}}\left({}_{(n-2)}y_i\right) = {}_{(n-2)}y_{(i+1)}$.

We repeat this procedure, downwards, repeatedly to find $E^{\left\{{}_{(2)}y_n\right\}}\left({}_{(1)}y_n\right) = {}_{(1)}y_{(n+1)}$.

We illustrate this with an Example of three terms.

Considering

$S = \{y_1, y_2, y_3\}$ which we write as

$S = \{{}_1y_1, {}_1y_2, {}_1y_3\}$ for future representational simplicity.

$E^{2y_1}\left({}_1y_1\right) = {}_1y_2$, $E^{2y_2}\left({}_1y_2\right) = {}_1y_3$. Now, we write

$E^{3y_1}\left({}_2y_1\right) = {}_2y_2$. We now evolve ${}_3y_1$ by one step using [2], i.e., perform $E^1\left({}_3y_1\right)$. And now, we write $E^{\left\{E^1\left({}_3y_1\right)\right\}}\left({}_2y_2\right) = {}_2y_3$. Finally, we write, $E^{\left({}_2y_3\right)}\left({}_1y_3\right) = {}_1y_4 = y_4$ which is the next term of the sequence $S = \{y_1, y_2, y_3\}$. This method can be used advantageously for forecasting.

Note that $E^1(0) = 0$ and $E^1(1) = E^1\left(\frac{2}{2}\right) = \frac{3}{2}$, from [2].

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