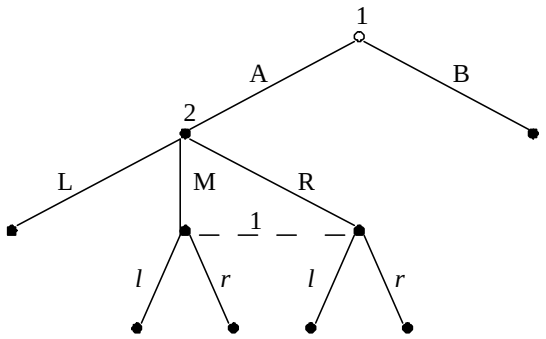
Collegio Carlo Alberto

Game Theory
Problem Set 6

1. (Mixed and behavioral strategies) Consider the following extensive-form game.



(a) Let σ_1^* denote player 1's mixed strategy in which she plays (B, r) with probability 0.4, (B, l) with probability 0.1, (A, r) with probability 0.3, and (A, l) with probability 0.2. Find the behavioral strategy of player 1 that is equivalent to σ_1^*. Can you find other mixed strategies that are equivalent to σ_1^*?

(b) Compute a behavioral strategy of player 1 that is equivalent to her mixed strategy in which she plays (B, r) with probability 0.7, (B, l) with probability 0.3. Is the behavioral strategy uniquely defined? Explain.

2. (Nash equilibria of an extensive-form game) Consider the following game. Player 1 first decides between to games A or B, then the game chosen by player 1 is played simultaneously. Player 1 knows which game is played, but player 2 does not know.

A

	L	R
U	$1, 0$	$0, 1$
D	$-1, 2$	$2, 0$

B

	L	R
U	$4, 3$	$-3, 2$
D	$1, 0$	$0, 0$

(a) Find an arbitrary mixed strategy Nash equilibrium of this game in which each pure strategy is played with positive probability. (Be careful in specifying the strategy space of each player).

(b) For the mixed strategy equilibrium you obtained in part b), give an equivalent presentation in behavioral strategies. (Be careful that mixed strategies and behavioral strategies generate the same distribution over terminal nodes).

3. (A parlor game) Formulate the following parlor game as an extensive-form game with imperfect information. First player 1 receives a card that is either H or L with equal probabilities. Player 2 does not see the card. Player 1 may announce that her card is L, in which case she must pay \$1 to player 2, or may claim that her card is H, in which case player 2 may choose to concede or to insist on seeing player 1's card. If player 2 concedes then he must pay \$1 to player 1. If he insists on seeing player 1's card then player 1 must pay him \$4 if her card is L and he must pay her \$4 if her card is H.
Define the set of strategies of each player and find the Nash equilibria of this game.