Prac4

2.

a) Random Ghost vs Minimax Pacman

```
E:\python_code\prac4_Pacman>python2 pacman.py -p MinimaxAgent -g RandomGhost -q -n 5
Pacman died! Score: -322
Pacman died! Score: -227
Pacman died! Score: 320
Pacman died! Score: 117
Pacman died! Score: 112
Average Score: 0.0
Scores:        -322.0, -227.0, 320.0, 117.0, 112.0
Win Rate:      0/5 (0.00)
Record:        Loss, Loss, Loss, Loss, Loss
```

b) Minimax Ghost vs Minimax Pacman

```
E:\python_code\prac4_Pacman>python2 pacman.py -p MinimaxAgent -g MinimaxGhost -q -n 5
Pacman died! Score: -501
Pacman died! Score: -1234
Pacman died! Score: -973
Pacman died! Score: -287
Pacman died! Score: 310
Average Score: -537.0
Scores:        -501.0, -1234.0, -973.0, -287.0, 310.0
Win Rate:      0/5 (0.00)
Record:        Loss, Loss, Loss, Loss, Loss
```

c) Random Ghost vs Expectimax Pacman

```
E:\python_code\prac4_Pacman>python2 pacman.py -p ExpectimaxAgent -g RandomGhost -q -n 5
Pacman emerges victorious! Score: 1524
Pacman died! Score: -1228
Pacman died! Score: -480
Pacman emerges victorious! Score: 551
Pacman died! Score: 14
Average Score: 76.2
Scores:        1524.0, -1228.0, -480.0, 551.0, 14.0
Win Rate:      2/5 (0.40)
Record:        Win, Loss, Loss, Win, Loss
```

d) Minimax Ghost vs Expectimax Pacman

```
E:\python_code\prac4_Pacman>python2 pacman.py -p ExpectimaxAgent -g MinimaxGhost -q -n 5
Pacman died! Score: -306
Pacman emerges victorious! Score: 1323
Pacman died! Score: 93
Pacman died! Score: -5062
Pacman died! Score: -530
Average Score: -896.4
Scores:        -306.0, 1323.0, 93.0, -5062.0, -530.0
Win Rate:      1/5 (0.20)
Record:        Loss, Win, Loss, Loss, Loss
```

	Minimax Ghost	Random Ghost
Minimax Pacman	Won:0/5 Avg.Score: -537.0	Won:0/5 Avg.Score:0.0
Expectimax Pacman	Won:1/5 Avg.Score: -896.4	Won:2/5 Avg.Score:76.2

3. Expectimax Pacman did better assumption than Minimax Pacman for both Random Ghost and Minimax Ghost.

1) Expectimax Pacman vs Minimax Ghost

   The Expectimax Pacman no longer looking at the worst case, and instead looking for the average case. However the Minimax Ghost always consider the Pacman to get the maximum score. From the result, we can see Minimax Ghost has a good assumptions even when implementing with Expectimax Pacman.

2) Minimax Pacman vs Minimax Ghost

   Minimax Pacman always consider the worst case of Ghost, and Minimax Ghost always consider the worst case of Pacman, so they both can not consider the right move of the opponent.

3) Minimax Pacman vs Random Ghost

   Minimax Pacman did really bad when meet up with random ghost. Because Minimax Pacman always assume the worst situation, while the random ghost not always do that. Minimax Pacman will be good at not dying but not wining. In the minimax algorithm, the levels of the game tree alternated between maximizing a player's moves and minimizing the ghost moves until the depth limit had been reached. The pacman often stay around and not move, because he doesn't know where he'd go after eating the dot.

4) Expectimax Pacman vs Random Ghost

   Compare to Minimax Pacman, the Expectimax Pacman did better. Because Expectimax Pacman will consider the average score instead of the worst case, which means it is no longer being thought of agents which are trying to minimize Pacman's score, but rather they are now being thought to be a part of the environment.

4. The Minimax Ghost seems cooperate with each other because they both work at the opposite of the Pacman, they have the same goal. The minimax algorithm operates under the assumption that the opponent will always make the optimal choice to make the player lose the game, which is that it looks for the worst-case scenario for the pacman.