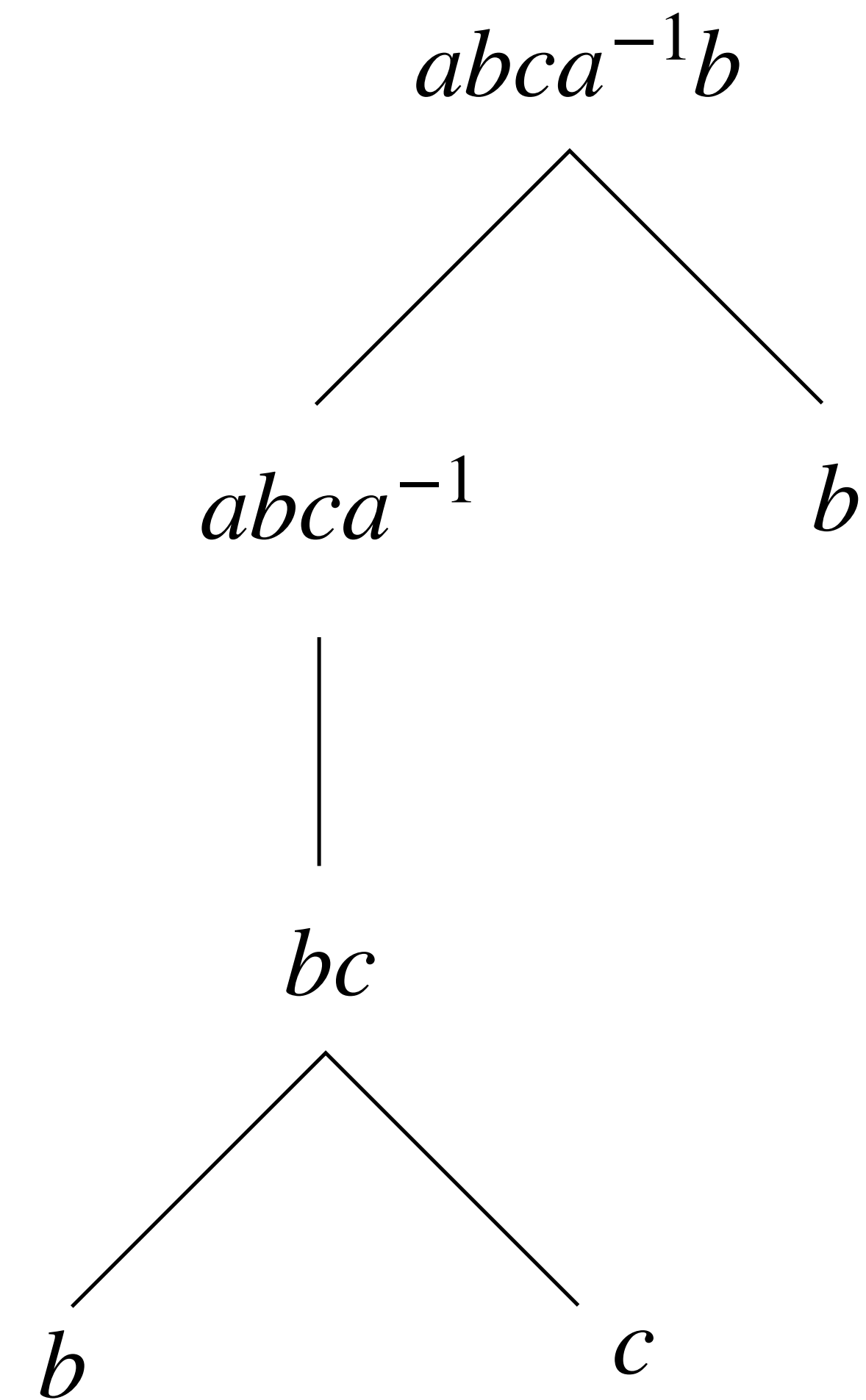


# Expression Trees

## Expression Tree for $w$

- Each node is labeled with a string.
- Root is  $w$
- If  $|v| \leq 1$  then  $v$  is a leaf.
- Otherwise  $v$  has one or two children:
  - If one child  $v'$  then  $v = sv's^{-1}$   
(**conjugate node**)
  - If two children  $w_1, w_2$  then  $v = w_1w_2$   
(**leaf node**)



# Relationship to $\rho$

- $L(T)$  is the number of leaves with nonempty label.
- An expression tree  $T$  is optimal if  $L(T) \leq L(T')$  for all other  $T'$ .
- $\rho(w) = L(T) \Leftrightarrow T$  is optimal.