

Game Theory: Homework

Mathematics 170

due Friday, December 10, 2004

1. *Mathematics and Politics*, Chapter 7, page 184, problem 14. Hint: either b or c is the second largest entry. Consider the two cases separately.
2. Suppose the utilities to Row of a game are

	C	N
C	2	-1
N	0	1

- (a) If Row knew that Column would pick C with a probability of 100%, what should Row's optimal strategy be? What utility would Row expect from this strategy?
 - (b) If Row knew that Column would pick C with a probability of 25%, what should Row's optimal strategy be? What utility would Row expect from this strategy?
3. Suppose we model the current conflict in Ukraine between supporters of Yushchenko and Yanukovich as a game. Let's say Yanukovich (who is already in power, and who won the disputed election) can either call for new elections or simply claim power. Let's say Yushchenko can either attempt to gain power through protesting, or concede defeat.

The utilities of the outcomes are:

- Yan. calls for new elections, Yush. concedes defeat: (+2 for Yan., -2 for Yush.)
- Yan. claims power, Yush. concedes defeat: (+6 for Yan., -10 for Yush.)

- Yan. calls for new elections, Yush. protests: (-2 for Yan., +5 for Yush.)
 - Yan. claims power, Yush. protests: (-4 for Yan., +4 for Yush.)
- (a) Do either of the sides have a dominant strategy? If so, what?
 - (b) Are there any Nash equilibria? If so, what?
 - (c) If Yanukovych doesn't know anything about Yushchenko's preferences, what should his optimal strategy be?
 - (d) If Yanukovych knows Yushchenko's preferences, what should his optimal strategy be?
 - (e) If Yushchenko doesn't know anything about Yanukovych's preferences, what should his optimal strategy be?
 - (f) If Yushchenko knows Yanukovych's preferences, what should his optimal strategy be?
4. Consider the following game. Starting from CC, with Row going first, find the Theory of Moves prediction. Use the "draw" criterion as in class, i.e. if the players end up back at CC, the game ends.

	C	N
C	(2,3)	(3,1)
N	(4,2)	(1,4)

5. Consider this model of conflict between Rwanda and Congo. Both countries can either send troops to their border or negotiate. Rwanda prefers that Congo does not send troops, and secondarily prefers sending troops. Congo prefers that Rwanda does not send troops; if Rwanda does send troops, Congo prefers to also send troops, but if Rwanda does not, Congo prefers to negotiate.
- (a) Write the matrix of a 2×2 ordinal game representing this situation. Determine the Nash equilibrium.
 - (b) Starting from the Nash equilibrium, with Rwanda moving first, use the Theory of Moves to determine whether the two sides will move away from the Nash equilibrium.
 - (c) Do the same thing with Congo moving first.