Problem Set #1
Due date Tuesday October 4

PART I: Problems

1) In-class on Thursday September 22, we played a game of competition between two firms. Recall each firm decides how many scooters to produce. They can choose to produce 0, 1, 2, 3, 4, or 5 scooters. They make their production choice simultaneously. The price of scooters falls the more scooters that are produced. In particular, if \( x_1 \) and \( x_2 \) are the number of scooters produced by firms 1 and 2 respectively, the price of scooters is given by the expression \( 10 - x_1 - x_2 \). (To make the numbers a bit more realistic you can think of this as being in units of thousands of dollars). Each scooter costs 1 (thousand dollars) to produce. Each firm’s profit can be found by calculating:

\[
\text{[Scooter Selling Price – Cost per Scooter] x [Number of Scooters produced]}
\]

a) Suppose each firm only considers the options of producing 2, 3, 4, or 5 scooters. Also suppose each firm’s payoff is their profit. Describe this game as a 4x4 strategic form game, and calculate the numbers in the bimatrix.

b) Are there any weakly or strongly dominated strategies? If so, identify them.

c) Represent this strategic form game in an equivalent extensive form game.

2) In the problem above,

a) If firm one produces 2 scooters, what strategy produces the most profit for firm two? (This is called a best response or best reply.) What about if firm one produces 3, 4 or 5 scooters?

b) If firm two produces 2 scooters, what strategy produces the most profit for firm one? What about if firm two produces 3, 4 or 5 scooters?

c) Is there a pair of production choices such that each firm is playing a best response to each other. If so identify such a pair. What profit does each firm make in this pair?

3) In the problem above,

a) Suppose the original situation changes. In particular, suppose firm one chooses its production amount first and then firm 2, after observing what firm 1 did, chooses its production amount. Represent this new situation as an extensive form game.

b) Suppose that firm one has committed to making 5 scooters, and now it’s firm 2’s turn to move. What choice will make the most profit for firm 2? What is firm 1’s profit if firm 2 chooses its best response?

4) Harrington Chapter 2, problem 1, page 51
5) Harrington Chapter 2, problem 6, page 52
6) Harrington Chapter 3, problem 6, page 89
7) Harrington Chapter 3, problem 9, page 90
PART II: Project Brainstorming

8) Think of two ideas for project topics that you could suggest to your group. We ask that everyone do this individually. For each idea please briefly explain:
   a. Who are the players in the situation that is of interest to you?
   b. Why do these players have differing interests? (e.g. an employee is interested in raising his income and working less while an employer wants to maximize profit, or a suspect is interested in minimizing his expected time in jail, but is less concerned with how long his accomplices are in jail.)
   c. What are the actions each player can take that have effects both on themselves and the other players?