



## AI & Problem Solving





### Problem formulation

- Suppose that the agent's sensors give it enough information to tell exactly which state it is in (i.e., the world is accessible);
- Suppose that it knows exactly what each of its actions does.
- Then it can calculate exactly which state it will be in after any sequence of actions





### Types of problems

- When the environment is completely accessible and the agent can calculate its state after any sequence of action, we call it a single-state problem.
- When the world is not fully accessible, the agent must reason about sets of states that it might get to, rather than single states. We call this a multiple-state problem.





# Components of a Well defined problems and solutions

- Data type
- Components:
- A Problem
- An Operator
- · The Goal Test function
- A Path Cost function





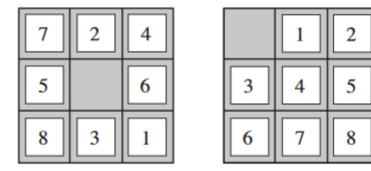
### Measuring problem solving Performance

The effectiveness of a search technique can be measured in at least three ways.

- 1) Does it find a solution?
- 2) Is it a good solution/low cost?
- 3) What is the search cost associated with the time and memory required to find a solution?







Start State

Goal State





#### Components of Agent

- States: A state description specifies the location of each of the eight tiles and the blank in one of the nine squares.
- Initial state: Any state can be designated as the initial state. Note that any given goal
  can be reached from exactly half of the possible initial states (Exercise 3.4).
- Actions: The simplest formulation defines the actions as movements of the blank space
   Left, Right, Up, or Down. Different subsets of these are possible depending on where
   the blank is.
- Transition model: Given a state and action, this returns the resulting state; for example, if we apply Left to the start state in Figure 3.4, the resulting state has the 5 and the blank switched.
- Goal test: This checks whether the state matches the goal configuration shown in Figure 3.4. (Other goal configurations are possible.)
- Path cost: Each step costs 1, so the path cost is the number of steps in the path.