1. For what project was the STRIPS planner originally created?

2. Consider a blocks world with \( N \) blocks. How many \( \text{On}(x, y) \) propositions are there?

3. PDDL uses database semantics. Name the two consequences of this.

4. What is Herbrand’s theorem?

5. Given a KB, prove \( A \) using refutation.

6. What search strategy does Prolog use?

7. What is a Horn clause?

8. Translate \( \forall x, \text{IsBlue}(x) \) into a FOL sentence containing an existential.

9. What are the two basic types of state-space search for use in planning?

10. Describe a planning heuristic that makes use of the problem structure encoded in a PDDL problem.

11. What properties must PDDL goals, preconditions, and effects have?

12. Describe a simple way in which a graph plan can be used as a heuristic for forward search.

13. In a planning problem with \( N \) propositions, how many literals might graphplan have to consider?

14. Why will Extract-Solutions sometimes fail?

15. Convert to CNF: \( A \land (B \lor C) \land (\neg D \Rightarrow E) \).

16. What do we mean when we say that FOL is semi-decidable?

17. What conditions give rise to mutexes between actions?

18. Why do we skolemize existential quantifiers rather than create a disjunction over all possible objects?

19. \( Y = 3x + 4, \sigma_x = 5 \). What is \( \sigma_y \)?

20. Given a Markov random field, how do we determine whether two variables are conditionally independent given the third?

21. What type of classifier creates a better classifier from many “dumb” classifiers?

22. Write the joint distribution for this MRF.

23. Likelihood weighting addresses which shortcoming of rejection sampling?

24. Moralize the alarm world.
25. What is the expected amount of information received when you find out whether your lottery ticket won? (assume odds of winning are 1 in $2^{32}$).

26. Why is k usually odd in kNN classifiers?

27. EKF. Suppose our state vector is N dimensional and our observation is Z dimensional. What is the cost of an observation step?

28. Why do EKFs become overconfident with non-linear systems?

29. Why is a covariance matrix always symmetric?

30. In a decision process, what does it mean for an agent to have a gamma of 1?

31. Which is more expensive (and why): value iteration or policy iteration?

32. What class of function can a single layer neural network using perceptrons express?

33. As gamma grows larger, what happens to the convergence rate of value iteration and why?

34. How does a typical human’s utility function resolve the St. Petersburg paradox?

35. What role does the learning rate play in perceptron learning?

36. An EKF propagation step is implemented using what technique?

37. If a robot observes a landmark for the first time, and adds it to the state vector, is this handled by a propagation step or an observation step?

38. In a decision process, what does it mean for an agent to have a gamma of 0?

39. T/F: For any combinational circuit, there is a network of perceptrons that computes the same function.

40. What type of classifier produces a “maximum margin” separator?

41. Name a data structure that can be used to accelerate kNN queries.

42. In adaboost, how are the weights adjusted for each training example?

43. Adaboost is a member of what family of classifiers?