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Location: Tula, Russia.

Born in 1982.

Graduated from Tula State University (Faculty of Technology) and Tula State Pedagogical University (Faculty of Psychology).

I work in the field of metal processing industry.

I am interested in elementary and analytic number theory. In addition to mathematics I am fond of poetry. [My books](#)

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2 The sum of reciprocals of Catalan numbers (with even indices, with odd indices)

3 Double hyperfactorial

4 Polynomials

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- 4.2 Polynomials Q_n(x) = 2^(-n) * ((x+sqrt(x^2+(x+6)-3)+1)^n - (x-sqrt(x^2+(x+6)-3)+1)^n) / sqrt(x^2+(x+6)-3)
- 4.3 Polynomials C_n(x) = Sum_{k=0..n} (2^k)!^k (x-1)^(n-k) / ((k+1)!^k k!)

5 Conjectures

Generalization of generating functions

The ordinary generating function for the alternating sum of k-gonal numbers

$$-x(1 - (k-3)x) / ((1-x)(1+x)^3)$$

A266088

The ordinary generating function for the alternating sum of centered k-gonal numbers

$$1 - (k-2)x + x^2 / ((1-x)(1+x)^3)$$

A270693

The ordinary generating function for the alternating sum of k-gonal pyramidal numbers

$$-x(1 - (k-3)x) / ((1-x)(1+x)^4)$$

A266677

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The ordinary generating function for the alternating sum of centered k-gonal pyramidal numbers

$$\frac{-x(1 - (k - 2)x + x^2)}{(1 - x)(1 + x)^4}$$

A270694 

The ordinary generating function for the first bisection of k-gonal numbers

$$\frac{kx + (3k - 8)x^2}{(1 - x)^3}$$

A270704 

The ordinary generating function for the first trisection of k-gonal numbers

$$\frac{3x(k - 1 + (2k - 5)x)}{(1 - x)^3}$$

A268351 

The ordinary generating function for the squares of k-gonal numbers

$$\frac{x(1 + (k^2 - 5)x + (4k^2 - 18k + 19)x^2 + (k - 3)^2x^3)}{(1 - x)^5}$$

A100255 

The ordinary generating function for the convolution of nonzero k-gonal numbers and nonzero h-gonal numbers

$$\frac{(1 + (k - 3)x)(1 + (h - 3)x)}{(1 - x)^6}$$

A271663 

The ordinary generating function for the convolution of nonzero k-gonal numbers with themselves

$$\frac{(1 + (k - 3)x)^2}{(1 - x)^6}$$

A271662 

The ordinary generating function for the convolution of nonzero k-gonal numbers and nonzero triangular numbers

$$\frac{1 + (k - 3)x}{(1 - x)^6}$$

A271567 

The ordinary generating function for the generalized k-gonal numbers

$$\frac{x(1 + (k - 4)x + x^2)}{(1 - x)^3(1 + x)^2}$$

A277082 

The ordinary generating function for the Sum_{k=0..n} m^k

$$\frac{1}{(1 - mx)(1 - x)}$$

A269025 

The ordinary generating function for the Sum_{k=0..n} (-1)^k m^k

$$\frac{1}{1 + (m - 1)x - mx^2}$$

A268413 

The ordinary generating function for the Sum_{k=0..n} floor(k/m)

$$\frac{x^m}{(1 - x^m)(1 - x)^2}$$

A269445 

The ordinary generating function for the sums of m consecutive squares of nonnegative integers

$$\frac{m(1 - 2x + 13x^2 + 2m^2(1 - 2x + x^2) - 3m(1 - 4x + 3x^2))}{6(1 - x)^3}$$

A276026 

The ordinary generating function for the number of ways of writing n as a sum of k squares

$$\vartheta_3(0, q)^k = 1 + 2kq + 2(k - 1)q^2 + \frac{4}{3}(k - 2)(k - 1)kq^3 + \dots$$

A276285 

The ordinary generating function for the values of quadratic polynomial p*n^2 + q*n + k

$$\frac{k + (p + q - 2k)x + (p - q + k)x^2}{(1 - x)^3}$$

A270710 

The ordinary generating function for the values of cubic polynomial p*n^3 + q*n^2 + k*n + m

$$\frac{m + (p + q + k - 3m)x + (4p - 2k + 3m)x^2 + (p - q + k - m)x^3}{(1 - x)^4}$$

A268644 

The ordinary generating function for the values of quartic polynomial p*n^4 + q*n^3 + k*n^2 + m*n + r

$$\frac{(r + (p + q + k + m - 4r)x + (11p + 3q - k - 3m + 6r)x^2 + (11p - 3q - k + 3m - 4r)x^3 + (p - q + k - m + r)x^4)}{(1 - x)^5}$$

A269792 

The ordinary generating function for the values of quintic polynomial b*n^5 + p*n^4 + q*n^3 + k*n^2 + m*n + r

$$\frac{r + (b + p + q + k + m - 5r)x + (13b + 5p + q - k - 2m + 5r)x^2 + (33b - 3q + 3m - 5r)x^3 + (26b - 10p + 2q + 2k - 4m + 5r)x^4 + (b - p + q - k - r)x^5}{(1 - x)^6}$$

A125083 

The ordinary generating function for the characteristic function of the multiples of k

$$\frac{1}{1-x^k}$$

A267142

The ordinary generating function for the continued fraction expansion of ϕ^{2k+1} , where $\phi = (1 + \sqrt{5})/2$, $k = 1, 2, 3, \dots$

$$\frac{\left[\frac{\phi^{2k+1}}{1-x} \right]}{1-x}$$

A267319

The ordinary generating function for the continued fraction expansion of ϕ^{2k} , where $\phi = (1 + \sqrt{5})/2$, $k = 1, 2, 3, \dots$

$$\frac{\left[\frac{\phi^{2k}}{1-x^2} + x - x^2 \right]}{1-x^2}$$

A267319

The ordinary generating function for the continued fraction expansion of $\exp(1/k)$, with $k = 1, 2, 3, \dots$

$$\frac{1 + (k-1)x + x^2 - (k+1)x^3 + 7x^4 - x^5}{(1-x^3)^2}$$

A267318

The ordinary generating function for the Fibonacci($k \cdot n$)

$$\frac{\left(\phi^k - \left(-\frac{1}{\phi} \right)^k \right) x}{\sqrt{5} \left(1 - \left(\phi^k + \left(-\frac{1}{\phi} \right)^k \right) x + (-1)^k x^2 \right)}$$

A269500

The ordinary generating function for the Sum_{k=0..n} (k mod m)

$$\frac{\sum_{k=1}^{m-1} kx^k}{(1-x^m)(1-x)}$$

A268291

The ordinary generating function for the recurrence relation $b(n) = k^n - b(n-1)$, with $n > 0$ and $b(0) = 0$

$$\frac{kx}{(1+x)(1-kx)}$$

A271427

The ordinary generating function for the recurrence relation $b(n) = k \cdot b(n-1) - m \cdot n$, with $n > 0$ and $b(0) = 1$

$$\frac{1 - (m+2)x + x^2}{(1-x)^2(1-kx)}$$

A268414

The ordinary generating function for the recurrence relation $b(n) = r \cdot b(n-1) + s \cdot b(n-2)$, with $n > 1$ and $b(0) = k$, $b(1) = m$

$$\frac{k - (kr - m)x}{1 - rx - sx^2}$$

A268409

The ordinary generating function for the recurrence relation $b(n) = k \cdot b(n-1) - m \cdot b(n-2)$, with $n > 1$ and $b(0) = 0$, $b(1) = 1$

$$\frac{x}{1 - kx + mx^2}$$

A268344

The ordinary generating function for the recurrence relation $b(n) = k \cdot b(n-1) - b(n-2)$, with $n > 1$ and $b(0) = 1$, $b(1) = 1$

$$\frac{1 - (k-1)x}{1 - kx + x^2}$$

A269028

The ordinary generating function for the recurrence relation $b(n) = 2 \cdot b(n-2) - b(n-1)$, with $n > 1$ and $b(0) = k$, $b(1) = m$

$$\frac{k + (k+m)x}{1 + x - 2x^2}$$

A268741

The ordinary generating function for the recurrence relation $b(n) = b(n-1) + 2 \cdot b(n-2) + 3 \cdot b(n-3) + 4 \cdot b(n-4) + \dots + k \cdot b(n-k)$, with $n > k-1$ and initial values $b(i-1) = i$ for $i = 1..k$

$$\frac{\sum_{m=0}^{k-1} \frac{(-m^3 - 3m^2 + 4m + 6)x^m}{6}}{1 - \sum_{m=1}^k mx^m}$$

A268349

The ordinary generating function for the recurrence relation $b(n) = b(n-1) + b(n-2) + b(n-3)$, with $n > 2$ and $b(0) = k$, $b(1) = m$, $b(2) = q$

$$\frac{k + (m-k)x + (q-m-k)x^2}{1 - x - x^2 - x^3}$$

A268410

The ordinary generating function for the recurrence relation $b(n) = \text{floor}(\phi^{2k} \cdot b(n-1))$, with $n > 0$, $b(0) = 1$ and $k = 0, 1, 2, 3, \dots$

$$\frac{1-x}{1 - (\phi^{2k} + (-\phi)^{-2k})x + x^2}$$

A278475

The ordinary generating function for the recurrence relation $b(n) = \text{floor}(\phi^{2k+1} \cdot b(n-1))$, with $n > 0$, $b(0) = 1$ and $k = 0, 1, 2, 3, \dots$

$$\frac{1-x-x^2}{(1-x)(1 - (\phi^{2k+1} + (-\phi)^{-2k-1})x - x^2)}$$

A278475

The ordinary generating function for the recurrence relation $b(n) = \text{floor}((1 + \sqrt{2})^{2k} \cdot b(n-1))$, with $n > 0$, $b(0) = 1$ and $k = 1, 2, 3, 4, \dots$

$$\frac{1-x}{1 - \left[(1 + \sqrt{2})^{2k} \right] x + x^2}$$

A278476

The ordinary generating function for the recurrence relation $b(n) = \text{floor}((1 + \sqrt{2})^{2k+1} b(n-1))$, with $n > 0$, $b(0) = 1$ and $k = 0, 1, 2, 3, \dots$

$$\frac{1 - x - x^2}{(1 - x)(1 - [(1 + \sqrt{2})^{2k+1}] x - x^2)}$$

A278476 

The ordinary generating function for the integers repeated k times

$$\frac{x^k}{(1 - x)(1 - x^k)}$$

A004526 

The ordinary generating function for the partial sums of numbers that are repdigits in base k (for $k > 1$)

$$\frac{\sum_{m=1}^{k-1} m x^m}{(1 - x)(1 - x^{k-1})(1 - k x^{k-1})}$$

A277209 

The ordinary generating function for the binomial coefficients $C(n, k)$

$$\frac{x^k}{(1 - x)^{(k+1)}}$$

A017764 

The ordinary generation function for the Gaussian binomial coefficients $[n, k]_q$

$$\frac{x^k}{\prod_{m=0}^k (1 - q^m x)}$$

A275944 

The ordinary generating function for the transformation of the Wonderful Demlo numbers

$$\frac{kx(1 + 10x)}{1 - 111x + 1110x^2 - 1000x^3}$$

A271528 

The ordinary generating function for the sequences of the form $k^n + m$

$$\frac{1 + m - (1 + km)x}{(1 - x)(1 - kx)}$$

A271527 

The ordinary generating function for the sequences of the form $k^*(n + 1)^*(n - 1 + k)/2$

$$\frac{\frac{k(k-1)}{2} + \binom{k(3-k)}{2} x}{(1 - x)^3}$$

A269457 

The ordinary generating function for the number of partitions of n into parts congruent to $1 \pmod{m}$ (for $m > 0$)

$$\prod_{k=0}^{\infty} \frac{1}{1 - x^{mk+1}}$$

A277090 

The ordinary generating function for the number of partitions of n into parts larger than 1 and congruent to $1 \pmod{m}$ (for $m > 0$)

$$\prod_{k=1}^{\infty} \frac{1}{1 - x^{mk+1}}$$

A277210 

The ordinary generating function for the surface area of the n -dimensional sphere of radius r

$$2x \left(1 + \pi \exp(\pi r^2 x^2) r x + 2\sqrt{\pi} \exp(\pi r^2 x^2) r x \int_0^{\sqrt{\pi r x}} \exp(-t^2) dt \right)$$

A072478 

The sum of reciprocals of Catalan numbers (with even indices, with odd indices)

$$\sum_{k=0}^{\infty} \frac{2k+1}{\binom{4k}{2k}} = \frac{2\pi}{9\sqrt{3}} - \frac{4(3\sqrt{5} \ln \varphi - 40)}{125}$$

A276483 

$$\sum_{k=0}^{\infty} \frac{2k+2}{\binom{4k+2}{2k+1}} = \frac{2\pi}{9\sqrt{3}} + \frac{6(2\sqrt{5} \ln \varphi + 15)}{125}$$

A276484 

Double hyperfactorial

$$H_2(n) = \begin{cases} n^n \cdot (n-2)^{n-2} \cdot \dots \cdot 5^5 \cdot 3^3 \cdot 1^1, & n > 0, n \Rightarrow \text{odd} \\ n^n \cdot (n-2)^{n-2} \cdot \dots \cdot 6^6 \cdot 4^4 \cdot 2^2, & n > 0, n \Rightarrow \text{even} \\ 0, & n = 0 \end{cases}$$

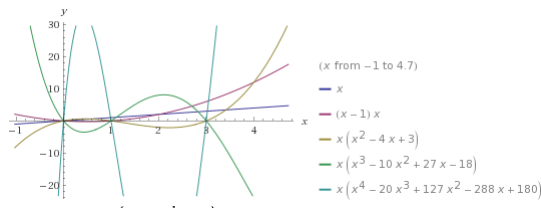
$$H_2(n) = \prod_{k=0}^{\lfloor \frac{n-1}{2} \rfloor} (n-2k)^{n-2k}$$

$$H_2(n) = \frac{1}{H_2(n-1)} \sqrt{\frac{H_2(2n)}{2^{n(n+1)}}}$$

A271385 

Polynomials

Polynomials $T_n(x) = -((-1)^n 2^{\lfloor n-1 \rfloor} \cos(\pi \sqrt{8x+1}/2) \Gamma(n - \sqrt{8x+1}/2 + 3/2) \Gamma(n + \sqrt{8x+1}/2 + 3/2)) / \pi$

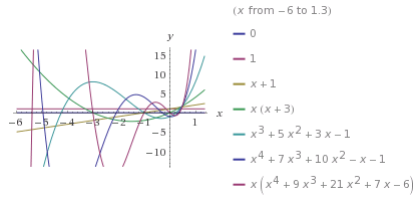


$$T_n(x) = \prod_{k=0}^n \left(x - \sum_{m=0}^k m \right)$$

$$T_n(x) = 0 \Rightarrow x = 0 + 1 + 2 + 3 + \dots = \frac{k(k+1)}{2}, k \leq n$$

A271386

Polynomials $Q_n(x) = 2^{(n-1)}((x+\sqrt{x(x+6)-3})+1)^n - (x-\sqrt{x(x+6)-3})+1)^n / \sqrt{x(x+6)-3}$

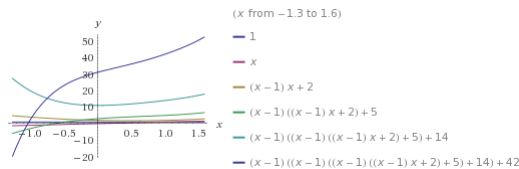


$$G(x, t) = \frac{t}{1 - (x+1)t - (x-1)t^2} = t + (x+1)t^2 + x(x+3)t^3 + \dots$$

$$Q_n(x) = (x+1)Q_{n-1}(x) + (x-1)Q_{n-2}(x) \Rightarrow Q_0(x) = 0, Q_1(x) = 1$$

A271451

Polynomials $C_n(x) = \sum_{k=0..n} (2^k)! * (x-1)^{(n-k)} / ((k+1)! * k!)$



$$G(x, t) = \frac{1 - \sqrt{1-4t}}{2t(1+t-xt)} = 1 + xt + (x^2 - x + 2)t^2 + (x^3 - 2x^2 + 3x + 3)t^3 + \dots$$

$$C_n(x) = (x-1)C_{n-1} + C_n(1) \Rightarrow C_0(x) = 1$$

$$C_n(1) = \frac{(2n)!}{(n+1)!n!}$$

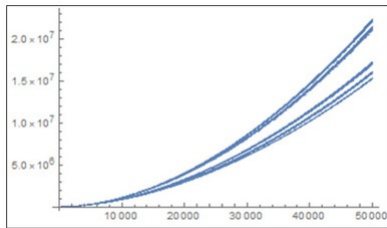
$$C_n(2) = \sum_{m=0}^n C_m(1)$$

A271453

Conjectures

Every number > 15 can be represented as a sum of 3 semiprimes.

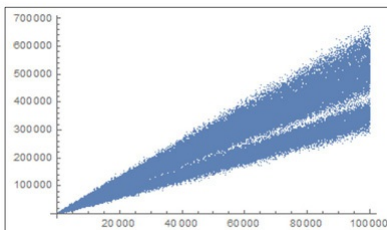
A282135



Every number is the sum of at most 6 square pyramidal numbers.

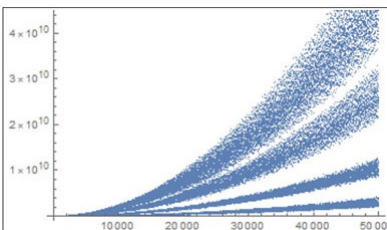
Every number is the sum of at most k+2 k-gonal pyramidal numbers (except k = 5).

A282173



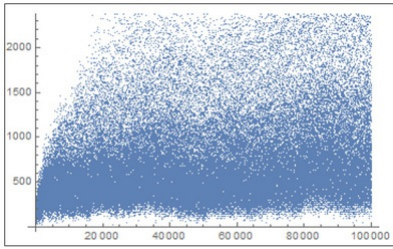
Every number is the sum of at most 12 squares of triangular numbers (or partial sums of cubes).

A284641



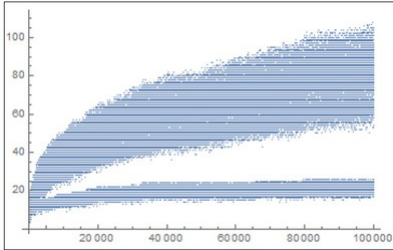
Every number > 27 can be represented as a sum of 4 proper prime powers.

A282289 



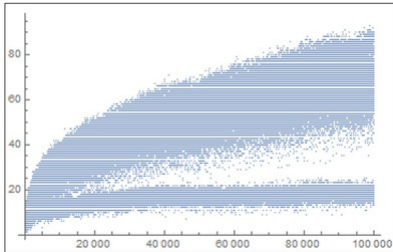
Every number > 8 can be represented as a sum of a proper prime power and a squarefree number > 1 .

A282290 



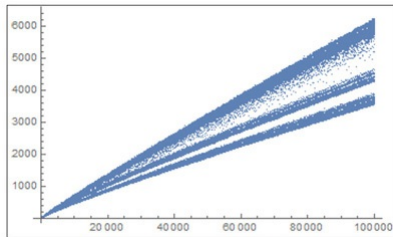
Every number > 108 can be represented as a sum of a proper prime power and a nonprime squarefree number.

A287299 



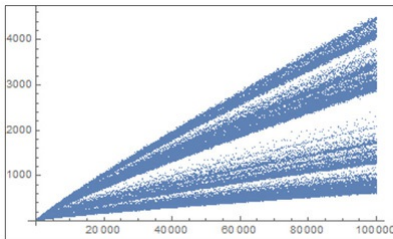
Every number > 10 can be represented as a sum of a prime and a nonprime squarefree number.

A282318 



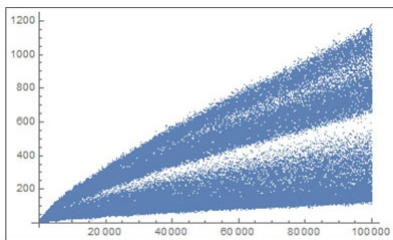
Every number > 30 can be represented as a sum of a prime and a squarefree semiprime.

A282192 



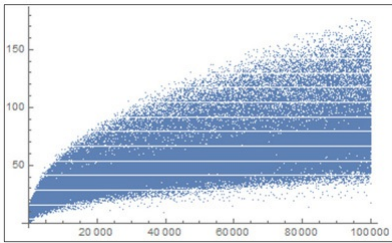
Every number > 30 can be represented as a sum of a twin prime and a squarefree semiprime.

A283929 



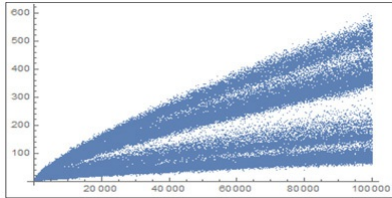
Every number > 108 can be represented as a sum of a perfect power and a squarefree semiprime.

A282947 



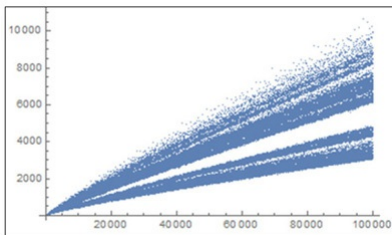
Every number > 527 can be represented as a sum of a prime with prime subscript and a semiprime (only 18 positive integers cannot be represented as a sum of a prime with prime subscript and a semiprime).

[A282355](#)



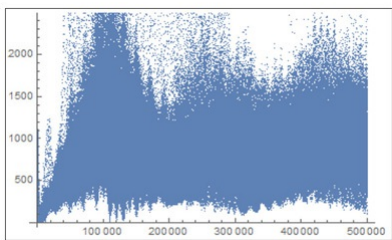
Every number > 51 can be represented as a sum of 2 multiplicatively perfect numbers.

[A282570](#)

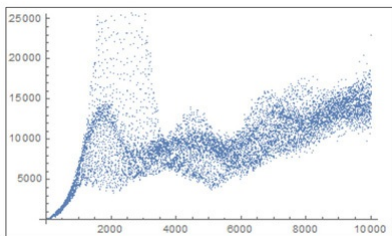


Any sufficiently large number can be represented as a sum of 3 squarefree palindromes.

[A282585](#)



Every number > 3 can be represented as a sum of 4 squarefree palindromes.



Every number > 82 can be represented as a sum of 2 numbers that are the product of an even number of distinct primes (including 1).

[A285796](#)

Every number > 57 can be represented as a sum of 2 numbers that are the product of an odd number of distinct primes.

[A285797](#)

Every number > 10 can be represented as a sum of 2 numbers, one of which is the product of an even number of distinct primes (including 1) and another is the product of an odd number of distinct primes.

[A286971](#)

Every number > 1 is the sum of at most 5 centered triangular numbers.

[A282502](#)

Every number > 1 is the sum of at most 6 centered square numbers.

Every number > 1 is the sum of at most $k+2$ centered k -gonal numbers.

[A282504](#)

Every number is the sum of at most $k-4$ generalized k -gonal numbers (for $k \geq 8$).

[A290943](#)

Every number is the sum of at most 15 icosahedral numbers.

[A282350](#)

Every number > 23 is the sum of at most 8 squares of primes.

Every number > 131 can be represented as a sum of 13 squares of primes.

[A275001](#)

Every number > 16 is the sum of at most 4 primes of form $x^2 + y^2$.

[A282971](#)

Every number > 7 is the sum of at most 4 twin primes.

[A283875](#)

Every number > 3 is the sum of at most 5 partial sums of primes.

[A282906](#)

Let $a_p(n)$ be the length of the period of the sequence $k^p \bmod n$ where p is a prime, then $a_p(n) = n/p$ if $n \equiv 0 \pmod{p^2}$ else $a_p(n) = n$.

[A282779](#)

Let $a(n)$ be the sum of largest prime power factors of numbers $\leq n$, then $a(n) = O(n^{2/\log(n)})$.

[A284521](#)

Let $a(n) = \sum_{k=1..n} \sigma(k)/k$, where $\sigma(k)$ is the sum of the divisors of k , it is assumed that the value of $a(n)/n$ approaches $P1^{2/6}$.

[A284648](#)

Let $a(n) = n - a(\lfloor a(n-1)/2 \rfloor)$ with $a(0) = 0$, then $a(n) \sim c^n$, where $c = \sqrt{3} - 1$.

[A286389](#)

$$G.f. = \frac{\sum_{k=0}^{\infty} \lfloor \varphi^2(k+1) \rfloor x^k}{\sum_{k=0}^{\infty} \lfloor \varphi(k+1) \rfloor x^k} = 1 + \frac{1}{1 + \frac{x}{1 + \frac{x^2}{1 + \frac{x^3}{1 + \frac{x^4}{1 + \frac{x^5}{1 + \dots}}}}}}}$$
$$\varphi = \frac{1 + \sqrt{5}}{2}$$

[A279586](#)

Recurrences (Pisot and related sequences)

$a(n) = \lfloor a(n-1)^2/a(n-2) \rfloor$, $a(0) = 3$, $a(1) = 16$.

$$a(n) = [x^n] \frac{3 - 2x + x^2 - x^3}{1 - 6x + 4x^2 - 2x^3 + 2x^4}$$

[A278681](#)

$a(n) = \lfloor a(n-1)^2/a(n-2) \rfloor$, $a(0) = 4$, $a(1) = 14$.

$$a(n) = [x^n] \frac{4 - 2x + x^2 - x^3}{1 - 4x + 2x^2 - x^3 + x^4}$$

[A278692](#)

$a(n) = \lfloor a(n-1)^2/a(n-2) \rfloor$, $a(0) = 5$, $a(1) = 13$.

$$a(n) = [x^n] \frac{5 - 2x + 4x^2 - 5x^3 + x^4 - 2x^5}{(1-x)(1-2x-3x^3-x^5)}$$

[A278764](#)

$a(n) = \lceil a(n-1)^2/a(n-2) \rceil$, $a(0) = 4$, $a(1) = 14$.

$$a(n) = [x^n] \frac{4 + 2x - x^2 - 3x^3 - 2x^4 - 2x^5 + 2x^6 - x^7}{(1-x)(1-2x-4x^2-4x^3-2x^4-x^5+x^6-x^7)}$$

[A277084](#)

$a(n) = \lceil a(n-1)^2/a(n-2) \rceil$, $a(0) = 5$, $a(1) = 12$.

$$a(n) = [x^n] \frac{5 - 3x + 3x^2 - 2x^3 + x^5 - 3x^6 - x^7 - 2x^8}{(1-x)(1-2x-2x^3-x^4-x^5-2x^6-x^7-x^8)}$$

[A277088](#)

$a(n) = \lceil a(n-1)^2/a(n-2) \rceil$, $a(0) = 6$, $a(1) = 15$.

$$a(n) = [x^n] \frac{6 - 3x - x^2 - 2x^3 + x^4 + 3x^5 - 5x^6}{(1-x)(1-2x-x^2-x^3-2x^6)}$$

[A277089](#)

- [Exponential generating functions of some integer sequences](#)
- [Sums of reciprocals](#)