Game Theory Week 1: Monday Exercises

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1. Describe the Nash equilibrium of the following game.

	L	R
T	$1, 1$	$3, -1$
B	$3, -1$	$1, 1$

2. Two neighboring towns are deciding how strict a new ordinance should be. Each town $i \in \{1, 2\}$ chooses a level of strictness $r_i \in [0, 1]$ where $r = 0$ is the status quo and $r = 1$ is the strictest implementation. The mayor of town 1 likes the status quo, while the mayor of town 2 prefers the stricter ordinance, but both are worried about how concordant their policy is with the other town's policy. Payoffs are:

$$u_1(r_1, r_2) = -r_1^2 - (r_1 - r_2)^2$$
$$u_2(r_1, r_2) = -(r_2 - 1)^2 - (r_1 - r_2)^2$$

Clearly, the first term in the utility function captures the loss from deviating from the optimal policy, while the second term captures that the towns are hurt by choosing very different policies.

(a) Find the pure strategy Nash equilibrium of this game. What are equilibrium payoffs?

(b) Show that in the Nash equilibrium you found in (a) players are playing their unique, rationalizable strategies.

(c) Now suppose the national government steps in and asks each town to propose a level of strictness $p_i \in [0, 1]$. The national government then forces both towns to adopt p_1 with probability $1/2$ and p_2 with probability $1/2$. Find the Nash Equilibrium of this game. What are equilibrium payoffs?