Proving closed form solution for $g(n)$

Recall $g(1) = 1$, $g(2) = 3$, and $g(n) = g(n-2)$ if $n \geq 3$.

We let $P(n)$ denote the statement: $g(n) = 1$ if n is odd and $g(n) = 3$ if n is even.

We wish to prove that $P(n)$ is true for all $n \in \mathbb{Z}^+$.

Let $N \geq 10$ be arbitrary.

Our Inductive Hypothesis is that $P(1) \wedge P(2) \wedge \ldots \wedge P(N)$ is true.

We wish to infer that $P(N+1)$ is true.

We write down what $P(N+1)$ asserts:

> $g(N+1) = 1$ *if* $N+1$ *is odd and* $g(N+1) = 3$ *if* $N+1$ *is even.*