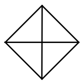


## Why

We want to discuss interactive decision making.

## Discussion

We are interested in talking about situations in which there are several *decision makers*, *agents* or *players*, each of which are making decisions that will affect the outcome for all involved.

### Example: rock paper scissors

Consider the game "rock-paper-scissors" in which there are two players $A$ and $B$. Each player may choose one of the three actions Rock, Paper, Scissors. To play, each player simultaneously selects an action, and these are compared. Here, both agents have the same actions.

## Definition

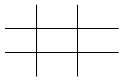
In both these games there is a finite set of *players*, or *agents*, or *controllers*. Let $\mathcal{I}$ be a finite set with $|\mathcal{I}| = n$, the players.

In rock-paper-scissors, for example, $\mathcal{I} = \{A, B\}$. There, each player could pick one of the three actions. Define $\mathcal{A}_A = \mathcal{A}_B = \{\textsc{Rock}, \textsc{Paper}, \textsc{Scissors}\}$. We call $\mathcal{A}_A$ the actions of $A$ and $\mathcal{A}_B$ the actions of $B$.

We have a set of outcomes $\mathcal{O} = \{\text{A Wins}, \text{B Wins}, \textsc{Tie}\}$. Let $f : \mathcal{A}_A \times C_B \to \mathcal{O}$ defined by $f(\textsc{Rock}, \textsc{Scissors}) = \text{A Wins}$

the set of *players*. Let $S$ be a finite set, the set of *states*. For $i = 1, \ldots, n$, let $\{A_s^p\}_{s \in S}$ be a family of sets, the *action sets by state*. Define $\mathcal{A}^i = \cup_s A_s^p$ the set of *actions* for player $i = 1, \ldots, n$.

Let $f : S \times \prod_i \mathcal{A}^i \to S$, the *game dynamics* or *transition function*.

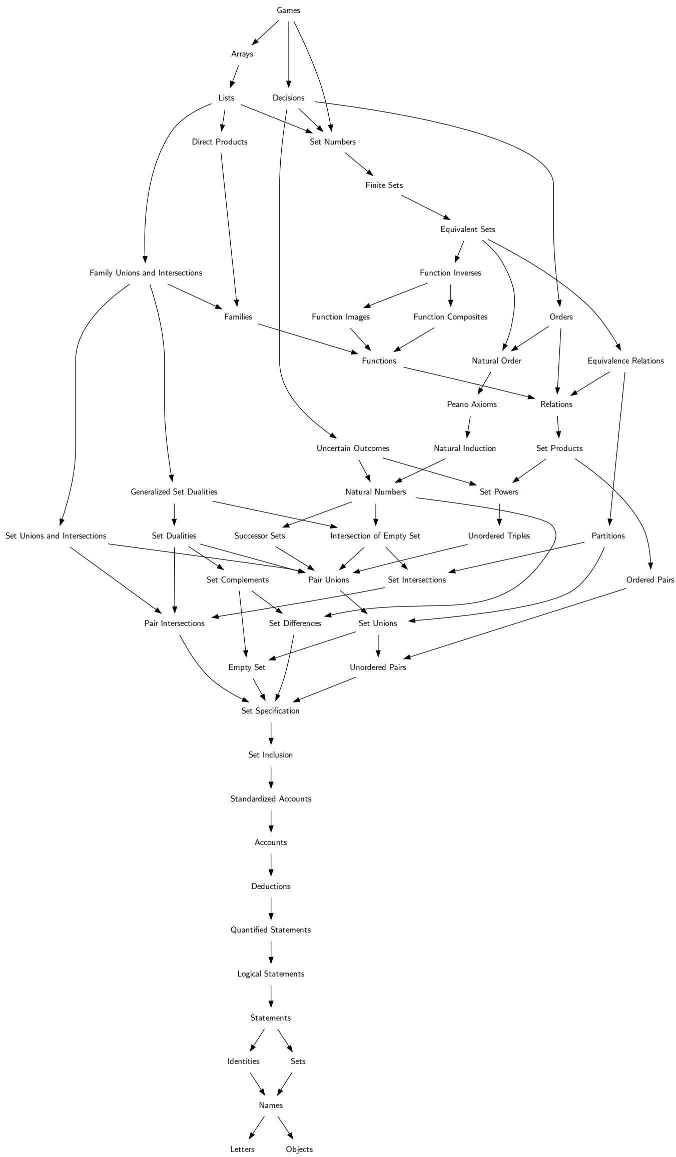


## Definition

The first thing to discuss is the set of players. Let $P$ be a finite set with $|P| = n$. The set $P$ is the set of players, and we

We begin with a single-player game.

Let $S$ be a set.


Games
Arrays
Lists
Decisions
Direct Products
Set Numbers
Finite Sets
Equivalent Sets
Family Unions and Intersections
Function Inverses
Families
Function Images
Function Composites
Orders
Functions
Natural Order
Equivalence Relations
Peano Axioms
Relations
Uncertain Outcomes
Natural Induction
Set Products
Generalized Set Dualities
Natural Numbers
Set Powers
Set Unions and Intersections
Set Dualities
Successor Sets
Intersection of Empty Set
Unordered Triples
Partitions
Set Complements
Pair Unions
Set Intersections
Ordered Pairs
Pair Intersections
Set Differences
Set Unions
Empty Set
Unordered Pairs
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects