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**Classical Theory of Problem Solving:** Systematically *searching* through a *space* of solutions or possible solutions

* go through a series of states to reach a goal state; The journey is usually the solution.
  + ex.: missionary and cannibals puzzle
  + ex.: towers of hanoi

**State:** Description or snapshot of a puzzle in the process of being solved

**Initial State:** Starting position or arrangement prior to any problem solving actions taken

**Goal State:** Final arrangement of elements that satisfies the requirements for a solution to the problem

**State Space:** Set of all possible states for a problem.

* not all states are reachable
* represented by sigma

**Move**: Transition from one state to another

**Operator(**= Operators**)** **:** A class of possible moves that may or may not be allowed in a given state.

* ex.: move pawn 2 steps forward.

**Partial Function:** A function that may not be defined for every element in its domain.

* in our case: not defined for every state in the state space.

**Operators represented as triples**

* **Name:** Name of the operator.
* **precondition function:** True/False, can you apply this operator in the current state.
* **state transformation function:** Perform the state transformation (the move)

**Problem Space:** State space () together with a set of operators () , defines a problem space ()

* defines relationships between states
* The same state space can be a part of multiple problem spaces
  + Let = Z+
  + = {add1}
  + = {add4, subtract3}

**Problem-Space Graphs:** lower case sigma = state space

* corresponding nodes in graph = s
* one to one mapping
* vertices = states
* Labeled graph
* Edges = pairs of vertices, labeled (info: which operator is responsible for this move)

**Tower of Hanoi Example Graph:**

* Because you can go back in a state (move from 1 to 2 and then from 2 to 1), the graph is undirected