

# 4109H: Game Theory, FALL 2005

## Homework 1

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September 15, 2005

**This homework is due on Thursday, September 22 at 4pm in class. All 2-player games have Player 1 choosing rows and Player 2 choosing columns.**

1. (20 points) Gibbons 1.4
2. (20 points) Gibbons 1.8
3. (20 points) There are 10 battlefields with military values  $a_1 < a_2 < \dots < a_{10}$ . Each player is endowed with  $n_i < 10$  soldiers ( $i = 1, 2$ ). A player's decision is to send his soldiers to these various battlefields. A player can send at most one soldier to a given battlefield. When the fighting begins, each player wins  $a_j$  for each battlefield  $j$  where he has a soldier but his opponent does not. The winner of the war is the army whose occupied territory has the highest total military value.
  - a) Write the normal form of this game. In order to do that you need to find a suitable mathematical description of  $S_i$  and  $u_i$ .
  - b) Show that you can find a unique outcome of the game by eliminating strictly dominated strategies.
4. (20 points) The demand for tobacco is given by

$$q = 100000(10 - p)$$

where  $p$  is the price per pound. However, there is a government price support program for tobacco that ensures that the price cannot go under \$0.25 per pound. Three tobacco farmers have each harvested 600000 pounds of tobacco. Each has to make an independent decision on how much to ship to the market and how much to discard.

a) Show that there are two Nash Equilibria, one in which each farmer ships the whole crop, and a second, in which each farmer ships 250000 pounds and discards the rest.

5. (20 points) Find all mixed strategy Nash Equilibria of the following game (Chicken):

	Turn	Go
Turn	-1, -1	-6, 6
Go	6, -6	-10, -10