Why

We want to simplify common questions using orderings of a rooted tree.[1]

Definition

A *topological ordering* of a rooted tree is an ordering σ for which $v \prec_\sigma \mathsf{pa}(v)$. If there are n vertices, the root has index n and every other vertex has an index less than its parent.

A *postordering* is a topological ordering in which descendents of a vertex are given consecutive numbers. For the postordering σ, if $\sigma^{-1}(v) = j$ and v has k proper descendents then the proper descendents of v have are numbered consecutively from $j - k$ through $j - 1$. Figure 1 shows an example.

One can generate a postordering by numbering vertices in decreasing sequence (starting at n) in the order they are visited.[2]

Given an ordering, the *first descendent* of v (which we denote $\mathsf{fdesc}(v)$) is the descendent with the lowest index. Given a postordering σ, one can check whether a vertex w is a proper descendent of v, by $\mathsf{fdesc}(v) \preceq_\sigma w \prec_\sigma v$.

[1] This sheet is incomplete and will be updated in future editions.

[2] Future editions will clarify.

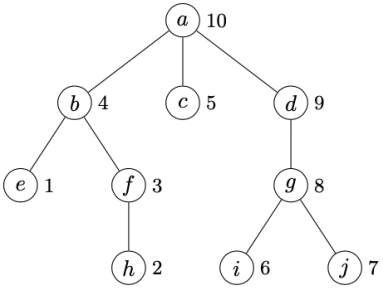
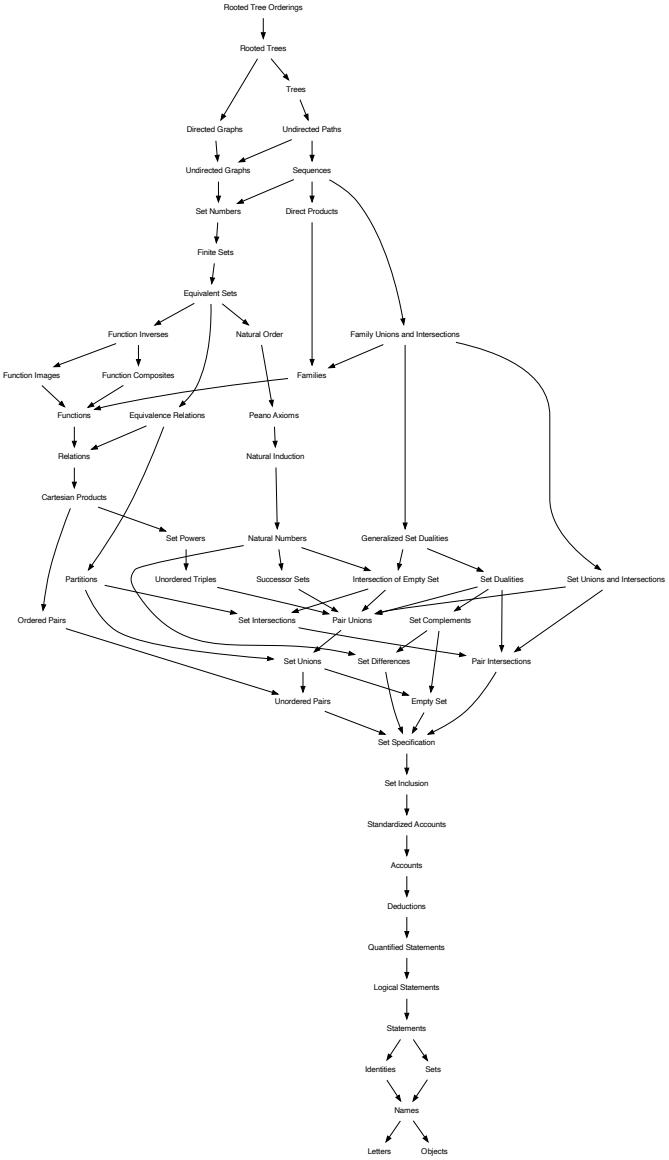


Figure 1: A postordering of a rooted tree.


Rooted Tree Orderings
Rooted Trees
Trees
Directed Graphs
Undirected Paths
Undirected Graphs
Sequences
Set Numbers
Direct Products
Finite Sets
Equivalent Sets
Function Inverses
Natural Order
Family Unions and Intersections
Function Images
Function Composites
Families
Functions
Equivalence Relations
Peano Axioms
Relations
Natural Induction
Cartesian Products
Set Powers
Natural Numbers
Generalized Set Dualities
Partitions
Unordered Triples
Successor Sets
Intersection of Empty Set
Set Dualities
Set Unions and Intersections
Ordered Pairs
Set Intersections
Pair Unions
Set Complements
Set Unions
Set Differences
Pair Intersections
Unordered Pairs
Empty Set
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects