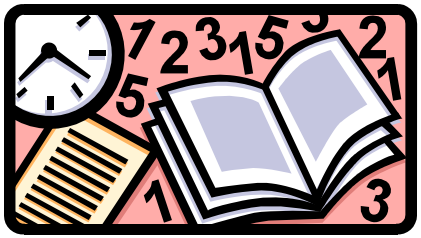
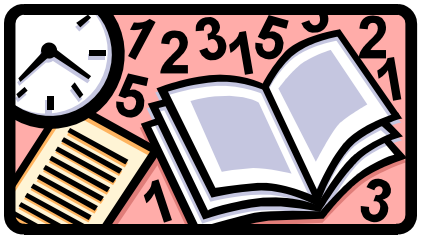
# AI Application Areas



- Neural Networks and Genetic Algorithms
  - These model the structure of neurons in the brain
  - Humans are good at interpreting noisy input. Neural networks can also handle noisy data because they use a large number of fine-grained units
  - Genetic algorithms contain genetic operator such as crossover and mutation

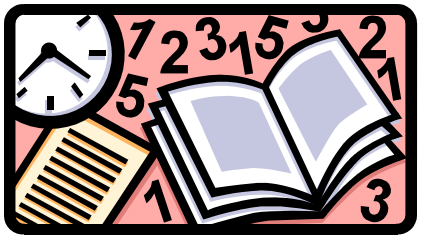
# Physical Symbol System Hypothesis



- Intelligence is achieved through:
  - Symbols to represent the problem domain
  - Operations on these symbols to generate solutions
  - Searching to select the most likely solution from this list

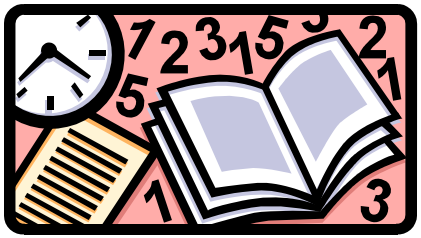
- These can be narrowed down to:
  - Knowledge representation
  - Search

# Knowledge Representation

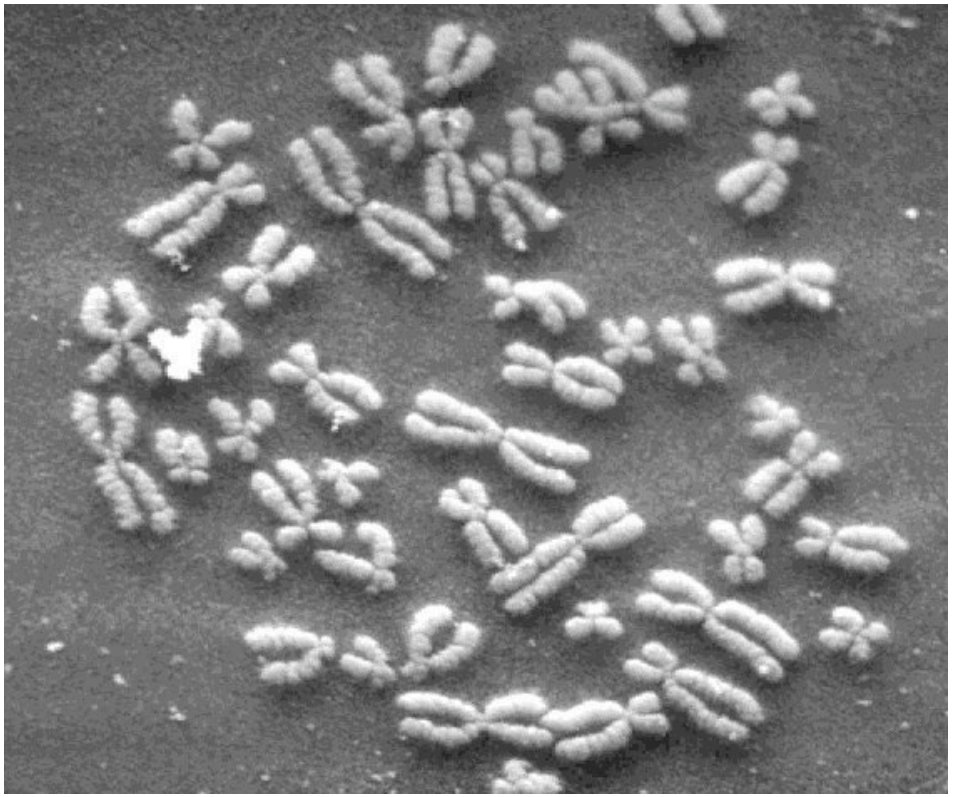


- Capture the essential features of a problem domain
- Provide the information to a problem-solving procedure
- Abstraction is important
- Expressiveness vs. efficiency
- The language should also be readable to humans

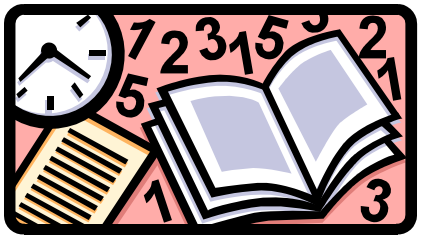
# What Representation



- It is important to select the most appropriate representation language for the problem



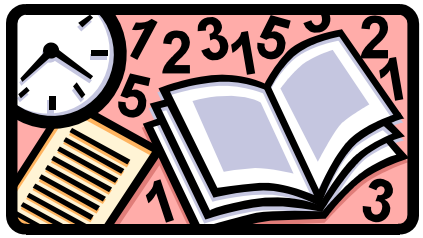
# Representation Schemes



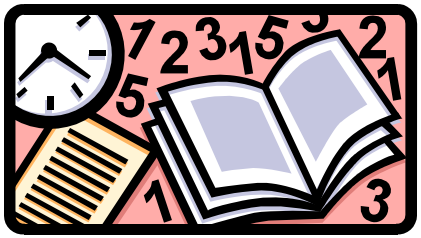
- These should:
  - Express all the necessary information
  - Resulting code should be executed efficiently
  - Be a natural scheme for describing the knowledge

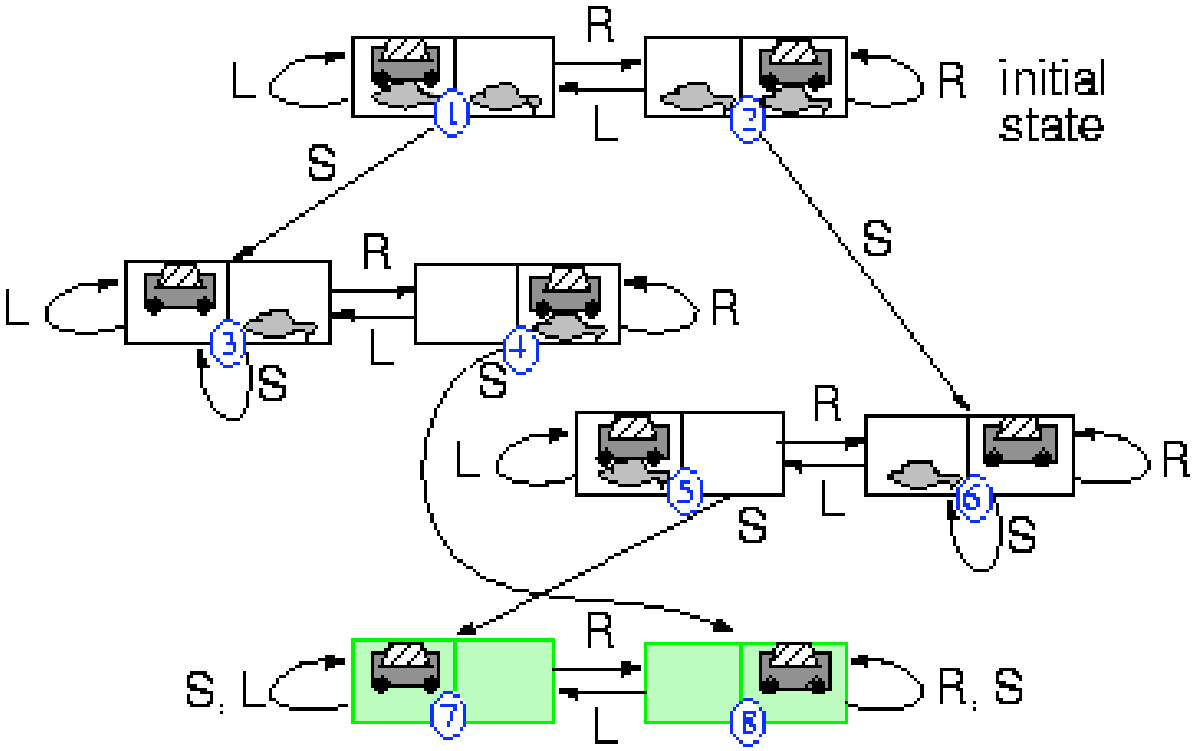
- AI problems tend to be qualitative not quantitative and use reasoning not calculation

# Handle Qualitative Knowledge

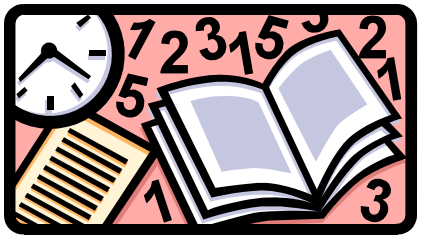


# Searching



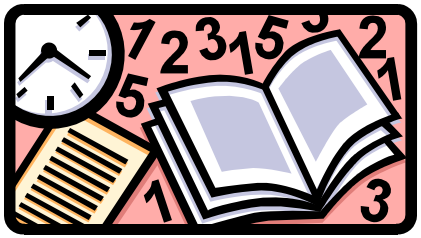


# Exhaustive Search



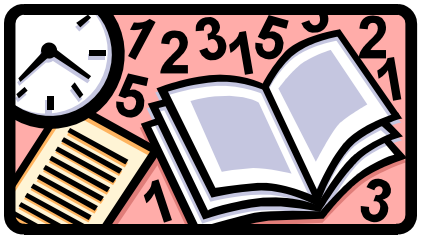
- Not possible for most problems
- Chess contains $10^{120}$ different board states
- Humans do not perform exhaustive searches
- Humans make decisions based on judgment rules
  - These are called heuristics

# Heuristic



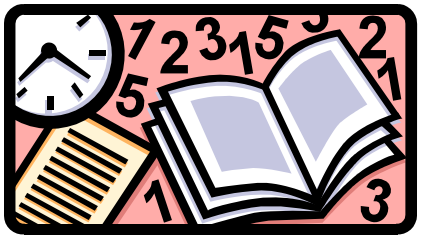
- A strategy for selectively searching a problem space
- Heuristics are not foolproof
  - But it should come close to a solution
- State space search formalizes the problem-solving process
- Heuristics infuse the formalism with intelligence

# Propositional Logic



- Symbols of propositional logic (calculus)
  - Propositional symbols:
    - P, Q, R, S, …
  - Truth symbols:
    - True, false
  - Connectives:
    - □ □ □ ≡

# Sentences



- Every propositional symbol and truth symbol is a sentence
- The negation of a sentence is a sentence
- The conjunction of a sentence is a sentence
- The disjunction of a sentence is a sentence
- The implication of one sentence from another is a sentence
- The equivalence of two sentences is a sentence