1.

a) We prove the following statement by induction on T, the root of a tree.

STATEMENT $S(T)$: Calling `preorder` on a tree T prints the labels of T in preorder.

BASIS. The basis is where T is a single node. Then line (1) prints the label of T, line (2) gets the leftmost child which is `NULL`, and thus line (3) fails, stopping execution of `preorder`.

INDUCTION. Suppose T is not a leaf. Then T has at least one child. Assume by the inductive hypothesis that `preorder` prints the labels of the children of T. Clearly the label of the root of T is printed by line (1). This proves the inductive step. We conclude that $S(T)$ is true for all labeled trees T. ✦