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Econ 160: Game theory and Economic Applications
Winter 2005

Problem Set 1 - Due 1/13/2005

1 Dominated Strategies

In the following normal-form game, which strategy profiles survive iterated elimination of strictly dominated strategies?

		Player 2		
		L	C	R
Player 1	U	$4,6$	$0,4$	$6,0$
	M	$6,0$	$2,2$	$7,3$
	D	$6,8$	$2,4$	$3,5$

2 The p-Beauty Contest

We played a game in class in which each player chose an integer between 0 and 20, and the winner was selected randomly among the players who were closest to $\frac{3}{4}$ of the average. This game is called the **p-beauty contest**, since unlike a standard beauty contest, you are not trying to guess what everyone else is guessing (hence, beauty is what people choose it to be), but rather guess p times the average, in this case $p = \frac{3}{4}$. Assume that there were n players in the class, where $n < \infty$ (there are a finite number of students in the class).

1. Which strategy (or strategies) of each player are eliminated after one round of elimination of **strictly** dominated strategies?

A strategy $s_i' \in S_i$ of player i is *weakly dominated* if there is some strategy $s_i \in S_i$ such that $u_i(s_i, s_{-i}) \geq u_i(s_i', s_{-i})$ for all $s_{-i} \in S_{-i}$.

2. How many rounds of elimination of **weakly** dominated strategies are needed to reach the set of strategies that survive iterated elimination? What is this set?

3. Does your answer to 2 above change if $p = \frac{1}{4}$?\

3 In the Neighborhood

There are n neighbors, each can choose to spend time cleaning the neighborhood where their limit is 2 hours. So, each can choose an amount of time $0 \leq x_i \leq 2$. After all the cleaning is done, the payoff of for each person is $v > 0$ times the sum of all efforts of all players, less his own effort x_i . (that is, assume that the personal cost of time is $c(x_i) = x_i$, whereas the benefit to each player is the same, for example, they all equally enjoy a clean neighborhood.) All the efforts are chosen simultaneously (i.e., each player chooses his/her effort without observing the other players' choices).

(*i*) Formulate this situation as a normal-form game.

(*ii*) What is the pure-strategy Nash equilibrium of this game when $v < 1$. Is it Pareto optimal?

(*iii*) If $v = 0.5$ and $n = 4$, would the neighbors prefer an outcome different from (ii) above?

(*iv*)What is the intuition for your conclusions in (*ii*) and (*iii*) above?