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Fibonacci Numbers

Zeckendorf's Theorem

Every positive integer N can be written **uniquely** as a sum of distinct non-neighboring Fibonacci numbers. To get unique representation, keep subtracting the biggest fibonacci number smaller than N repeatedly until N becomes 0.

Resources: Wiki | Proof

Fibonacci GCD

Let $f(x)$ be the x_{th} fibonacci number.

Theorem: $gcd(f(x), f(y)) = f(gcd(x, y))$

Related Lemma:

1. $gcd(f(x), f(x-1)) = 1$
2. $f(m+n) = f(m+1)f(n) + f(m)f(n-1)$
3. if $m|n$, then $f(m)|f(n)$

Resources: Math Fun Facts