2. In this question we will test the new ghostAgent with different pacman agents. In your assignment you were asked to complete a Minimax pacman a version of Expectimax for pacman was provided. If you have not completed the assignment just use the provided expectimax version.

We will perform some experiments to compare the performance of pacman against different types of ghost agent:

1.a random (not smart) ghost vs a pacman that assumes optimal play from ghosts (ie minimax pacman).

2.a smart (minmax) ghost vs a pacman that assumes optimal play from ghosts

3.random ghosts vs pacman that assumes ghosts may not always do an optimal move

4.smart (minimax) ghosts vs pacman that assumes that ghosts may do suboptimal moves.

This will result in a table similar to the following:

	Adversarial ghost depth = 2	Random ghost
Minimax pacman Depth = 4	Won: 3/5 Avg.score: 669	Won: 4/5 Avg.score: 871.2
Expectimax pacman Depth = 3	Won: 0/5 Avg.score: -294.6	Won: 1/5 Avg.score: -407.6

3. Describe the performance (in terms of the distribution) of Pacman in each case.

Case 1: A random (not smart) ghost vs a pacman that assumes optimal play from ghosts (ie minimax pacman):

The pacman tend to eat food and be far away from the ghosts, while the ghosts do not pursue and capture the pacman. However, since the ghosts are not smart, they cannot find the best solution of movement. So the smart pacman sometimes cannot make the most effective choice of movement.

Case 2: A smart (minmax) ghost vs a pacman that assumes optimal play from ghosts

While the ghosts are smart, they tend to find the best choice of every single movement, so the smart pacman are able to predict the choices of ghosts. The pacman could get more scores .

Case 3: random ghosts vs pacman that assumes ghosts may not always do an optimal move

In this cases, the ghosts are unpredictable and the pacman does not always make the optimal move. However, generally speaking, the pacman can keep distances between ghosts but the distances tend to be shorter.

Case 4: smart (minimax) ghosts vs pacman that assumes that ghosts may do suboptimal moves.

The ghosts tend to catch the pacman but cannot always find the optimal choice, since the pacman not always do an optimal move.

In which cases is the Pacman agent implementing the correct assumption of the ghosts behavior?

In the case 2, the Pacman agent implementing the correct assumption of the ghosts behavior. Since only in this case, theoretically speaking, the ghosts always do an optimal movement and the pacman always assume that the ghost do optimal movements. So the pacman is able to predict the movement of the ghosts with a higher depth.

4. Describe why the ghosts seem as if they are cooperating when using minimax even though they are not sharing information with each other.

Although the ghosts do not share information, in the minimax method, every ghost is tend to minimalize the maxima of the scores of the choices of pacman. In another word, they have the same aim and use same strategy. So both of their movement will have similar tendency, which makes them seem as if they are cooperating.