

ECON 121: Problem Set #11

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Dr. Jasmine N Fuller

Alejandro Ouslan

Problem 1

Centipedes: Imagine a two player game that proceeds as follows. A pot of money is created with \$6 in it initially. Player 1 moves first, then player 2, then player 1 again and finally player 2 again. At each player's turn to move, he has two possible actions: grab (G) or share (S). If he grabs, he gets 2/3 of the current pot of money, the other player gets 1/3 of the pot and the game ends. If he shares then the size of the current pot is multiplied by 3/2 and the next player gets to move. At the last stage in which player 2 moves, if he chooses share then the pot is still multiplied by 3/2, player 2 gets 1/3 of the pot and player 1 gets 2/3 of the pot.

- (a) Model this as an extensive form game tree. Is it a game of perfect or imperfect information?
- (b) How many terminal nodes does the game have? How many information sets?
- (c) How many pure strategies does each player have?
- (d) Find the Nash equilibria of this game. How many outcomes can be supported in equilibrium?
- (e) Now imagine that at the last stage in which player 2 move, if he chooses to share then the pot is equally split among the players. Does your answer to part (d) above change?

Problem 2

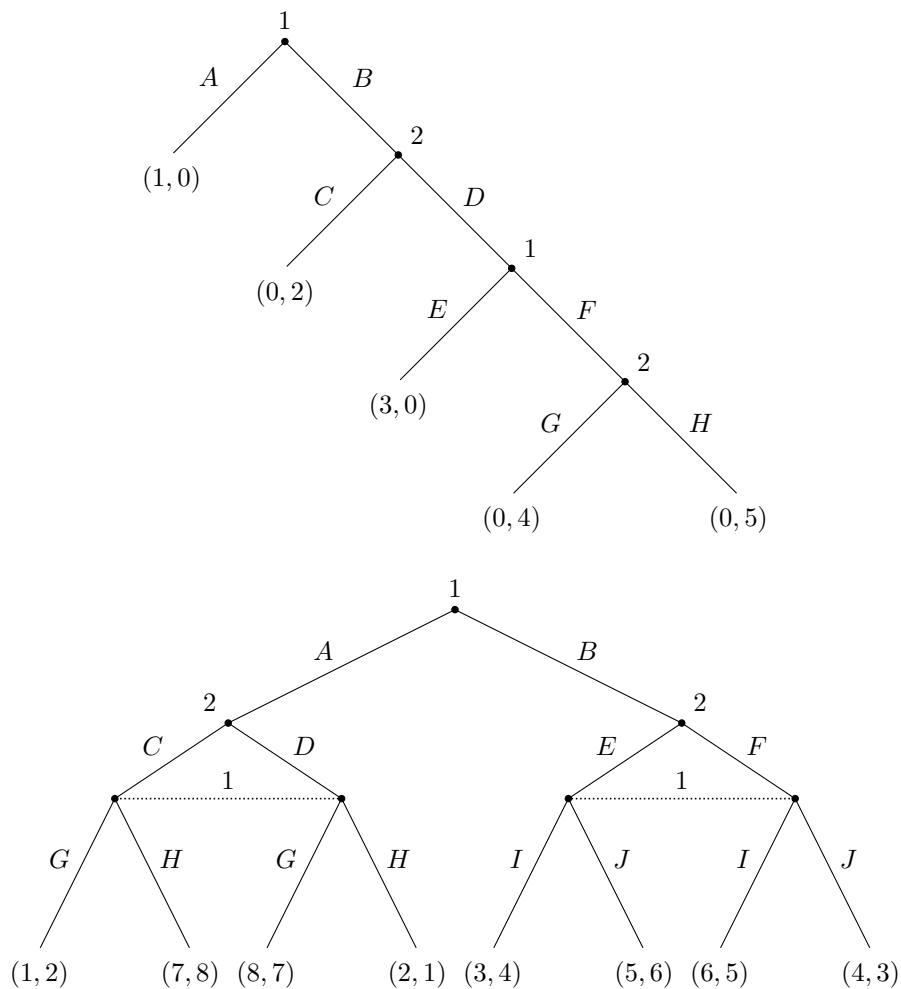
Consider two firms that play a Cournot competition game with demand $p = 100 - q$, And costs for each firm given by $c_i(q_i) = 10q_i$. Imagine that before the two firms play the Cournot game, firm 1 can invest in cost reduction. If it invests, the cost of firm 1 will drop to $c_1(q_1) = 5q_1$. The cost of investment is $F > 0$. Firm 2 does not have this investment opportunity.

Problem 3

Problem 4

Someone stole from a bloodthirsty crime boss. The boss is questioning one of his workers, seeking a confession. He says to the worker, "If you do not confess your crime, I will kill you." The worker agrees that the boss is going to kill him, but he notes that the boss' threat is not credible. Why is the worker correct? (Hint: What happens if the worker confesses?)

Problem 5



Problem 6

Consider a simplified version of the Centipedes game. There is a stack of N dollar bills. Player 1 can take \$2 and end the game, or she can take one dollar and allow Player 2 to act. Then, if there are at least \$2 left, Player 2 can either take \$2 and end the game or take \$1 and allow Player 1 to act, and so on. If there is only \$1 left, the acting player takes the dollar.

- What is the SPINE for $N = 2$? $N = 3$?
- is the outcome of the SPINE for $N = 10000000$
- A complete strategy is "always take \$1 no matter what." What is the best response to that strategy, for some N ?
- With words, while two chess grandmasters will always end up taking \$2 immediately.