

# Decomposition of Triply Rooted Trees

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**Abstract:** We give a decomposition of triply rooted trees into three doubly rooted trees. This leads to a combinatorial interpretation of an identity conjectured by Lacasse in the study of the PAC-Bayesian machine learning theory, and proved by Younsi by using the Hurwitz identity on multivariate Abel polynomials. Let  $[n] = \{1, 2, \dots, n\}$ . We also give a bijection between the set of functions from  $[n+1]$  to  $[n]$  and the set of triply rooted trees on  $[n]$ , which leads to a symmetry property and a refined enumeration of functions from  $[n+1]$  to  $[n]$  with respect to the number of elements in the orbit of  $n+1$  and the number of periodic points.

**AMS Classification:** 05A15, 05A19

**Keywords:** doubly rooted tree, triply rooted tree, bijection

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