An implementer's variable $A$ holds a binary tree representation as follows. If the tree is empty, $A = [\text{nil}]$. If the tree has left subtree $L$ and right subtree $R$ and root value $n$, then $A = [L; n; R]$. The tree

![Binary Tree Diagram]

is represented as $A = [[[\text{nil}]; 2; [[\text{nil}]; 5; [\text{nil}]]]; 3; [[\text{nil}]; 7; [\text{nil}]]]$. The tree must be reimplemented using implementer's variable $B$ as follows. If the tree is empty, $B = 0$. If the tree has left subtree $L$ and right subtree $R$ and root value $n$, then

$$B = \text{"left"}\rightarrow L \mid \text{"root"}\rightarrow n \mid \text{"right"}\rightarrow R$$

The same example tree is represented as

$$B = \begin{array}{l}
\text{"left"} \rightarrow (\text{"left"} \rightarrow 0 \\
\quad \text{"root"} \rightarrow 2 \\
\quad \text{"right"} \rightarrow (\text{"left"} \rightarrow 0 \\
\quad \quad \quad \text{"root"} \rightarrow 5 \\
\quad \quad \quad \text{"right"} \rightarrow 0 ) ) \\
\quad \text{"root"} \rightarrow 3 \\
\quad \text{"right"} \rightarrow (\text{"left"} \rightarrow 0 \\
\quad \quad \quad \text{"root"} \rightarrow 7 \\
\quad \quad \quad \text{"right"} \rightarrow 0 ) 
\end{array}$$

(a) What is the data transformer?

(b) A user has natural variable $n$ and the operation

$$\text{root} \equiv n := A \ 1$$

which assigns to $n$ the root value. Use your transformer from part (a) to transform $\text{root}$.

no solution given