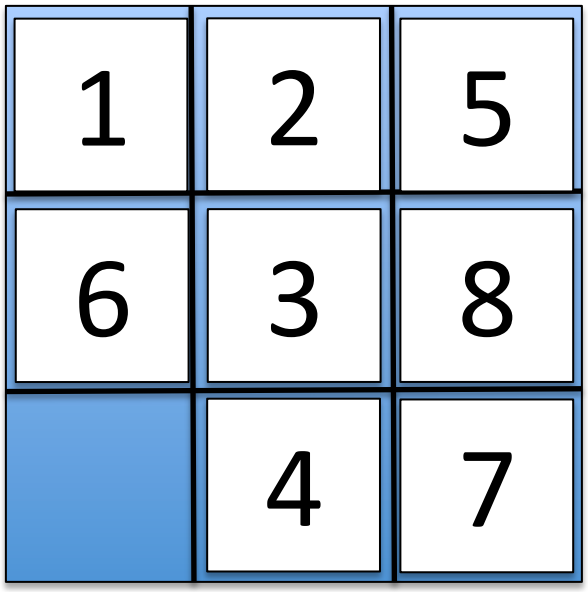
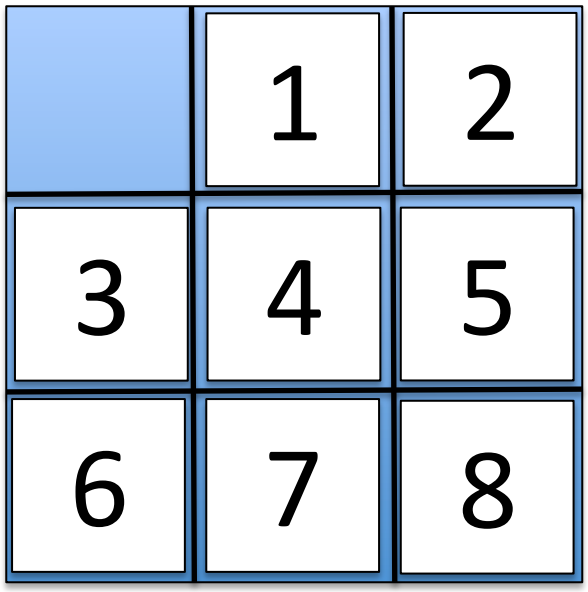
Exploring graphs

- Have seen examples of finding paths through graphs that represent physical networks
- Can also use graph search to explore changes to state of a physical system
  - Nodes represent states of system
  - Edges represent actions that cause a change of state
  - Want to find sequence of actions to convert system to desired state

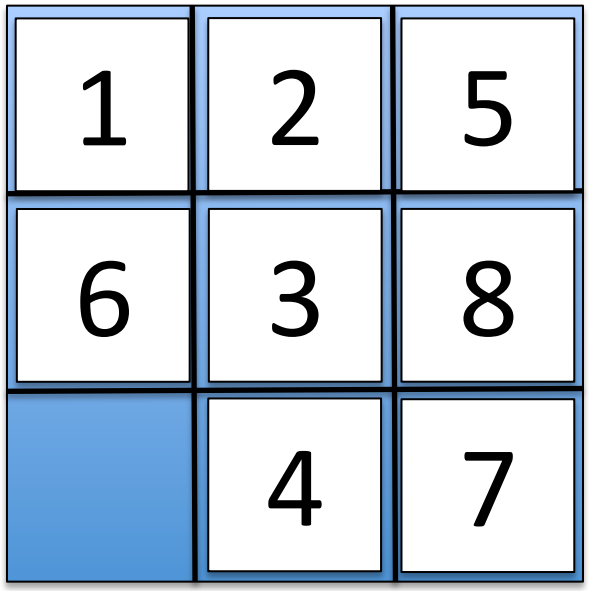
Solving the 8-puzzle



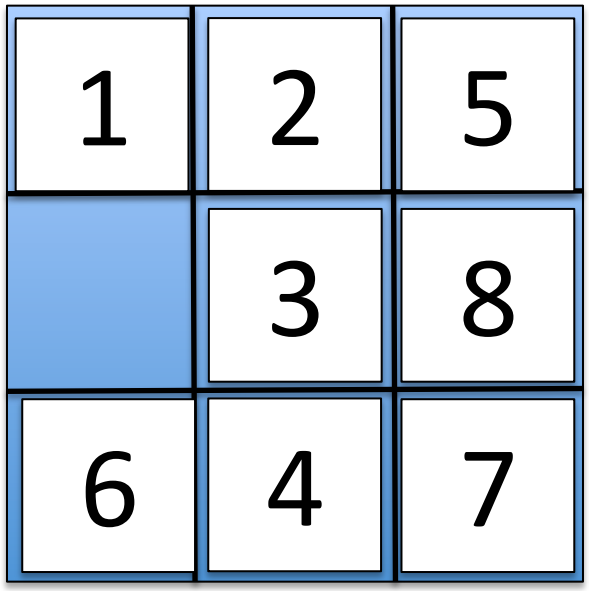


- Slide any tile into blank space
- Find sequence of slides to reach goal

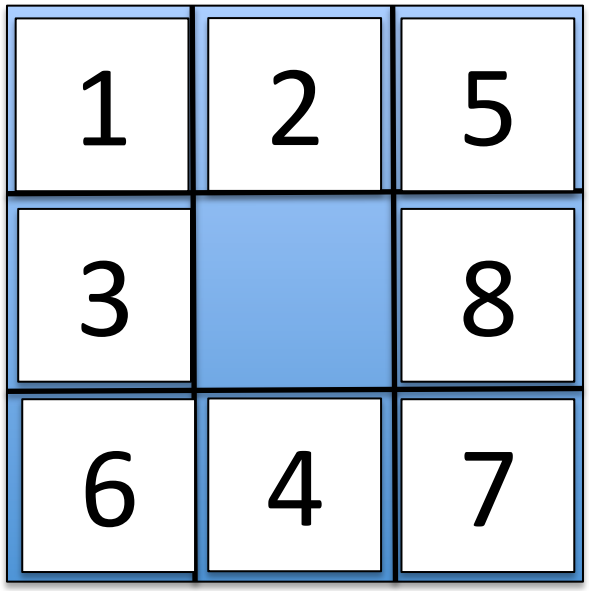
An example solution



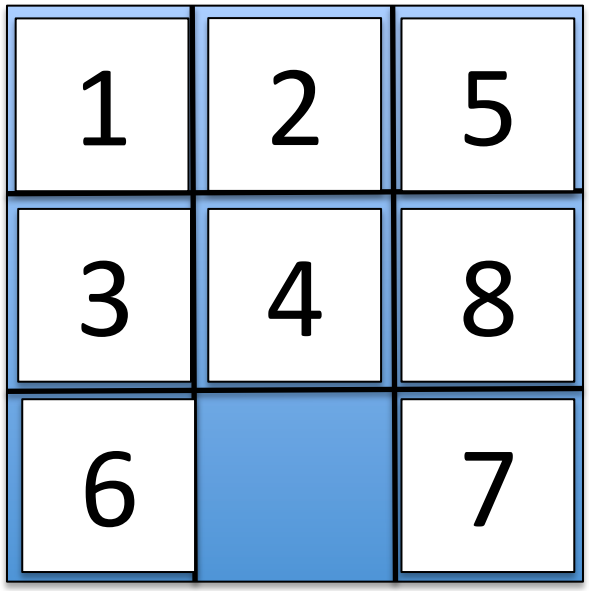
An example solution



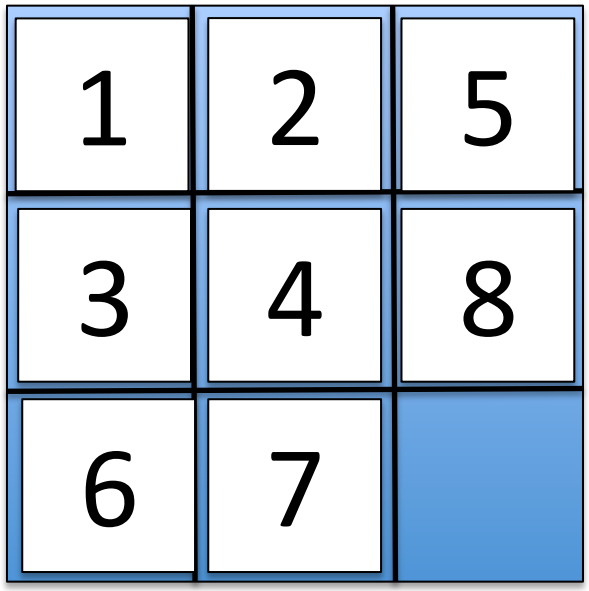
An example solution



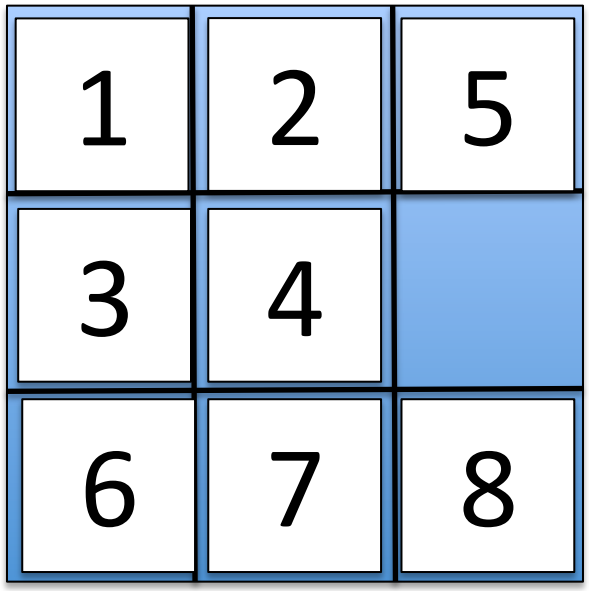
An example solution



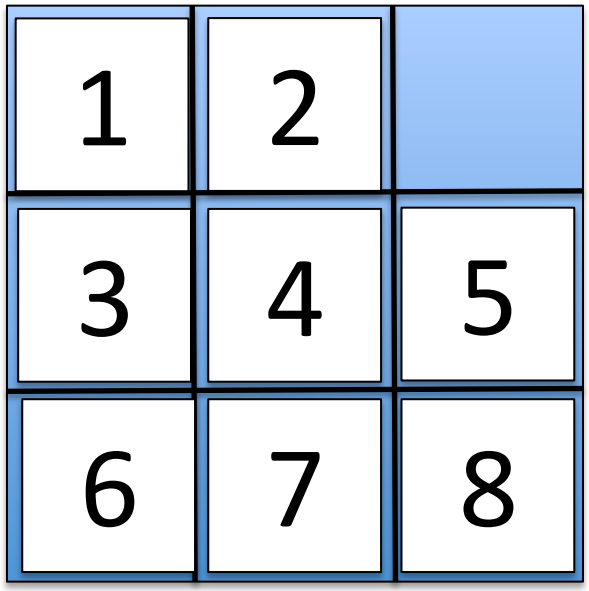
An example solution



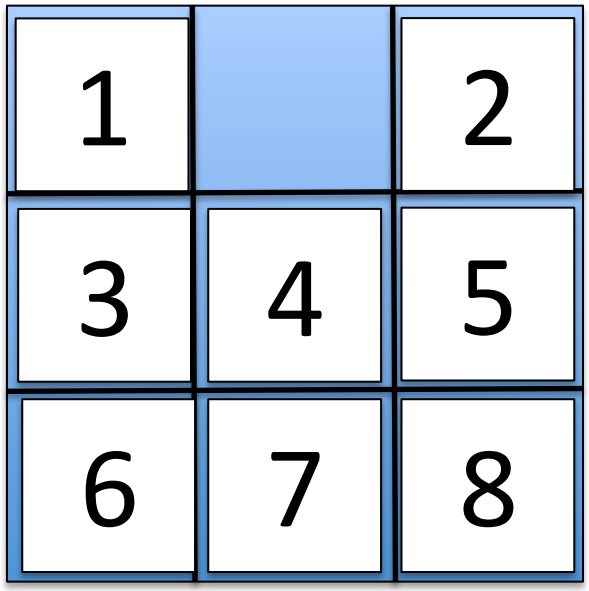
An example solution



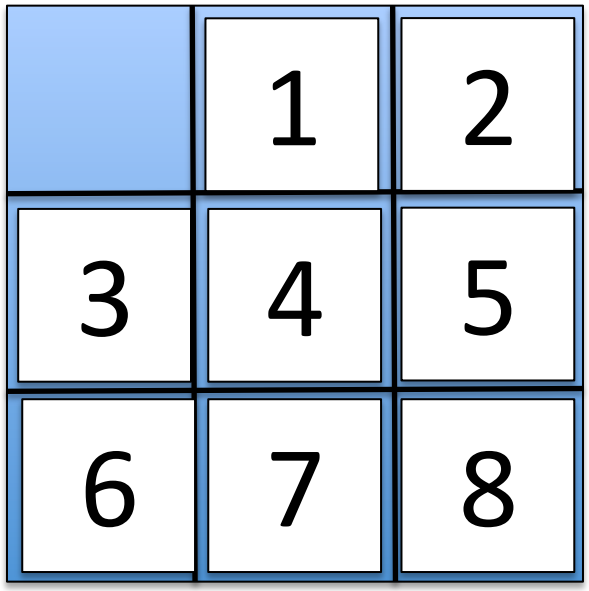
An example solution



An example solution



An example solution



How could we solve this?

- Each node in graph is a state of the puzzle
  - Specific layout of tiles in puzzle
- Each edge of the graph specifies which tile to slide to get to a new state of the puzzle
- Solution space is very large:
  - 9! or 362880 nodes
  - Each node has 2, 3, or 4 edges
  - Graph has almost 1 million edges
- Is there another way?