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Problem Set 1

Exercise 1. Two children of a tree, called 1 and 2, are choosing among a set of combinations of colors they will wear, starting with color 1. In the first round of the game, child 1 chooses a color from the set  $\{1, 2, 3, 4, 5\}$ . In the second round, child 2 chooses a color from the set  $\{1, 2, 3, 4, 5\}$ , and so on. The game ends when a child chooses a color that is the same as the color chosen by the other child in the previous round. The payoff to child 1 is the number of rounds that the game lasts. The payoff to child 2 is the number of rounds that the game lasts minus 1. The game ends when a child chooses a color that is the same as the color chosen by the other child in the previous round. The payoff to child 1 is the number of rounds that the game lasts. The payoff to child 2 is the number of rounds that the game lasts minus 1.

- Write down the extensive form of the game.
  - Find all the Nash equilibria of the game.
  - Find all the subgame perfect equilibria of the game.
- Exercise 2. Two children of a tree, called 1 and 2, are choosing among a set of combinations of colors they will wear, starting with color 1. In the first round of the game, child 1 chooses a color from the set  $\{1, 2, 3, 4, 5\}$ . In the second round, child 2 chooses a color from the set  $\{1, 2, 3, 4, 5\}$ , and so on. The game ends when a child chooses a color that is the same as the color chosen by the other child in the previous round. The payoff to child 1 is the number of rounds that the game lasts. The payoff to child 2 is the number of rounds that the game lasts minus 1. The game ends when a child chooses a color that is the same as the color chosen by the other child in the previous round. The payoff to child 1 is the number of rounds that the game lasts. The payoff to child 2 is the number of rounds that the game lasts minus 1.

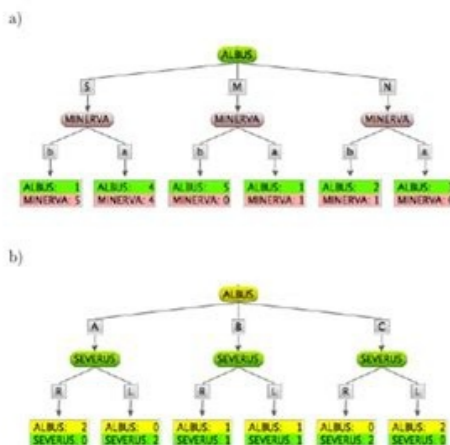
Problem Set 1 Solution

17.01.2017  
 October 18, 2014

1. Mirrow 4.11 (pp.107-9)

Suppose the two children of the tree, called 1 and 2, are choosing among a set of combinations of colors they will wear, starting with color 1. In the first round of the game, child 1 chooses a color from the set  $\{1, 2, 3, 4, 5\}$ . In the second round, child 2 chooses a color from the set  $\{1, 2, 3, 4, 5\}$ , and so on. The game ends when a child chooses a color that is the same as the color chosen by the other child in the previous round. The payoff to child 1 is the number of rounds that the game lasts. The payoff to child 2 is the number of rounds that the game lasts minus 1. The game ends when a child chooses a color that is the same as the color chosen by the other child in the previous round. The payoff to child 1 is the number of rounds that the game lasts. The payoff to child 2 is the number of rounds that the game lasts minus 1.

1. Consider the following games where the names of players are written in red and the actions in squares. In each of the following games, how many pure strategies (complete plans of action) are available to each player? List all of the pure strategies for each player. Identify the rollback equilibria outcome and the complete equilibrium strategy for each player.



<b>A</b>		1, 2	3, 4
		2, 1	4, 3
<b>B</b>		???	???
		???	???

## Business 101: Game Theory

### Problem Set 1

#### 1. Graphical Representation of Strategy-Dependent Payoffs

Consider the following game (from [http://www.econlib.org/library/Book/Leibenstein/leib101.html](#)):

	Left	Right
Up	1, 1	0, 2
Down	2, 0	1, 1

- Draw the Normal Form matrix.
- Draw the extensive form game tree for this game.
- Write your best response.

#### 2. Payoff Matrix Solution

What is the best response to the best response of the other player? (This is the best response to the best response.)

What is the best response to the best response of the other player?

What is the best response to the best response of the other player?

What is the best response to the best response of the other player?

#### 3. Equilibrium

What is the best response to the best response of the other player? (This is the best response to the best response.)

What is the best response to the best response of the other player?

What is the best response to the best response of the other player?

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