# Game Theory
## Exercise Sheet 2

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Students: Andreas Frorath, Tarek Saier

## Exercise 2.1

$G = \langle N, (A_i), (u_i) \rangle$ with
$N = \{1, 2\}$
$A_i = \{Rock, Paper, Scissors, Lizard, Spock\}$
and payoff matrix:

| | *Rock* | *Paper* | *Scissors* | *Lizard* | *Spock* |
|---|---|---|---|---|---|
| *Rock* | 0 , 0 | -1 , 1 | 1 , -1 | 1 , -1 | -1 , 1 |
| *Paper* | 1 , -1 | 0 , 0 | 1 , -1 | -1 , 1 | 1 , -1 |
| *Scissors* | -1 , 1 | 1 , -1 | 0 , 0 | 1 , -1 | -1 , 1 |
| *Lizard* | -1 , 1 | -1 , 1 | 1 , -1 | 0 , 0 | 1 , -1 |
| *Spock* | 1 , -1 | -1 , 1 | 1 , -1 | -1 , 1 | 0 , 0 |

## Exercise 2.2

**(a)**
$d_2$ stictly dominates $a_2$, eliminating $a_2$ leaves us with:

| | $b_2$ | $c_2$ | $d_2$ |
|---|---|---|---|
| $a_1$ | 2 , 7 | 1 , 4 | 0 , 3 |
| $b_1$ | 3 , 2 | 2 , 1 | 1 , 1 |
| $c_1$ | 2 , 2 | 1 , 5 | 6 , 1 |
| $d_1$ | 1 , 2 | 0 , 2 | 3 , 9 |

$b_1$ stictly dominates $a_1$, eliminating $a_1$ leaves us with:

| | $b_2$ | $c_2$ | $d_2$ |
|---|---|---|---|
| $b_1$ | 3 , 2 | 2 , 1 | 1 , 1 |
| $c_1$ | 2 , 2 | 1 , 5 | 6 , 1 |
| $d_1$ | 1 , 2 | 0 , 2 | 3 , 9 |

**(b)** Set of Nash equilibra: $\{(b_1, b_2)\}$
Player 1 should therefore play $b_1$.