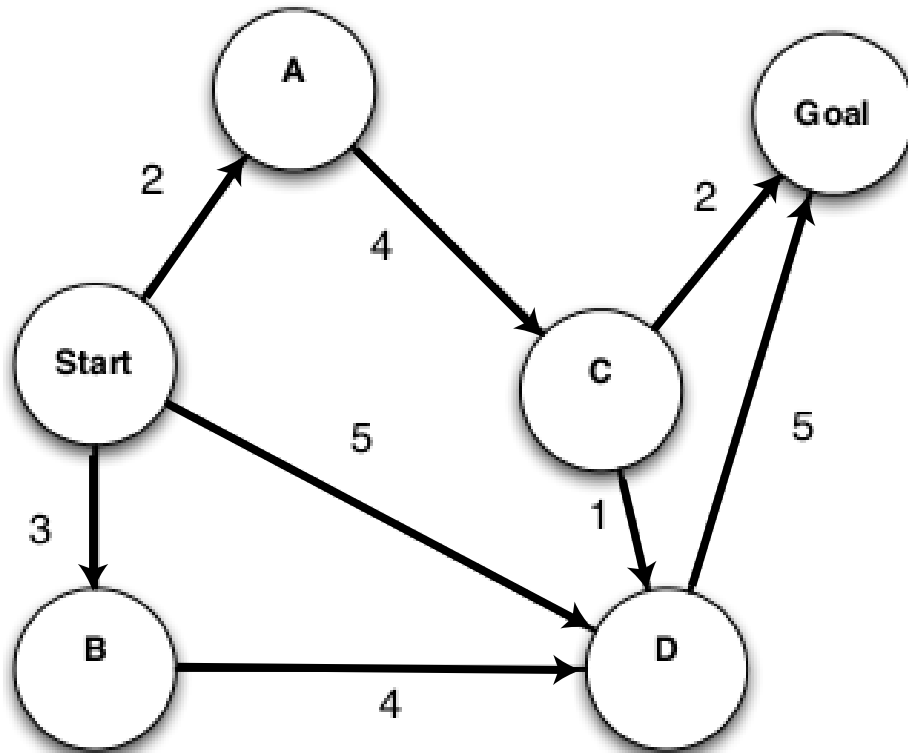# 1   Search Algorithms in Action (Uninformed Search Review)

For each of the following graph search strategies, work out the order in which states are expanded, as well as the path returned by graph search. In all cases, assume ties resolve in such a way that states with earlier alphabetical order are expanded first. Remember that in graph search, a state is expanded only once.

a)   Depth-first search.
States Expanded: Start, A, C, D, Goal
Path Returned: Start-A-C-D-Goal

b)   Breadth-first search.
States Expanded: Start, A, B, D, C, Goal
Path Returned: Start-D-Goal

c)   Uniform cost search.

States Expanded: Start, A, B, D, C, Goal
Path Returned: Start-A-C-Goal

Note that for States Expanded, including or not including the Goal node is valid. This is a small detail based on implementation.

2 Agents and Environments

(a) Below is a list of task environments. For each of the sub-parts, choose all the environments in the list that falls into the specified type.

A: The competitive rock-paper-scissors game

B: The classical Pacman game (with ghosts following a fixed path)

C: Solving a crossword puzzle

D: A robot that removes defective cookies from a cookie conveyor belt

  (i) Which of the environments can be formulated as *single-agent*? ☐ A ■ B ■ C ■ D

 (ii) Which of the environments are *static*? ☐ A ☐ B ■ C ☐ D

(iii) Which of the environments are *discrete*? ■ A ■ B ■ C ☐ D

An environment cannot be formulated as a single-agent environment when the other agent's actions can depend on our own choices. An environment is static when the performance measure is invariant to changes in the agent's deliberation time. An environment is discrete when percepts, actions, and states can reasonably be modeled as belonging to a countable set; it would not be reasonable to model a robot's video input as belonging to a countable set, and its actions are effectively continuous.

(b) **(i)** ○ T ● F   Reflex agents cannot be rational.

     (ii) ● T ○ F   There exist task environments in which no pure reflex agent can behave rationally.