This handout includes space for every question that requires a written response. Please feel free to use it to handwrite your solutions (legibly, please). If you choose to typeset your solutions, the `README.md` for this assignment includes instructions to regenerate this handout with your typeset LATEX solutions.

1.a

$$V_{minimax}(s, d) = \begin{cases} Utility(s) & \text{if IsEnd(s)} \\ Eval(s) & \text{if d} = 0 \\ max_{a \in Actions(s)} V_{minmax}(Succ(s, a), d) & \text{if Player(s)} == \text{agent, i.e. index=0} \\ min_{a \in Actions(s)} V_{minmax}(Succ(s, a), d) & \text{if Player(s)} == ghost_i \text{ and } i < numGhosts \\ min_{a \in Actions(s)} V_{minmax}(Succ(s, a), d - 1) & \text{if Player(s)} == ghost_i \text{ and } i = numGhosts \end{cases}$$

3.a

$$V_{expectimax}(s, d) = \begin{cases} Utility(s) & \text{if IsEnd(s)} \\ Eval(s) & \text{if d} = 0 \\ max_{a \in Actions(s)} V_{expectimax}(Succ(s, a), d) & \text{if Player(s)} == \text{agent, i.e. index=0} \\ mean_{a \in Actions(s)}(Succ(s, a), d) & \text{if Player(s)} == ghost_i \text{ and } i < numGhosts \\ & \text{and } \mathbf{card}(Actions(s)) > 0 \\ mean_{a \in Actions(s)} V_{expectimax}(Succ(s, a), d - 1) & \text{if Player(s)} == ghost_i \text{ and } i = numGhosts \\ & \text{and } \mathbf{card}(Actions(s)) > 0 \end{cases}$$

Note, in the above formulas if the set of actions $Action(s)$ is empty the the $mean$ function should return 0.