CSE 486/586, Assignment 2

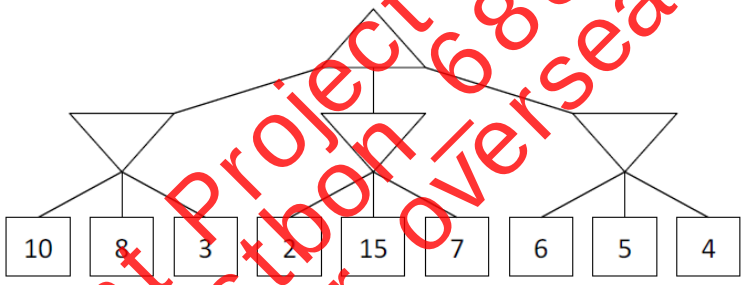
Due: Tuesday, July 30, 2024, by 11:59 pm.

Note 1: The total mark for this assignment is **30**. You should *NOT* directly copy anything from slides or other resources. You may get the ideas from slides but what you submit *must be in your own words*. Any help must be acknowledged.

Note 2: Questions 6 and 7 are optional but you are strongly encouraged to work on this kind of problems (extra credit!).

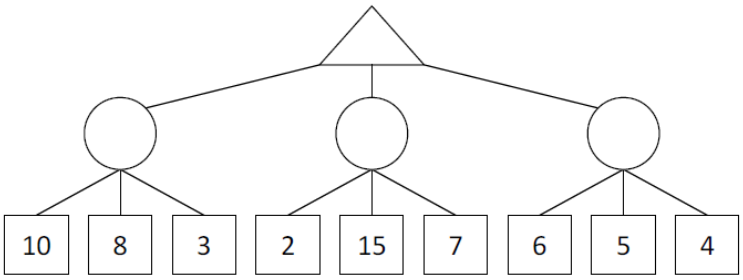
1. Implement the min-conflicts for the 8-queens problem (assume that there is exactly one queen in each column and each row). (**6 points**)

2. a) Consider the zero-sum game tree shown below. Triangles that point up, such as at the top node (root), represent choices for the maximizing player; triangles that point down represent choices for the minimizing player. Assuming both players act optimally, fill in the minimax value of each node. (**4 points**)



b) Which nodes can be pruned from the game tree above through alpha-beta pruning? If no nodes can be pruned, explain why not. Assume the search goes from left to right; when choosing which child to visit first, choose the left-most unvisited child. (**2 points**)

3. a) Again, consider the same zero-sum game tree, except that now, instead of a minimizing player, we have a chance node that will select one of the three values uniformly at random. Fill in the expectiminimax value of each node. The game tree is redrawn below for your convenience. (**4 points**)



b) Which nodes can be pruned from the game tree above through alpha-beta pruning? If no nodes can be pruned, explain why not. (**2 points**)

4. After your yearly checkup, the doctor has bad news and good news. The bad news is that you tested positive for a serious disease and that the test is 99% accurate. The good news is that this is a rare disease, striking only 1 in 10,000 people of your age. What are the chances that you actually have the disease? (**6 points**)

5. Explain in detail how can we construct a general and powerful spam filter using Naive Bayes Classifiers. Write your solution mathematically as discussed in class. (**6 points**)

6. Implement the above spam filter. (**Optional problem, 3 EXTRA credits, show me your code in an online office hours by the end of semester.**)

7. Design an AI that plays chess using the minimax algorithm and alpha-beta pruning. (**Optional problem, 3 EXTRA credits, show me your code in an online office hours by the end of semester.**)