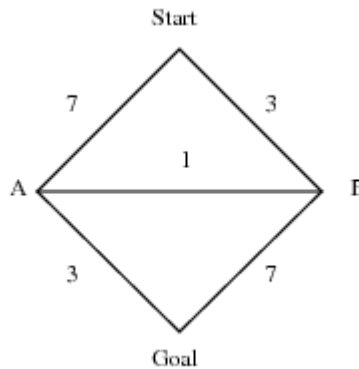


# Exam Artificial Intelligence 09-06-01

You may use a dictionary. You can answer in either English or Swedish

## 1. Algorithm A and A\*



In algorithm A, we have  $f(n) = g(n) + h(n)$ , where  $h(n)$  is the estimated distance from node  $n$  to the goal. The picture above shows the real distances between the nodes. Give values to  $h(A)$  and  $h(B)$ , so the function  $f(n)$  is

- a) optimistic and monotone
- b) optimistic but not monotone
- c) not optimistic but monotone
- d) not optimistic and not monotone

If some case isn't possible explain why.

- e) What does it mean *for the search process* if  $f(n)$  is monotone and/or optimistic?

## 2. Planning

- a) Explain briefly what we need to model/define/describe in order to solve a *planning problem*.
- b) Explain what the *frame problem* is in the context of planning.
- c) How does STRIPS handle the frame problem?

## 3. Expert systems

- a) What three roles are identified in relation to expert systems?
- b) What functions should an expert system have?
- c) Describe briefly the advantages and disadvantages of Certainty Factors compared to pure statistics (using Bayes' rule) in expert systems. If you can, discuss them for each of the roles of question a).

## 4. Learning

Explain the concept and give a *concrete* example, of

- a) *supervised learning*,
- b) *unsupervised learning* and
- c) *reinforcement learning*.

## 5. Natural Language

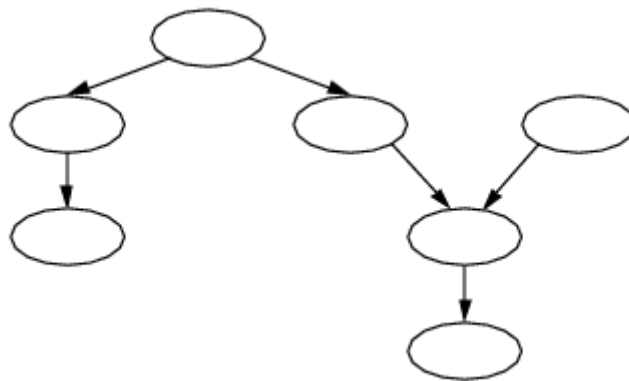
Suppose we have the following context free grammar:

S → NP VP	N → John
NP → N PP	N → Bill
NP → N	N → a telescope
VP → V NP PP	V → saw
VP → V NP	P → with
VP → V PP	
VP → V	
PP → P NP	

The sentence "John saw Bill with a telescope." could then be parsed in more than one way. Draw the parse trees and *explain how they could be interpreted*.

## 6. Bayesian network

Suppose we have the following skeleton of a Bayesian network:



a) Put the following concepts of a car's electrical system into the nodes above:

Battery	Music
Gas	Radio
Ignition	Starts
Moves	

b) Discuss how information influences the probabilities if we learn in turn:

The car doesn't move  
We hear music

Good Luck!  
Roland & Mats