Homework 2    PS 30    October 2018

In Homework 1, you set up the various games, and in this homework you make predictions for them by the two methods of (1) iteratively eliminating dominated strategies and (2) finding Nash equilibria. For clarity’s sake, the “new parts” are in bold.

1. In the yawning example, there is no game, so don’t worry about this.

2. In the “$14.95, $18.95, $34.95” example, there is no game, so don’t worry about this either.

3. Don’t worry about the “Don’t Go to Graduate School!” article either.

4. Say that you and a friend are meeting for lunch. Both you and your friend can either be late or on time. If both of you are on time, you each get a utility of 3. If one is on time and the other is late, the prompt one gets a utility of 1 (since she has to wait around doing nothing) and the tardy one gets a utility of 4 (since she doesn’t have to wait). However, if both are late, you don’t find each other and you each get a utility of 0.

   a. Model this as a strategic form game.

   b. **Are there strongly or weakly dominated strategies in this game?**

   c. **Find the (pure strategy) Nash equilibria of this game.**

5. Say you and a friend each privately choose a whole number between 0 and 5 (that is: 0, 1, 2, 3, 4, or 5). If you both choose the same number, I will give you both that number times $100. If your number is exactly one less than your friend’s, however, you will get your friend’s number times $100 plus a bonus $100 and your friend will get nothing. Similarly, if your friend chooses a number exactly one less than yours, then your friend will get your number times $100 and you will get nothing. In any other case, both of you get nothing. So for example, if you both choose the number 5, I will give you both $500. If you choose 4 and your friend chooses 5, you will get $600 and your friend nothing. If you choose 3 and your friend chooses 2, then your get nothing and your friend gets $400. If you choose 3 and your friend chooses 5, you both get nothing.

   a. Model this as a strategic form game.

   b. Read the article “Hollywood’s Death Spiral” by Edward Jay Epstein on the web site. Can you use this game to think about the situation described in the article?

   c. **“Solve” this game by iteratively eliminating weakly dominated strategies.**

   d. **Find the (pure strategy) Nash equilibria of this game.**
6. Ann and Bob are each trying to win a prize in a school raffle (lottery). Each can buy either 0, 1, 2, or 3 raffle tickets. Ann and Bob are the only two people in the raffle, and each ticket has an equal chance of winning. The prize is worth $60. If no one buys any tickets, the raffle is cancelled.

   For example, if Ann buys 2 tickets and Bob buys 3 tickets, then there are a total of 5 tickets in the raffle. Since Ann has 2 tickets, she has a 2/5 chance of winning. Since Bob has 3 tickets, he has a 3/5 chance of winning. Since the prize is worth $60, and Ann has a 2/5 chance of winning, her payoff is $24. Since the prize is worth $60, and Bob has a 3/5 chance of winning, his payoff is $36.

   a. Say that raffle tickets are free. What does the game look like? Are any strategies in this game strongly or weakly dominated? Can you iteratively eliminate strongly or weakly dominated strategies? What are the (pure strategy) Nash equilibria of this game?

   b. Now say that raffle tickets cost $6 each. What does the game look like? Are any strategies in this game strongly or weakly dominated? Can you iteratively eliminate strongly or weakly dominated strategies? What are the (pure strategy) Nash equilibria of this game?

   c. Now say that raffle tickets cost $10 each. What does the game look like? Are any strategies in this game strongly or weakly dominated? Can you iteratively eliminate strongly or weakly dominated strategies? What are the (pure strategy) Nash equilibria of this game?

7. Say that Spy 1 is trying to listen in on Spy 2. There are three rooms, A, B, and C, arranged in a line like this: A—B—C. In other words, A is on the left, B is in the middle, and C is on the right. Each spy must decide independently and simultaneously which room to enter. Their payoffs are determined as follows. If they both choose the same room, then they will see each other, a bloody gun battle will ensue, and both get payoff −10. If they are in adjacent rooms (for example, if Spy 1 is in room A and Spy 2 is in room B) then Spy 1 can set up her eavesdropping equipment and can intercept Spy 2's communications; hence Spy 1 gets a payoff of 5 and Spy 2 gets a payoff of −5. If they are not in adjacent rooms and they are not in the same room (for example, if Spy 1 is in room A and Spy 2 is in room C) then the distance between them is too great for the eavesdropping equipment to work; Spy 1 gets no secrets and Spy 2 gets to keep hers, and so both get a payoff of 0.

   a. Model this as a strategic form game.

   b. Are any strategies in this game strongly or weakly dominated? Can you iteratively eliminate strongly or weakly dominated strategies? What are the (pure strategy) Nash equilibria of this game?
8. Say that persons 1, 2, and 3 each decide whether to go to restaurant $A$ or restaurant $B$. Person 1 wants the dinner group to be as large as possible. For person 1, the worst thing is if she goes to a restaurant alone, the best thing is if all three go to the same place, and going with one person (it doesn’t matter which) is OK, neither best or worst. Person 2 is the exact opposite; she wants the dinner group to be as small as possible. All person 3 cares about is going to the same place as person 1, since he likes person 1.

a. Model this as a strategic form game.

b. Are any strategies in this game strongly or weakly dominated? Can you iteratively eliminate strongly or weakly dominated strategies? What are the (pure strategy) Nash equilibria of this game?

c. Now say that person 3 loses interest in person 1 and becomes grouchy like person 2. Model this as a strategic form game.

d. Are any strategies in this game strongly or weakly dominated? Can you iteratively eliminate strongly or weakly dominated strategies? What are the (pure strategy) Nash equilibria of this game?

9. Say that there are two people, a security guard and a thief. The security guard can either be vigilant or relax. The thief can either steal or do nothing. If the guard is vigilant, then the thief would rather do nothing than steal. If the guard is relaxed, however, the thief would rather steal than do nothing. If the thief steals, the guard would rather be vigilant than be relaxed. If the thief does nothing, however, the guard would rather be relaxed than vigilant.

a. Model this as a strategic form game. Feel free to choose payoffs which make sense to you.

b. What are the (pure strategy) Nash equilibria of this game?


a. Are any strategies in this game strongly or weakly dominated? Can you iteratively eliminate strongly or weakly dominated strategies? What are the (pure strategy) Nash equilibria of this game?

11. Look at Clip 1 of Return to Paradise on the web site (look under the “Media Clips” link). Model the situation as a game with two players (Sheriff and Tony). Feel free to choose payoffs which make sense to you (that’s what makes the problem kind of interesting).

a. In your version of the game, are there strongly or weakly dominated strategies? What are the (pure strategy) Nash equilibria of this game?