Binary expansions exist proof

Representing positive integers

Theorem: Every positive integer is a sum of (one or more) distinct powers of 2. binary expansions exist!

Proof by strong induction, with b = 1 and j = 0.

Basis step: WTS property is true about 1.

Recursive step: Consider an arbitrary integer $n \ge 1$. Assume (as the IH) that the property is true about each of $1, \ldots, n$. WTS that the property is true about n + 1.