

**EVOLUTION AND THE THEORY OF GAMES (Spring 2009)**  
**EXERCISES 1 - 4**

1. Consider a game with the following pay-off matrix:

(5,4)	(3,4)	(1,3)	(1,5)
(0,1)	(2,3)	(4,2)	(4,1)
(2,1)	(3,2)	(0,1)	(2,2)

Find all (a) dominating strategy solutions and (b) minmax solutions whenever they exist.

2. Colonel Blotto is faced with the following problem: The Enemy is about to reinforce its army in Middle Island and has the choice of two alternative routes. He can sail either via the Northern Route, where the weather is rainy, or via the Southern Route, where the weather is generally fair. In any case, the journey will take three days. Colonel Blotto has to decide where to concentrate the bulk of his reconnaissance aircraft. The Enemy wants its ships to have the least possible exposure to enemy bombers, and, of course, Colonel Blotto wants the reverse. The following matrix gives the expected number of days of bombing exposure.

		Enemy's choice:	
		North	South
Blotto's choice:	North	2 days	2 days
	South	1 day	3 days

What route would you advise Colonel Blotto to send his aircraft to and why?

3. Two players put an integer number of euros (1,2,3,...) in a pot without knowing the number of the other. The player with the highest number wins and receives a reward of three euros. What is in the pot is confiscated by the referent. Give the strategy sets and payoff functions of both players as well as the payoff matrix if in case of a draw (a) neither player gets the reward and the referent keeps the pot, or (b) neither player gets the reward but the contribution to the pot is returned, or (c) each payer gets half the reward but the referent keeps the pot.

How would you play this game and why?

4. Two duellists stand  $2N$  paces apart with loaded pistols and start to walk to each another. At each pace they can decide to fire their one bullet, and the chance of hitting and killing their opponent increases as they get nearer. If they fire and miss, honor demands that they still keep walking nearer. (a) Model this game by defining the strategy sets and the payoff functions. (b) In a normal duel you would know if your opponent had fired and missed. Now suppose that the pistols are completely silent so that the fact that you are alive can mean one of two things: your opponent hasn't fired yet, or he fired but missed. How does this "silent duel" differ from the "noisy duel"?