Structural Induction:

$x \neq \emptyset$

Let x be a well-ordered set. Let $P(x)$ be a proposition for $x \in X$. If:

1) $P(x_0)$ holds where x_0 is the least element of x

2) $\left\{ \begin{array}{l} \text{for all } y < z \\ \quad \text{if } P(y) \text{ is true} \end{array} \right\} \Rightarrow P(z)$ is true.

then $P(x)$ is true for all $x \in X$.

e.g. $N \times N = \{(a,b)\}$. $\quad (a,b) < (x,y)$ if $a < x$

or $a = x$ $b < y$.

e.g. Let T be a binary tree with height h and n nodes

Show that $n \leq 2^{h+1} - 1$