We prove this by induction on the number of nodes in $T$. Let $n_0(T)$ denote the number of leaves of a binary tree $T$, and let $n_2(T)$ denote the number of nodes with two children.

The basis of the induction is a tree with a single node. This node is the only leaf, and there are no nodes with two children.

Now, let $T$ be an arbitrary binary tree on more than one node, and let $v$ be a leaf. Since $T$ has more than one node, $v$ is not the root, so it has a parent $w$. Let $T'$ be the tree obtained by deleting $v$.

If $u$ had no other child in $T$, then it becomes a leaf in $T'$, so we have $n_0(T') = n_0(T)$ and $n_2(T') = n_2(T')$. Applying the induction hypothesis to $T'$ completes the induction step in this case. On the other hand, if $u$ had another child in $T$, then it does not become a leaf after the deletion; but it used to have two children and now it doesn’t. Thus we have $n_0(T') = n_0(T) - 1$ and $n_2(T') = n_2(T') - 1$. Again, applying the induction hypothesis to $T'$ completes the induction step in this case.