Unit n°31

Supplement 2
A Collatz-inspired recursion

$$x(t+1) = \text{co.newcomer}(x(t))$$
$$= \text{größte Primzahl, die in } (2x(t)+1) \text{ als Faktor enthalten ist}$$
$$x(t) \in \mathbb{N};\ t = 0,1,2,3,4,\ldots$$

Execution records for various initial values $x(0)$

$x(0) =$ 2, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19,13, 3, 7, 5, 11, 23, 47, 19, …

$x(0) =$ 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, …

$x(0) =$ 4, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, …

$x(0) =$ 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, …

$x(0) =$ 6, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, …

$x(0) =$ 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, …

$x(0) =$ 8, 17, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, …

$x(0) =$ 9, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, …

$x(0) =$ 10, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, …

$x(0) =$ 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, …

$x(0) =$ 12, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, …

$x(0) =$ 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, …

$x(0) =$ 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, …

$x(0) =$ 20, 41, 83, 167, 67, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, …

$x(0) =$ 40 000, 2963, 5927, 2371, 31, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, 19, 13, 3, 7, 5, 11, 23, 47, …

Das Verhaltensmuster „Einschwingvorgang + periodischer Teil (Zyklus), hier per(3, 7, 5, 11, 23, 47, 19, 13)“ tritt für alle $x(0)$ auf.

Diese numerisch induzierte Vermutung ist zu beweisen.

An extension of co.newcomer

$$
\begin{aligned}
x(t+1) &= \text{co.newcomer.m1}\big(x(t)\big) \\
&= \text{co.newcomer}\big(x(t)+k\big) \\
&= \text{größte Primzahl, die in } \big(2\big(x(t)+k\big)+1\big) \text{ als Faktor enthalten ist} \\
&\quad x(t), k \in \mathbb{N};\ t = 0,1,2,3,4,\ldots
\end{aligned}
$$

Execution records for various $x(0)$ and k

$k = 1$

$x(0) =$ 2, 7, 17, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, …

$x(0) =$ 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, …

$x(0) =$ 4, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, …

$x(0) =$ 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, …

$x(0) =$ 6, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, …

$x(0) =$ 7, 17, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, …

$x(0) =$ 8, 19, 41, 17, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, …

$x(0) =$ 9, 7, 17, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, …

$x(0) =$ 10, 23, 7, 17, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, …

$x(0) =$ 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, …

$x(0) =$ 12, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, …

$x(0) =$ 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, …

$x(0) =$ 14, 31, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, …

$x(0) =$ 20, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, …

$x(0) =$ 21, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, …

$x(0) =$ 22, 47, 97, 197, 397, 797, 1597, 139, 281, 113, 229, 461, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, …

$x(0) =$ 35, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, …

$x(0) =$ 39, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, …

$x(0) =$ 42, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, …

$x(0) =$ 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, …

$x(0) =$ 44, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13 , 29, 61, 5, 13, …

$x(0) =$ 45, 31, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, …

$x(0) =$ 46, 19, 41, 17, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, …

$x(0) =$ 47, 97, 197, 397, 797, 1597, 139, 281, 113, 229, 461, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, …

$x(0) =$ 48, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, …

$x(0) =$ 49, 101, 41, 17, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, …

$x(0) =$ 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, …

$x(0) =$ 62, 127, 257, 47, 97, 197, 397, 797, 1597, 139, 281, 113, 229, 461, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13 □

$x(0) =$ 63, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181,73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, 149, 43, 89, 181, 73, …

$x(0) =$ 64, 131, 53, 109, 17, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, …

$x(0) =$ 80, 163, 47, 97, 197, 397, 797, 1597, 139, 281, 113, 229, 461, 37, 11, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, ..

$x(0) =$ 100, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, 61, 5, 13, 29, …

Das Verhaltensmuster „Einschwingvorgang + periodischer Teil, hier per(5, 13, 29, 61) oder per(3) oder per(43,89,181,73,149)“ tritt für alle $x(0)$ auf.

Dabei ist für $2 \le x(0) \le 1000$ das Verhältnis der Auftrittshäufigkeiten 909:5:85.

$k = 2$

$x(0) =$ 2, 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3, …

$x(0) =$ 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3,11, 3, 11, 3, 11, 3, 11, 3, 11, …

$x(0) =$ 4, 13, 31, 67, 139, 283, 571, 37, 79, 163, 331, 29, 7, 19, 43, 13, 31, 67, 139, 283, 571, 37, 79, 163, 331, 29, 7, 19, 43, 13, …

$x(0) =$ 5, 5, 5,

1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, …

$x(0)=$ 132, 269, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, …

$x(0)=$ 496, 997, 1999, 4003, 8011, 47, 11, 3, 11, 3, 11, 3, 11, 3, 11, 3, 11, …

$x(0)=$ 1000, 401, 269, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, 313, 631, 181, 367, 739, 1483, 2971, …

Das Verhaltensmuster „Einschwingvorgang + periodischer Teil, hier per(3,11) oder per(5) oder per(13, 31, 67, 139, 283, 571, 37, 79, 163, 331, 29, 7, 19, 43) oder per(181, 367, 739, 1483, 2971, 313, 631)“ tritt für alle $x(0)$ auf.

Dabei ist für

** $2 \le x(0) \le 1000$ das Verhältnis der Auftrittshäufigkeiten 151:14:803:31.

** $2 \le x(0) \le 10000$ das Verhältnis der Auftrittshäufigkeiten 1433:26:8114:426.

Aufgaben

** Experimentieren Sie weiter mit co.newcomer und mit eigenen Collatz-Derivaten.

** Denken Sie über Anwendungen nach.

** Untersuchen Sie Verhaltensmuster von co.newcomer und eigener Collatz-Derivate bei x- oder k-Injektionen (Infektionen), speziell das Umschalten zwischen Zyklen.

** Denken Sie über einen co.calculus nach; vgl. das Statement von Paul Erdös [5] zum Beweis der Collatz-Vermutung „Die Mathematik ist für solche Probleme noch nicht bereit.“

D.Schönfeld

$$x(t+1) = \text{co.newcomer.m2}(x(t))$$
$$= \text{co.newcomer}(x(t)+k)$$
$$= \text{(größte Primzahl, die in } (2x(t)+1) \text{ als Faktor enthalten ist) + } k$$
$$x(t), k \in \mathbb{N};\ t = 0,1,2,3,4,\ldots$$

Execution records for various $x(0)$ and k

$k = 1$

$x(0)=$ 2, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62,6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, …

$x(0)=$ 3, 8, 18, 38, 12, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, ..

$x(0)=$ 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, …

$x(0)=$ 5, 12, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, …

$x(0)=$ 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, …

$x(0)=$ 7, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, …

$x(0)=$ 21, 44, 90, 182, 74, 150, 44, 90, 182, 74, 150, 44, 90, 182, 74, 150, 44, 90, 182, 74, 150, 44, 90, 182, 74, 150, 44, 90, 182, 74, …

$x(0)=$ 36, 74, 150, 44, 90, 182, 74, 150, 44, 90, 182, 74, 150, 44, 90, 182,

$x(0) =$ 74, 150, 44, 90, 182, 74, 150, 44, 90, 182, 74, 150, 44, 90, …
48, 98, 198, 398, 798, 1598, 140, 282, 114, 230, 462, 38,
12, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, 14, 30, 62, 6, …

Das Verhaltensmuster „Einschwingvorgang + periodischer Teil, hier per(6,14,30,62) oder per(4) oder per(44,90,182,74,150)“ tritt für alle $x(0)$ auf.

Dabei ist für $2 \le x(0) \le 1000$ das Verhältnis der Auftrittshäufigkeiten 909:5:85.

Vergleich mit co.newcomer.m1,k =1
Das Verhaltensmuster „Einschwingvorgang + periodischer Teil, hier per(5, 13, 29, 61) oder per(3) oder per(43,89,181,73,149)“ tritt für alle $x(0)$ auf.

Dabei ist für $2 \le x(0) \le 1000$ das Verhältnis der Auftrittshäufigkeiten 909:5:85.

Kommentar!

k =2

$x(0) =$ 70, 49, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, …

$x(0) =$ 71, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21, 45, 15, 33,
69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21, 45, 15, …

$x(0) =$ 72, 31, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9,
21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, …

$x(0) =$ 73, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21,
45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, …

$x(0) =$ 74, 151, 103, 25, 19, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31,
9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, …

$x(0) =$ 75, 153, 309, 621, 115, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5,
13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, …

$x(0) =$ 76, 19, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21, 45, 15,
33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21, 45, …

$x(0) =$ 77, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21, 45, 15, 33, 69,
141, 285, 573, 39, 81, 165, 333, 31, 9, 21, 45, 15, 33, …

$x(0) =$ 78, 159, 31, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333,
31, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, …

$x(0) =$ 79, 55, 39, 81, 165, 333, 31, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39,
81, 165, 333, 31, 9, 21, 45, 15, 33, 69, 141, 285, 573, …

$x(0) =$ 80, 25, 19, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21, 45,
15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21, …

$x(0) =$ 81, 165, 333, 31, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165,
333, 31, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, ..

$x(0) =$ 87, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21,
45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, …

$x(0) =$ 88, 61, 43, 31, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, 333,
31, 9, 21, 45, 15, 33, 69, 141, 285, 573, 39, 81, 165, …

$x(0) =$ 89, 181, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, 13, 5, …

$x(0) =$ 90, 183, 369, 741, 1485, 2973, 315, 633, 183, 369, 741, 1485, 2973,
315, 633, 183, 369, 741, 1485, 2973, 315, 633, 183, 369, 741, …

Das Verhaltensmuster „Einschwingvorgang + periodischer Teil, hier per(5,13) oder per(7) oder per(15, 33, 69, 141, 285, 573, 39, 81, 165, 333, 31, 9, 21, 45) oder per(183, 369, 741, 1485, 2973, 315, 633)“ tritt für alle $x(0)$ auf.

Dabei ist für $2 \le x(0) \le 1000$ das Verhältnis der Auftrittshäufigkeiten 151:15:803:30.

Dabei ist für $2 \le x(0) \le 10000$ das Verhältnis der Auftrittshäufigkeiten 1433:27:8113:426.

Vgl. co.newcomer.m1,k=2; Kommentar!

k =3

Das Verhaltensmuster „Einschwingvorgang + periodischer Teil, hier per(10) oder per(14, 32,16) oder per(26,56,116,236,46,34)“ tritt für alle $x(0)$ auf.

Dabei ist für $2 \le x(0) \le 10000$ das Verhältnis der Auftrittshäufigkeiten 52:6761:3186.

k =4

Das Verhaltensmuster „Einschwingvorgang + periodischer Teil, hier per(11,27,15,35,75,155,315,635,45,17) oder per(23,51,107,47)“ tritt für alle $x(0)$ auf.

Dabei ist für $2 \le x(0) \le 10000$ das Verhältnis der Auftrittshäufigkeiten 7605:2394.

k =5

Das Verhaltensmuster „Einschwingvorgang + periodischer Teil, hier per(16) oder per(10,12)“ tritt für alle $x(0)$ auf.

Dabei ist für $2 \le x(0) \le 10000$ das Verhältnis der Auftrittshäufigkeiten 71:9928.