2

Which of the following definitions of Intelligence and Artificial Intelligence is NOT mentioned in our lectures?
(3 Points)

- The ability to learn and solve problems
- The intelligence exhibited by machines or software
- The branch of Computer Science dealing with the creation of autonomous systems that are good at solving hard problems better than humans ✓
- The science and engineering of making intelligent machines
- The study and design of intelligent agents, which can perceive its environment and take actions that maximize its chances of success

3

As an engineer and AI student, which school of thought you should be interested in?
(3 Points)

- Thinking Rationally
- Acting Rationally ✓
- Thinking Humanly
- Acting Humanly
- Thinking Randomly

4

The term Artificial Intelligence was coined by _____ at Dartmouth meeting in 1956.
(3 Points)

- Alan Turing
- Claude Shannon
- Dean Edmonds
- John McCarthy ✓
- Walter Pitts

5

Which one of the following disciplines have contributed, and mentioned as the foundation of AI?
(3 Points)

- Physics
- Economics ✓
- English Literature
- Machine Learning
- Deep Learning

6

Which of the following is NOT an AI application mentioned in our lectures?
(3 Points)

- Speech/Handwriting Recognition
- Recommendation Systems
- Machine Translation
- Interstellar Transportation ✓
- Sentiment Analysis

7

Which of the following is the definition of an AI agent mentioned in our lectures?
(3 Points)

- Anything that perceives its environment through actuators and acting upon its environment through sensors
- Anything that perceives its environment through sensors and acting upon its environment through actuators ✓
- Anything that perceives its environment through sensors
- Anything that is operated by machine learning algorithms
- Anything that acts upon its environment through actuators

8

Which one of the following agents deals with degree of happiness?
(3 Points)

- Model-based reflex agent
- Learning agent
- Utility-based agent ✓
- Goal-based agent
- Simple reflex agent

9

Consider the following robotic agent Rob: Rob's job is to find the exit from any given room. Rob has cameras that allow it to "see" the objects in front of it. Rob has wheels that enable it to move in different directions. Rob also has arms with which it can try to move objects out of its way. What type of agent is Rob?
(3 Points)

- Model-based reflex agent
- Learning agent
- Utility-based agent
- Goal-based agent ✓
- Simple reflex agent

10

Consider graph search algorithms for some search space. Suppose the branching factor b is finite, the shallowest goal is at finite depth d, and step costs are finite, greater than some small positive constant, but not necessarily all equal. Which one of the following is true?
(3 Points)

- Depth-First Search is optimal
- Depth-Limited Search (limit > d) is optimal
- Iterative-Deepening Search is optimal
- Breadth-First Search is optimal
- Uniform-Cost Search is optimal ✓

11

Consider a graph search problem where for every action, the cost is at least ϵ, with $\epsilon > 0$. Assume the used heuristic is consistent. Which one of the following is true?
(3 Points)

- Depth-first graph search is guaranteed to return an optimal solution
- Breadth-first graph search is guaranteed to return an optimal solution
- Greedy graph search is guaranteed to return an optimal solution
- A* graph search is guaranteed to return an optimal solution ✓
- A* graph search is guaranteed to expand no more nodes than depth-first graph search

12

Choose the WRONG phrase that can complete the following sentence.
In zero-sum games _____.
(3 Points)

- agents take turns
- there is pure competition between the agents
- one agent maximizes one single value, while the other minimizes it
- each move in the game by one of the players is called a ply
- there are more than one objective functions ✓

13

Comparing Expectiminimax to Minimax, which of the following is WRONG?
(3 Points)

- Expectiminimax changes Minimax to handle randomness (e.g., throwing a dice, or shuffling cards) in the search
- Expectiminimax solves deterministic games, whereas Minimax is for stochastic games ✓
- Expectiminimax generalizes Minimax to handle chance nodes
- For a chance node Expectiminimax returns the average value of its successors
- For a non-chance node, Expectiminimax returns the highest of its successors for MAX and the lowest for MIN

14

Which of the following is a criterion used to compare search algorithms?
(3 Points)

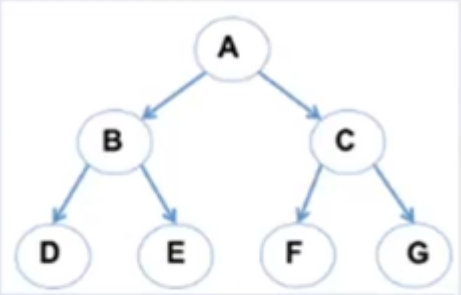
- Time complexity
- Space complexity
- Completeness
- Optimality
- All of the options. ✓

15

Check the WRONG statements which compare BFS vs. DFS.
(3 Points)

- [ ] DFS and BFS use a similar amount of space ✓
- [ ] DFS uses less space than BFS
- [ ] For finite state spaces, both have exponential time

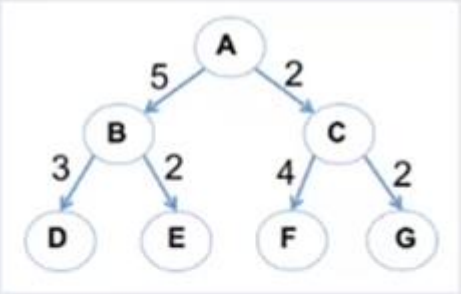
16



Using BFS, choose the correct order in which the nodes are visited (visit from left to right).
(3 Points)

- A, B, C, D, F, E, G
- A, B, D, C, E, F, G
- A, B, C, D, E, F, G ✓
- A, B, D, E, C, F, G
- A, B, D, C, F, E, G

17



Using UCS, choose the correct order in which the nodes are visited.
(3 Points)

- A, B, C, D, F, E, G
- A, C, G, B, F, E, D ✓
- A, B, G, D, C, F, E
- A, C, G, B, E, D, F
- A, B, E, D, C, G, F

18

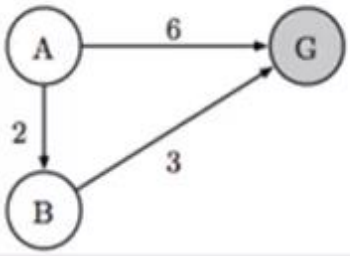
Which of the following statements is correct in comparing BFS vs. IDS for tree search?
(3 Points)

- BFS uses less space than IDS
- BFS uses more space than IDS ✓
- BFS and IDS use the same space
- BFS repeats searching already explored nodes, IDS does not.
- Both of them are based on DFS.

19

Consider the search problem given in the figure. It has only three states and three directed edges. A is the start node and G is the goal node. To the right, four different heuristic functions are defined, numbered I through IV.

Which of these heuristic functions is NOT admissible?
(3 Points)



	h(A)	h(B)	h(G)
I	4	1	0
II	5	4	0
III	4	3	0
IV	5	2	0

- I
- II ✓
- III
- IV

20

Which of the following are AI?
(Choose all that apply.)
(3 Points)

- [ ] Spreadsheet that calculates sums and other pre-defined functions on given data
- [ ] A music recommendation system such as Spotify that suggests music based on the users' listening behavior ✓
- [ ] Big data storage solutions that can store huge amounts of data (such as images or video) and stream them to many users at the same time

21

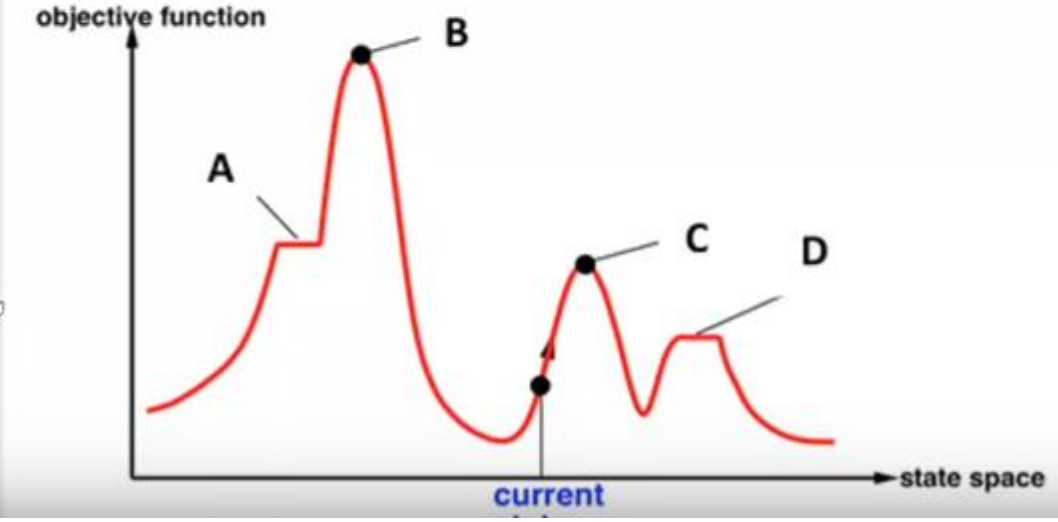
A search algorithm is called complete if it _____.
(3 Points)

- ○ always finds a solution if one exists ✓
- ○ keeps searching for a better solution once a solution is found
- ○ visits all nodes in the state space
- ○ finds the best solution
- ○ is space-efficient

22

The figure shows the State-Space Landscape for local search where we have on the x-axis the "location" defined by the state, and on the y-axis, the "elevation" defined by the objective function.

What is the corresponding name of the local search elements represented by letters on the figure?
(3 Points)

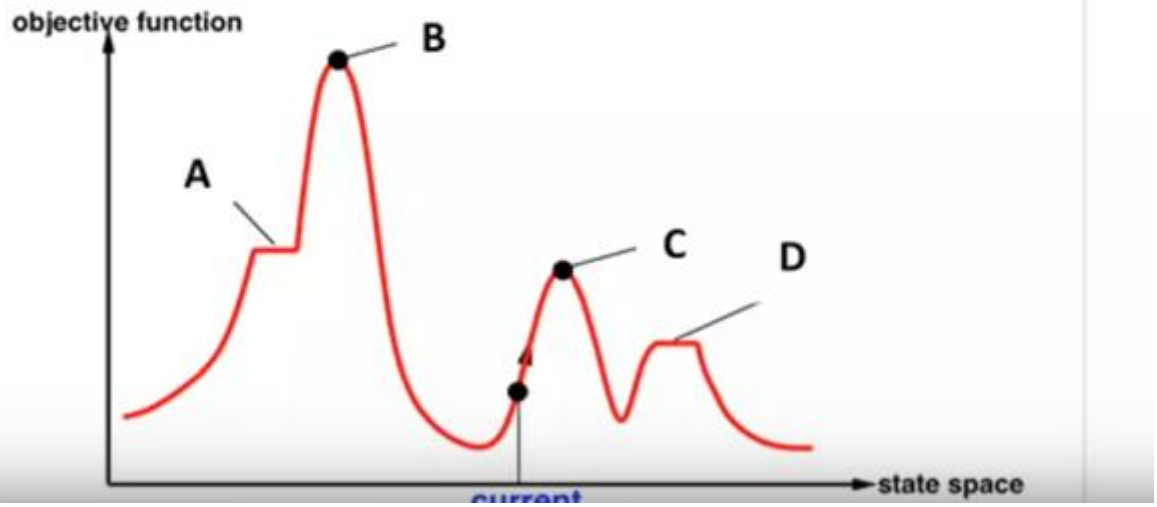


A: Shoulder B: Global Maximum C: Local Maximum D: Flat Local Maximum ✓

23

The figure shows the State-Space Landscape for local search where we have on the x-axis the "location" defined by the state, and on the y-axis, the "elevation" defined by the objective function.

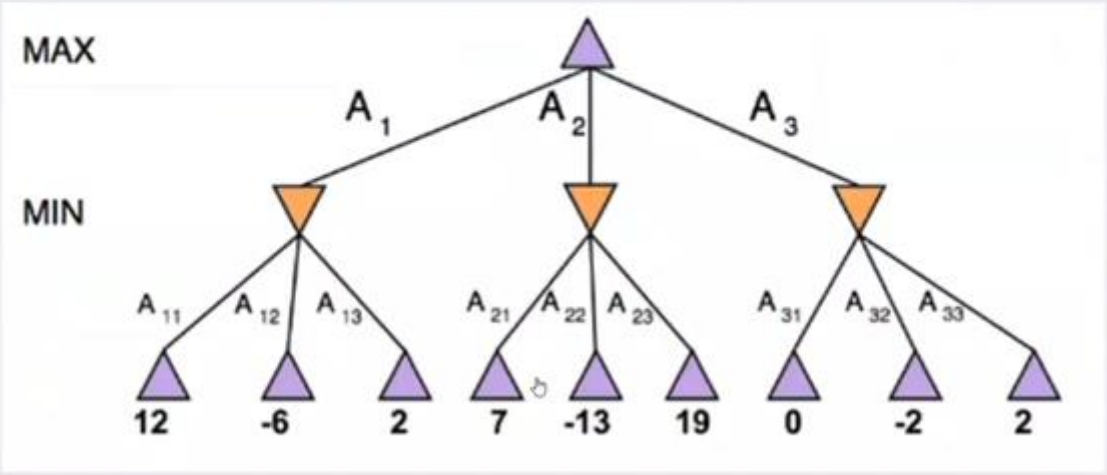
Since y-function is an objective function, what is the goal of the search?
(3 Points)



- Finding the global maximum
- Finding the local maximum
- Finding the global minimum
- Finding the local minimum
- Given information is not enough to answer ✓

24

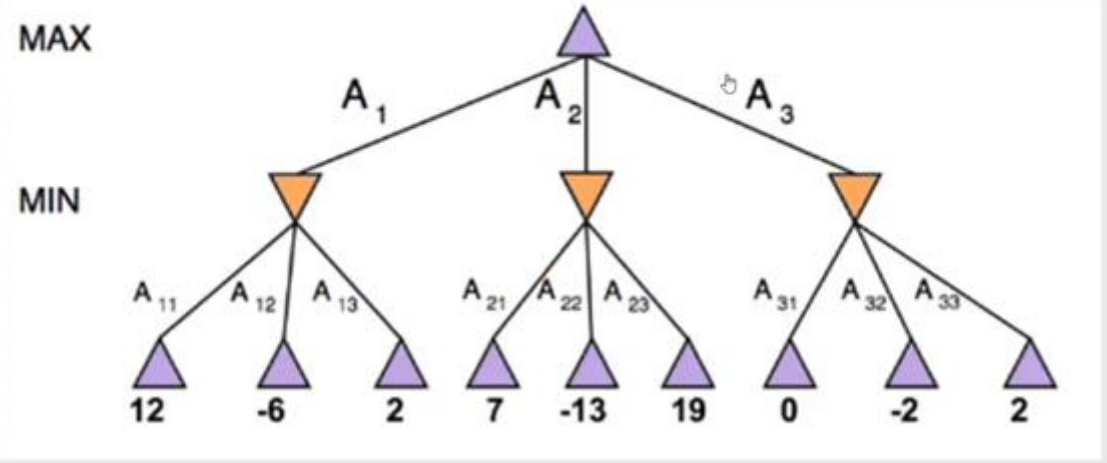
Using minimax, which of the three possible moves should MAX take at the root node?
(3 Points)



A3

25

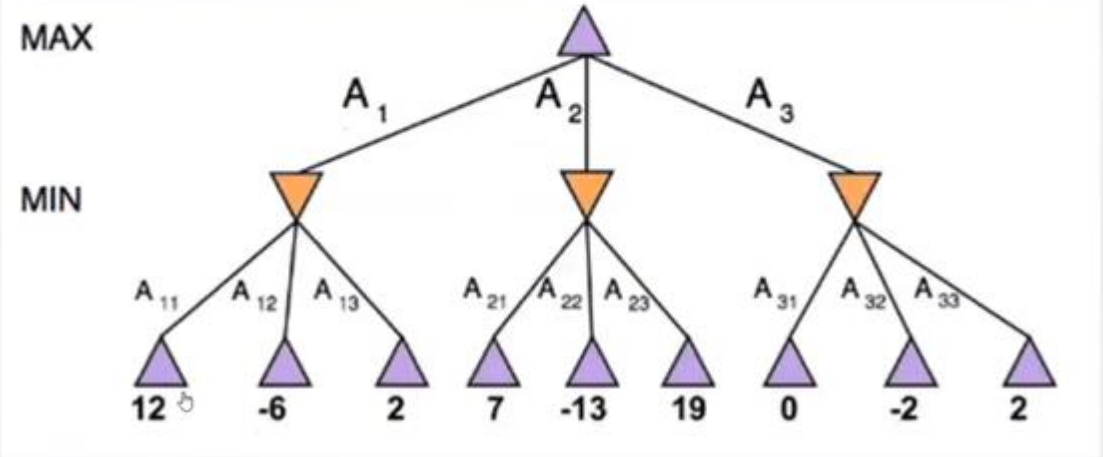
Using minimax, what is the value of MAX at the root?
(3 Points)



-2

26

Using minimax with alpha-beta pruning, what branches are pruned? (Check all that apply)
(6 Points)



A23

27

Suppose that you are using a Genetic Algorithm. Two individuals (i.e., candidate solutions) in the current generation are given by 8-digit sequences as: [1 4 6 2 5 7 2 3] and [8 5 3 4 6 7 6 1].

Which of the following is a possible result of performing a 1-point crossover with a cross-point between the third and fourth digits, and then mutation on a single digit?
(6 Points)

- [1 4 6 4 6 3 6 1] ✓
- [1 4 6 4 6 7 6 1]
- [8 5 3 2 5 7 2 3]
- [8 5 9 2 5 6 2 3]
- [1 4 6 2 6 3 6 1]

28

If we define success in terms of an agent's opinion of its own performance, an agent could achieve perfect rationality simply by deluding itself that its performance was perfect.
(1 Point)

- True ✓
- False

29

Episodic environments are much simpler than sequential environments because the agent does not need to think ahead.
(1 Point)

- True ✓
- False

30

In the taxi-driving environment, avoiding collisions maximizes the performance measure of all agents, and only one car can occupy a parking space, so it is a partially competitive multiagent environment.
(1 Point)

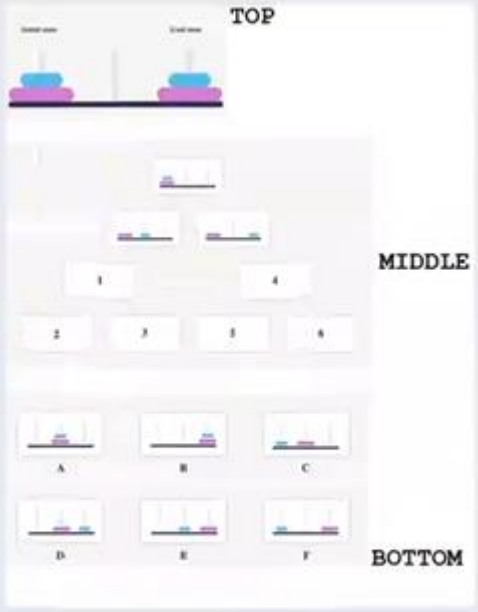
- True
- False ✓

31

Dynamic environments are easy to deal with because the agent need not keep looking at the world while it is deciding on an action.
(1 Point)

- True
- False ✓

32



The Towers of Hanoi: This puzzle involves three pegs, and two discs (one large, and one small).

The Towers of Hanoi: This puzzle involves three pegs, and two discs (one large, and one small). The top figure shows the initial state and the goal state. In the initial state, both discs are stacked in the first (leftmost) peg. The goal is to move the discs to the third peg. You can move one disc at a time, from any peg to another, if there is no other disc on top of it. It is not allowed to put a larger disc on top of a smaller disc.

The middle figure shows the overall structure of the state diagram and the positions of the first three states. You need to complete the state diagram by placing the remaining states at the bottom figure in the correct places.

(Note that the transitions are again symmetric and you can also move sideways (left or right) or up in the diagram.)

Write your answer for boxes 1 to 6 with CAPITAL LETTERS and without spaces, as in the following format:
ABCDEF
(12 Points)

Enter your answer

Correct answers: EBFDCA,EFBDCA,EBFDAC,EFBDAC