

Quiz 1 Game Theory

Abolfazl A. Ansari

May 2022

(a)

Find pure-strategy Nash equilibrium of the following game:

Best response for first player:

	L	M	N	R
Up	1,1	2,2	3,4	9,3
Down	2,5	3,3	1,2	7,1

Best response for second one:

	L	M	N	R
Up	1,1	2,2	3,4	9,3
Down	2,5	3,3	1,2	7,1

Pure Nash equilibrium:

	L	M	N	R
Up	1,1	2,2	3,4	9,3
Down	2,5	3,3	1,2	7,1

(b)

Find mixed-strategy equilibrium of the game and find expected payoffs.

reductions tasks

	L	M	N	R
Up	1,1	2,2	3,4	9,3
Down	2,5	3,3	1,2	7,1

$N \gg R$. so R deleted

	L	M	N
Up	1,1	2,2	3,4
Down	2,5	3,3	1,2

$1/2 * L + 1/2 * N = (5/2, 7/2) \gg (2, 3) = M$, so M deleted

	L	N
Up	1,1	3,4
Down	2,5	1,2

expected payoffs:

$$\begin{aligned} (*) \quad y + 3(1 - y) &= 2(y) + (1 - y) \\ 3 - 2y &= y + 1 \\ y &= 2/3 \end{aligned}$$

$$\begin{aligned} (**) \quad x + 5(1 - x) &= 4x + 2(1 - x) \\ 5 - 4x &= 2x + 2 \\ x &= 1/2 \end{aligned}$$

$x = 1/2, y = 2/3$ substitute in (*), (**):
expected payoff in the mixed-strategy = $(5/3, 3)$