1. **S4.3, Exercise 43:** For a full binary tree $T$, use structural induction to show that $n(T) \geq 2h(T) + 1$.

**Basis step:** Let $R$ be the full binary tree consisting solely of a root node. We have that $h(R) = 0$. Thus $2h(R) + 1 = 2 \cdot 0 + 1 = 1$, and as $n(R) = 1 \geq 1$, the claim holds for $R$.

**Inductive hypothesis:** Let $T_1$ and $T_2$ be full binary trees and assume $n(T_1) \geq 2h(T_1) + 1$ and $n(T_2) \geq 2h(T_2) + 1$.

**Inductive step:** Let $T = T_1 \cdot T_2$ be a full binary tree. We must show that the expression holds for $T$. We have that:

\[
n(T) = n(T_1) + n(T_2) + 1 \\
\geq (2h(T_1) + 1) + (2h(T_2) + 1) + 1 \quad \text{by the inductive hypothesis} \\
= 2(h(T_1) + h(T_2) + 1) + 1
\]

For any two nonnegative integers $x$ and $y$, we have that $x + y \geq \max(x, y)$. Thus, we have:

\[
n(T) \geq 2(\max(h(T_1), h(T_2)) + 1) + 1 \\
= 2h(T) + 1 \quad \text{since } h(T) = \max(h(T_1), h(T_2)) + 1
\]

Thus, the claim holds, as shown by structural induction.