Economics 204 B Winter 2017
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Problem Set #2

Instructions. Due in class February 7. Collaboration is encouraged with two caveats: (a) key contributions should be acknowledged, and (b) write-ups should be sole-authored.

Part I. Problems. When insufficient information is provided, write down a plausible specific assumption and proceed to the solution.

1. a. Draw a game form ("tree trunk") for a three move situation in which the first move is a choice between R and L, the second move is a choice between r and l, and the third move is a choice between ρ and λ.

b. Suppose that the first move is owned by player 1, the second by player 2 and the third by player 1 (again). Player 2 observes player 1's first move. At his last move, player 1 does not observe player 2's move, though he remembers his own initial move. Complete the game tree (except the payoffs) accordingly.

c. For the tree in part b., write out the complete set of pure strategies for each player. (Hint: remember that each strategy is a *complete* contingency plan!) Then write out the full normal form and the reduced normal form for the game (payoffs still unspecified).

d. Alter the game in part b., as follows. At player 1's last move, he only knows whether or not the earlier moves matched. (Hint: (R, r) and (L, l) match but (R, l) and (L, r) do not.) Given a mixed strategy σ_1 for player 1 and σ_2 for player 2, what is the probability that player 1 chooses ρ on his final move, given that he is in the information set for matched earlier moves?

e. [extra credit, but not especially hard.] Does an arbitrary mixed strategy for player 1 for the game in part b. induce a unique behavior strategy? Does it for the game in part d.? (Hint: think about imperfect recall, and look for a discussion of Kuhn's theorem in MCWG or elsewhere.)

2. [Based on a paper by A. Rubinstein]. An absent-minded driver can either turn south or continue east through two junctions. His payoffs are 0 if he turns at the first junction, 4 at the second, and 1 if he doesn't turn.

a. Draw and solve the decision tree given perfect information.

b. Draw the tree if the driver can recognize a junction but has no clue whether it is the first or the second.

c. What is the driver's optimal behavior and corresponding expected payoff in b? You should consider mixed strategies that are consistent with imperfect recall.

d. [Extra credit] Do you see anything paradoxical (or "time-inconsistent") about your solution in c? If so, resolve the paradox.

3. Consider the matching pennies game, where the payoff parameters a,b,c,d are all positive:

	h	t
H	a, 0	0, d
T	0, c	b, 0

a. Verify that there are no pure NE, and compute the unique mixed NE s*.

b. Derive the comparative statics—precisely how does each player's NE mix change when each of the parameters change?

c. Most people have the intuition that changes in player i's payoff will affect the equilibrium mix mainly for player i, and have little or no effect on the mix for other players j. Try to reconcile this intuition with your findings in part b.

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4. a. Compute all NE of the following 2 player normal form game.

	L	C	R
T	2, 0	1, 1	4, 2
M	3, 4	1, 2	2, 3
B	1, 3	0, 2	3, 0

b. Write out an extensive form game of perfect information with the same payoffs as above but in which Row moves first, and solve for all NE.

5. Software and Hardware form a joint venture in which they agree to split revenue evenly. Each can exert either high effort at cost 20 or low effort at cost 0. Hardware moves first but Software does not observe her effort. Revenue is 100 if both exert low effort, or if parts are defective. If parts are not defective, revenue is definitely 200 if both exert high effort, and is 200 with probability 0.1 (and 100 with probability 0.9) if only one partner exerts high effort. Both partners initially believe the probability of defective parts is 0.3. Hardware discovers the truth before she chooses effort level, but Software does not.

a. Draw the game tree, including the non-trivial information sets for Software.
b. Write out the bimatrix for the corresponding normal form.
c. Find all NE for the game in b.
If we have covered the relevant topics before the due date, then
d. Compute all Bayesian Nash equilibria (BNE).
e. In BNE (if several, pick one), what is Software's belief about Hardware's choice?
f. In a branch where Software chose high effort and sees revenue of 100, what is her belief that the parts were defective?

II. Textbook problems. Skim all the problems in MCWG Chapter 7-8. Write up and turn in solutions to 8.D.9 and 8.E.1. For extra credit, also do 8.D.5.

III. Short essay. Write briefly (about 100 words) for an audience whose technical background is similar to yours. Please print it in an easily-read format.

What are the differences between Nash equilibrium, rationalizable equilibrium and IDDS? In your opinion, which is most plausible and/or useful? Explain very briefly.

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