Quiz 5 ANSWERS, G300

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The total number of points is 50. Score distribution:
0-9: 5
10-19: 10
20-29: 7
30-39: 3
40-50: 5.

1. Consider the payoff matrix below.

		B: Up	B: Down
A	Up	4,4	0,0
	Down	0,0	1,1

(a) (4 points) What game from this course does this payoff matrix represent?

ANSWER. This is a Ranked Coordination game.

(b) (6 points) The game has two pure-strategy equilibria. It also has a mixed strategy equilibrium. With what probability does A choose Up in the mixed-strategy equilibrium?

ANSWER. In the mixed strategy, A chooses its probability u of UP to make B indifferent between his pure strategies. Thus,

Payoff (up)= 4 u + (0) (1-u) = Payoff (down) = 0 u + 1 (1-u).

This means that 4u=1-u, and u = .20.

2. (8 points) Route 222 is curved like a half circle between Springfield and Smallsville, and is 100 miles long. The state government has imposed a price floor on gasoline of 2 dollars per gallon, and given a license to just one gas station, which is located 80 miles out of Springfield. Now, after paying large campaign contributions, a second company is allowed to open a gas station. Where should they locate it, and why?

ANSWER. The second company should locate 79.9 miles out of Springfield, just before the old gas station. That way the second company will get the business of all the people who might drive there from Springfield and the points in between. If the second company located on the other side of the old gas station, it would only get business from people between there and Smallsville, a much smaller area.

3. Four firms must simultaneously choose output of their cola drinks for the year. Each firm has a somewhat different product. The demand curve facing Firm 1 is

$P_1 = 64 - 3Q_1 + Q_2 + 2Q_3 + Q_4$

Firm 1 has a marginal cost of 1 per unit of output regardless of its output, and a fixed cost of 2.

(a) (6 points) What is Firm 1's profit function?

ANSWER. Firm 1's profit function is

$P_1 Q_1 - \quad Q_1 - 2,$

which can be better written as

$(64 - 3Q_1 + Q_2 + 2Q_3 + Q_4) Q_1 - \quad Q_1 - 2$

or

$(63 Q_1 - 3Q_1^2 + Q_2Q_1 + 2Q_3Q_1 + Q_4 Q_1 - 2$

(b) (10points) If each of the other firms produces output of 2, how much should Firm 1 produce?

ANSWER. Maximizing its profit, Firm 1 should set the derivative of its profit function equal to zero, so

$63 - 6Q_1 + Q_2 + 2Q_3 + Q_4 = 0.$

Plugging in the values of the other firms' outputs yields

$63 - 6Q_1 + 2 + 4 + 2 = 0.$

Thus, $6Q_1 = 71$, and $Q_1 = 71/6$ when profits are maximized.

4. (10 points) In the story of the previous question, both the Old gas station and the New competitor were worrying a lot about what the governor of the state would decide, because each one had to decide whether to place an order for extra cans of automobile oil for the next year. Each thought there was a 20 percent chance the governor would approve New competitor's gas station. The governor told New Competitor first, after which New competitor placed their order for 0 or 300 cans. Old Gas Station had a spy in the oil company, who would tell them New Competitor's order, but Old Gas Station had to place its own order of 20 or 500 cans without knowing the governor's decision.

Draw a game tree representing the moves and information in this game. You do not need to include the payoffs, since I haven't given you any information on them.

ANSWER. (not in the version posted on the web, but included in the hardcopy)

5. (6 points) Seven firms are selling keyboards in the same market in a country that has no anti-trust laws, and whose courts will even enforce cartel agreements. What will happen?

ANSWER. Probably they will create a formal cartel agreement to keep output down to the monopoly level, sharing the output among the firms, perhaps making side-payments to equalize out profits. It may well happen, however, that they cannot all agree on how to split the profits in such a cartel. One company might stay out, for example, and produce more than it would otherwise, taking advantage of the restraint of the other firms. Or, it might be that none of the companies will reach agreement with each other to keep output low, because of disagreement over how to split the profits, and the price will be something above cost but below the monopoly level. This is what happened in class, so you should definitely have included this possibility.