Relational Logic

Alloy is a first-order logic with relations and transitive closure. Relation is a fancy word for table; tuple is a fancy word for row. An intuition for transitive closure is ‘where can we get to from here?’

\[
\text{sig Tree} \{ \text{root} : \text{Node} \} \\
\text{sig Node} \{ \\
\quad \text{left}, \text{right} : \text{Node}, \\
\quad \text{value} : \text{Int} \\
\}
\]

![Alloy model of a binary tree](image)

Comprehension questions:
1. Why isn’t Node4 included in this relation?
2. How could the expression be changed so that Node4 would be included?
3. What does the expression Tree0.root.^(left + right) evaluate to?

\[
\text{reflexive transitive closure: } *r \equiv \wedge r + \text{idem}
\]