Intermediate Microeconomic Theory
ECN 100B, Fall 2019
Professor Brendan Price

Section Problems #5
(Week of Monday, November 4)

Who's on first?

Two firms compete by choosing quantities, as in the Cournot and Stackelberg models of oligopoly. However, unlike the continuous versions we discussed in class, suppose that each firm can only choose among three levels of output (Low, Medium, High):

		Firm 2		
		Low	Medium	High
Firm 1	Low	18, 18	15, 20	9, 18
	Medium	20, 15	16, 16	8, 12
	High	18, 9	12, 8	0, 0

a. Suppose that the firms choose their quantities at the same time, as in the Cournot model. Find the pure strategy Nash equilibrium. What are the equilibrium payoffs?

b. Now suppose Firm 1 moves first, followed by Firm 2. (As in the dynamic games we studied in class, assume that Firm 2 observes which action Firm 1 chooses.)

   Draw the game tree, then find the subgame perfect Nash equilibrium. (Be sure to specify each firm's complete "if-then" strategy.) What sequence of actions will we see the firms actually play if they use these strategies? What are the equilibrium payoffs?

c. Consider this pair of strategies:

   - Firm 1's strategy: "Low".
   - Firm 2's strategy: "If Firm 1 chooses Low, we'll choose Medium. Otherwise, we will choose High."

   Is this pair of strategies a Nash equilibrium? If yes, is it subgame-perfect?

Fortune favors the bold

Consider a duopoly market in which total demand is given by $p(Q) = 72 - 2Q$, where $Q = q_1 + q_2$. The firms have identical costs, given by $C_1(q_1) = 24q_1$ and $C_2(q_2) = 24q_2$.

a. Suppose the firms choose their quantities at the same time (as in the Cournot model). Find the Nash equilibrium quantities q_1^* and q_2^*. Compute each firm's profits.

b. Now suppose that Firm 1 chooses its quantity first, followed by Firm 2 (as in the Stackelberg model). Find the Nash equilibrium quantities q_1^* and q_2^*. Show that, relative to the Nash equilibrium we saw under Cournot, Firm 1's profits have gone up and Firm 2's profits have gone down.

