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Algebras

Sets

- Carrier set (U): The set that contains all possible elements that we might consider in the algebra.
- Set of operations: union, intersection, difference, complement.
- Tournaments, players, teams, and matches can all be modeled as sets.
    - There cannot be duplicates of players within the same tournament
    - There cannot be two or more instances of the same tournament at the same time.
    - The same match cannot be played twice
- Example of usages:
    - The set of teams registered in Tournament A
    - The union of teams to obtain the team members
    - The intersection between teams in different tournaments to obtain all the tournaments that team is or has participated in.
    - The difference between the set of communities the user has followed and the set of unfollowed communities

Boolean Algebra

- Carrier set (U): contains all possible Boolean values {TRUE, FALSE} or {0,1}
- Set of operations: NOT, AND, OR, NOR, NAND, XOR
- Used in logic for system decisions (permissions, bracket advancement, conditions).
- Example of usages:
    - A match result is valid if (matchPlayed = TRUE) AND (scoreReported = TRUE).
    - A team (team A) wins a match if [teamAscore > teamBscore) = TRUE] OR NOT(hasOpponent) = TRUE
    - XOR to decide a single winner for the match

Tree Data Structure

- Carrier set (U): The set of all possible nodes in the tree
    - Each node can contain different data:
        - Players
        - Matches
        - Teams
- Set of operations: Different traversal methods that depend upon the implementation
    - Pre-Order (Root, Left, Right)
    - In-Order (Left, Root, Right)
    - Post-Order (Left, Right, Root)
- Example of usage:
    - Tournament brackets, each bracket is a pair of nodes that contain a team