Exercise 7

General Game Playing

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Exercise 7.1

Consider the interated prisoners dilemma (lecture 7, slide 14) for n iterations. That means the prisoners dilemma game is played n times in a row and the outcome is the sum of the individual outcomes.

a) How many strategies are there?

b) Write down the normal form of the game for n=2. Find the pure nash equilibria.

Exercise 7.2

		Player 2 a	Player 2 b	Player 2 c	Player 2 d
Player 1	x	2 2	2 4	3 3	4 1
	y	5 5	5 3	1 6	2 2
	z	3 5	4 9	0 8	5 2

a) Are there strictly or weakly dominated strategies?

b) Find the pure strategy nash equilibria!

Exercise 7.3

		Player 2 a	Player 2 b	Player 2 c
Player 1	x	0 6	3 4	1 -2
	y	2 -3	0 -4	3 5
	z	1 1	2 -1	0 2

a) Find the pure strategy nash equilibria!

b) Is the following combination of strategies a mixed strategy equilibrium?
Player 1: $\left(\frac{1}{10}, \frac{2}{5}, \frac{1}{2}\right)$, Player 2: $\left(\frac{1}{3}, \frac{1}{9}, \frac{5}{9}\right)$

Exercise 7.4

In the following three-player game, player 1 has strategies t and b (top and bottom row), player 2 has strategies l and r (left and right column in each matrix), and player 3 has strategies L and R (left and right matrix). The payoffs in each cell are given in the order of the players.

		Player 2	
		l	r
Player 1	t	$3,4,4$	$1,3,3$
	b	$8,1,4$	$2,0,6$

Player 3: L

		Player 2	
		l	r
Player 1	t	$4,0,5$	$0,1,6$
	b	$5,1,3$	$1,2,5$

Player 3: R

Apply iterated elimination of strictly dominated strategies to this game. What are the Nash equilibria?

Exercise 7.5 (optional)

On a beach there are several ice-cream vendors competing for customers. Since they all sell the same brand the price of the ice-cream is fixed and the customers just go to the nearest ice-cream stall. For simplicity, consider the beach to be one-dimensional and of limited length l. The number of ice-cream vendors is n. If two or more vendors are at the same position, customers are evenly distributed among them. A strategy for each ice-cream vendor is to choose a position on the beach, that means a real number between 0 and l.

a) Find a pure nash equilibrium for $n = 2$!

b) Find a pure nash equilibrium for $n = 4$!